The Two-Zodiac Problem:
History, Analysis, and Solution

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Abstract: Ancient stargazers initially pegged the equinox and solstice points to the constellations despite the slow drift of these points relative to the backdrop of the fixed stars. Once precession was formally discovered by Hipparchus and the zodiac was firmly moored to the cardinal points by Ptolemy, the integrity of the system was consolidated—at least in the west. Regrettably, knowledge of precession was not transmitted to India when it would have been critical to the development of their astrology. Instead, they inherited their system from the Greeks but only piecemeal and without sufficient understanding of the zodiac's astronomical basis. The result: two contradictory zodiacs.[1]

Can two zodiacs co-exist without contradiction? Both Western and Hindu astrology have a long history and should be respected as whole systems. But every field has issues, including physics, chemistry, and so on. When anomalies arise that challenge the dominant viewpoint, competing solutions are proposed and eventually a consensus is reached that inaugurates a new model. In his seminal *The Structure of Scientific Revolutions,* Thomas Kuhn asserts this is how knowledge advances. Our field is no exception. While astrology has been called the mother of all sciences, we must allow that the old girl is still evolving. For if it were not, it would be the only scientific field so defined.

Astrology is predicated on the assumption that specific periods of time have discernable qualities that are reflected in the personality and fate of people born during those periods. The foundation of this claim is the zodiac, which divides the year into twelve 30-degree segments of time, roughly corresponding to months, each with its own meaning and quality.

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The problem is that the field is currently divided by two different zodiacs, tropical and sidereal, both of which claim validity.

Aristotle's law of non-contradiction states that contradictory statements cannot both be true in the same sense at the same time. Put simply, a thing cannot be itself and not itself; March cannot be March *and* February. Given that both zodiacs use a 30-degree, 12-sign zodiac in which the meanings given to signs are roughly similar yet fall on different dates, this is a problem. Two zodiacs that assign the same meanings to different dates and different meanings to the same dates are inherently contradictory. And since these contradictions apply to every sign in the two zodiacs, Aristotle would argue that both zodiacs cannot be valid.

Differentiating the Two Zodiacs Astronomically

The essence of the problem lies in radically different ways of defining the zodiac. Both zodiacs reside along the ecliptic, which, practically speaking, is the Sun's equator extended indefinitely out into space.[1] And because the planets orbit the Sun within eight degrees above or below the plane of the ecliptic, the zodiac is a 16° band circling the Sun. However, this is where the two zodiacs part company.

The sidereal zodiac is defined as 12 equal, 30-degree c*onstellations* —groupings of stars—visible along the ecliptic. While both zodiacs begin with Aries, the sidereal zodiac defines Aries in terms of fixed stars. Conversely, the tropical zodiac places Aries at the vernal equinox (first day of spring), which is where the earth's *celestial equator* intersects the plane of the ecliptic due to the earth's axis being tilted at an angle of 23° relative to its orbital plane. Ken Bowser states the matter plainly: "The [tropical] zodiac is defined by the seasons and is disconnected from the stars as a frame of reference," whereas "the [sidereal] zodiac is defined by the stars themselves and is disconnected from the seasons as a frame of reference."[2]

These differences are sufficiently critical that further explanation is warranted. First and foremost, as Bowser makes clear, the tropical zodiac is *not* related to the constellations, except perhaps as a distant cousin.[3] Rather, it is a 360-degree orbital continuum formed of a succession of angles based on the Earth's annual revolution about the Sun. These angles, which we call tropical *signs*, are a measure of the earth's position in its orbital cycle relative to the vernal equinox.

Again, the vernal equinox is that point in space where the earth's *celestial equator* intersects the plane of the ecliptic (see Figure 1). Because the Earth's axis tilts at an angle of 23° degrees away from its orbital plane (the ecliptic), its equator is not in the same plane as the ecliptic. If the ecliptic is the Sun's equator extended into space, and the celestial equator is the Earth's equator similarly extended, it is the interaction of these two planes that comprises the substance of the tropical zodiac.

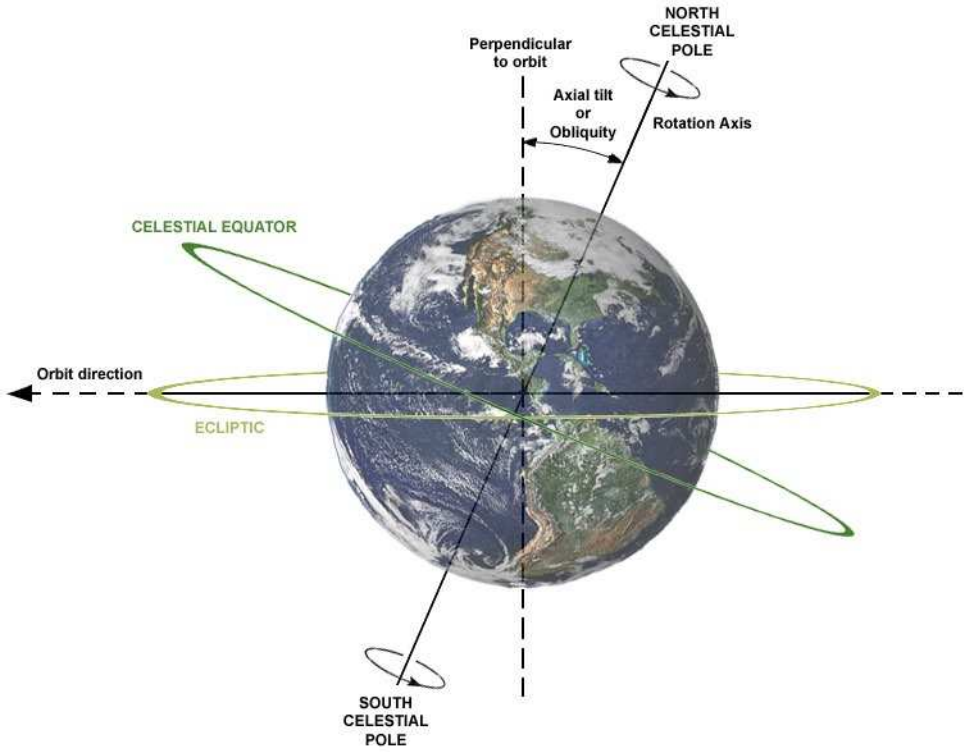

Figure 1: The earth's celestial equator is like a hoop tilted at an angle of 23° to the plane/hoop of the ecliptic. The intersection of these two planes establishes the equinox points.

There are four critical points of relationship between the plane of the ecliptic and the celestial equator. These are the *cardinal* angles of the tropical zodiac, a term deriving from the Latin 'hinge', meaning "pivotal" and "of the greatest importance." The cardinal points are cardinal precisely because they divide the year into four seasons of three months each.

At the vernal equinox—where the plane of the Earth's equator intersects the plane of the ecliptic—we have the first day of spring, or the beginning of the zodiac at zero degrees tropical Aries. Next, we have the summer solstice—that point where the northern hemisphere is tilted at its

maximum angle toward the Sun (the two planes being furthest apart)—thus marking the beginning of summer, or zero degrees tropical Cancer. Three months later at the autumnal equinox, the planes again converge, this time at zero degrees tropical Libra. They then separate over the next three months to their maximum distance at the winter solstice, which marks the shortest day of the year at zero degrees tropical Capricorn (see Figure 2).

