Astrological, Political, Religious and Cultural History

L'Horloge Astronomique de le Cathédrale Notre Dame

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by

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Like many artifacts emanating from Christian worship in that age of religious preoccupation, the timepiece of the Middle Ages developed into a work of beauty and complexity. Clocks became showpieces.
--Anthony Aveni[1]

Introduction

L'Horloge Astronomique, the Astronomical Clock, housed in the *Cathédrale Notre-Dame* in Strasbourg, France is a living icon to a half-millennium of history. Its most striking feature is a massive planetary dial with the signs of the Zodiac and real-time representations of the locations of the Sun, Moon and five visible planets which, given today's Christian attitude toward astrology, appears either hypocritical or a blatant dichotomy. Why would a Catholic cathedral display such a device if its purpose was not astrological? How and why did that attitude change over six hundred years? What was the real story behind *L'Horloge Astronomique?* The answer lies in the mosaical picture presented by the religious, scientific and political context between the 12th – 19th Centuries.

Strasbourg, located in northeastern France, has a long and colorful history. Known in Roman times as Argentoratum where Julian defeated Chnodomar's Germans in 357 CE, it was later named *Strazzeburc* or *Stratiburgum* or "fortress of the roads."[2] It was also here that Gutenberg (1394/1400 – 1468) perfected his first printing press in the winter of 1436/1437[3] and where Goethe, Pasteur, and even Napoleon walked the halls of *Université de Strasbourg,* an institution chartered in 1621.[4] On the Ill River a short distance west of the Rhine, Strasbourg was a critical port within the network of rivers and canals that facilitated Europe's shipping lanes, a strategic advantage for which the city's borders bounced back and forth between the Holy Roman Empire/Germany and France several times. This prime locale also made it a lively center of education and commerce which drew great thinkers, artists, engineers, and connoisseurs of *pâté de foie gras,* which originated in this "city of roadways."

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[1] Aveni, Anthony, *Empires of Time: Calendars, Clocks, and Cultures* [Boulder: University Press of Colorado, 2002] 84.
[2] Ford, Franklin L., *Strasbourg in Transition 1648-1789* [New York: W. W. Norton & Company, 1958] 3.
[3] Bellis, Mary, "Johannes Gutenberg and the Printing Press," http://inventors.about.com/od/gstartinventors/a/Gutenberg.htm. accessed 12 December 2010.
[4] Ford, 6.

Construction of the *Cathédrale Notre-Dame de Strasbourg* began during the Early Gothic Period (1140-1194) when similarly ornate religious structures were springing up throughout Christendom; other cathedrals begun during this period include Laon (1190); Chartres (1194); Bourges (1195); and Notre Dame Paris (1215) with numerous others following and eventually spreading to Germany, England and Italy.[5] There were notable similarities associated with these *eglises magnifiques* including rose windows, a complex design of stone-set glass which originated with Jean de Chelles and creates a *"'multifoliate rose' of light, ever-changing in hue and intensity with the hours of the day, seems to turn solid architecture into a floating vision of the celestial heavens—a constellation of radiant, jewel-like stars."*[6] As speculative as it may be, it's worth noting in the context of astrology that Bernadette Brady implies that the first "rose window" was indeed a map of circumpolar stars.[7]

Figure 1. Rose Window Strasbourg Cathedral.

Christianity's Oscillating Attitudes toward Astrology

Throughout the Christian era Church leaders' opinions toward astrology were far less stable than their Gothic architecture. This resulted from two basic conflicts, only one of which is doctrinal in nature: First, the direct relationship an individual could establish with the heavens through astrology versus the motives of Christian leadership who felt the necessity to mediate between its members and God; and second, pre-determination versus free will. Another consideration goes even deeper than that, however, and relates to Christianity's roots in the Roman Empire.

The relatively new religion gained significant momentum with the conversion of the Roman Emperor, Constantine, in 312, who ultimately made Christianity the state religion. For millennia it was common practice for the prevailing ruler to impose his religious beliefs upon the populace at large. *Sol Evictus*, the attempt to fully equate the emperor with deity, had failed to create the religious fervor anticipated and thus establish political unity. Thus, it will never be known for certain what went on in Constantine's mind when he experienced his inspirational vision of the Christian Chi-Rho symbol, *i.e.* whether he saw this new religion as a path to salvation or a political tool.[8] Roman Emperors had without a doubt proven ruthless in achieving their goals, giving such

[5] De la Croix, Horst, *Gardner's Art Through the Ages Eighth Edition* [San Diego: Harcourt Brace Javanovich, 1986] 374 - 388.
[6] De la Croix, 389.
[7] Brady, Bernadette, *Brady's Book of Fixed Stars* [York Beach, Maine: Samuel Weiser, 1998] ii.
[8] Campion, Nicholas, *A History of Western Astrology Volume I: The Ancient World* [London: Continuum, 2008] 264.

tactics a strong measure of credibility versus entertaining concerns regarding their soul's eternal damnation. If there was one thing emperors had undoubtedly noted as multitudes of Christians were thrown to the lions it was the fact that religious beliefs are fixed in the heart as opposed to the head, giving them more power to motivate behavior than mere politics. Thus, it naturally followed that Jesus Christ held more worship appeal than Roman emperors, charming, daunting and deadly as they may have been. And thus, for one reason or another, Constantine converted to Christian.

The parties to any marriage bring their respective cultural traditions to the union with the Roman Empire and its bride, Christianity, no exception. The Romans had a long history of hypocrisy when it came to the use of astrology whereas the New Testament and Christian doctrine failed to address the topic entirely. After all, it was astrology that inspired the Magi to worship the Christ child, certainly not a bad recommendation for messages found in the stars. Emperors and those who aspired to that rank were likewise believers in astrology. However, it wasn't that all astrologers were a fraud so much as the competent ones were too powerful; astrology worked and those of high position didn't want anyone besides themselves to have access to it.[9] To wit, brutal means were employed for establishing an astrologer's abilities, such as Tiberius who had candidates who wished to serve as his astrologer yet were unable to pass his competency exam tossed over the wall of his hilltop villa to the sea below.[10] With regard to limiting its use, various edicts intended to evict astrologers from Rome were issued by Augustus in 11 CE, Tiberius in 16 CE, by Claudius in 52 CE, by Vitellius in 69 and Vespasian in 70.[11]

These attempts were obviously unsuccessful or repetition would have been unnecessary. Thus, dispelling cultural practices which had endured for centuries in spite of being outlawed was not easily accomplished. Ecclesiastical policies, however, held promise of having greater effect, with this option now easily available to Constantine's Roman Court who now controlled religious leaders and their policies. In other words, Roman emperors had been trying to eradicate astrology from the masses for centuries and now they could add religious doctrine to their arsenal.

Augustine, bishop of Hippo from 395 CE, had a major impact on Christian policy toward astrology which influenced Christianity for the ensuing 1,200 years. Augustine was the son of a pagan father and Catholic mother who received a proper education. At age 19 he joined the Manichaeans, a Gnostic Christian sect, which believed in astrology. However, when he converted to Catholicism at 28, his attitude changed. While he accepted celestial influences, he rejected any belief which could make the stars at fault for one's sins. His theological objections were thus twofold, first that astrology's roots were supernatural, implying demonic intervention, and second, that they were deterministic, denying free will.[12] This attitude was reinforced by the policy instituted by

[9] Campion, Vol. I. 241.
[10] Campion, Vol. I. 235.
[11] Campion Vol. I. 230.
[12] Campion, Vol. I. 122, 280 – 284.

