The Papacy and Ancient China by Tai Peng Wang

It is widely known that the famous Florentine astronomer Paolo del Posso Toscanelli(1397- 1482) in 1474 sent Columbus two letters and a map of navigation virtually providing a roadmap to the discovery of America. Two biographers of Columbus, his son Fernando and Bishop Las Casas of Chiapaz, even praise Toscanelli as the first to conceive the bold new idea of sailing to India by the western route. Yet few, indeed, have learnt of Toscanellis own startling admission that he had a long conversation with a Chinese ambassador who told of their great feeling of friendship for the Christians in 1433 during the papacy of Pope Eugenius IV(1431-1447). Even less accepted this as a historical fact. Much of the exciting intellectual interactions between Renaissance Florence and Ming China so far remained nevertheless buried in the sands of time. As a result, even now Renaissance Italy is widely viewed as some purely European event without any traceable influences from the Chinese technology and science particularly in navigation and astronomy, which were without a doubt the most advanced, anywhere in the 15th century world.

In his letter to Christopher Columbus, Toscanelli simply did not specify who this Chinese ambassador was. The surviving fragmentary Chinese historical records available were also silent on this issue. As a result, this has sparked a host of speculations about the identity of this unnamed Chinese ambassador since then until now. And one speculation is that Toscanellis unnamed sources was, indeed, Nicolo di Conti, a Venetian visitor to Florence, who had spent many years travelling through the islands of the East Indian archipelago and acquiring first-hand information on the trade in spices and other oriental wares. (1) But this seems highly unlikely. In the context of Toscanellis letter, he was referring to the enduring friendship between the Great Khan of China and the Church over the past two centuries. About two hundred years ago they sent ambassadors to the Pope, asking for many learned men and teachers to instruct them in our faith; but these ambassadors, encountering obstacles on the way, turned back without reaching Rome, said Toscanelli. (2) Clearly, in this historical context of China making request for more Christian missionaries from the papal court, Nicolo Di Conti himself a Muslim convert from Christianity, would be disqualified for such a religious mission in the first place. What is more, Toscanelli quoted this Chinese ambassador as his most authoritative sources about the great size of their royal palaces and marvelous length and breadth of their rivers and the multitude of cities in their lands. (3) Moreover, not a few historians have their doubts about whether Di Conti had ever set foot on the soil of Southern China. And presumably, Nicolo Di Contis visit to India and east of India, if at all, would have taken place only after 1438, 5 years later than the Chinese visit to Florence. Certainly he is ruled out as too obviously unlikely.

Still, the question remains that did any Chinese ambassador visit Florence in 1433 or not, and if so, why? Of course, the answer is affirmative. Back then, however, China knew Florence as a country of Fulin or Farang or one of the Papal States. As Yu Lizi, a Chinese scholar, correctly points out, Yuan China in 1342 called the papacy in Avigon that ruled Italy and southern
France as the country of Farang, an example that shows Yuan China called all the European
papal states or the papal court as Fulin or Farang.(4) Under Eugenius IV(1431-47), the papal court was moved from Rome to Florence. At that time, Florence had a population of about 50,000 same as Seville and London, while the largest cities in Europe such as Naples and Venice were only twice as big.(5) Despite its small population, politically as the capital of the papacy, it was the heart of Europe. For any Chinese delegation to visit Europe in 1433, Florence, would certainly be the best place to be. Yet, the diplomatic exchanges between the Roman Catholic Church and Ming China began as early as 1371, according to the Ming history, when Hongwu assigned a foreigner from Fulin or Farang called Nei Kulun(Nicolas?) as the Chinese ambassador to the papacy to inform it of the dynastic change in China. Later on, however, Hongwu once again appointed a delegation led by Pula (Paul?) to Farang (the papal court) to continue its tributary system of international trading with the papacy.(6) In return, Farang or Fulin (the papal court) sent its embassy to bear gifts and tribute to China. That was not all. China during the reign of Yongle(1403 1424) also received a delegation from the papacy. But ever since then, the papacy no longer sent its delegation to China as often as before but only once in a long while, according to Yuan Congjian, the Ming author of Zhouyu Zhouzhi Lu[A comprehensive collection of information about foreign lands]. (7)