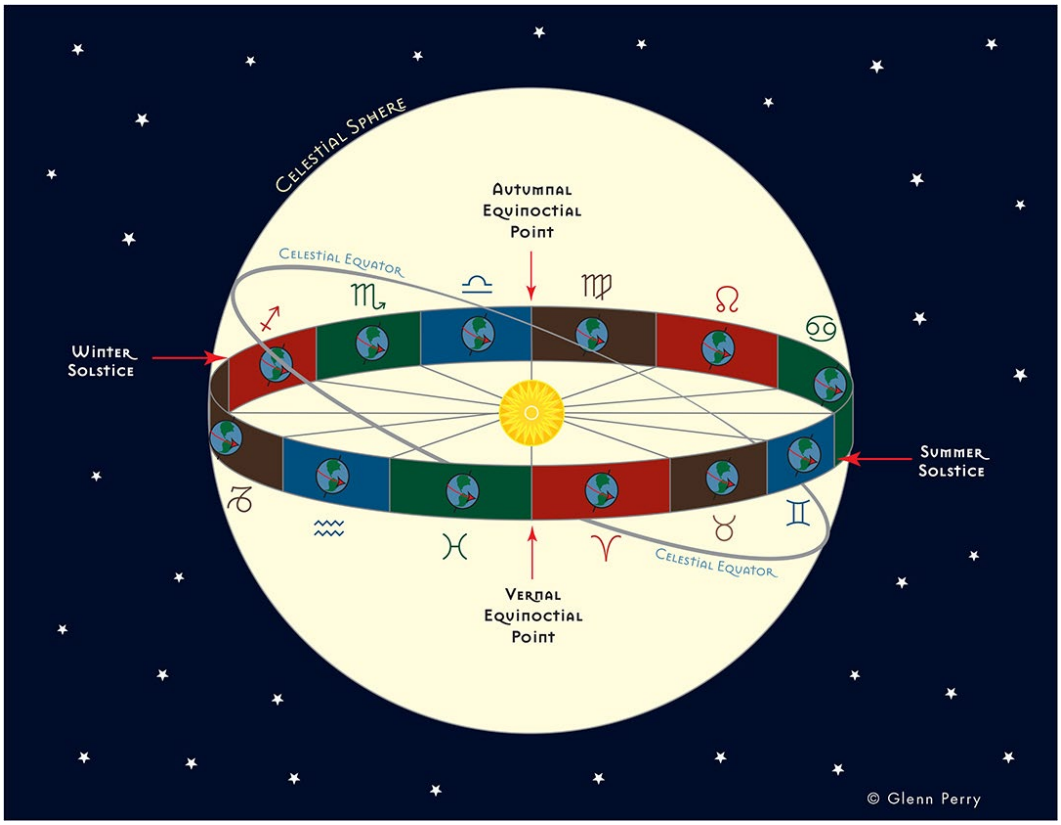

Figure 2: Earth's Orbit Marking out the Signs and Seasons
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In this side view perspective, the colored band with the 12 earth positions is the ecliptic (zodiac), which we can think of as the Sun's equator extended into space. Note how the earth's (celestial) equator intersects the ecliptic at 0° Aries and 0° Libra due to its axial tilt. It is the earth's position in the *opposite* sign that places the Sun in its proper seasonal sign. Thus, when earth enters tropical Capricorn, it is the summer solstice since the Sun will be entering tropical Cancer. This process is self-contained with no reference to stars beyond our own Sun. The tropical zodiac is entirely comprised of angles between the earth and the vernal point. These angles are *signs* rather than constellations.

Because of the Earth's axial tilt relative to its orbital plane, a succession of angles is formed between the Earth's orbital position and the vernal point (0° Aries). The first 30° from the vernal point constitutes the first degree of

Taurus, 60° marks the inception of Gemini, 90° the start of Cancer, and so on round the circle. These angles, in effect, constitute the tropical signs, while also being responsible for seasonal variations throughout the year. A zodiacal sign simply refers to the angle of the earth's orbital position relative to the vernal equinox, nothing more.

Accordingly, the tropical zodiac is a symbolization of the year as expressed in seasonal changes with each sign signifying a specific phase in the annual sequence. The key to the entire system is the equinoctial and solstitial dates. These are the four cardinal points of the tropical zodiac, marking the start of the cardinal signs Aries, Cancer, Libra and Capricorn.

In contrast to the astronomical complexity of the tropical zodiac, the sidereal zodiac is simpler with the further advantage of being visible. Sidereal signs are 30-degree constellations of the same name encircling the Sun like a belt. Like the tropical zodiac, it begins with Aries, by which I mean the *constellation* of Aries. This has been true since the formal inception of the Babylonian (sidereal) zodiac in approximately 420 BC when signs and constellations had not yet been fully differentiated. That differentiation would take another 700 years.

Due to precession of the equinoxes (a topic we will return to later), the constellations no longer have any relation to the cardinal points and therefore no connection to the seasons. Significantly, this was not the case when the zodiac began toward the end of the 2nd millennia BC in Babylonia (current day Iraq). Around that time, a jumble of different sized constellations was reduced to 12 equal 30-degree sectors along the ecliptic. These sectors were called *signs* rather than constellations, even though they meant roughly the same thing. Most importantly, the center of each cardinal sign (Aries, Cancer, Libra, and Capricorn) was placed precisely at the equinoctial and solstitial points, as if anchored to them. The vernal equinox was at 15° sidereal Aries, the summer solstice at 15° sidereal Cancer, the autumnal equinox at 15° sidereal Libra, and the winter solstice at 15° sidereal Capricorn.[4] From this, one might surmise an intention to associate specific constellations with specific seasons.

While the origins of zodiacal constellations predate recorded history, the bulk of Mesopotamian constellations were created within a relatively short interval from around 1300 to 1000 BC. Seventeen to eighteen irregularly sized constellations along the ecliptic are enumerated in the *Enuma Anu Enlil*, a series of cuneiform tablets dug up in Babylonia (modern day Iraq) in

the 19th century, mostly in the 1840s by the British archaeologist, Austen Layard.

This is where the story gets interesting. Most treatments of the sidereal-tropical debate focus on when the zodiac came into being and of what it was comprised. The consensus view is that toward the end of the second millennium BC the Babylonians converted approximately 18 fuzzy, unequal constellations into 12 sharply defined 30-degree sectors corresponding to the twelve 30-day lunar cycles that comprised the solar year. Converting arbitrarily defined constellations into 30-degree rigorously spaced months not only made for a more accurate calendar, it gave them greater computational accuracy in measuring planetary positions along the ecliptic.

At this point in history, signs and constellations were conflated; constellation was sign, and sign was constellation. In fact, there was no distinction between them. This remained so until the official advent of the tropical zodiac in the 1st century AD. The Babylonian mathematical zodiac in the 4th century BC was sidereal only in the sense that planetary positions were determined in relation to the fixed stars of the constellations. This is beyond dispute. And for advocates of the sidereal zodiac, it ends the discussion. The original and true zodiac was sidereal! Case closed!

But not so fast. Left out of this pronouncement is the critical question of why the zodiac came into being in the first place. That is, where and when did the constellations originate, and for what purpose? Defenders of the tropical zodiac claim that sign meanings were then and are now indissolubly linked with seasonal processes. As such, they served a calendrical purpose. This is the critically important point upon which the entire zodiac controversy hinges.

Each month of the year had its own discernable quality. Zodiacal signs were metaphors of seasonal processes occurring in nature. Aries was spring-like as nature was heating up and new life sprouting, bold and fresh. Libra was balanced, just as the duration of light and darkness was perfectly balanced at the start of autumn. Scorpio was transformational as leaves were turning colors, falling to the ground, and nature was dying. Capricorn was winter-like, signifying when nature was maximally contracted, days were short, and austerity was required by the impoverishment of nature.

The starry heavens comprised the ancient calendar and were a means for organizing time into discernible segments and qualities. Later, zodiacal signs came to have additional meanings that went beyond their correlation to seasonal processes. Yet – and again this is a critical point – all such meanings were self-consistent with their original, root meaning in nature. Aries, for example, signified the start of spring when life was renewing, nature heating up, and the struggle for survival paramount. From these foundational correlations were derived analogous Aries meanings pertaining to fighting, war, assertion, fresh starts, and new beginnings. Just so with the other signs, although not all their correlations to nature are as immediately obvious.

In contrast, apologists for the sidereal zodiac insist their 30-degree constellational meanings are not derived from, nor have any relation to, the seasons. They contend that constellations have intrinsic meaning and power in themselves, and that somehow these meanings were discovered independent of seasonal processes. In effect, the entire two-zodiac controversy hinges on a single question: Could constellational meanings have originated independent of the seasons? That is, could the constellations have come into being without being anchored to the equinoctial and solstitial points that mark the change of seasons? As will be shown, this is extremely unlikely.