Theodosius II and his western counterpart, Honorius, who in 409 required all astrologers to burn their books in the presence of a bishop or be exiled.[13]

Considering that the scriptures had nothing to say about the matter, it seems more than likely that this negative influence derived from imperial tradition as opposed to divine revelation, though even the latter was undoubtedly heavily influenced by the imperial court. Thus, 4th Century Catholics were indoctrinated against astrology, but the united empire ended in 395 with emperors in the East and West likewise gone by the latter part of the 5th Century. By this time the church had grown in strength and numbers as well, providing its clergy with the authority and confidence to make independent decisions, though local political leadership still had a hand in religious policy for centuries to come.

By the 12th Century, attitudes toward astrology were changing. Robert Grosseteste (1168-1253), Bishop of Lincoln, a chancellor of Oxford and a Council Father at the Council of Lyons (1245) thought astrology was the "supreme science."[14] Shortly thereafter, Dominican monks, Albertus Magnus (1193 – 1280) and his protégé, Thomas Aquinas (c. 1224 – 1274) upset the status quo with regard to astrology in a way which would endure for several centuries. Both men lived during the time when majestic cathedrals were under construction throughout Western Europe and clock technology was on the rise, thus opening up the way to join an ancient art with a new technology such that both would be memorialized in ornate, intricately engineered timepieces.[15]

Albertus, author of the *Speculum Astronomiae*, stated *"…the stars are never the causes of our actions, indeed we have been made free agents by the Creator and are the masters of our acts"* implying that the stars and planets could have psychological and physical effects, but the faithful, through their own free will, could control their reaction to it, which effectively dismissed Augustine's objection to it being deterministic.[16] Albertus studied and preached in the Dominican Cloister in Strasbourg, so his philosophies were undoubtedly known in that region.[17] It was also assumed at that time, which reiterated what Ptolemy's *Centiloquium* had indicated centuries before, that for astrology to be accurate and divinely inspired it was required that it be approached in a reverent manner by both an astrologer and client who had a devout relationship with God.[18] This philosophy would naturally elect members of the clergy as the best practitioners. Albertus' approach, however, was theological as opposed to practical but his opinions served to break the seal on the virtual Pandora's Box which Augustine had thought he'd secured centuries before; Aquinas, however, was the one who tossed the lid aside, casting the subject of astrology to the gathering winds of the Renaissance.

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[13] Campion, Vol. I. 286.
[14] Campion, Vol. I. 46.
[15] See Appendix B for a partial listing of astronomical clocks throughout Western Europe.
[16] Campion, Nicholas, *A History of Western Astrology Volume II: The Medieval and Modern Worlds* [London: Continuum, 2009] 48.
[17] Ford, 4.
[18] Campion, Vol. II. 62.

Thomas Aquinas was born into an aristocratic family and spent his formative years in a Benedictine monastery. He was further educated at the university of Naples where he undoubtedly was exposed to a full range of Greek studies which would have included astrology. He also studied under Albertus Magnus as well as numerous others. He ultimately joined the Dominican Order and authored the *Summa Contra Gentiles* and *Summa Theologiae*. In essence, Aquinas accepted Augustine's premise that celestial influences affected the body but he opined that they did not affect the soul, which was accountable to God and thus allowed free agency to make moral choices. Thus, celestial bodies provided various influences but an enlightened soul could resist any inappropriate impulses; natural astrology, such as that employed to predict the weather or diagnose illnesses, was acceptable, as it had been previously. While Aquinas encountered significant resistance, he gathered enough followers to his logical yet spiritual approach that once his direct opposition died off he was ultimately canonized in 1323.[19]

Roger Bacon (1214-1294?), an English scholastic philosopher, scientist and Franciscan, who was a contemporary of Albertus and Aquinas, was another 13th Century figure who accepted astrology. According to J. H. Bridges "the influence of the stars over human life was a belief almost universally held by all instructed men from the thirteenth to the sixteenth century; and abundant traces of it are visible throughout the seventeenth, not to speak of still later times."[20] This statement indicates that knowledge and acceptance of astrology held *a priori* status with educated men at that time.

Numerous significant events occurred in the years which followed, including the beginning of the Hundred Years War in 1337 and the Black Death in 1347 and 1351. According to Whitfield, the Black Death ironically served to improve astrology's reputation. At the request of King Philip VI the medical faculty of the University of Paris was asked to consider the plague's origin. Their conclusion was issued in a judgment dated October 1348 which declared that the triple conjunction of Mars, Jupiter and Saturn in Aquarius on 28 March 1345 had caused the *"pernicious corruption of the surrounding air…."* Others claimed that the total lunar eclipse on 18 March 1345 was to blame as well. The final consensus was that the plague was the will of God, but He had used astrological forces to project his divine displeasure. This ultimately demonstrated *"the role of the stars as intermediaries through which God governed the universe…"* which further reconciled astrology with Christianity.[21]

Early Timekeeping and the Development of Astronomical Clocks[22]

Mankind's attempt to model the universe goes back at least as far as the 2nd Century BCE when the Antikythera mechanism of ancient Greece was invented to calculate the positions of the Sun, Moon and stars at any given point using mechanical

[19] Campion, Vol. II. 50.
[20] Tester, Jim, *A History of Western Astrology* [Suffolk: The Boydell Press, 1988] 180
[21] Whitfield, Peter, *Astrology: A History* [New York: Harry N. Abrams, 2001] 112-113.
[22] Appendix B contains a partial listing of astronomical clocks in Western Europe.

gears.[23] Some attribute the first weight-driven clock to Pacificus, archdeacon of Verona, as far back as the 9th Century. Gerbert, a monk who eventually became Pope Sylvester II, is often credited with the invention of the mechanical clock around 996.[24] In the 11th Century the Song Dynasty Chinese horologist, mechanical engineer and astronomer Su Song, created a water-driven astronomical clock; Al-Jazari created a water-powered astronomical clock in 1206; and Ibn al-Shatir created an astrolabic clock in the early 14th Century.[25] A short time later in 1286 London's St. Paul's Cathedral has mechanical figures that struck a bell on the hour and the Canterbury Cathedral had one in 1292.[26] Thus, clocks and Catholic edifices began a long history together at a time when astrology was accepted.

Richard of Wallingford (1292-1336) was an English mathematician, scientist, astrologer and clock designer who spent six years studying at Oxford University before becoming a monk at St. Albans. He later spent another nine years at Oxford and became abbot of St. Albans in 1326. He demonstrated his acceptance of astrology in his *Exafrenon pronosticacionum temporis* which does not condone either determinism or respect for pagan deities associated with the planets, which were often objections voiced by religious authorities.[27] While abbot he designed what may have been the first astronomical clock which is described in the *Tractatus Horologii Astronomici* (1327) and was almost certainly the most complex clock mechanism in the British Isles at the time and the most sophisticated to be found anywhere. It was completed about 20 years after his death by William of Walsham but unfortunately it was destroyed during Henry VIII's reformation and dissolution of the abbey in 1539.[28] Richard also designed and built an equatorium he called Albion which calculated lunar, solar and planetary longitudes and predicted eclipses. He published works on trigonometry, celestial coordinates, astrology and various religious works. It's important to note that at this time the solar system was believed to be geocentric so these clocks were designed to incorporate the epicycles inherent to the Ptolemaic model, complicating them significantly.