But diplomacy between Europe and China then was hardly a one way traffic. Instead, it was a two way street. Europe sent European ambassadors to visit China and in return China sent Chinese ambassadors to visit Europe. It was especially true when Yongle in the early Ming sought to rationalize his usurped empire with commercial diplomacy and cultural glamour by repeatedly sending out Zheng He voyages as reciprocation to foreign diplomatic visits. After returning home, the Chinese diplomat gave an account of his first hand observations in Fulin:
The countrys climate was rather cold. Unlike China, the houses here are made of cement but without roof tiles. The people make wine with grapes. Their musical instruments include clarinet, violin, drum, and so on. The King (the Pope) wears red and yellow shirts. He wraps his head with golden thread woven silk. In March every year [much more likely here it is talking about Easter Day or Easter Sunday, a Sunday in March or April when Christians remember the death of Christ and his return to life] the Pope will go to the Church to perform his Easter Services. As a rule, he will be sitting on a red colored carrier carried by men to the Church. All his prominent ministers (cardinals) dress like the King (the Pope) either in green, or beige, or pink, or dark purple and wrap their heads. They ride horses when going out. Minor offences are usually punished with rod beating to several tens times. Serious offences up to two hundred times. Capital offences, however, are punishable with death, usually drowning the offenders in the sea. These Papal States are peace loving. As it was often the case when a minor dispute or rivalry arose, the disputing states only waged a war of words in the exchange of diplomatic dispatches. But if there were a serious conflict erupted, they would also prepare to go as far as to war. They make gold and silver coinage as their monetary currencies. But unlike the Chinese coinage that can be stringed as a unit to count, there are no holes in any of their coinage for such purpose. On the back of the money is the face of the King (the Pope) bearing his title and name. Law forbids any monetary coinage made privately. The land of Fulin produce gold, silver, pearls, western cloths, horses, camels, olives, dates and grapes.(

So, too, Mingshi Waiguozhuan[Profiles of foreign countries in the Ming
History] attests to the continued diplomatic exchange between Ming China and the Roman Catholic Church in Italy. This Chinese primary sources mentions the country of Lumi in a list of the nominally existing foreign nations that had paid China an official visit and tribute during Yongles reign(1403-1424). (9) Lumi, indeed, is Rome in Chinese. It was originated from the country name Lumei as mentioned by the Song author, Zhao Ruqua (1170 - 1228 AD) in his book Zhufan Zhi [Description of various barbarians]. Lumi could be Rum Bilad ar-Rum in Arabic, meaning the territories of the Greek. Lumei is a Chinese translation from muhidun in Arabic, meaning the heathen. As Zhao Ruquas sources about foreign countries were the Muslim Arabs in China, when they talked about the heathen country name lumei, at first they meant it Constantine and then Rome, according to Professor Han Zhenghua.(10) In 1225, Zhao wrote; All men are wearing turbans as their head wears. In winter, they will be wearing colored fur or leather coats to keep warm. One of their staple foods is a dish of spaghetti with a sauce of meat. They, too, have silver and gold currencies used as money. There are 40,000 weaver households in the country living

on weaving brocades. (11) No doubt, this account of the Lumi booming weaving industry is wildly exaggerated as by 1178 Florence had about 30,000 inhabitants only. But anyway, the fact remains that at that time, Florence was equally well known for its weavers as for its artists. In this city, wool industry set thousands to work. Florentine cloth was prized in Europe, Persia --- and even China --- mainly for its brilliant colors.(12)

When Lumis delegation visit Yongles China, the papal court was still in Rome. But here the delegation from Farang and the delegation from Lumi received by Yongle were most likely referring to the papal court of the Roman Catholic Church instead. Above all, all the above mentioned primary Chinese sources attest to the fact that the continuity of a long diplomatic exchange between the Roman Catholic Church and China over the past centuries was somehow maintained well into the era of Zheng Hes naval expeditions. It is clear that in 1370 during Hongwu the Church sent a delegation of people headed by William De Prato to Beijing as the cardinal of China.(13) And even in 1410 during Yongle, the Church appointed Archbishop Sulyanyeh to take care of the Churchs affairs in China. And according to the record of the papal court, following William De Prato, there were ten Bejing cardinals being appointed and one of them was appointed as late as in 1426.(14) Nevertheless, it was a time when the Church was split by the Great Schism (1378-1417), with one line of popes in Rome and another line of popes in Avigon. For a time, a third line of popes in Pisa made the situation even more confusing. Little wonder, then, that until the tenure of Archbishop Sulyanyeh ended in 1483, there was still no cardinal stationed in Beijing.(15) Yet despite all the chaos and anarchy during the Great Schism, the Church still tried its utmost best to maintain the continuity of its presence in China. Thus, in this historical context, it really surprises no one that Toscanelli met a Chinese delegate from Zheng Hes fleet, who was on a mission to issue Chinese calendar and promote Chinese civilization in the papal court in Florence in 1433.

Act II: The Chinese Transoceanic Astronomical Navigation Technology

Indeed, the great significance of the historic meeting between Toscanelli and the Chinese ambassador cannot be overemphasized. Before then, not only Europeans were voyaging without any accurate longitude determination but also their maps were drawn without the graduation of longitudes and latitudes. All these began to change soon after the watershed year of 1433 when Toscanelli met the visiting Zheng Hes delegate in Florence.