Evidence from Archaeoastronomy

We will begin our inquiry with evidence from archaeoastronomy, a relatively new field that investigates the astronomical knowledge of prehistoric cultures. It is difficult to summarize in a few paragraphs the immensity of data detailing how early humans organized virtually every facet of tribal life in conformity with the equinox and solstice points. From Egypt and Mesopotamia, to Europe, Asia and the Americas, the story is the same: All peoples throughout the history of the globe shared a unifying vision derived from observations of the night sky that determined their annual cycle of hunting and gathering, planting and harvesting, alignment of architectural sites, organization of social structure, naming and worship of sky-gods, and timing of religious ceremonies. Early humans were so preoccupied with the equinoxes and solstices that, in the words of astro-archaeologist Evan Hadingham, "It dominated their mythology, the organization of their settlements and social lives, and even the interior arrangements of their homes."[5]

Since there are no written records from prehistoric times, one way of determining how the zodiac got started is to put oneself in the position of stone age, Neolithic humans (8000 – 5000 BC) when settled agriculture was just beginning. Unless we can place ourselves in the mind-set of humans when the night sky first took on meaning, our treatment of the problem is apt to be short-sighted, a dry, objective analysis and interpretation of facts, but without any depth of understanding. To achieve depth, we must utilize not only facts, but imagination and empathy.

We must imagine what it was like before astrology and try to empathize with early humans gazing upwards as the stars slowly drifted across the vault of heaven. There were no clocks or calendars; there was only the night sky and earthly phenomena—weather variations, vegetative cycles, animal migrations, and the like, all of which appeared to change in accord with solar and lunar movements through various sectors of the sky, which came to be known as *constellations*.

Just before dawn every morning, early humans could see a specific constellation rise before the Sun (heliacal rising). As the days proceeded, a new constellation would gradually emerge at dawn from below the horizon and in front of the Sun. The all-important Sun appeared to be advancing forward through the constellations over the course of the year. As the weather changed and days grew longer or shorter, earthly phenomena reflected changes in the duration of daylight in an ever-repeating annual cycle. Understandably, the ancients concluded it was the constellation that the Sun was currently occupying that determined such changes. Constellations were thought to be all-powerful sky gods that regulated and determined events on earth.

The ancients linked constellations to the seasons for the simple reason that the linkage was self-evident. As the Sun's movement into different constellations occurred predictably overhead, so the seasons changed below on earth, year after year, always the same way—or, so it seemed. According to archeoastronomer, E.C. Krupp, the ability to predict when the seasons were about to shift was critical to the survival of the tribe and was the prime motivation for observing the changing sky. Alterations in daylight and night, heat and cold, animal migrations, the availability of eatable vegetation (nuts, berries), and proper times for sowing, cultivating, and harvesting crops were universal human concerns and constituted the basis for organization of tribal life.[6]

Especially critical, therefore, were those times during the year when: 1) days and nights became equal in length but daylight was increasing (vernal equinox); 2) daylight was maximum but the Sun's northward movement in the sky appeared to stall and reverse (summer solstice); 3) days and nights were once more equal but darkness was increasing (autumnal equinox); and 4) daylight was minimal but the Sun's southward movement again appeared to stall and reverse itself (winter solstice), thus heralding the return of increasing daylight. These dates and their corresponding constellations marked the turn (*tropos*) of the seasons. They have been celebrated worldwide with religious festivals and sacrifices to the appropriate deity since the dawn of recorded history.

Obsession with celestial correlates to equinox and solstice dates was so prevalent in the ancient world that it constituted a kind of human unanimity, being the central defining feature of ancient ceremonial monuments virtually everywhere on earth, from the Inca's Torreon in Machu Picchu, to the Mayan pyramid of Chichen Itza, the Bighorn Medicine Wheel and Sundance Lodge of the Plains Indians, Stonehenge in England, Newgrange in Ireland, and the Great Pyramid of Egypt whose sides famously align with the four cardinal directions.

At each site there is invariably a face, an aperture, a shaft, or some other means upon or through which the rays of the Sun exactly pass on the day of an equinox or solstice, thus heralding the changing of the seasons. E.C. Krupp asserts that the precise timing of solstice and equinox dates and the construction of monuments to predict them was "an old, old religious response that is not a byproduct of culture but something that makes culture the way it is."[7]

Mythological Correlates

Not only were the equinoxes and solstices sanctified in ancient monuments, they were the source of universal myths that depicted the annual vegetative cycle. For example, the marriage of Inanna and Dumuzi was one of the defining myths of Babylonian culture, though it had parallels in other cultures.[8] As a female god associated with the last zodiacal constellation, Pisces, Inanna symbolized fecundity and sex. And as a male god linked with the contiguous constellation, Aries, Dumuzi was associated with the growth of grain and dates—or, more generically, he was the god of food and vegetation.[9] Their marriage on the spring equinox

symbolized the union of Pisces and Aries and thus consecrated the rebirth of life, rekindled anew in every blossom, seed, and fruit.

According to Mesopotamian scholar Samuel Kramer, Babylonian kings established their legitimacy by assuming the role of Dumuzi, Inanna's consort, in a ritual that occurred during the tenth day of *Akitu*, the Babylonian new year festival celebrated annually at the spring equinox. During this sacred marriage ceremony, the king had ritual intercourse with the high priestess of Inanna, who played the role of the goddess. Their "love" assured that life would begin anew, crops would flourish, and the great cycle of nature would continue unabated. On the 12th and final day of Akitu, the people began to plow and prepare for another cycle of seasons.[10] Similar myths and rituals prevailed throughout the ancient world.[11]

In Gavin White's, *Babylonian Star-Lore*, he writes that the constellational figures were…

> an array of symbols, created by the human imagination, to express the basic nature of the seasons….From their perspective, the constellations were formed at the beginning of time, not by man, but by the gods. Nor were the star figures simply passive symbols representing the seasons; rather, they were thought to be altogether more efficacious, with a more direct, indeed causative, effect on the world of men.[12]

White makes plain that the meanings of Babylonian constellations were wedded to the seasons. The Babylonian New Year began on the first new moon closest to the vernal equinox, which further underscores that the equinoctial and solsticial points were important markers of temporal order. "The different seasons," says White, "impart to the constellations much of their symbolic character [and] the solar stations of the solstices and equinoxes seem to be the all-important defining points of the whole system."[13]

Because Babylonian astronomical observation was initially in the service of developing an accurate calendar, it is impossible to understand the meaning of constellations outside of a calendrical framework. Month by month, each zodiacal constellation could be seen emerging in front of the rising Sun. As such, the constellations were an eminently practical calendar for predicting the seasons. White gives an example from Babylonian

mythology: “The familiar figure of Aquarius with his overflowing water jars is a pictorial allegory of late winter and early spring, when the rains of heaven fall in their greatest abundance and swell the rivers towards their annual flooding.”[14] He goes on to explain that Aquarius’ overflowing vases were not regarded as simply a seasonal allegory of the rains, but the actual physical source of the waters dwelling in the heavens.

Since human activity was related to seasonal processes, the activities that were performed at various times of the year — herding, planting, building, harvesting, storing — became associated with the constellational deity that ruled that phase of the year. Monthly rituals, festivals, and appropriate sacrifices to the titular god/goddess all occurred in synchrony with the annual appearance of the representative constellation in the morning sky.

Stories (myths) evolved within the culture to explain how and why the constellational gods controlled their corresponding seasonal processes. In this way, natural events were symbolically encoded in allegorical representations. This made the constellations memorable—capable of being remembered—which was critically important at a time in history when writing (in the sense that we regard the term) did not exist for the general population.

The Zodiac as Calendar

Given the manifest importance of the equinoctial and solstitial points in ancient cultures, the Babylonians roughly approximated their location in the sky and then built the zodiac around them. Just as ancient cultures built monuments in alignment with the cardinal points to commemorate the dates they occurred, so the cardinal points became the mighty frame for the entire zodiac structure.

This was clearly in evidence by 1000 BC when cuneiform tablets from the MUL.APIN revealed that the cardinal points were located in the middle of the cardinal constellations—Aries, Cancer, Libra, and Capricorn—thus linking these constellations forever to the start of the four seasons.[15] I say “forever” because, as Otto Neugebauer established, there is no evidence that the Babylonians had any “conscious recognition of precession.”[16] That is, they did not know that the equinoxes drift backward in the zodiac at a rate of 1° every 72 years; thus, they could not have known that the constellations would slowly get out of synch with the cardinal points.