In 1352, less than three decades after Aquinas was canonized, four years after the acknowledgment that astrological forces had contributed to the Black Death, and while the St. Albans clock was still under construction, work began on the Astronomical Clock in the Strasbourg Cathedral known as *The Clock of the Three King*. The official publication issued by *Fabrique de la Cathédrale* describes this first clock as follows:

> *"The instrument's case, some twelve metres [sic] in height, stood against the west wall of the southern arm of the transept, where a few brackets and fastenings retain traces of its emplacement. From bottom to top, the structure was composed of: a calendar, an astrolabe and a statue of the Virgin and Child before*

[23] BooksLLC, *Astronomical Clocks: Astronomical Clock, Zytglogge, Prague Astronomical Clock, de Dondi, St. Mark's Clock, Strasbourg Astronomical Clock* [Memphis: BooksLLC, 2010] 2.
[24] Chernow, Barbara, Editor, "Clocks" *The Columbia Encyclopedia* [Houghton Mifflin, 1975]. 580.
[25] BooksLLC, 2.
[26] Chernow, 580.
[27] Tester, 182.
[28] BooksLLC, 32.

which, every hour, the Magi came to bow, while chimes played various melodies and a cock crowed and flapped its wings."[29]

When *The Clock of the Three Kings* was completed in 1354 it employed an astrolabe, a mechanical device used to determine a planet's position from specific latitudes. Due to the fact that the Church's opinion toward astrology at this time was favorable and scientific interest with regard to placement of the planets was not yet a concern, all evidence indicates that astrology was inherent in *The Clock's* inception.[30]

The Clock of the Three Kings, which would operate from 1354 until the early 16th century, kept time during much of France's Hundred Years War with England (1337 – 1453). That conflict had little or no bearing on the cathedral or clock, however, since Strasbourg, though it would eventually become part of France, at this time was part of the Holy Roman Empire[31] as it had been since 923, the French border approximately a hundred miles west of the Rhine.[32] Strasbourg had become a "free imperial city" in 1262, so it enjoyed a fair amount of independence which the citizens clearly exercised; a corporate government with heavy involvement with the local guilds was adopted in 1332.[33]

The Clock continued to run between 1378 – 1417 when there were numerous disruptions within the Catholic Church related to papal ascendancy which resulted in two popes reigning simultaneously, one in Rome and one in Avignon. During part of this time, which came to be known as the Great Schism, France refused to recognize either. The Council of Pisa determined that both were null and elected another pope with more contention to follow after which more popes were deposed. The schism ended in 1414 with the election of Martin V, the point being that during this time the Catholic Church's political battles were quietly undermining the respect and consequently the support of the members, particularly in France where the people refused to follow any of them until the matter was settled.

While *The Clock's* gears continued to track time and space yet another individual had a tremendous impact on Catholic attitudes toward astrology. Marsilio Ficino (1433-1499), another Dominican whom Campion calls "the cosmic ideologue of the Italian

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[29] Lehni, Roger, trans. R. Beaumont-Craggs, *Strasbourg Cathedral's Astronomical Clock* [Saint Ouen: Editions La Goelette, 2002] 5.

[30] This clock like all others at the time predated mathematical calculations for determining planetary orbits as well as the realization that orbits were heliocentric, a theory which Copernicus would not introduce and publish formally until nearly two hundred years later in 1543, the year of his death. Copernicus' theory, while a vast improvement from the geocentric model with its necessity for epicycles to explain the planet's sometimes erratic paths across the sky, was still not entirely correct because he still maintained that the orbits were circular (a misperception which Johannes Kepler corrected with his First Law of Planetary Motion which wouldn't be published until 1609).

[31] Appendix A contains a listing of Strasbourg's border changes between the Holy Roman Empire/Germany and France.

[32] Haywood, John, *Historical Atlas of the Early Modern World 1492-1783* [New York: Barnes & Noble, 2002] 4.07

[33] Chernow, Barbara, Ed. "Strasbourg," *The Columbia Encyclopedia.* [Houghton Mifflin, 1975], p. 2631.

Renaissance,"[34] found favor with banker Cosimo de Medici who set him up in a villa above Florence where he proceeded to translate classical and Hellenistic work and add commentaries as he sought to reconcile pagan and Christian beliefs. He believed that the Hermetic and Christian gods were similar and that there was a *"prisca theologia"* or original pure religion which had been embraced by Zoraster, Hermes, Orpheus, Pythagoras and Plato. (Besides this "high priest of the Neo-Platonic cult" another frequent visitor to the Medici villa was the artist Sandro Botticelli, whose style also opened up new vistas and may have found his inspiration from Ficino's philosophies, showing how religion and art mingled together during that time. [35])

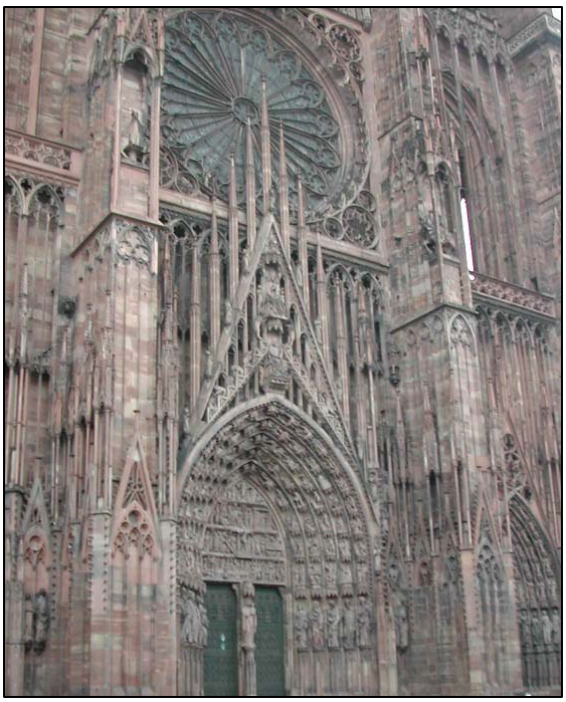

Figure 2. Strasbourg Cathedral.

Prior to his sojourn in Florence, Ficino had completed medical school at the University of Bologna where he would have encountered medical astrology and his interest continued. He practiced horoscopic astrology and believed that the powers of heaven could be accessed and used for healing via direction from the stars and inspiration in the use of ritual meditation, astral magic, using talismans as well as color and music therapy coupled with herbal medicine; man could improve his life by harmonizing with the heavens. Whereas Aquinas had embraced horoscopic astrology only as it applied to the body and not the soul, Ficino through his application of Platonism maintained that it was also applicable to the soul. He effectively reconciled pagan learning with Christianity, but earned numerous enemies along the way, which may have had sufficient influence for him to later denounce astrology, perhaps under pressure since it contradicted his own use of it. Furthermore, he had committed the cardinal sin of acknowledging other paths to spirituality which had been trod before by those not under papal authority, one of many steps leading to the Enlightenment as well as the doctrinal discontent which ultimately led to the Protestant Reformation.

While *The Clock* continued to function Leonardo da Vinci (1452 – 1519) was born; Columbus discovered the New World (1492); and Nicolaus Copernicus (1473-1543) as well as Nostradamus (1503 – 1566) were born.

[34] Campion, Vol. II. 85.
[35] De la Croix, 589.

It is unknown the exact date or even the year when *The Clock* gave up the ghost other than "the early 16th Century," but it appears that it began to deteriorate about the time the Catholic faith was confronted by the Reformation. In the 1520s Strasbourg accepted the Reformation under the leadership of Martin Bucer (1491-1551) after which Strasbourg became an important Protestant center; even the university was Protestant at its founding.[36] Bucer, a former Dominican and a humanist, like Ficino, heard Martin Luther speak on the doctrine of free will in Heidelberg in 1518, after which Bucer left the Dominicans, eventually coming to Strasbourg in 1523 where he contributed significant momentum to the Protestant movement.[37]

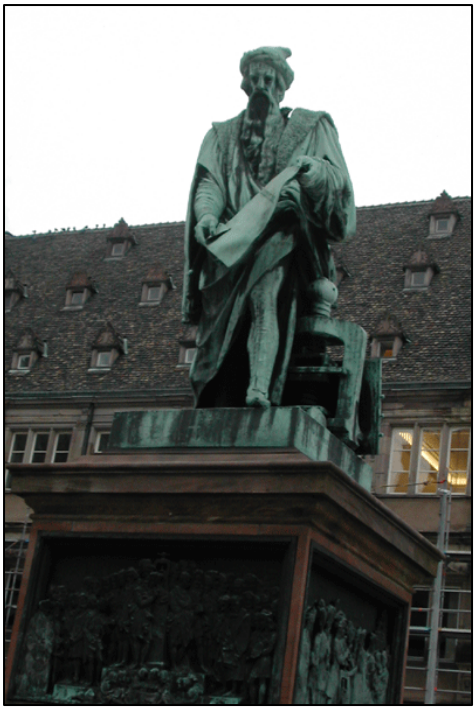

Figure 3. Gutenburg statue, Strasbourg.