However, it is far from certain that whether or not Zheng Hes delegate did give Toscanelli a world map before or during or after his long conversation. But there can be no doubt that by way of issuing Chinese astronomical calendars the Chinese ambassador helped Toscanelli and his circle of friends lay the astronomical ground work of latitude and longitude determination for so many successful European transatlantic navigation during the turn of the 15th and 16th centuries. And without a doubt, the Chinese had been leading Europeans in making transoceanic navigation for hundreds of years in the Indian Ocean with the most advanced astronomical method of determining both latitude and longitude of a ship in the sea. In the 14th century, Wang Dayuan did achieve a cross-ocean navigation from Mozambique directly to Sri Lanka, 150 years before the Portuguese navigator Vasco da Garma. This, he did with a combination of compass and stars linked positions reading skills called guoyang qianxing [transoceanic navigation guided by the same configuration of stars in the sky] to determine his ships latitude and longitude in the sea. (16) Also in Zheng Hes fourth maritime expedition (1413-1415), a separate flotilla made a direct crossing from Sumatra to the East Coast of Mogadishu in Somalia, a straight run of some 3,700 miles. It took them ten days in full wind to reach Maldives or Liu Shan and then 15 days across the Indian Ocean in full wind to reach Mogadishu of East Africa. (17) European navigators, by contrast, were only capable of getting their ships longitudes at sea by a relatively primitive way called dead reckoning vaguely estimating sailing time and speed, from Norse times and until well after the fifteen century. They knew also measuring the altitude of the noon sun to determine latitude. But longitude determination remained a problem most difficult to crack in navigation, a realm of endeavor where nothing had worked for centuries. So during which, anything like the Chinese transoceanic voyages was a clear impossibility to European mariners.

But since 1433,with the enormously reassuring help from Toscanellis new astronomical knowledge and his world map with graduation in longitudes and latitudes, transatlantic voyages for the first time ever became almost a sure thing for enterprising European mariners like Columbus and Vespucci. Toscanelli himself was undisputedly the first to conceive the idea of going to Indies by way of the West. As well, his world map dated 1474 was the first graduated in longitudes and latitudes and it was not until the middle of the 16th century that graduated maps were known and even common. (1 More significantly, this map, as Professor Wagner and Henry Vignaud pointed out more than 80 years ago, assumed a terrestrial degree of 50 x 5/4 = 66 2/3. He accomplished a scientific work, that of employing for a marine chart a projection used only for terrestrial maps, a projection which enabled him to represent on a single map, Asia to the left, Europe and Africa to the right, says Henry Vignuad. (19)

It is thus no exaggeration to say that Toscanelli was the intellectual architect of westward transatlantic enterprise to Indies and China. But then already, in Columbus time, the theory of longitude that it could be fixed by calculating the difference in time of a predictable celestial occurrence between a chosen place and a standard meridian was well known.(20) Columbus had attempted to calculate his longitude with an eclipse in Spain but got it all wrong. The real breakthrough came only with Amerigo Vespucci, allegedly a personal acquaintance of Toscanelli, who determined in 1499 the longitude in the delta of Amazon. At that time, he evolved a valid astronomical method of determining longitude by measuring lunar distances in relation to the time of a conjunction. In calculating the length of a degree, he improved the current figure and produced an estimate of the Earths equatorial circumference, which was the most accurate of the time, only 50 miles short of the actual dimension. (21)

Chinese timekeeper method of longitude Determination As we all know, a longitude prerequisite is having precise knowledge of the hour in two different places at once. But it was not until Gemma Frisus, who published Libellus de Locurum in 1533 that the theory of how longitude could be calculated using a clock to determine the difference in local and absolute times was first proposed in Europe.(22) And amazingly, China was already getting there as early as Yuan and early Ming. Although imperfect still, the Chinese had already invented their own timekeeper approach to do just that. One such Chinese timekeeper was, as Professor Han Zheng Hua points out, the Chang Ming Deng[Ever Bright Lanterns]. Says Xie Jie, a Ming author: The Compass cabin burns ever bright lanterns day and night, 5 geng in a night and 5 geng in a day. So a ship sails 12 Chinese hours equivalent to 10 geng in total. This was called the compass navigation method of the Zhangzhou people. As a timekeeper, the lantern can tell the time of a geng [24 hours = 10 geng] by nearly 0.1 catty of oil it usually consumed if 10 geng used up nearly 1 catty of oil. With this timekeeper, after a certain number of days of journey, the Chinese navigator could get the local time difference at his ship from his homeport. He can find it out by comparing the local time for sunrise or sunset and homeport time for the same as told by the ever-bright lantern. Yet another Chinese timekeeper called incense coils did the same. Both ever-bright lanterns and incense coils were used to time weeks or months. If the Chinese used the sunrise time at the homeport as the standard time starting to burn the incense coils or ever-bright lantern, and after several

days of journey in the seas, the incense coils or ever-bright lantern burned up to the supposedly dawning point but the night remained. At that point, they will restart the timekeeper called Qi qeng[starting timing geng] or Mashang Benchi Xinglou[immediately starting timing by using new water clock] to find out exactly after how long in homeport time later on (as measured by the amount or the weight of water used) was the local time at the ship for sunrise. With this time difference, the Chinese mariners could roughly get their ships longitude. Given the Earth takes 24 hours to complete one full revolution of 360 degrees, one hour marks 15 degrees in longitude. And if the time difference, is, for example, one ke [24 hours = 100 ke, 1 ke = 0.24 hour] or one lou [one liter of water in a Chinese water clock], that means this 0.24 hours time difference between the ship and the starting point marks the progress of 3.6 degrees of longitude to the east, if the sun rises earlier at the ship, or west, if the sun rises later.(23)