Apologists for the sidereal zodiac make a distinction between the Babylonian *calendar* and the Babylonian *zodiac*, claiming that the latter is unrelated to the former.[17] They argue that the sidereal zodiac has no relation to seasonal processes. But this begs credulity. It is difficult to imagine how the Babylonian zodiac could have evolved on an entirely separate yet parallel path with the Babylonian calendar. There is no evidence in support of this. To the contrary, the evidence is overwhelming that the sidereal zodiac of the 5th century BC was a mathematical construction that served a calendric purpose inextricably attached to the equinoctial and solsticial points. Seasonal predictability was the whole impetus behind calendar keeping, and calendar-keeping is the foundation upon which astrology rests.[18]

In fact, says Larson, the reduction from 17/18 irregular constellations in 1300 BC to 12 equal 30-degree constellations by 420 BC was directly related with the establishment of the Babylonian calendar.[19] The MUL.APIN series of tablets from 1000 BC gives a calendar scheme of twelve 30-day months in which, according to van der Waerden, the vernal equinox is in the middle of Month I, the summer solstice in the middle of Month IV, the autumnal equinox in the middle of Month VII, and the winter solstice in the middle of Month X.[20] This is a 12-month solar calendar fixed to the seasons and the prototype for the twelve-sign sidereal zodiac that was in use by 420 BC. This new scheme of the sidereal zodiac, asserts Larson, "was a refined version of the ideal calendar." Twelve months of 30 days became 12 signs of 30 degrees.

Ken Bowser acknowledges that the equinoxes were mentioned often in Babylonian cuneiform tablets, but claims they were merely used to reckon the varying length of daylight, the shifting latitude of the Sun, and to keep the Babylonian calendar synchronized with the solar year, as if all this had nothing to do with astrology.[21] But as we have seen, the very foundation of astrology was calendrical. Astronomy and astrology were one, indivisible science.

To claim that astrology evolved on an entirely separate track from its foundational purpose of predicting qualities of time—daily, monthly, and yearly—is nonsensical. For millennia, astrology was built upon knowledge accumulated from studying the heliacal rising of constellations with corollary terrestrial phenomena, even if attributions of causality to the constellations were erroneous.

That the Babylonian sidereal zodiac was tied to the seasons is also plainly evident in the fact that the beginning of their New Year coincided with the appearance of the constellation Aries that rose at the time with the vernal equinox. When Aries rose heliacally on the eastern horizon, the first visible crescent Moon marked the beginning of the first Babylonian month, *Nisannu*. In other words, the first day of the first month of the Babylonian calendar was defined by the new Moon closest to the vernal equinox. According to the tradition of the MUL.APIN, the spring equinox was set to the 15th day of Nisannu and anchored the beginning of the Babylonian year, starting precisely when the Sun and Moon conjuncted in Aries. Just so, the Sun's passage through the remaining constellations was schematized to correlate with subsequent 30-day intervals. "The result," says Francesca Rochberg, "would be an association of twelve 30-day months and twelve constellations, later standardized to intervals of 30° along the ecliptic."

There seems little doubt that the sidereal zodiac was derived from the Babylonian ideal year of twelve 30-day months and organized to correspond with the four seasons. Larson points out that the "parallelism of the zodiac and the calendar is illustrated by the occasional use of the names of the months in place of the names of zodiacal signs in Babylonian texts."[22] The zodiacal signs were named after their corresponding monthly constellations even though the signs themselves were abstract, mathematical, 30-degree divisions of the ecliptic. Accordingly, the terminology of 5th century BC astronomical diaries was often ambiguous in differentiating between zodiacal constellations and zodiacal signs.[23]

Pointing Fingers—or, Why Measure from the Fixed Stars

Van der Waerden and Neugebauer both established that the Babylonians defined the starting points of zodiacal signs by their positions relative to the fixed stars, *not* the vernal point. While the equinoctial and solstitial points were placed *in* the cardinal signs, the location of a planet was measured in reference to a fixed star. Accordingly, sidereal apologists downplay the importance of the cardinal points in ancient astrology. In fact, this is their central argument for the sidereal zodiac: *it was defined solely in relation to the fixed stars.* But, as we have seen, this is a misleading half-truth.

The equinoctial and solstitial points were not pinned to specific stars in specific constellations. Rather, their corresponding dates could only be

determined by measuring durations of sunlight and darkness via standing stones, monuments, and temples constructed for that purpose. Their location in the night sky was an approximation. However, that Babylonian astronomers could not readily locate the vernal point in the sky is not an argument for the validity of the sidereal zodiac. It merely amounts to saying that early astronomers measured planetary position from fixed stars because it was the only means available at the time.

Let's back up for a moment. By the 5th century BC, Babylonian astronomers had become proficient at mathematical computation and measurement. Out of their growing need for a more exact frame of reference, they created a straightforward ecliptic coordinate system: twelve equal 30-degree signs in rough correspondence to the twelve lunar cycles of the 360° solar year. The signs were defined by longitude from 0° sidereal Aries, which was determined by measuring 45° backwards from the fixed star Aldebaran at 15° Taurus. Once the vernal point was established, the signs ceased to have any real relationship to the constellations. The zodiac became a mathematical reference system representing 360° along the path of the sky counted from 0° sidereal Aries. But how was one to locate 0° Aries in the sky if there was no star that marked the spot? Babylonian astronomers could only locate celestial points in relation to certain fixed stars along the ecliptic.

There were clear advantages to using fixed stars as reference points. The 30 or so bright ("Normal") stars along the ecliptic were visible. Conversely, there was no clear, definite, and visible starting point for Aries or any other constellation. More importantly, there were no clear, visible markers in the sky for the equinoctial and solstice points. As Hunger and Pingree note, the zodiac cannot be observed directly since the boundaries between zodiacal signs of 12 equal parts are invisible constructs. "The Babylonians could determine the beginnings of zodiacal signs in the sky only from their distances from Normal Stars."[24]

It follows that the Babylonians were able to measure the zodiac from an invisible point—0° Aries—only in reference to the fixed star Aldebaran at 15° Taurus. Since Aldebaran was at 15° Taurus, the vernal equinox was at 15° degrees Aries. Henceforth, the other equinoctial and solsticial points were located in the middle of their corresponding constellations until precession of the equinoxes slowly eroded their position. The vernal equinox was slowly drifting backwards against the fixed stars at a rate of 1° every 72 years, but this would not be formally recognized until 134 BC.

Keep in mind, there were no telescopes or computers to aid in measurement in the 1st millennium BC. Until the astrolabe was invented sometime between 220 and 150 BC, the convention was to measure distances by 'cubits' (average length of a forearm), fingers, and digits (based on the breadth of a finger). Babylonian astronomers eyeballed the reference star and measured forward or backward to a planet's position by holding up their forearms and fingers. In effect, the fixed stars were a convenience; that is, a heuristic device for measuring longitudes along the ecliptic. The evolution of a sharp 30-degrees per/sign ecliptic coordinate system allowed for more precise measurements of planetary positions, but it did not obviate the need for stellar reference points to conduct measurements.

We should also note that as more sophisticated mathematical schemes slowly evolved from the 3rd millennia BC onward, constellations were chopped, expanded, added, or eliminated accordingly, which only underscores that they never had any inherent meaning in themselves—that is, they were not gods with divine powers to determine events on earth as the ancients supposed. They were merely artificial constructs, expedient groupings of stars that served as a backdrop for measuring planetary movements and shifting phases of time, the causes of which were still not understood.

The point here is that the original zodiac of the Babylonians was a tropical-sidereal hybrid that made no distinction between what later became two distinct systems. Early astronomers located the equinoctial and solstitial points in the middle of their respective cardinal signs but did so by utilizing fixed stars as reference points for determining their location. In this regard, there was only one zodiac—a hybrid zodiac that was both tropical (seasonal) and sidereal (constellational). The Babylonian zodiac that crystallized by 500 BC was a fabric of constellations hung upon the equinoctial and solsticial points like dressing on a frame.

Precession of the Equinoxes

Because the precession of the equinoxes is critical to our understanding of why the original zodiac bifurcated into two separate zodiacs—one sidereal, the other tropical—it will be useful to examine exactly what precession is, how it was discovered, and its ultimate implications for the question of which zodiac is valid.

Precession of the equinoxes is due to the Earth's wobble on its axis induced by the gravitational pull of the Sun and the Moon. Like a child's wobbling top, the Earth's polar axis traces out a cone of approximately 26,000 years, which is how long it takes the vernal point to make a complete circle and return to a previous position. This means that the vernal equinox slowly drifts backwards through each constellation. Accordingly, the first degree of *tropical* Aries, which is the vernal equinox, creeps backwards over time relative to the fixed stars.

Tropical signs and sidereal constellations exactly coincided in the 3rd century (Circa A.D. 220). Since then, the vernal equinox has precessed some 25 degrees, which means zero degrees tropical Aries is currently at 5 degrees in the constellation of Pisces. The vernal equinox will continue to slip backwards relative to the constellations at a rate of approximately 1° every 72 years. It takes the vernal equinox about 2160 years to traverse each 30-degree constellation.