As far as astrology with its implications toward *The Clock* was concerned, Luther's opinion was that as a celestial art it was infallible and signs and wonders in the heavens were sent by God, as predicted in the scriptures, but astrologers themselves were fallible; furthermore, devout Christians should have no need for astrology when they could have direct personal contact with God. Nonetheless, some organizers and proponents of high station in the movement felt otherwise, specifically Philip Melanchthon (1492-1590) who led the Reformation while Luther was in hiding, and was an avid astrologer and humanist.[38] Having been a Dominican, many of whom embraced astrology, the logical conclusion is that Bucer's opinions toward the cosmic art were likewise favorable.

During these unstable and rebellious times principalities that embraced Protestantism essentially banished Catholicism from their midst and commandeered Catholic resources and edifices, including the Strasbourg Cathedral.[39] It would appear that it was during this timeframe that *The Clock of the Three Kings*, its vast mechanical innards falling prey to the discord surrounding it, stopped. In 1533 a dial which indicated the movements of the Sun and Moon through the zodiac was installed on the southern façade of the transept. Its operation was dependent on the hands of *The Clock*, however, which would have to be renovated, an effort that didn't begin until another fourteen years had passed and would turn out to be short-lived.

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[36] Chernow, "Strasbourg." 2631.
[37] Chernow, Barbara, Editor. "Martin Bucer," *The Columbia Encyclopedia* [Houghton Mifflin, 1975] 384.
[38] Campion, Vol. II. 114-115.
[39] Appendix A contains a listing of the years and rationale behind the numerous changes the cathedral experienced from Catholic to Protestant.

The Quest for Accuracy

Meanwhile, Nicolaus Copernicus (1473-1543), a Polish monk, lawyer, physician, economist and artist, someone who clearly exemplified a "Renaissance man," was working on his book *De Revolutionibus Orbium Coelestium, i.e.* "On the Revolutions of the Celestial Spheres," which was published in 1543, the year of his death. While the ancient Greek astronomer, Aristarchus, had theorized a heliocentric universe two centuries before, this incomprehensible concept as far as the masses were concerned dissolved into obscurity until it was resurrected by Copernicus, an astrologer avidly seeking more accurate data.[40]

Originally astrologers gathered their information via direct observation of the sky using astrolabes, introduced to Europe around 1030, which increased accuracy compared to what had been previously available, but constructing a horoscope by hand still took several hours; Toledan astronomer al-Zarqali (1028 – 1087) invented the *equatorium* with ephemeredes and tables following somewhat later.[41] Tables greatly simplified the process of casting a horoscope but due to the fact that they were based on observational data, not correct mathematical formulae, their accuracy dwindled, a likely factor in the inaccuracy of astrological predictions which earned astrologers persistent criticism. Thus, astrologers had a vested interest in obtaining more accurate data to improve their forecasts, whether they related to weather or judicial astrology, a need which motivated Copernicus, Tycho Brahe (1546-1601) and Kepler, all of whom used astrology, to pursue the work which ultimately placed their names in history books.

As early as 1510 Copernicus decided that part of the problem was the existing model of the universe which was far too complicated, a situation which could be remedied with a heliocentric approach. He incorporated his ideas into the *Commentariolus* in 1514, but it was not published until the 19th Century, possibly because he respected the Church enough to refrain even though authorities clear up to the papal level was aware of and approved of his work.[42] Nonetheless, it is difficult to suppress a good secret, especially one that has the ring of truth, and astrologer, physician, cartographer, globemaker and author Georg Joachim Rheticus, who also studied with Copernicus, let the cat out of the bag in 1539 when he published his own version of the theory. Campion believes that word of the theory was probably on the streets by 1520, but the Reformation was just starting to warm up so it certainly was not a favorable time for a loyal monk to start yet another controversy. Furthermore, Copernicus may have wanted to confirm his theory before putting it before the world.

Fits and Starts

Regardless of the rationale for the delay, considering either Rheticus' 1539 divulgence or the official publication of Copernicus' work in 1543, certainly by 1547, the year that work began on a *New Clock* to be positioned opposite *The Clock of the Three*

[40] Kaufmann, William J, *Universe* [New York: W. H. Freeman and Company, 1985] 53.
[41] Campion, Vol. II. 31, 41.
[42] Campion, Vol. II. 108.

Kings, the word on a Sun-centered universe was out. Nonetheless, in 1547, several years after the Reformation began (but while followers were still fighting with the Holy Royal Empire in the person of Emperor Charles V), work began on a *New Clock* opposite the original that was still based on the Ptolemaic model. The project was entrusted to Chrétien Herlin, astronomer and professor at the High School, as well as doctor Michel Herr and theologian Nicolas Prugner, both "excellent mathematicians" (who should certainly have been aware of Copernicus' theory). The architect, Bernard Nonnenmacher, constructed the stone case with its spiral staircase.

Work stopped abruptly in 1548, however, when the Augsburg Interim imposed by Charles V instituted a hiatus against change of church ownership until the general church council could settle the property disputes which arose out of the Reformation, an action which restored the cathedral to the Catholic faith. Clearly this explains why the Protestant Magistrate lost interest in anything related to the building, as well as everyone else involved in the project.[43] Religious conflict continued to rage, sometimes more violently than others, until the Peace of Augsburg in 1555 which guaranteed the princes and free cities such as Strasbourg the right to determine their own choice of religion.[44] The church was fully returned to the Protestants in 1559 after which the clock project resurrected and men capable of continuing the project were sought, a quest that culminated in 1571.

How heavily their motivation was driven by astrology is unknown other than the fact that Charles V was a votary of astrology and by the Catholic's own admission "when these rulers lived astrology was, so to say, the regulator of official life; it is a fact characteristic of the age, that at the papal and imperial courts ambassadors were not received in audience until the court astrologer had been consulted"[45] indicating that astrology truly had friends in high places during this time. Lucus Gauricus (1476-1558) succeeded Ficino as a protégé of the Medicis and allegedly predicted that Giovanni de Medici would become Pope, which he did as Leo X (1513-21) who continued to be a proponent of astrology, and Gauricus also worked for the future Pope Clement VII (1523-34) and his successor, Alessandro Farnese a.k.a. Pope Paul III, another votary.[46] Martin Luther opposed astrology due to the fallibility of astrologers while Philip Melanchthon (1497-1560) was himself an astrologer, implying that the Lutherans saw astrology in a favorable light as well, implying the data provided by the *New Clock* would be used astrologically regardless of which religion was represented.[47]

Eventually, Herlin's disciple and successor as professor of mathematics at Strasbourg Academy, Conrad Dasypodius (1531-1601), assumed work on the project. Others involved included David Wolkenstein of Breslau and clockmaker Isaac Habrecht (1544-1620) who together with his brother, Josias, would construct the mechanisms.

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[43] Lehni, 7
[44] Cameron, Euan, ed. *Early Modern Europe: An Oxford History* [New York: Oxford University Press, 1999] 110.
[45] The Catholic Encyclopedia. "Astrology." http://www.newadvent.org/cathen/02018e.htm accessed 20 Dec 2010.
[46] Campion, Vol. II, 124.
[47] Campion, Vol. II, 113.

Painter Tobias Stimmer (1539-1584) was the artistic director who painted the celestial globe and decorated the entire case. The stone case was constructed by Hans Thomann Uhlberger who had the haughty privilege from 1565 – 1608 of being architect of Œuvre Notre-Dame. Yet still Copernicus was ignored, though Lehni claims this may have been because the astrolabe was already drafted or simply that Dasypodius was still faithful to Ptolemy's universe.[48] Either way, the clock was obsolete long before the *New Clock's* great iron wheels and gears started to move in 1574.