Chinese star reading method of longitude determination Chinese mariners, Chinese Muslim seafarers especially, also sought their longitude solution from the heavens. According to Gong Zhen, Zheng Hes fleet were relying only on the sights of the rising or setting sun or moon to help determine the ship gone how far away to the east or west and the height of stars to determine the distance of the ship from the stars.(24) By then the Chinese were already pretty good at using Guoyang Qianxing [transoceanic navigation by gauging the fixed stars vertical positions above the horizon] to help determine a ships distance, how far or close, to its destination. This method of positioning was only used in transoceanic voyages. It is evidenced from the book Charts of Zheng Hes Voyages. In which, there were Four guoyang qianxing tu[stars positioning charts for transoceanic voyages] given in the appendix, all of which were used for transoceanic voyaging. Two of them were used by Zheng Hes fleet making a round trip of direct crossing of Bay of Bengal from the northern tip of Sumatra to Sri Lanka. The other two were used for making direct crossing of the Arabic Sea from Dandi Bandar of Indonesia to Hormuz and the returned trip therefrom.(25) In a recent in-depth study of this astronomical technique of transoceanic voyaging, Xi Feilong, Yang Xi, Tang Xiren, three co-authors argue that the ideas of this astronomical technique of transoceanic voyaging are very similar to the modern astronomical theory of locating a ship. 90 degrees above the ship is the highest height of a star to the ship. If the height of an eastern star above the horizon is getting higher and higher, that means the ship is getting closer and closer to the east. Similarly, observing the stars in the west, or north or south can also do the same job of locating the ships whereabouts. Accordingly, the Chinese fleets used 10 stars to help find their latitude and longitude at sea. These 10 stars included the North Pole and South Pole and Sagittarius for latitude determination, and the Northwest pusi [Gemini or Pollux] and Southwest pusi stars [Procyon] in Arabic, Taurus, and Zhinixing[woman weaver star] in the east for longitude determination. (26)

For example, when Zheng He set sail from Pulau Rondo of Sumatra (6*04 N, 95*07 E) on October 10, 1432 to Sri Lanka, says The Charts of Zheng Hes Voyages, gauging the vertical positions of the given stars above the horizons in the East, West, North and South. Reached Sri Lanka. Clearly, the Chinese fleets werent gauging the vertical positions of given stars in the four directions just to find their fleets latitude. But in fact they were doing all this in order to get their longitude right. The fleet arrived in Kuli or Calicut of India, (11*15N, 75*46E) on December 10, 1432. Three days later, they set out on a long journey of 35 days arriving in Hormus or Bandar-e Abbas in Persian Gulf on January 16, 1433. At that time, they decided a route to sail westwards from Southeast to Northwest. And on its way, they did a transoceanic voyage by crossing the Arabian sea straight from Dingde Baxi (now Dandi Bandar, 16*00N, 73*03E) to Shaguma Mountain(Jabal Khamis Mountain, 22*25N, 59*27E). The Chinese established their ships whereabouts in the east by checking out the vertical heights of Zhini star [woman weaver star] and Nanmen Shuangxi [South Gate twin stars or Sagittarius]. And the westward route was determined by vertical positions of Gemini and Procyon, according to the above-mentioned new study. (27) Qianxing Shu[reading vertical position of the given stars
Above the horizon] was by no means used only for latitude determinattion, as Chinese historians

of science quite mistakenly believe, but instead, it was really for the use of both latitude and longitude determination. There is further evidence of this Chinese expertise of the Cantino map of 1502, where the coast of East Africa is depicted with such an accuracy that it appears to have been drawn with the aid of satellite navigation. Even today, six hundred years later, one still cant help to be amazed by the Cantino that, as Gavin Menzies suggests, had the longitude correct to within thirty miles along thousand of miles along the coastline.(2

In contrast, when China really did rule the waves in Zheng Hes era, Europe was still ignorant of longitude. It confined oceangoing vessels to coastal navigation of a few safe passages by latitude alone. Indeed, even during the 15th, 16th and 17th centuries, European sea captains still relied on
dead reckoning to gauge their distance east or west of homeport. The technique of dead reckoning for them was reading the crude speedometer in his ships logbook, along with the direction, which he took from the stars or compass, and the length of time on a particular course, counted with a sand glass or a pocket watch.(29) The Chinese, however, were clearly far more advanced in their techniques of longitude determination at sea. But there is so far little or no evidence to suggest that since 1432 there was any of Chinese longitude solutions such as incense coil timekeeper or reading the vertical positions above the horizon of a configuration of given stars was adopted by European voyagers. Still, it seems that there is some concrete evidence to indicate that the Chinese visit was leaving marked influences in Toscanelli and his circle of friends, and, through them, in the dawn of European Renaissance thinking and worldview.