Neugebauer asserts that the ancients displayed no technical or written understanding of precession until the 2nd century BC, and even then, it was not widely known or properly understood. For early stargazers, the constellations and earthly phenomena seemed to be in a fixed relationship to one another, as if attached by cosmic cables.[25] This cosmological feature was called *durmahu* by the Babylonians, which refers to a strong rope made of reeds that tied terrestrial seasons to celestial movements. According to Rochberg, the symbolic anchoring of the heavens by means of a rope or cable can be traced back to a phrase in an early Sumerian hymn, "the twisted rope to which heaven is secured."[26]

As the Sun moved into a new constellation every month, so the seasons were pulled along like an ox pulls a cart—or, so it seemed. Months and constellations were indissolubly linked. With no awareness of precession or the actual cause of seasonal variations, early stargazers conflated constellations with their corresponding seasonal periods. If the constellation Virgo rose ahead of the Sun every year when wheat was ready to be harvested, the ancients naturally associated Virgo with the harvesting of wheat.

However, in approximately 134 BC, the Greek astronomer Hipparchus checked the measurements of star positions by his predecessors. He noted that a certain star's appearance in the dawn sky was drifting slightly forward century to century relative to the autumnal equinox. According to

the calculations of Timocharis in 280 BC, the first magnitude star Spica in the constellation of Virgo was 8° before the autumnal equinox. But 150 years later, Hipparchus measured it at 6°. Even with this discovery, however, there was no understanding of the *cause* of this movement; nor was it clear whether the stars were moving forward-eastward or the equinoctial point was drifting backward-westward. Hipparchus ultimately concluded the latter, and he approximated the rate of precession to be about 1° per/century.

The implication of Hipparchus' discovery was staggering because it directly implied that the stars were not stable markers of the seasons and thus could not be relied upon for construction of accurate calendars over time. Imagine, for instance, that an important agricultural activity is slated to start precisely when the Sun reaches a certain star in a certain constellation. But if that star is now two degrees away from the proper date for commencing the requisite action, then the timing is off by two days. Over the centuries, this mismatch of activity with its proper date could become a serious problem. Seasonal predictability was gradually eroded by reliance upon fixed stars as celestial markers.

Again, as the *MUL.APIN* indicates, the equinox and solstice points fell in the middle of their corresponding constellations at the beginning of the 1st millennium BC when a 12-sign zodiac was consolidated. However, by mid-millennium, the vernal equinox had drifted to about 10 degrees Aries. And when Hipparchus discovered precession in 134 BC, it had shifted to about 5 degrees Aries. The drifting of the equinoxes relative to sidereal correlates was a source of persistent confusion and worry amongst astronomers of the day.[27] Given the rate of precession, the equinoctial and solstitial points would eventually fall in constellations completely out of synch with earthly seasons and their requisite activities.

The Greek Astronomer Euctemon seems to have anticipated the problem when in 432 BC he devised a calendar of twelve 30-day months named after the signs and commencing with the vernal equinox as the *start* of the first month. Euctemon's star calendar was a forerunner of the tropical zodiac and probably contributed to its eventual adoption. In creating a mere calendar, Euctemon was not bound to the tradition of locating the equinoctial and solstitial points in relation to fixed stars. He could simply put them where he thought they most logically belonged; so, he moved them from 8° to 0° of their respective cardinal signs, thus fixing the

calendar to the cardinal points themselves without any reference to fixed stars.

Hence, Aries began with the vernal equinox, Cancer commenced with the summer solstice, Libra began with the autumnal equinox, and Capricorn started with the winter solstice. This paved the way for what Hipparchus was to advocate three centuries later. After all, it was not the fixed stars themselves that were important, but the equinoctial and solsticial points to which they pointed.

According to Neugebauer, Hipparchus was aware that opinions differed amongst his predecessors as to where the equinoctial and solstitial points should be located within the signs. "Hipparchus informs us that Eudoxus placed the midpoints (15°) of the signs at the cardinal points whereas he himself, following 'most of the old mathematicians' (and Aratus) reckoned the seasons from the beginning of the signs."[28] This is an extraordinarily significant statement in that it reveals Hipparchus was not alone in his decision to put the cardinal points at the beginning of the cardinal signs. Euctemon had done so, and "most of the old mathematicians (and Aratus)" as well.

Not only was it a logical starting point for the year, it was the only way to keep the zodiac anchored to the seasons. Quite likely, this had been the original intent of the Babylonians as well. They placed the cardinal points in the middle of their corresponding constellations at the end of the 2nd millennium BC when the 12-sign/constellational (sidereal) zodiac was first formulated, but before which there was a clear understanding of precession.

One thousand years later, Hipparchus' formal discovery of precession solidified his decision to begin the tropical zodiac *with* the vernal equinox, just as Euctemon had done before him. Subsequently, others followed. By separating the vernal point from the constellations and making it the official beginning of the zodiac, Hipparchus' tropical model did a better job of measuring time. Hence, it slowly gained prominence and superseded the older, less reliable sidereal model.

Ptolemy's Summation—The Tetrabiblos

Following Hipparchus some 300 years later, the illustrious Greek astronomer, Claudius Ptolemy (100-170 AD), likewise adhered to the

vernal point as the beginning of the zodiac. It is explicit from Ptolemy's writings that he was keenly aware of Hipparchus work. And it can be inferred that he was likewise aware of Timocharis, Euctemon, Eudoxus, Aratus, Manilius, Columella and the entire history of the debate as to what constitutes the zodiac and where cardinal points should be placed. As he concludes in his *Tetrabiblos*:

> It is reasonable to reckon the beginnings of the signs also from the equinoxes and solstices, partly because the writers make this quite clear, and particularly because from our previous demonstrations we observe that the natures, powers, and familiarities [of the signs] take their cause from the solstitial and equinoctial starting-places, and from no other source. For if other starting places are assumed, we shall either be compelled no longer to use the natures of the signs for our prognostications or, if we use them, to be in error, since the spaces of the zodiac which implant their powers in the planets would then pass over to others and become alienated.[29]

A careful reading makes plain that Ptolemy, along with "the writers" who preceded him, believed that the powers of the signs are derived from their relations to the solstitial and equinoctial points—that is, from the seasons in which they occur—and that to assume otherwise is to be in error, for if signs are defined by constellations no longer in synch with the seasons, their true meanings are lost. Clearly, Ptolemy is aware of the earlier tradition of the sidereal zodiac, with which he explicitly disagrees.

Ptolemy's major astrological tome, *Tetrabiblos,* is written in a style that summarizes the astrological tradition as it had been handed down by his predecessors. "Although there is no natural beginning of the zodiac, since it is a circle," he writes, "they assume the sign which begins with the vernal equinox, that of Aries, is the starting point of them all."[30] Note his use of the word "they" in reference to his predecessors claiming that Aries begins with the vernal equinox and is the first sign the zodiac.

After discussing the effects of the four angles/seasons inherent in the zodiac, Ptolemy goes on to explain "the natural characters of the zodiacal signs themselves as they have been handed down by tradition." Again, Ptolemy's reference to "tradition" is significant because he is summarizing the consensus view as to sign meanings. He asserts, "their more general temperaments are each analogous to the seasons that take place in them."[31] This is an especially important statement, for it again implies that

his predecessors—that is, the tradition of astrology itself—associated sign meanings with seasonal processes.

Ptolemy's style of writing suggests he was carefully reporting the consensus view as to how cardinal signs derived their names and meanings from seasonal processes. He does not sound like a radical theorist arguing for an entirely new understanding of the zodiac in opposition to the Alexandrian astrological community, which was a veritable hotbed of Hellenistic astrology at the time. His entire rendition of the zodiac, including the fixed and mutable signs, is replete with descriptions of corresponding weather phenomena—relative amounts of moisture, heat, dryness, and cold—occurring during the month associated with a given sign. If such descriptions did not originate with Ptolemy, we must assume they were part of the astrological practice of his time. Significantly, there is no astrological work of the same period that refutes Ptolemy.