Prelude to The Enlightenment

During the *New Clock's* tenure between 1574 – 1788, its Julian calendar became obsolete with the Gregorian reform in 1582 and in 1586 Pope Sixtus V issued a papal bull opposing astrology. In 1597 Tycho Brahe (1546 – 1601), another astrologer obsessed with accurate astronomical measurements, began his work under the auspices of Rudolph II, King of Bohemia; Strasbourg passed its sweeping Church Ordinance of 1598 which made the city extremely inhospitable to any religion other than Lutheran[49]; in 1609 Galileo Galilei (1564 – 1642) aimed his telescope at the skies with his observations relative to the Moon and Jupiter's moons published in 1610; and Johannes Kepler (1571 – 1630) published his first two laws of planetary motion, also in 1609, with the third law to follow a decade later. Meanwhile, a year after that in 1620 the pilgrims would reach the New World and first set foot upon Plymouth Rock.

The years between 1597 – 1620 comprised a veritable scientific revolution. The Earth had been demoted to its rightful place orbiting the Sun and the era of scientific discoveries backed up by mathematical formulae had begun. While Brahe, Galileo, and Kepler were all astrologers, for the rest of the world the new scientific paradigm had relegated anything unseen or unexplained to the realm of superstition and the occult. When their interests and ultimately their life's work turned to the astronomical side of the equation, with only so many hours in a day (which so far was only 24) even their pursuit of astrology undoubtedly coasted to a halt, further reinforced by Pope Urban VIII *Bull Inscrutabilis* in 1633 which yet again declared a Catholic stand against astrology. Nonetheless, Francis Bacon (1561 - 1626) called for an *astrologia sana* purged of superstition and published *Novum Organum* in 1620, indicating that educated and respected individuals still showed an interest in the ancient cosmic art.

The Thirty Years War between 1618-1648 left France economically exhausted and ended with the "Peace of Westphalia" after which France gained control of much of Alsace, but not quite as far as Strasbourg, which was able to avoid actual fighting by abandoning its former Protestant alliances, but was ravaged nonetheless by famine, plague and economic stagnation.[50]

Placidus de Titis, yet another Benedictine monk who was in Germany during this time, was astrologer to Leopold-Wilhelm von Hapsburg, Grand Master of the Teutonic

[48] Lehni, 9.
[49] Ford, 18.
[50] Ford, 6

Knights, and published a textbook, *Primum Mobile*, in 1657 which reflected Kepler's views on the subject; clearly Placidus was unfamiliar with *Bull Inscrutabilis.* Anyone familiar with astrology will recognize Placidus' name as one given to the popular house system he developed. Meanwhile, primarily in England and the New World, which at this time was still linked with its "Mother Country," commoners and aristocrats alike were enjoying almanacs which brought astrology into their lives in a simple, relevant manner which related to their everyday lives, keeping an interest in astrology alive, even though the horoscopic/judicial version was on sabbatical leave.

In 1660 Louis XIV (1638-1715) began his reign, seizing Strasbourg in 1681, formalized in 1697 by the Treaty of Ryswick. Having Strasbourg within French borders provided access to the Rhine with its commercial and strategic interests, which would prove particularly advantageous in the war years to come. Louis XIV revoked Protestant privileges in 1685, but the persecutions that followed in most of France did not reach Strasbourg. Article Three of the capitulation signed in 1681 set forth the agreement which stated:

> *His Majesty will leave the free exercise of religion as it has been since the year 1624 up to the present, with all the churches and schools, and will permit no one to make demands on them or on ecclesiastical properties…but will guarantee them in perpetuity to the city and its inhabitants.*[51]

This, however, had a caveat as noted in the margin of the agreement by an agent of the crown which stated: *"Granted, as regards ecclesiastical properties, in accordance with the Treaty of Münster, except for the body of the Church of Notre Dame, otherwise called the cathedral, which will be returned to the Catholics…"*[52] Ford states that Strasbourg was one of few cities where all citizens were not compelled to accept the monarch's choice of religion. The only official religions were Lutheran and Catholic, however, for another hundred years. Calvinist worship was not allowed with the French authorities counting on the Lutherans to keep their rivals in their place, which comprised being permitted to live in Strasbourg but conducting their worship services in a rural church in a neighboring town. All Jews had to leave the city at sundown.

Meanwhile, while Louis was busy trying to convince France to bow to his will, Isaac Newton (1642 – 1727) invented calculus (1665 – 1666) and published his *Principia* in 1687, sandwiching Louis XIV's coup between scientific advances which would take forty years for France to support.[53]

The *New Clock* ticked away, its automatons performing their daily dance as Europe progressed into the 18th Century. Galileo, Kepler and Newton's collective works ironically had a detrimental effect on astrology, which had already attracted controversy for over a thousand years. Thus, while attention turned to the heavens in the scientific

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[51] Ford, 103.
[52] Ford, 103-104.
[53] Briggs, Robin, "Embattled Faiths: Religion and Natural Philosophy in the Seventeenth Century," *Early Modern Europe: An Oxford History,* ed. Euan Cameron [Oxford: Oxford University Press, 1999] 192.

context, astrology remained quiet yet active amongst its dedicated practitioners which included among others selected members of secret societies such as the freemasons who were less swayed from ancient wisdom by popular opinion. The papacy issued an anti-Masonic Bull in 1738 which apparently was as effective as the one banning astrology based on the fact there were 30,000 freemasons in Europe by 1790.[54]

The Enlightenment held Europe in a firm grip as ideas spread via the now well-established printing industry while numerous leaders with despotic tendencies stepped in to impose the newly evolving social ideologies, one of which was Louis XIV. Louis XIV maintained an absolute monarchy based on the theory of the divine right of kings as expressed by *"L'état, c'est moi," i.e.,* "I am the State." Louis died in 1715, succeeded by his great-grandson, Louis XV during which numerous minor wars were fought while the country's irresponsible fiscal policies drove the government to the brink of bankruptcy. Also of interest, however, is the fact that he was the proud owner of a rococo table top astronomical clock presented to him in 1754 which took 12 years for a clockmaker and an engineer to build.[55] Louis XV died in 1774 and was succeeded by his grandson, Louis XVI, who not only inherited the throne but all the trouble the country was in, again illustrating that some things never change.

Louis XVI married Austrian archdutchess Marie Antoinette in 1770. He was far from being a monarch who was deeply interested in ruling his kingdom, preferring to hunt or hang out in his locksmith's workshop.[56] The *coup de gras* for the French economy came with their intervention in the American Revolution in 1776. Then things went from bad to worse in 1788 when France suffered a major crop failure. During this time Romanticism was gathering momentum while the Masonic order known as "The Golden Rosy Cross" was formed in Germany in the 1770s and the Grand Orient, the umbrella body for French freemasons, was formed in 1779, an order which grew from 104 lodges in 1780 to 629 in 1790. Freemasons were further divided into political, religious and quasi-mystical orders, however, so all were not necessarily proponents of astrology.[57] Nonetheless, astrology may have been quiet but certainly not dead as evidenced by the publication in France in 1772 of Alliet le Jeune's *Le Zodiaque Mysterieux* which combined astrology with Tarot.[58]

About the time Marie Antoinette allegedly declared "Let them eat cake" to the starving peasants, the *New Clock*, which had been operating for two hundred fourteen years, again sensing the discord surrounding it, exercised its incredible sense of timing and quietly gave up the ghost.

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[54] Campion, Vol. II, 194.
[55] BooksLLC, 7.
[56] Chernow, Barbara, Ed. "Louis XVI," *The Columbia Encyclopedia* [Houghton Mifflin, 1975]. 1617.
[57] Campion, Vol. II, 194-195.
[58] Campion, Vol. II, 205.