Act III: Chinese Astronomical influences in Toscanelli and his circle of friends

True, it is unlikely that the Chinese had passed Europe over their linking stars positions and timekeeper approaches to longitude determination in transoceanic navigation. But it is absolutely possible to establish with certainty that the Ming Datong Astronomical Treatise was imported into the papacy of Florence. Since it was mandatory for a new Chinese emperor to inform foreign countries of the change of dynasties or emperors in China by issuing new Chinese calendars to them, Zheng He and all his envoys took it as their primary mission even to the remotest foreign nations they visited. In this context, it was only natural that the Chinese ambassador issued the Ming Datong Calendar to the papal court of Florence and even Toscanelli.

But Datong li, literally Great Union System of Calendical Astronomy, is a system of calendrical astronomy officially adopted by the Ming Bureau of Astronomy in 1384. Its computational techniques and basic parameters are basically identical with the Yuans Shou Shi Li. (30). Shoushi Li (literally Season Granting System of Calendarical Astronomy) an official system of calendrical astronomy composed between 1276 and 1281 by Guo Shoujing. This system, which is often believed to be the most advanced in China before the 16th century, was remarkable in its accuracy in marking time and predicting the phase of the moon, the changing of seasons, and the timing of lunar and solar eclipses. For hundreds of million of people across the vast Mongol Empire spanning Asia, Middle East and Russia and even Europe, the calendar worked well. However, during the reign of Hongwu emperor in the Ming, the Shuoshi Li was renamed as Datong Lifa [Great Union System of Calendrical

Astronomy] with very little change in substance.[it should be pointed out that the values of time for sunrise and sunset in the Shoushi Li was totally different from those in the Datong Calendar]. Yet, the Chinese imperial calendars or Li, indeed, as Joseph Needham points out, like the astronomical Almanacs published by the Greenwich Observatory, were essentially astronomical stars. They are astronomical treatise in its own way.(31) It is thus arguable that the export of Chinese astronomical knowledge to Europe began with the issuing of Datong Calendars in Florence in 1433.

The evidence is also that Toscanelli did take a page from Chinese astronomy after his meeting With the Chinese ambassador, who he greatly admired as men of learning and ingenuity as well in religion as in all other sciences. As Gavin Menzies points out, Toscanelli was the first European to observe Comets in 1433, 1449-50(Halley), two in 1457 and 1472. According to his
own testimony these observations cost him immense labors and long vigils. All his observations on comets, however, were done only after the Chinese visit although there were plenty for him to observe before then. Toscanelli predicted and made accurate observations on Halleys comet, which passed by the earth between 8 June and 8 July 1456.(32) While it may be hazardous to attribute his observations on comets to the direct influence of Chinese astronomy, but it seems more than pure coincidence that he did it all after his meeting with the Chinese ambassador. And it is not difficult to see why. It is commonly known that the Chinese had over nearly 2000 years of history in recording comets. They had charted every arrival of Halleys comet from 240 BC. But then Toscanelli, who was strangely silent about his sources of inspiration, according to Giorogio de Santillana, never talked about his theory and what he gave to the public were results. The only piece of his own that we have is his computation of the comet of 1460. It is an excellent computation, as Celoria has shown, and agrees with the figures of Regiomontanus quite perfectly, says Girogo de Santillan.(33)

Still, he was widely acknowledged as the most distinguished astronomer of the 15th century in Europe. Much of his fame came from a monument to his astronomical skill that still exists at the Cathedral of Santa Maria del Flore in Florence in the well-known gnome, which he constructed about 1468. A marble slab, having a small opening in it was placed at the height of 277 feet in the dome over the middle of the left transept. By the shadow Toscanelli can determine midday to a half-second and could accurately determine when the sun was as its maximum height. (When the suns shadow is at its shortest). And here again quite rightly so, Gavin Menzies attributes Toscanells sources of inspiration to the Chinese astronomical knowledge in the common use of identical sundials for centuries. (34). Toscanellis friend, Regiomontanus was himself a great admirer of Toscanell. In a correspondence to Toscanelli, Regiomontanus even called him as a second Archimedes. Both of them evidently seemed to have known of the Chinese methods of obtaining declination of the sun by measuring the suns height at midday on the same longitude but at different latitude. In particular Regiomontanus did so by taking a series of measurement at Farrara. In 1474, he published his tables of declination. By using declination table and measuring the suns height, European navigators were now able to determine a ships latitude at sea. Diego Cao was the first European navigator to use them and Dia did so to determine latitude of new new discoveries and be able to return home to the latitude.(36)

