DOWNLOAD PDF III. OBSERVATIONS TO DETERMINE THE SOLAR PARALLAX, J. M. GILLISS. 1856.

Chapter 1 : Cosmic distance ladder - Wikipedia

Magnetical and meteorological observations, under the direction of J. M. Gilliss. extracted picklist extracted picklist Call number Camera Canon 5D.

In Christian Ludwig Gerling, Marburg Germany , sug- gested the solar parallax to be determined by measuring the position of Venus close to its inferior conjunction, especially at the stationary points, from observatories on nearly the same meridian but widely dif- fering in latitude. Gilliss, astronomer at the newly founded U. Naval Observatory, enthusiastically adopted this idea and pro- cured a grant for the young astronomical community of the United States for an expedition to Chile. There they were to observe several conjunctions of Venus and oppositions of Mars, while the accompany- ing measurements were to be taken at the US Naval Observatory in Washington D. This expedition was supported by A. From to not only were astronomical, but also meteorological and mag- netic observations and measurements recorded, mainly in Santa Lucia close to Santiago, Chile. In retrospect this expedition can be recognized as the foundation of the Chilean astronomy. The exchange of data between German, Amer- ican and other astronomers during this expedition was well mediated by J. After the surge of Newtonian mechanics in the 18th century the precise astronomical unit became crucial to understanding the structure of the solar system, e. Finally, in the 19th century the first calculation of a stellar parallax by Bessel [Bessel] showed that the astronomical unit is a key value in the cosmological distance ladder. It was therefore unsurprising that Benjamin A. One of the main challenges to solving this problem was the parallax measurements of the inner planets Mercury and Venus during their transits. The first of these transits failed to improve the solar parallax value, but the results stimulated the scientists in their efforts for the next transit in The values then derived for the solar parallax from different participating groups ranged from 8. It was Franz Encke, who, after a detailed analysis of all data for both transi- tions finally deduced a value for the solar parallax of 8. One critical point was that the data delivered by the two most distant stations, at Wardhus in Norway and at Otaheite on the Friendly Islands, be most accurate. On page Encke says: Such precision would require a hundred of observers at Wardhus and the same number at Otaheide. All the observations of together have but a value equal to three complete observations at Wardhus and at Otaheite. After Littrow discovered that Father Hell, the astronomer at Wardhus in , had computed an erroneous time for his observations, Encke revised the computation of the solar parallax value for the transit of and, combining the corrected value with that of the transit in , published the value 8. Two other methods had been suggested to find a more precise number for the solar parallax. Around Tobias Mayer [Mayer] developed the so called lunar theory and used the motion of the moon to deduce the solar parallax. One of the perturbation terms depends on the angle between sun and moon, the coefficient of that term on the solar parallax. One of the earliest ideas of how to find the size of planetary orbits was to measure the position of Mars with observatories at different latitudes. In the 17th century Cassini and Richer made the first efforts to observe the declination of Mars. In Lacaille made more such observations during his expedition to the Cape of Good Hope and compared them with corresponding measurements in the northern hemisphere [Gould]. At that time the instruments lacked the necessary precision. The expedition to the southern hemisphere â€" 3 Fig. Christian Ludwig Gerling â€" It was Christian Ludwig Gerling who in came up with a third method not counting the lunar theory: The paper presented here is based on publicly available information about the U. Naval expedition to the southern hemisphere and the scientific estate of Chr. Gerling containing his correspondence concerning this expedition [Gerling Archive]. He was educated together with his longtime friend Johann Franz Encke, who later became director of the Berlin Observatory. At that time he used a small observatory in Cassel for astronomical observa- tions and occupied himself with calculating the ephemerides of the asteroid Vesta. In spite of several offers he remained at the university in Marburg till his death in [Madelung]. Gerling pursued the scientific topics of astronomy of that time, making meridional observations and differential extra-meridional measurements of stars, planets and as- teroids, observations of