Figure 4. Outside Clock, Strasbourg Cathedral.

Silent and Still for a Half Century

Meanwhile, Louis XVI eventually asked the Assembly of Notables for their consent in taxing the privileged classes and it was all downhill from there, eventually resulting in the storming of the Bastille on July 14, 1789. Thus, the French Revolution came at a time when France was still governed by elite clusters of clergy and nobility while the productive working classes were being taxed heavily to pay for foreign wars, court extravagances, and a rising national debt, the familiarity of which in modern times evokes the phrase "Those who fail to learn from history are doomed to repeat it." Louis XVI and Marie Antoinette were eventually both found guilty of treason and guillotined in 1793.

The French Revolution didn't end until 1795 but in 1792 the Republic instituted a calendar reform approach intended to entirely wipe out the traditional calendar and timekeeping systems, which would have affected the Strasbourg clock had it remained in force. The existing system up until that time had derived from equal divisions of the 360 degree Zodiac. There were twelve months, 24 hours in a day, 60 minutes in an hour, and 60 seconds in a minute. The intent was to replace the Christian era with one that began in 1792. New Year's Day fell on 22 September, *i.e.* the equinox. There were ten days in a week instead of seven. Under the new scheme there were still twelve months, but each had thirty days with a five-day period at the end. The months were renamed to represent seasonal aspects such as mist, frost, snow, germination, harvest, etc. Days were divided using a decimal system that comprised ten hours of one hundred minutes each with every minute having a hundred seconds, which clearly made the local time element of the Strasbourg clock obsolete. This time system was in effect for fourteen years, until 1806 when the Gregorian calendar and conventional timekeeping were restored.[59]

It's easy to understand why the *New Clock* wasn't replaced during the French Revolution when everyone clearly had more important things on their minds such as finding enough to eat. The new timekeeping system further delayed any changes until 1806, though hourly timekeeping was but a minor function compared to tracking the planets in a Ptolemaic universe. The Napoleonic Wars began 20 April 1792 when the French Assembly declared war on Austria and ended 22 June 1815 when Napoleon abdicated as emperor.[60] During this time resources in war-torn France would have been in demand to support much more important endeavors than renovating Strasbourg's *New Clock*.

[59] Aveni, 127.
[60] Rothenberg, Gunther E., *The Napoleonic Wars* [London: Cassell, 1999] 10, 13.

Nonetheless, while civil disturbances of all varieties were raging in France, at least one person had not forgotten or given up on the town's astronomical clock. According to the history provided by its current custodians, relevant events transpired in the late 18th Century several years before work actually started:

> *One day when the cathedral's beadle, having shown some visitors the motionless and silent clock, concluded by saying that no one would ever be able to set it going again, a boy cried out to him: "Really! Well, I shall make it work!" It was young Jean-Baptiste Schwilgué (1776-1856) who, entirely self-taught, was to devote his life to the acquisition of all the knowledge needed for such an enterprise. Having become a mechanical engineer, he was at last entrusted, at the age of 61, with the renovation of the clock, which he carried out from 1838 – 1842.*[61]

Figure 5. Johann Wolfgang von Goethe statue, Strasbourg France.

The *New Clock* continued to sleep as it waited for Schwilgué to fulfill his prophetic promise. Meanwhile there was at least one person of letters well-beloved by the people of Strasbourg, as demonstrated by the memorial statue which stands to this day, who spoke favorably toward astrology, none other than Johann Wolfgang von Goethe (1749-1832). Goethe, an avid Romanticist, believed that astrology was part of the natural world, further emphasized by the fact that his autobiography included a listing of planetary positions at his birth which he explained as auspicious.[62] In a letter written in 1798 to his close friend, poet and dramatist Johann Christoph Friedrich von Schiller (1759-1805), Goethe defended the cosmic art, stating, "Such fanciful ideas, and others of the same kind, I cannot even call superstition; they come naturally to us and are as tolerable and as questionable as any other faith."[63] Meanwhile, in neighboring Germany, Wilhelm Pfaff (1734-1835) published *Astrologie* in 1816 as well as pocket books on astrology in 1822-3.[64]

L'Horloge Astronomique

Ironically, the growing interest in astronomy which began in the 18th century served to revive interest in astronomical clocks.[65] As far as astrology is concerned, the time period during which the final *l'Horloge Astronomique* was constructed occurred

[61] Lehni, 11
[62] Campion, Vol. II, 200.
[63] Goethe letter to Schiller 8 December 1798 cited in Moriz Sondheim "Shakespeare and the Astrology of his time" Journal of the Warburg Institute 2(3) (January 1939):243-4 as quoted in Campion Vol. II. 319.
[64] Campion, Vol. II, 205.
[65] BooksLLC, 3.

when Romanticism was in vogue with astrology making yet another comeback. However, Goethe, one of its most influential fans of the cosmic art, left Strasbourg nearly a half-century earlier in 1771.[66] It's possible that some Church authorities adamantly against astrology preferred to enforce Pope Sixtus V's 1586 bull, *Coeli et terrae*, condemning judicial astrology. If this were the case, however, it could have been easily outweighed due to Strasbourg's tradition, considering the cathedral had housed an astronomical clock for five centuries which contributed to the city's pride, since few others could boast having one as ornate as theirs which, combined with the current interest in astronomy, provided the Church with the opportunity to use the clock also to show its support of science.

Figure 6. Gears of *Comput Ecclesiastique.*

Strasbourg's Current Clock Description

Thus, after sleeping for over a half-century, the third *l'Horloge Astronomique* began its reign in the Strasbourg Cathedral, a clock which continues to operate to this day. While Schwilgué wanted to entirely replace its predecessor with a case that comprised large areas of glass so that observers could see and admire the internal mechanism, this approach was too costly to suit the town, which preferred a renovation of the old one. Thus, the 16th Century case and sculptures were preserved with only a few modifications.

However, it does sport two cases with glass doors through which the gears that calculate the ecclesiastical calendar (*e.g.* Easter) for the coming year each December 31 (*Comput Ecclesiastique*); and the positions of the Sun and Moon (*Equations Solaires & Lunaires*) can be seen. As far as its other functions are concerned, there is a small, nondescript "normal" Roman numeral clock which has two sets of hands, one silver, the other gold. The silver hands show the official time while the golden hands, which are thirty minutes slower than the others, indicate the local mean time which is used for operating the chimes and automata, which perform specific routines on each quarter hour. For example, the midday chimes are hailed by a procession of the Apostles before Christ whom they salute as he blesses the crowd when the last one has passed.

The days of the week are personified by statuary likenesses of their tutelary gods seated in chariots on a carousel displayed individually through an opening directly below the conventional clock. The calendar wheel shows the day, including which "saint's day." A massive dial of the apparent or true solar time (*Temps Apparent*), a typical feature of astronomical clocks, is at the foot of the case flanked on either side by Apollo and Diana. A large disk representing the northern hemisphere is at the center with pointers indicating the relative location and apparent motion of the Sun and Moon. This device reproduces eclipses, indicates the lunar phases and two pointers also mark the

[66] Ford, 230.

hour of sunrise and sunset. This complex dial comprises a timekeeping clock as well but rather than the usual twelve hours on its dial there are twenty-four with Noon at the top and Midnight at the bottom, strikingly similar to the *Medum Coeli* and *Imum Coeli*, respectively, on a horoscope.