Powell, writing in the 21st century, claims Ptolemy's fixing of the vernal point at 0° Aries was simply because the vernal point had precessed to within 1° of the start of sidereal Aries at that time in history.[32] This is the standard position of sidereal apologists: Ptolemy made a stupid mistake. He didn't know what he was doing. But it is clear from Ptolemy's writings that he, like Hipparchus before him, was aware the vernal point would continue to move at a rate of approximately 1° per/century. And since he knew this, he would not pin the first degree of Aries permanently to the vernal point merely for convenience, or because he mistakenly conflated the two. For to do so would create an egregious error for perpetuity.

Moreover, Ptolemy explicitly argued "the natures, powers, and familiarities [of the signs] take their cause from the solstitial and equinoctial starting-places, and from no other source."[33] By "no other source" we might legitimately surmise that Ptolemy was referring to the fixed stars of the constellations, which is the only other source to which he could have been referring. In short, Ptolemy was emphatic that the powers of the signs did not derive from sidereal constellations, but from their connection to the cardinal points and the seasons in which they occurred.

A Transitional Period

In his book, *The History of the Zodiac,* Powell reports that most Greek horoscopes from the 1st through the 5th centuries were referenced to the fixed stars and thus perpetuated the sidereal tradition. Likewise, Bowser

claims that available data into the 7th century "show a mixture of tropical but primarily sidereal positions of varying accuracy, sometimes within the same document."[34] It seems the centuries following Ptolemy were transitional in that the new, tropical zodiac was partially and unevenly applied.

Again, however, this is to be expected. Not only was it practical to determine planetary positions in relation to visible stars, it was part of an astrological tradition that had endured for at least 8 centuries prior to Ptolemy. Even Ptolemy, the most authoritative astronomer of his day, continued to use fixed stars as a frame of reference for determining the position of celestial objects. It is unrealistic to expect that the Hellenistic astrological community would suddenly stop using them for measuring planetary positions, especially in the absence of telescopes and reliable ephemerides for calculating longitudinal position through pure mathematics.

Most importantly, the duration of the sidereal zodiac is no argument for its validity. The history of science is replete with faulty notions that stubbornly persist well after there is compelling evidence to refute them. Consider the geocentric model of the cosmos, which continued for more than a century after Copernicus developed his heliocentric model in the 16th century. Kuhn tells us that resistance to Copernicanism was fierce, bitter, and enduring.[35]

Not until the 6th century did Arabic astrologers, after translating Ptolemy's *Tetrabiblos,* begin utilizing *only* the tropical zodiac in their construction of birth charts, a practice that was ultimately transmitted to Europe via Spain in the 12th century. Powell laments that the Arabs accepted Ptolemy uncritically, not knowing that there had ever been an astrology based on the sidereal zodiac prior to Ptolemy. "Consequently," he says, "the sidereal zodiac was forgotten. Evidently, it's very existence was unknown to the Arabic astrologers."[36]

This last statement is questionable. There were several well-known astrological texts during the first few centuries AD—writings by Vettius Valens and Firmicus Maternus in particular. Surely, at least some Arabic astrologers operating in the very birthplace of astrology would be aware of authors beyond Ptolemy even if those texts were not translated into Arabic. They would have known there was an earlier, more backward tradition that presumed the constellations had powers of their own.

Regardless of what the Arabs may have known, what *we* know is that the pre-precessional, earlier tradition had seeped into India via the Hellenistic Greeks by the 1st and 2nd centuries AD.

Transmission to India

By all accounts, Hellenistic astrology was transmitted to India in the 1st and 2nd century AD from Alexandria, which was a hub for the dissemination of astrology throughout the ancient world. Quite possibly, the transmission started earlier. Virtually all scholarly investigators—Otto Neugebauer, Bartel van der Waerden, and David Pingree among them—agree that India inherited most of its astrology from the Greeks.

The written evidence is compelling. One example: since Hindu zodiac signs are written in Sanskrit and their corresponding Hellenistic signs in Greek, they sound very different; yet, their symbols are virtually identical. The Greek symbol of Sagittarius, the "archer", is mirrored by the Hindu symbol of *dhanu*, which means "bow". Since India had no zodiac prior to the 2nd century AD, this correspondence of terminology throughout their system underscores that Sanskrit names were translated from the original Greek source.

It is noteworthy that transmission of astrology to India occurred prior to Ptolemy's publication of his *Tetrabiblos.* Ptolemy's monumental work summarized the existent knowledge of the day and advanced an argument for the validity of the tropical zodiac when the community was still in transition on this issue. There appears to be no evidence that Hindu astrologers at the time were aware of Ptolemy's arguments in support of the tropical zodiac, nor of Hipparchus' discovery of precession.

Up to the 2nd century AD, Indian astrology was limited to a system of 28 lunar *Nakshatras* analogous to constellations, numbered in apparent correspondence to the 28 days of the lunar month. It was hardly an astrology at all. Even the Nakshatras might have derived from 2nd and 1st millennium BC constellations listed in the MUL.APIN. Pingree details how early Indian astrologers simply split and multiplied the original 18 Babylonian constellations into the requisite number to fit the 28 days of the lunar month.[37] Like all constellational schemes, it was an ad hoc system that used stars for calendrical purposes; that is, to identify days of the month via 28 divisions of the lunar cycle.[38]

Prior to the 2nd century AD, there was no sidereal zodiac in India of 12 equal, 30-degree divisions with four cardinal points. In fact, there was no zodiac at all. Once imported, the sidereal zodiac of India began with the constellation Aries, just as it did with the Hellenistic Greeks.[39] And up until the 5th century AD, Aries began with a fixed star that roughly coincided with the vernal point at that time.[40] In other words, right up to the 5th century, the Hindu zodiac continued to reflect the tropical zodiac of the post-Ptolemaic Greeks, at least in terms of its reliance on the cardinal points for division of the year.

Although Hindus copied the Greeks in linking the cardinal signs to the equinoctial and solstitial points, there is no mention of precession in Indian astrological texts until the 10th century AD, more than a thousand years *after* Hipparchus discovered precession in the west. Vedic scholar Dieter Koch asserts that the Puranas and other Vedic texts from 200 to 600 AD all state "the solstices are at the beginning of Capricorn and Cancer and the equinoxes at the beginning of Aries and Libra."[41] He concedes that while current Vedic astrology is purely sidereal and out-of-step with the seasons, traditional Vedic texts attributed foremost importance to the seasonal-based tropical year and its four cardinal points.

In fact, from approximately 2500 BC, the lunar mansions (Nakshatras) began with *Krttika*, which at the time coincided with the vernal equinox. Like the Babylonian constellations from which they were purportedly derived, the Nakshatra constellations appear to have originally been tied to the seasons, but over millennia have drifted out of synch with them.

All of this underscores that early Indian astrology was consistent with both Babylonian and later Hellenistic formulations that recognized the central importance of the equinoctial and solstitial points as seasonal markers. Until the 5th century AD, their calendar was clearly tropical and so was their astrology. The problem was that they had no formal knowledge of precession, at least to the degree that it impacted their astrology.

This is evident, for example, in the *Surya Siddhanta*, the main text used by Hindu astrologers from the 5th century onward. While it started the sidereal zodiac at the vernal equinox, it makes no mention of progression, a trend which continues for another six centuries in virtually every subsequent text. Again, it was not until the 10th century that Indian astronomers formally acknowledged precession. In 932 AD an astronomer

named Munjala noted the discrepancy between 0° sidereal Aries and the vernal point, and from that moment forward the standard was sidereal.[42]

It is unclear why Hindu astrologers abandoned the linkage between signs and seasons, though one might surmise they had become habituated to conflating signs with constellations as had the Babylonians before them. It was nearly a thousand years between their importation of Hellenistic astrology and Munjala's formal recognition of precession. By the 10th century, the vernal point had precessed some 6° backwards relative to the fixed stars and was now in the constellation Pisces. It became obvious that the original correspondence of 0° sidereal Aries to the vernal point no longer held. Yet, having become habituated for a thousand years to the notion that the constellations were the true powers, they adopted the sidereal zodiac officially and abandoned any reference to the vernal point as the start of the zodiac.

A likely contributing factor was that during the 2nd and 3rd centuries, the vernal point and 0° sidereal Aries were roughly in correspondence. Accordingly, in the absence of knowledge of precession, it would have been easy for Hindu astrologers to make the mistake of measuring planetary position from the fixed stars with only passing reference to the equinoctial and solstitial points. After all, this was the original tradition. Evidence suggests they assumed, as had the Babylonians before them, that signs and constellations were essentially the same—twelve 30° sectors that would remain in a fixed relationship to the seasons forever.