Beyond that, Chinese astronomic influences can be traced in the two torquetums surviving in the world, one belonged to Nicholas of Cusa , and the other to Regiomontanus, both of whom were involved in calendar reform, including setting the date of Easter, Torquetum is an advanced version of the armillary sphere and was first invented by Arabs sometime between AD 1000 to 1200. During Yuan, Guo Shoujing made a metal torquetum called the simplified instrument in 1270. It was purely equatorial, with Arabic ecliptic components left out. Needham called this simplified instrument the precursor of all equatorial mounted telescopes. Needham believed that some knowledge of it eventually reached Tychro Brahe in Denmark three centuries later. And this led to Brahes taking up equatorial astronomy for his instrument. But in fact Europeans originally followed the Greek-Indian-Muslim tradition, which more or less ignored the equator, China, meanwhile, largely ignored the horizon and the ecliptic. In the 17th century, however, European astronomers came to realize that the Chinese equatorial system was more convenient and showed greater promise. As a result, it was adopted by Tychro Brahe and his successors and remains the basis of astronomy today. Modern astronomical observatories are, therefore, not derived from the European tradition but from the Chinese, according to Dick Teresi.(37) To many western historians of science, it remains puzzling as to how did the Chinese knowledge of Guo Shoujings equatorial torquetum find its way to Tycho Brahe in the 17th century. But in fact Zheng Hes delegation to the papal court of Florence in 1433 may hold the clue to the Chinese roots of Tychro Brahes equatorial mounted telescope. And the two tosquetums belonged to Nicholas of Cusa and Regiomontanus produced from the Chinese astronomical knowledge imported into Renaissance Italy during then were most likely the source of inspiration for Tycho Brahes torquetum, which were no doubt very similar to Guo Shoujings simplified instrument.

Act IV: Results of the 1433 Chinese visit to Florence

Both Regiomontanus and Nicholas of Cusa(1401-64) were within the circle of Toscanellis friends. But Nicholas of Cusa, who was a very close lifelong friend to Toscanelli, had studied Latin, Greek, Hebrew, and, in later years Arabic. (3  . Not surprisingly, the researches and writings of this multilingual German humanist, scientist, statesman and philosopher formed major advances in Renaissance mathematics, astronomy, and mysticism. In 1436, about three years after the Chinese visit, he presented to the Church a memorandum to call for revision of the church calendar (De reparatione kalendari). He is said to have described the Gregorian calendar reform in detail before it occurred. And in 1444, he purchased sixteen books on astronomy, a manuscript celestial globe, an astrolable and a torqetum in Germany. His astronomical study led him to hold before the time of Copernicus and Newton that the nearly spherical earth revolves on its axis around the sun and that the stars were other suns and that space was infinite. He even believed that the stars had other worlds orbiting them which were inhabited.(39) At this time, however, the Ming Datong Calendar based on Guo Shoujings Time Service Calendar imported into Italy in 1433, was of course still the most advanced anywhere in the world because it is in complete agreement with the Gregorian Calendar counting a year 365.2415 days. It could still serve as a corrective to reform the Julian Calendar in 1436. But in more ways than one, Nicholas of Cusa had already begun to push Europe out the Dark Ages and into the modern world with his astronomical and philosophical ideas. Especially his astronomical ideas which connected the infinite nature of God and infinite nature of mathematics and the universe and his concept of sun-centered system represented the greatest scientific breakthrough then even though yet to be verified by observations. By then, Renaissance Italys major advances in astronomy had already clearly led Chinas stagnant astronomy by a growing wide gap especially when the theory of sun-centered universe widely circulated among Italian intellectuals for 30 years before Nicholaus Copernicius published his theory in 1543.(40)

Back in 1433 when Zheng Hes delegation visited Florence, however, Ming China remained an envy of the world and greatly admired by Europeans. To the early Renaissance Italian intellectuals like Toscanelli, China was worth seeking by the Latins not only because great wealth may be obtained from it, gold and silver, all sorts of gems and spices, which never reached them. But also because of its learned men, philosophers and expert astronomers, and by what skill and art so powerful and magnificent a province was governed, as well as their wars were conducted. (41) The Chinese visit to Florence in 1433, it is

true, was enormously important to Toscanellis unprecedented advocacy of sailing westward to China. Toscanelli knew for certain that China and the East could be reached not only eastwards around Africa but westwards in the Southern Hemisphere only after the Chinese visit. How could he be so sure about it? In his letter to Columbus, he says : the voyage has become not only possible but certain, fraught with inestimable honor and gain, and most lofty fame among Christians because he have had accurate and copious information from eminent men who have come from those places to the Roman court and from merchants who have traded a long time in those parts and speak with great authority on such matters. But Toscanellis geographical knowledge, according to Taviani, was based on books on cosmography and astronomy; on maps that were multiplying not only in Genoa and venice but in Flanders, Germany, and Viena; on written accounts by explorers, missionaries, and business agents, especially Marco Polos Milione. He also relied heavily on information gathered directly from contemporary travelers, which were Toscanellis most valuable first-hand primary sources. Among his traveler sources, they included travelers who came through Florence like Tartars from the Don basin and Ethiopian emissaries who reached Italy in 1441 with Alberto da Sarteano. One German traveler to Italy was Regiomantanus, who was the teacher of Martin de Beham, the traveler and author of the famous world map of 1492 preserved in Viena. Regiomontanus had frequent discussions in Rome with Toscanelli. (42)