Also at the foot is a celestial globe which replicates the movement of the celestial sphere of stars around the Earth:

> *It includes more than five thousand stars and revolves in one sidereal day, which corresponds to the interval between two passages of the same star at the meridian and is approximately four minutes shorter than the average solar day. Sidereal time is indicated on a ringshaped dial fixed to the sphere. Underneath it, a wheel-movement reproduces the almost imperceptible gyration of the Earth's axis which takes 25806 years.*[67]

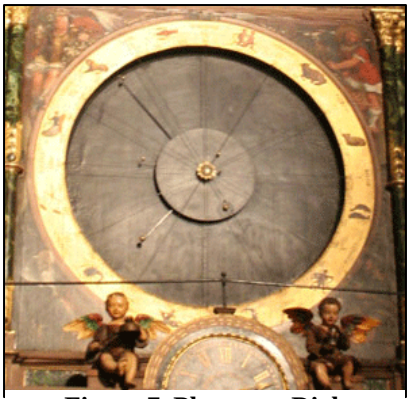

Figure 7. Planetary Dial.

Above the doubled-handed "normal" clock is the planetary dial which is rimmed by the signs of the zodiac divided into 360 degrees. The Sun is at the center with representations of Mercury, Venus, Earth, the Moon, Mars, Jupiter and Saturn shown in their current zodiacal location to one hundred-millionth scale. Above the planetary dial is a lunar globe, half blackened and half gilded, to display the lunar phases throughout the lunar month of 29 days and 55 minutes. To once again quote Lehni:

> *When they created the astronomical clock in 1571, its makers' aims were to describe Time by every means, in a work which was to be useful but would also ornament the cathedral and add to the town's prestige. The 1838 renovation made it, from a technical point of view, a masterpiece unique in the world, thanks to Schwilgué's genius which astronomer Camille Flammarion did not hesitate to compare with that of Copernicus or Galileo.*[68]

Figure 8. Apollo, The Sun God (Sunday).

Artwork by Tobias Stimmer decorates the entire clock, emphasizing scriptural themes such as the Creation, Last Judgment, the Four Empires (Assyria, Persia, Greece and Rome) of the Prophet Daniel's vision, and the Fall as well as a representation of the four seasons in the appropriate sectors of the Planetary Dial as analogies to the Four Ages of man. Stimmer also paid homage to the men, arts and sciences that contributed to the clock's

[67] Lehni, 29.
[68] Lehni, 31.

creation. These included astronomy's muse, Urania, and he also copied a self-portrait of Copernicus while artist Gabriel Guérin added a portrait of Schwilgué under that of Copernicus in 1843. Stimmer also sketched the design for the carousel figures which represent the days of the week.

This final clock has kept time for more than a century and is still ticking, though that term is rather trite for such a magnificent instrument. Its construction began in 1838, contemporary with the Battle of Blood River (Boer Wars); printing of paper photographs; Elizabeth Barrett's first published poem; and the first calculation of the distance to a star (other than the Sun) by German astronomer and mathematician, Friedrich Bessel (1784-1846), which turned out to be only fifty percent accurate. Its completion in 1842 shared the historical record with the final establishment of the US/Canadian border; Charles Dickens' first USA tour; the first use of ether as an anaesthetic; the invention of "sociology" by Auguste Comte (1798-1857); and the discovery of the modern planets, Uranus (1781), Neptune (1846) and Pluto (1930) as well as numerous asteroids, events with further upended astrology, astronomy and astrological clocks.

On a more local basis, *l'Horloge Astronomique* kept time in 1852 when Louis Napoleon was proclaimed Emperor Napoleon III. Its gears continued to turn from 1871 – 1918 when Strasbourg was ceded back to Germany and still when it was returned to France at the end of World War I. The animatons still danced from 1940 – 1944 when Strasbourg was again annexed by Germany, which may have contributed to the fact it survived World War II in one piece. Since that time, *l'Horloge Astonomique* has marked time as both the Berlin Wall and the USSR rose and fell and transportation advanced from the horse and carriage to space vehicles.

Christianity's Current Stand on Astrology

The Church's official stand on astrology remains unfavorable. The Catholic Catechism under "Divination and Magic" states in paragraph 2116:

> *All forms of* divination *are to be rejected: recourse to Satan or demons, conjuring up the dead or other practices falsely supposed to "unveil" the future.*[48] *Consulting horoscopes, astrology, palm reading, interpretation of omens and lots, the phenomena of clairvoyance, and recourse to mediums all conceal a desire for power over time, history, and, in the last analysis, other human beings, as well as a wish to conciliate hidden powers. They contradict the honor, respect, and loving fear that we owe to God alone.*[69]

It's rather interesting to note that the entry in the online Catholic Encyclopedia for "Astrology" translates to over fourteen 8 ½ x 11 pages long, certainly unexpected for something held in such low regard and admits that numerous popes in the past practiced astrology or had Vatican astrologers. In the 20th Century Pope John Paul II spoke out against horoscopes in his *Angelus* address given September 6, 1988:

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[69] Catechism of the Catholic Church, para. 2116, <http://www.vatican.va/archive/catechism/p3s2c1a1.htm#IV> accessed 29 Dec 2010.

I would like to remind everyone of a basic principle of faith: prior to and beyond our projects there is a mystery of love which surrounds and guides us: the mystery of God's love. If we want to give good direction to our life, we must learn to discern its plan, by reading the mysterious "road signs" God puts in our daily history. For this purpose neither horoscopes nor fortune-telling is useful. What is needed is prayer, authentic prayer, which should always accompany a life decision made in conformity with God's law.[70]

In addition, the objection continues to be that astrologers are fallible as indicated by the statement:

By turning to divination, a person turns away from God. Instead of trusting God to reveal His plans and to care for His children, a person who consults horoscopes places his trust in other human beings. Someone who is involved with any form of divination also opens himself to the occult—to Satan rather than to God.[71]

Figure 9. Strasbourg Cathedral

It's important to note that church authorities do not condemn astrology as false or declare that messages derived through horoscopes are not of divine origin, but rather that astrologers as human beings are prone to errors in interpretation, a fact that no astrologer would deny. However, given that so many church-going Christians do consult astrologers, rather than condemning them as sinners it would be more practical to encourage them to seek out Christian astrologers and then confirm any information attained through horoscopic readings through prayer or the Holy Spirit, an approach that dates back as far as Ptolemy's *Centiloquium*. The fact that so many seek guidance through astrology further indicates either a deficiency in the church's ability to counsel their members in a satisfactory manner or failure to address and remedy their lack of faith, begging the question of how much the problem lies with church members versus modern ecclesiastical leaders' ability to fulfill the spiritual needs of their congregations.

Even the Catholics admit that various previously noted leaders, including some who were canonized such as Thomas Aquinas, as well as Popes Sixtus IV, Julius II, Leo

[70] Catholics United for Faith, *Faith Facts:* "Horoscopes: Should the Christian Faithful Utilize," <http://www.cuf.org/FaithFacts/details_view.asp?ffID=272> accessed 30 Dec 2010.
[71] Catholics United for Faith, "Horoscopes: Should the Christian Faithful Utilize."

X, Clement VII and Paul III were all strong proponents of astrology who recognized its benefits in spite of the fact early Christian legend separated astronomy from astrology, attributing the former to the Old Testament prophet, Abraham, and the latter to Cham, undoubtedly some dubious character aligned with Satan.[72] The Jews, however, claim that it was Abraham who taught astrology to the Chaldeans.[73]

Nonetheless, the point remains that in the past Christian authorities recognized astrology for providing inspiration and guidance though the implication remains undisputed by all that discernment is an important element. In the past it was assumed that church leaders retained Christian astrologers and interpreted their readings under the influence of the Holy Spirit. It's interesting to note that the Vatican put the seal of approval on the Harry Potter books and motion pictures because they point out a clear difference between good and evil as well as their view that their author, J. K. Rowling, is a Christian woman with Christian morals and writing style.[74] Similarly, it seems that Christian astrologers could likewise through the ethical use of astrology provide guidance, hope, understanding and increased faith to their clients by acknowledging that any data acquired through God's creations is intended for their eternal welfare. The Church was once against a Sun-centered Universe and kept Galileo under house arrest for the last eight years of his life for his assertions until the preponderance of evidence forced them to accept reality.[75] As they say, ignoring the facts does not change the facts. Others have speculated that if the mechanism of astrology is ever determined and classified as scientific, then the church would accept it as well.