lunar occultations, etc. The discovery of new asteroids, beginning with 5 Astrea in and the expansion of the solar system after the discovery of the planet Neptune in must have encouraged many astronomers to increase their research into the solar system. There are two main points in this paper: There is, however, a disadvantage in observing Venus: Under these conditions observatories required merid- ional instruments of highest quality to obtain results, which could improve the solar parallax value. Second, Gerling proposes observing Venus at the stationary points of its loop Fig. The other reason is that at the stationary points the planet is moving so slowly that day-time meridional observations at different latitudes can easily be reduced by interpolation to the same meridian, if the longitudes of the observatories involved are fairly similar. Higher precision can be achieved by increasing the number of observations. Gerling suggested measuring the position of the planet through differential meridional and extra-meridional observations, especially at the stationary points of the loop, where the apparent motion of the planet is almost zero. He calculated a rough observation plan for the Venus loops of and Gerling also published a statement with these additional explanations in the Astronomische Nachrichten [Gerling b]. The success of the project required the cooperation of suitable observatories in different hemispheres of the world. Gerling began collecting information about the situation of astronomy in different parts of the world. In his pursuit he contacted Dr. He also sought to directly contact someone in South America, and although this attempt was in vain [Gerling Archive], Ms. A good source of information about his life can be found in his memoir, read before the National Academy on January 26th, by Benjamin A. Navy at the age of Being inter- ested in scientific work, he applied for leave of absence in to pursue an education at the University of Virginia. In he continued his studies in Paris before return- ing to his professional duties as a lieutenant of the Navy in Washington. He was given responsibility for the care and distribution of charts and instruments required by national vessels and for the rating of chronometers by determining the time with transit instruments. In he joined the U. Exploring Expedition as the observer responsible for moon culminations, occultations and eclipses to determine differences in longitudes. Gilliss observed more than After his return from the expedition the Secretary of the Navy assigned him the duty of preparing building plans and collecting the instruments for a new observatory. In September Gilliss reported the work complete and the observatory ready for use. However, it was Lieut. Maury, a young officer without scientific education or experience, who became the first director of the new U. Naval Observatory in Washington. Maury had be- come known for his contributions to charting winds and ocean currents, but never as an astronomer. Gilliss was assigned to duty upon the Coast Survey under Professor Bache. It is very likely that Dr. Naval Observatory [Gould]. After Gerling had a look at this report, he published a very positive note in the Heidelberger Jahrbuch of and in August Gilliss was elected a member of the Naturwissenschaftliche Gesellschaft [Gerling Archive], Ms. In June Gilliss received a letter from Gerling introducing the idea of the Venus observations for determining the solar parallax. Gilliss was overwhelmed by this proposal, which should almost completely occupy his life henceforward. From to he operated the expedition to the southern hemisphere and after returning began with reducing the data. In the Congress of the U. Although Gilliss found his name on this list, the Secretary of the Navy offered him the same salary to continue his work and prepare the remaining volumes of his report. Gilliss was later returned to duty, in he received a commission as Commander and a year later as Captain [Gerling Archive], Ms. In and he went on expeditions to observe total eclipses. He revived the idea of determining the solar parallax by simultaneous observations in Chile and in the United States â€” and finally succeeded! He died early in at the age of 54, just as the results of these observations were published. However, neither did Gilliss return to Europe nor Gerling travel to the United States; they never met personally. It is remarkable that at that time the young and developing American scientific community was becoming involved in astronomical research but had not yet published a noticeable contribution to science [Rothenberg]. Sears Cook Walker at that time at the U. Naval Observatory and soon both were forwarding it to all American astronomers and observatories and to the National Intelligencer, one of the leading newspapers in Washington at that time. Noteworthy are the several articles this newspaper published during the preparations and actual course of the expedition. Until November Gilliss studied the idea.

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Counting on the new U. Boguslawski, director of the Breslau observatory welcomed and published it in his circular Uranus. Encke also sent an encouraging note. Gilliss soon was able to convince all of the leading American astronomers! Peirce, professor of mathematics at Harvard University, responded: There were however many other very important observation and measurements, which Gilliss reported in volumes I, II and VI. The volumes IV and V never were published. The data planed to be included in these volumes where published later by the U. Naval Observatory in its Astronomical and Meteorological Observations. Washington observations for , app. I, , and Astronomical, Magnetic and Meteorological observations Washington observations for , app. Gerling cannot be regarded as inferior in importance to any problem in practical astronomy. And then Peirce continued: Unlike Gilliss he preferred an observatory on the mainland of Chile and not at one of the southern islands. He recommended a location near to Valparaiso, mainly because of the more stable weather conditions in that area, whereas the closer proximity to the northern station at Washington D.

Chapter 2 : Tuttles of Harvard College Observatory part 2 | Richard Schmidt - racedaydvl.com

Magnetical and meteorological observations, under the direction of J. M. Gilliss. extracted picklist extracted picklist extracted picklist Call number Camera Canon 5D.