Recall that western astrologers had not formally and decisively shifted to the tropical zodiac until after Hipparchus' discovery of precession in 134 BC, which was underscored by Ptolemy's *Tetrabiblos* written in the 2nd century AD. Moreover, since a different language separated the two cultures (Hellenistic and Hindu) at the inception of Indian horoscopic astrology, Hindus could only know what was available via translations from Greek into Sanskrit. It appears they were simply following the pre-precessional/sidereal tradition prior to Hipparchus and Ptolemy, not knowing their understanding was incomplete.

It seems the phenomenon of precession was informally known by some Vedic practitioners (not astrologers) dating as far back as the 2nd millennium BC. According to S.D. Sharma in *History of Astronomy in India,* the starting point of their nakshatra system was changed from time to time to keep it in alignment with the spring equinox and/or winter solstice.[43] As

the equinox drifted backward against the stars and eventually accumulated a discrepancy equal to one nakshatra (13° 20'), the next nakshatra constellation that aligned with the vernal equinox became the *new* start of their 28-phase lunar calendar.

First it was *Krttika*, then *Bharani*, and then *Asvini*. But after 500 AD, this practice was abandoned. From that time forward, says Sharma, the nakshatra constellation *Asvini* was almost exclusively taken as the beginning of the year, even though the vernal point was increasingly drifting away from it. Accordingly, the zero point of the nakshatra system has been fixed in Asvini since 200 BC, after which no changes were made. Like their sidereal-centered zodiac, the nakshatra system has been entirely divorced from the equinoctial and solsticial points.

Sharma notes that various Hindu astronomers after 500 AD did mention precession, but there were disagreements about its velocity and significance. Other astronomers ignored it completely or disagreed as to its relevance. The situation was extremely muddled and there was no consensus until Munjala in the 10th century calculated the *Ayanamsa* (0° sidereal Aries) to have accumulated a distance of about 6° from the vernal equinox.

Without clear boundaries for determining the structure of their zodiac, there was unavoidable confusion about the timing of planetary ingresses from one sidereal sign to the next. Munjala tried to remove the confusion by fixing the value of the Ayanamsa through his own observations. Subsequently, others followed. A provisional consensus was reached as to the location of the Ayanamsa amongst the stars, but it was never absolute and over the years some 25 or more Ayanamsa schemes have been proposed.[44] To this day, there is a nagging uncertainty as to which Ayanamsa is correct.

Part of the difficulty is that the Hindu sidereal zodiac merely copied the twelve 30-degrees per/sign division of the sky that originated with the Babylonians in the early 1st millennium BC. In that regard, the sidereal zodiac is a misnomer since it's not actually based on constellations but on a mathematical division of the ecliptic into 12 equal sectors. Because constellational boundaries are arbitrary, irregular, and indefinite, defining equal 30-degree signs in terms of fixed stars is extremely problematic. Unmoored from the vernal point, it is not surprising that there has been

significant disagreement over the centuries as to which star (if any) can be utilized for determining zero degrees sidereal Aries.

During the millennium following Munjala (10th century to present), some Hindu astronomers tried to resolve the chaos by fixing the Hindu zodiac to the vernal equinox—that is, make 0° Aries accord with the tropical zodiac as occurs throughout the rest of the world. However, the sidereal zodiac had become deeply entrenched with Indian social and religious practices. For thousands of years, rites and festivals have been timed by the position of the Moon in relation to specific stars in the corresponding nakshatras.

As mentioned, these lunar positions initially synched to important events in the cycle of nature and the solar year—such as the winter solstice—but have since drifted out of synch with them due to precession. If the tropical zodiac were accepted, the proper timing of religious festivals would revert to the appropriate seasonal date, not merely the alignment of the Moon with a particular star that no longer correlates to earthly events. But this would upset the prevailing tradition and, accordingly, resistance has been tremendous. For this reason, the proposed changes have never been sanctioned by Hindu religious authorities.

Most recently, the Hindu Calendar Reform Committee of 1955 proposed beginning the year with March 21st (vernal equinox) but it was not accepted by traditional calendar makers because, again, Hindu astrologers rely on these ancient calendars to set "auspicious dates" for weddings, corporate mergers, and other worldly activities as per the Hindu religion. Not wanting to buck tradition or jeopardize their business, almanac makers are unwilling to accept the tropical year for the religious Hindu calendar. "This is why," says Sharma, "the proposals of the Calendar Reform Committee did not receive recognition, and in the near future there is no hope to switch over to the *sayana* [tropical] system of calendar-making for Hindu religious rites."[45] This controversy continues in India to the present day.

The Southern Hemisphere Question

A primary argument of sidereal apologists is that sign meanings are the same in the southern hemisphere despite the seasons being reversed. Summer in the southern hemisphere begins with tropical Capricorn on December 21st, the very sign that begins winter in the north. Yet, astrologers in the south generally agree that Capricorn still has the same

meaning as it does in the north— conservative, hard, cold, and *winter*-like. Sideral defenders assert this proves that sign meanings are independent of seasonal processes.

Is it possible that astrologers in the southern hemisphere simply have it wrong and sign meanings *are* reversed? There has been some intriguing research in this direction. But astrologers in the southern hemisphere contend that reversal of sign-meaning is unlikely. Let's assume for the sake of argument that sign meanings are the same in both hemispheres. How can we explain this? At present, there is no good explanation, at least of which I am aware. It is worth noting, however, that our planet appears to be northern-hemisphere dominant. 90% of the earth's population and nearly 70% of its land mass are in the northern hemisphere. Perhaps sign meanings are the same all the way down for reasons we do not yet understand. Perhaps there's something about the earth's poles – north and south, positive and negative – that play into it.

While the southern hemisphere issue is problematic for a season-based, tropical zodiac, it is not a fatal problem. For even if sign meanings are not reversed in the south, the fact remains their meanings *do* correspond with seasonal processes in the northern hemisphere where astrology originated. Aries is about new life being born; Taurus about the fecund earth as seeds take hold; Cancer is warm and soft (like summer); Libra values balance, just as light and darkness are balanced at the autumnal equinox; Nature dies and recycles in Scorpio; Capricorn is winter-like (cold, contracted); Piscean dissolution is reflected in snows melting and rivers flooding as winter ends. For anyone who understands the core principles of the signs, it should be obvious their psychological properties are analogous to seasonal processes.

All Meaning is an Angle

A crucial factor in support of the tropical zodiac is that astrological meanings are inseparably related to geometric angles formed from planetary cycles. We can think of an astrological archetype as having four modes—sign, house, aspect, and planet. The first three are angles derived from a 12-fold division of a 360° planetary cycle. In effect, it is the movement of planets that form angles.

Zodiacal **signs** are angles carved by the earth's annual orbit about the Sun. Moving counterclockwise, every 30° from the vernal equinox (where the

earth's equator intersects the ecliptic) constitutes a new sign. Likewise, **houses** are angles that derive from a 12-fold division of the earth's 24-hour diurnal cycle, starting from where the eastern horizon intersects the plane of the ecliptic. And finally, **aspects** are angles formed between planets during their synodic cycle, which is the time it takes the two planets to reform a conjunction after the faster separates from the slower and goes all the way around the zodiac to conjoin the slower planet once again. In aspect theory, every 30 degrees from a conjunction constitutes a new aspect—semi-sextile (30°), sextile (60°), square (90°), trine (120°), quincunx (150°), and opposition (180°).

Corollary signs, houses, and aspects are all facets of a single astrological archetype based on particular angle within a 360° cycle. A sign is the archetype in its motivational mode, a house is its contextual mode, and an aspect is its relational mode. For each angle/archetype, there is a planet that signifies its corresponding action. Consider, for example, that Libra is the need for beauty, the 7th house a context within which beauty (harmonious proportionality) is a primary theme, and the opposition a dialogue between two planets that requires beautifying (balancing of opposites). The planet Venus symbolizes the corresponding actions to beautify, balance, and harmonize. This complementarity of angle, sign, house, and aspect is shown in the graphic below.