L'Horloge Astronomique has seen kings and kingdoms rise and fall for over eight centuries as the astrological tides have shifted, scientific knowledge expanded, and the primary purpose of the original clock lost in the noise of ecclesiastical debate. Einstein's $E = mc^2$ in and of itself is neutral yet can be used to build a bomb or a power plant. Thus, astrological information found in the stars can be utilized as its users see fit. *Cathédrale Notre Dame de Strasbourg* has stood the test of time with its astronomical clock a proud fixture in one form or another since the 14th Century. Its usage for astrological purposes is highly likely for its first two versions while its most recent one was probably intended more as an elaborate display of art, science and engineering skills by which Strasbourg's identity has been enhanced for a half millennium. It will be interesting to see how long this *l'Horloge Astronomique* keeps time and whether it follows the tradition of its predecessors by ceasing to function in light of another significant historical event with equal importance to the Protestant Reformation and the French Revolution.

Indeed, time will tell.

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[72] The Catholic Encyclopedia. "Astrology." http://www.newadvent.org/cathen/02018e.htm accessed 20 Dec 2010.
[73] Kaplan, Aryeh, *Sefer Yetzirah: The Book of Creation* [York Beach: Samuel Weiser, 1990] xiv.
[74] Winfield, Nicole, Chicago Sun Times Feb. 4, 2003, "Vatican: Potter's Magic OK," http://www.jesus-is-savior.com/False%20Religions/Roman%20Catholicism/vatican_approves_witchcraft.htm accessed 30 Dec 2010.
[75] Olenick, 36.

Appendix A

It's not surprising that Strasbourg as well as its province of Alsace, of which it is the capital, is fiercely independent, individually and collectively, and maintains a culture which blends both sides of the Rhine with the people simplifying the matter by simply considering themselves "Alsatians."

Strasbourg Boundary Bingo	
923	Holy Roman Empire
1262	Granted "Free Imperial City" status
1681	Seized by Louis XIV for France (Treaty of Ryswick 1697)
1871	Ceded back to Germany after Franco-Prussian War (Treaty of Frankfurt)
1919	Recovered by France following WWI

Strasbourg Cathedral Ownership Bingo		
1176-1439	Catholic	Gothic Cathedral constructed by Catholic Church
1520	Protestant	Strasbourg accepts Reformation
1548	Catholic	Augsbourg Interim directs Cathedral to original owner.
1559	Protestant	Peace of Augsbourg returns cathedral to Protestants
1681	Catholic	Reverts to Catholicism via a caveat in Article Three of Strasbourg's capitulation to Louis XIV

Figure 10. Le Petit France District, Strasbourg.

Appendix B

Partial Listing of Astronomical Clocks Through History[76]

"An astronomical clock is a clock with special mechanisms and dials to display astronomical information, such as the relative positions of the sun, moon, zodiacal constellations, and sometimes major planets".[77]

Name	Location	Date Built	Notes
Antikythera Mechanism	Ancient Greece	2nd Century BCE	Calculated positions of sun, moon and stars with complex mechanical gears.
Posidonius' Orrery	Ancient Rome	1st Century BCE	Cicero claimed this clock's function equaled that of the Antikythera Mechanism.
Su Sung Cosmic Engine	Kaifeng City, China	11th Century	Water-driven astronomical clock for clock-tower. Full sized working replica in Taiwan's National Museum of Natural Science, Taichung City.
Al-Jazari's Astronomical Clock	Middle East	1206	Water-powered castle clock.
Ibn al-Shatir Astrolabic Clock	Middle East	14th Century	
Astronomical Clock of Richard of Wallingford	St. Alban's	1330s	Showed sun, moon (age, phase & node), stars, planets, wheel of fortune and tide at London Bridge.
Giovanni de Dondi	Padua, Italy	1348-1364	Jacopo and Giovanni de'Dondi. 7-faced construction showing positions of sun, moon, give planets and religious feast days. Includes

[76] BooksLLC, 3-55.
[77] BooksLLC, 1.

			an Astrarium with astrolabe, calendar dials, indicators for sun, moon & planets and comprehensive calendars.
Cathédrale Notre Dame Astronomical Clock	Strasbourg, France	1352-1354 1547-1574 1838-1842	Astronomical and calendrical functions including computus to calculate Easter and various automata.
Olomouc Astronomical Clock	Moravia, Czech Republic	1420 c. 1940-50	Destroyed by Nazis in May 1945. Religious figures replaced with athletes, workers, farmers, scientist and so forth while part of communist regime.
Taqi al-Din Astronomical Clock	Ottoman empire	1565	Weight-driven with train of gear, an alarm, and moon's phases with zodiac.
Lund Cathedral *Horologium mirabile Lundense*	Sweden	14th Century	In storage until 1837, restored in 1923.
Copenhagen City Hall Astronomical Clock	Denmark	1948-1955 1995-1997	Built over 50 yrs by clockmaker Jens Olsen; rebuild by watchmaker Søren Andersen.
Rasmus Sørnes Clock	Unknown since sale in 2002. Tools, drawings etc. of designer in Borgarsyssel Museum in Sarpsborg, Norway	Built by Rasmus Sørnes (1893-1967)	Compact in size, also included Pluto, precession, eclipses, local sunset/sunrise, moonphase, tides and sunspot cycles.
Astronomical Clock	Brescia, Italy		
The *Torrazzo*	Cremona Cathedral, Cremona, Italy		
Palazzo della Ragione	Mantua, Italy		
St. Mark's	St. Mark's Square,	1496-1499	Built by Gian Paulo

Astronomical Clock	Venice, Italy		and Gian Carlo Rainieri.
Exeter Astronomical Clock	Exeter Cathedral Exeter, U.K.	1480s	Main, lower dial oldest part.
Wells Astronomical Clock	Wells Cathedral Wells, U.K.	1386-1392	Mechanism replaced 19th Century; pre-Copernican universe.
Hampton Court Palace Astronomical Clock	Hampton, U.K.	Post-Copernican	
York Minster Astronomical Clock	York Minster, U.K.	1955	Built to commemorate the RAF and commonwealth nations' efforts in WWII.
The *Gros Horloge*	Rouen, France	14th Century	Movement dates to 14th century, façade more recent.
Lyon Cathedral	Lyon, France	14th Century	
Astronomical Clock	Haguenau, France		Renaissance building of former chancellery, now Musee alsacien displays an astronomical clock on its façade. NOTE:--may be an earlier version of the Strasbourg Clock.
St. Paul's Astronomical Clock	St. Paul's Cathedral Münster, Germany	1540	Hand-apinted zodiac symbols, planets and Glockenspiel tune every noon.
St. Mary's Astronomical Clock	St. Mary's Church Rostock, Germany	1472	Built by Hans Duringer. Daily time, zodiac, lunar phases, calendar valid until 2017.
Zytglogge Astronomical Clock	Bern, Switzerland	15th Century	Tower built in 13th Century. Zytglogge translates to "time bell." Astrolabe, zodiac, Julian calendar, lunar

			phases, planisphere
Gdansk Astronomical Clock	St. Mary's Church Gdansk, Poland	1464-1470 1945 reconstructed	Built by Hans Düringer of Toru.
Besançon Astronomical Clock	Besançon Cathedral Besançon, France	1860	Built by Auguste-Lucien Verite of Beauvais.
Dar al-Muwaqqit	Al-Karaouine Mosque Fes, Morocco	1361	Includes water clock of Al-Lajai.
Prague *Orloj*	Prague, Czech Republic	1410 1490 calendar dial 1552 repaired 1865-6 repaired	Destroyed in May 1945 rebuilt 1948.

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