Toscanelli was known as the first European in history to conceive the idea of going to the Indies by way of the West. And as Professor Herman Wagner argues, Toscanelli have given proof of his learning by making the first European map graduated into longitude and latitude before 1474. He is also to be admired for daring to maintain an opinion of which Ptolemy disapproved.(43) But despite Toscanellis repeatedly emphasized that his advocacy of westward route to the East based chiefly on his first-hand sources from China and Europe well-connected with the East and China, most historians of modern ages like Henry Vignaud remain very skeptical of his claim. Henry Vignaud, for example, alleges that it is an historic fact that no ambassador came from China at that period, and if one had come he certainly would not have called his country Cathay.(44) Turns out, Henry Vignaud just cant be more wrong. Truth is, on the contrary it is an historical fact that the diplomatic exchanges between China and the Church during then was somehow maintained and continued by the diplomatic efforts from both sides. According to the record of the papal court itself, following William De Prato appointed as Beijing cardinal in 1370, the Church appointed its Beijing cardinals one after another up to a total of ten even as late as 1426. And all of this was reciprocated with a Chinese delegation to visit the papal court at Florence in 1433 during Zheng Hes last mission. Ming Shi also claims that Zheng Hes ship reached Franca where he met tall people with beards, long nose, deep eye socketsand red hair. Yet, it was a certain Ming Chinese scholar by the name of Yan Gongjiang whose Conprehensive Record of Foreign Lands that has provided the most detailed and credible Chinese observations made in this visit to Europe.

Conclusion:

In conclusion, it is certain that both Chinas and the Churchs almost hitherto obscured and untold histories bore evidence of Toscanellis claim that there was a Chinese ambassador visiting Florence during the papacy of Pope Eugenius IV (1431-1447). Also all the indications are that Chinese astronomical and geographical knowledge came to inspire Toscanelli and his circle of friends to lay the astronomical and cartographic groundwork in latitude and longitude determination for so many successful transatlantic navigation to come at the turn of the 15th and 16th century. Both Renaissance Italy and early Ming China were not as isolated as Henry Vignaud imagined. Instead, they remained interacting with each other with a different result at the end. Renaissance Italy as a leading center for the development of ideas from other countries benefited from this Chinese visit, and came to surpass China in the next century.(45) Whereas the increasingly autocratic and isolationist Ming China had the world passed it by as it began to cease functioning as a leading center for international trade and that for the development of ideas from other countries ever since the end of Zheng Hes era. Time began to stand still in China for centuries to come.

Wang Tai Peng is a bilingual historian cum journalist based in Vancouver. He is a columnist of Asia-Inc Monthly based in Singapore. He is also the author of a widely acclaimed book of overseas Chinese history: The Origin of Chinese Kongsi (Kuala Lumpur: Perlanduk Publications, 1994). His research interests include Zheng He history and the history of Zheng Chengongs maritime empire.

Footnotes:

(1) GR Crone, The Discovery of America, (Britain, 1969), p.42, 43
(2) The Life of the Admiral Christopher Columbus, by his son Don Fernando Colon, Translated and annotated by Benjamin Keen, (New Jersey, Rutgers University Press, 1959), p.21
(3) Ibid.
(4) Yu Lizi: Yuandai Fulin Ji Aishi Shengdi Diwang Bianzheng[The correct locations of Fulin countries and the birthplace of Ai Shi during Yuan China]in Haijiaoshi Yanjiu[Maritime Historical Studies] 1990-2, Quanzhou, p.51
(5) J.R. Hale: Florence and the Medici,(Thames & Hudson, London 1977),p.15
(6) Yan Congjian: Zhuyu Zhouzi Lu [Comprehensive Record of Foreign Lands]
(7) See Zhang Xing Lang: Zhongxi Jiaotong Shiliao Huibian,[Collected historical Sources of the History of contacts between China and the West]. Vol. 1. Chapter 6, pp.315
(See Zhang Xing Lang, pp.331, Yan Congjian: Zhuyu Zhouchi Lu, volume 11
(9) Ming Shi Waiguozhuan[Profiles of Foreign countries in the Ming History] vol.5 p.47
(10) Han Zhenghua: Zhufan Zhi Zhubu[Additional Annotated Description of various barbarians], (The University of Hong Kong, 2000)p.231
(11) Ibid., p.232
(12) John Rigby Hale: Renaissance (New York, 1965),p.78
(13) Fang Hao: Zhongxi Jiaotong Shi[A History of Contacts between China and Europe],(Taipei, 1953),vol.3, p.211-217.
(14) Zhang Guogang & Wu Liwei: Mengyuan Shidai Xifang Zai Hua Zongjiao Xiuhui[The Church in yuan China], in Haijiao Shi Yanjiu[Maritime History Studies], 2003.1,p.62
(15) Paul Robert Walker: The Italian Renaissance, (New York, 1995),p.34
(16) Wang Tai Peng: Zheng He, Wang Dayuan and Zheng Yijun: Sone Insights in Asian Culture ,Singapore, June 2004,pp.54-62.See also W.Scott Morton & Charlton M. Lewis: China Its History And Culture,(McGraw Hill, New York 2005),128
(17) Ibid.
(1 See Henry Vignaud: The Columbian Traditon on the Discovery and the part played therein by the Astronmer Toscanelli,(Oxford Univerity Press, 1920),p.41
(19) Ibid, p.39