Angle	Sign	House	Aspect
0°	♈	1st	☌
30°	♉	2nd	⚺
60°	♊	3rd	⚹
90°	♋	4th	□
120°	♌	5th	△
150°	♍	6th	⚻
180°	♎	7th	☍
150°	♏	8th	⚻
120°	♐	9th	△
90°	♑	10th	□
60°	♒	11th	⚹
30°	♓	12th	⚺

Figure 3: A System of Rulerships Based on Angles

Complementarity of angle underlies our system of rulerships in astrology. Signs, houses, and aspects are all formed from multiples of 30°. For example, the first 90° of the zodiac constitutes the square that Cancer makes to the vernal equinox. Likewise, the first 90° from the eastern horizon during earth's diurnal cycle is the square the 4th house makes to the Ascendant. And an opening square between two planets is the first 90° that the faster planet forms to the slower planet. The sign Cancer, the 4th house, and the opening square share a kinship of meaning because they are based on the same 90° angle. This is why we say the Moon rules Cancer, the 4th house, and the opening square.

Here's the point: Houses and aspects have absolutely no relationship to constellations yet share a kinship of meaning with signs of the same angle. This underscores that all meaning in astrology *is* an angle, a phase within a more encompassing 360° cycle. Constellations have nothing to do with it.

Summary and Conclusion

Like all early cultures, the Babylonians tracked the movements of stars as a way of measuring time and making sense of seasonal changes on earth. Constellations that appeared before the rising Sun were initially organized into 17-18 uneven groups, deified as all-powerful sky gods, and mythologized in accordance with the seasonal activities they presided over. The Sun's apparent longitudinal movement along the ecliptic through specific constellations timed the various phases of the year. By the 5th century BC, the constellations were consolidated into twelve equal 30° sectors for greater computational accuracy.

The Babylonian zodiac was developed for the sake of measuring time via measurement of space. Toward this end, the heliacal rising and setting of fixed stars were the most convenient reference points for determining phases of nature, and for measuring solar, lunar, and planetary positions. However, the Babylonians needed a discernable structure to the zodiac, and this was provided by the equinoctial and solstitial points, which clearly marked the four quarters of the year, beginning with the vernal point (spring) that was a natural corollary to the birth of new life.

Since the cardinal points had no obvious celestial correlates visible to the naked eye, early humans first established their location on the terrestrial horizon via observation of the latitudinal (north/south) movement of the Sun as it rose and set in ever varying locations throughout the year. They

marked the dates accordingly with stones, monuments, or other physical structures, as we can still see in places like Stonehenge.

Next, the location of these points in the sky were determined by noting the Sun's longitudinal position against the backdrop of fixed stars that rose just ahead of the Sun on those dates. The stars that surrounded these cardinal points were given names—Aries, Cancer, Libra, and Capricorn—with the equinoctial and solsticial points located roughly in the center of each star-group. Ultimately, these four constellations came to be called *cardinal* by the Greeks, a term deriving from the Latin 'hinge', meaning "pivotal" and "of the greatest importance."

Though invisible, the equinoctial and solstitial points anchored the constellations – the gods – to the seasonal processes they were thought to govern. In effect, the original zodiac was a hybrid model constructed of two factors: 1) invisible equinoctial and solstice points that established the four seasons; and 2) visible constellations that provided markers for timing the 12 phases of year. Each of the four seasons were subdivided into three substages, thus correlating to the twelve lunar cycles (months/moons) of the year. In this way, the Sun, Moon, and constellations were like a giant calendar-clock in the sky.

With precession, however, the equinoctial and solstitial points slowly retrograded westwards along the ecliptic at the rate of 1° every 72 years. Since the cardinal points always remained in the same relationship to the seasons, this meant their corollary constellations were slowly drifting out of synch with the seasons they were designed to herald. By 134 BC, precession of the equinoxes was formally recognized by Hipparchus and its approximate rate discerned.

During the ensuing centuries, it became increasingly apparent to astronomer-astrologers that the signifying constellations were unreliable markers of earthly time. This further implied they had no causal relationship to seasonal events on earth. And if constellations were not responsible for geophysical, seasonal phenomena, it is unlikely they were responsible for anything else either. All sign meanings are self-consistent and derivative of their seasonal processes in nature. Once the presumed meanings of constellations were refuted, the old system collapsed. The star-based reference system of the sidereal zodiac was gradually discarded and replaced with one that relied solely upon the equinoctial and solstitial points—the tropical zodiac.

This was a momentous breakthrough, the importance of which cannot be overstated. For millennia, the constellations had been the shiny object that distracted from the true importance of the equinoctial and solstitial points. But it was the latter, not the constellations themselves, which established the structure of the yearly cycle and the qualities of monthly durations. So, when Hipparchus realized that the equinoctial and solstitial points were drifting away from their corresponding star groups, the umbilical cord was severed, and the cardinal points were finally liberated from their entrapment in arbitrary, superfluous, made-up constellations. The old sidereal division of twelve fixed-star signs slowly fell into disuse both observationally and computationally.

Our debt to Hipparchus and Ptolemy is incalculable. In modern astronomical tables, the ecliptic coordinate system of the tropical zodiac is now used as the principal frame of reference worldwide for determining the exact location of the Sun each day, as expressed in degrees, minutes, and seconds of arc from 0° (vernal point) to 360°. It is also the principal reference system of astrologers worldwide apart from India and a small group of sidereal holdouts in the west.

Although the door to debate and discussion must always remain open, it behooves us to ask whether a historical error occurred that resulted in a splitting of the original zodiac into two. In line with Occam's razor, the simpler explanation is usually correct—to wit, the two zodiacs were originally one, a sideral-tropical hybrid prior to discovery of precession. Ancient stargazers pegged the equinox and solstice points to the constellations, but without an adequate understanding of the astronomical basis of those points or the fact that they shifted over time.

Once precession was formally recognized by Hipparchus and the zodiac firmly moored to the cardinal points by Ptolemy, the integrity of the system was consolidated—at least in the west. Regrettably, scientific knowledge of precession was not transmitted to India when such information would have been critical to the development of their astrology. Instead, they inherited their system from the Greeks but only piecemeal and without sufficient understanding of the zodiac's astronomical basis.

As a result, the sidereal zodiac hangs on, a vestigial organ once relevant to our Babylonian ancestors but no longer in accord with our current

understanding of the cosmos. The sidereal zodiac was effectively terminated by the tropical zodiac, but like a ghost haunting its executioner, casts a troubling shadow over our profession. For if astrologers cannot determine which zodiac is correct, the credibility of the entire field is thrown into question.

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Notes and References

[1] The **solar equator** is the latitude on Earth at which the Sun is observed directly overhead at midday. In this regard, it is inseparable from the ecliptic. Due to the obliquity of Earth's axis, the solar equator is perceived to vary during the year, from the Tropic of Capricorn on the December solstice to the Tropic of Cancer on the June solstice. On the day of either equinox, the Sun's position is at the zenith when viewed from the geographic equator.

[2] Bowser, Ken (2017), "Western Sidereal Astrology: The Zodiac Issue," from https://www.westernsiderealastrology.com/part-one-of-three-part-series, accessed 10/19/17.

[3] The "distant cousin" analogy refers to the fact that when the zodiac originated in the 2nd millennium BC it was sidereal only in the sense that constellations provided stellar reference points for determining equinoctial and solsticial points, and for measuring planetary positions. By 500 BC, however, the constellations became superfluous when the zodiac was newly conceptualized as a pure mathematical system of twelve 30° phases organized around the equinoxes and solstices.

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[15] Van der Waerden, Ibid, pp. 80-83

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[24] Hunger, Herman and Pingree, David (1999). *Astral Sciences in Mesopotamia.* Boston, MA: Brill Publishers, p. 146

[25] Rochberg, Ibid, p. 198

[26] Rochberg, Ibid

[27] See John Steele ("Celestial Measurement in Babylonian Astronomy," Annals of Science, Volume 64, Number 3, 2007, Pages 293-325.)

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[30] Ibid, p. 59-61

[31] Ibid, p. 65

[32] Powell, Ibid., p. 83

[33] Ptolemy, Ibid., p.

[34] Bowser, Ibid. 109-111

[35] Kuhn, Thomas (1957). *The Copernican Revolution: Planetary Astronomy in the Development of Western Thought.* New York: Vintage Books, pp. 185-229.

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[38] The lunar cycle of a synodic month (29.3 days) reflects the period it takes for the Moon to orbit the earth. A synodic month reflects the orbital geometry of the earth-Moon-Sun relationship and is entirely independent of the stars that form a backdrop to the Moon's daily movement. A natural beginning point is the "new Moon" when the Moon is aligned with the Sun and between the Sun and Earth; thus, the side of the Moon facing Earth is not illuminated by the Sun.

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