(20) Felipe Fernadez-Armesto: Columbus,(Oxford University Press, 1991),p.100
(21) Jennifer Jury: Amerigo Vespucci: His life and Why His Name is Appropriate Legacy for Our Continent uweb, millerscille, educ/-columbus/papers/july-01.html.
(22) JJ OCoonor & E F Robertson: The History of cartographyp.8 in www-groups.des.st-and.ac....arphy.html
(23) Han Zheng Hua: Hanhai Jiaotong Maoyi Yanjiu[A Study of Contacts by Navigation and Trade](The University of Hong Kong, 2002),P.248,249
(24) Gong Zhen, Xiyang Banguo Zhi,[Notes on Barbarian countries in the Western Seas], preface, (Zhonbghua bookshop, Beijing)
(25) Xi Fei Long, Yang Xi, Tang Xiren ed.: Zhongguo Kexue Jishu Shi, Jiaotong Quan[The history of Chinese science and technology, volume on transportation,(Science Publisher, Beijing 2004),395,396
(26) Ibid.p.396, pusi was the Chinese translation from pasu, pastu in Arabic, meaning single- edged axe, according to a study of Han Zhenghua, (2002, p.571).
(27) Ibid,p.397
(2 Gavin Menzies: 1421 The Year Discovered The World,(Bantam Press, London, 2002),p,331
(29) Dava Sobel: Longitude, The True Story of a Lone Genius Who Solved the Greatest Scientific Problem of His Time,(Walker & Company, New York 1995)p.13,14
(30) See Yunli Shi: The Korean Adaptation of the Chinese-Islamic Astronomical Tables communicated by J C Martloff, Arch. Hist. Exact Sci.57 (2003) 25-60. Spinger-Verlag 2003.
(31) Joseph Needham: Zhongguo Gudai Kexue[Science in Traditional China],(Shanghai Bookshop, 2000),p.146,147
(32)Gavin Menzies: Chinese Astronomical methods adopted by Toscanelli. European determination of Latitude unpublished paper, 2004. See also paolo dal Pozzo Toscanelli in Catholic Encyclopedia, newsadvent.org/cathen/14786a.htm
(33) Girogio de Santillana: Paolo Toscanelli And His Friends in Bernard O Kelly edited: The Renaissance Image of Man And The World, (Ohio State University Press, 1966), p.111, 116, 126.
(34) Cavin Menzies, Ibid.
(35) Ibid.
(36) See Formation of the Chinese Civilization, Astronomy and Mathematicsp.6. www.china.org.cn/e-gudai/6.htm
(37) Dick Teresi: Lost Discoveries, The Ancient Roots of Modern Science from the Babylonians to Maya,excerpt from Chapter 3, Astornomy: Sky Watchers and More: China, p.7
www.readinggroup.com/guid...eries3.asp
(3 Nicholas of Cusa in www.newadvent.org/cathen/11060b.htm
(39) Jasper Hopkins: Nicholas of Cusa in Joseph R. Strayer ed. Dictionary of the Middle Ages(New York: Chareles Scribers Sons, 1987),p122-125
(40) Paul Robert Walker: The Italian Renaissance (Facts on File, New York 1995), p.96. The Church during the Renaissance, notes the author, was incredibly corrupt but it was surprisingly tolerant of free expression. Occasionally, progressive thinkers like Lorenzo Valla and Pico della Mirandola ran afoul of the papacy, but they werent killed for their ideas. Even Copernicus ideas of a sun-centered system had been explained to Pope Clement VII without causing serious objection. It was not until 1542 Pope Paul III established the Inquisition in Rome that the free spirit of Renaissance began to wane. Ibid, p.120,121. In a sharp contrast, Ming China crushed the free spirit of Chinese intellectuals with Qin legalist terrorism and inevitably as a result, it became stagnated and increasingly lagged far behind a new global power --- the Old World of Europe turned toward the New World across the Atlantic Ocean.
(41) Don Fernado Colon,p.20
(42) Don Fernado Colon, p.22.
Also see Paolo Emilio Taviani, tr. by Luciano F Farina & Marc A Beckwith: Columbus, The Great Adventure, His life, His Times, and His Voyages,(Orion Book, New York 1991),p.51,52
(43)Henry Vignaud,p.41,
(44) Ibid, p.59
(45) Florence in 1433 was the very heart of the Italian Renaissance. From it arose an astonishing parade of great thinkers and artists as the shining lights of the Italian Renaissance. But Florences greatest historical progress was after all its republicanism and its prevailing political philosophy as articulated by Leaonardo Bruni. Liberty is equal to all, wrote Bruni in 1428. The hope of attaining public office and rising to higher status is equal for all. See J.R. Hale:Florence and the Medici, The Pattern of Control, (Thames and Hudson, London 1977),p.9 And objectively speaking, Renaissance Florence in 1433 had, indeed, long preceded for centuries Chinese republicanism that emerged during the turn of the 19th and 20th centuries. The contrast may well explain the markedly different results at the end after the intellectual interactions between imperial Ming China and republican Renaissance Florence in 1433.