The approximation is far more accurate for parallax errors that are small relative to the parallax than for relatively large errors. Then, eventfields in spacetime can be deduced directly without intermediate models of light bending by massive bodies such as the one used in the PPN formalism for instance. Measurements made by viewing the position of some marker relative to something to be measured are subject to parallax error if the marker is some distance away from the object of measurement and not viewed from the correct position. For example, if measuring the distance between two ticks on a line with a ruler marked on its top surface, the thickness of the ruler will separate its markings from the ticks. If viewed from a position not exactly perpendicular to the ruler, the apparent position will shift and the reading will be less accurate than the ruler is capable of. A similar error occurs when reading the position of a pointer against a scale in an instrument such as an analog multimeter. Photogrammetry Aerial picture pairs, when viewed through a stereo viewer, offer a pronounced stereo effect of landscape and buildings. Measurements of this parallax are used to deduce the height of the buildings, provided that flying height and baseline distances are known. This is a key component to the process of photogrammetry. Photography Contax III rangefinder camera with macro photography setting. Because the viewfinder is on top of the lens and of the close proximity of the subject, goggles are fitted in front of the rangefinder and a dedicated viewfinder installed to compensate for parallax. Failed panoramic image due to the parallax, since axis of rotation of tripod is not same of focal point. Parallax error can be seen when taking photos with many types of cameras, such as twin-lens reflex cameras and those including viewfinders such as rangefinder cameras. In such cameras, the eye sees the subject through different optics the viewfinder, or a second lens than the one through which the photo is taken. As the viewfinder is often found above the lens of the camera, photos with parallax error are often slightly lower than intended, the classic example being the image of person with his or her head cropped off. This problem is addressed in single-lens reflex cameras , in which the viewfinder sees through the same lens through which the photo is taken with the aid of a movable mirror , thus avoiding parallax error. Parallax is also an issue in image stitching , such as for panoramas. Sights Parallax affects sighting devices of ranged weapons in many ways. On sights fitted on small arms and bows , etc. A typical hunting rifle. Optical sights Simple animation demonstrating the effects of parallax compensation in telescopic sights, as the eye moves relative to the sight. In some reticled optical instruments such as telescopes , microscopes or in telescopic sights "scopes" used on small arms and theodolites , parallax can create problems with aiming when the reticle is not coincident with the focal plane of the target image. Some firearm scopes are equipped with a parallax compensation mechanism, which basically consists of a movable optical element that enables the optical system to shift the focus of the target image at varying distances into the exact same optical plane of the reticle. Many low-tier telescopic sights may have no parallax compensation because in practice they can still perform very acceptably without eliminating parallax shift, in which case the scope is often set fixed at a designated parallax-free distance that best suits their intended usage. Scopes for airguns are very often found with adjustable parallax, usually in the form of an adjustable objective or "AO" for short design. These may adjust down as far as 3 yards 2. Non-magnifying reflector or "reflex" sights have the ability to be theoretically "parallax free. At finite distances eye movement perpendicular to the device will cause parallax movement in the reticle image in exact relationship to eye position in the cylindrical column of light created by the collimating optics. Therefore, when aiming its guns at the target, the fire control system must compensate for parallax in order to assure that fire from each gun converges on the target. Rangefinders Parallax theory for finding naval distances A coincidence rangefinder or parallax rangefinder can be used to find distance to a target. The apparent displacement, or difference of position, of an object, as seen from two different stations,

or points of view. In contemporary writing parallax can also be the same story, or a similar story from approximately the same time line, from one book told from a different perspective in another book. Sure the picture is in my eye, but I am also in the picture.

Chapter 3 : Matthew Fontaine Maury - Wikipedia

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Maury also had Dutch-American ancestry from the "Minor" family of early Virginia. The family moved to Franklin, Tennessee , when he was five. He wanted to emulate the naval career of his older brother, Flag Lieutenant John Minor Maury , who, however, caught yellow fever after fighting pirates as an officer in the US Navy. Maury strongly considered attending West Point to get a better education than the Navy could offer at that time, but instead, he obtained a naval appointment through the influence of Tennessee Representative Sam Houston , a family friend, in , at the age of Almost immediately, Maury began to study the seas and to record methods of navigation. Scientific career[edit] His seagoing days came to an abrupt end at the age of 33, after a stagecoach accident broke his right leg. Thereafter, he devoted his time to the study of naval meteorology, navigation , charting the winds and currents, seeking the "Paths of the Seas" mentioned in Psalms 8: He would assemble them night and morning to read the Psalter for the day, verse and verse about; and in this way, so familiar did this barefooted boy [M. Maury] become with the Psalms of David, that in after life he could cite a quotation, and give chapter and verse, as if he had the Bible open before him. His Bible is depicted on his monument beside his left leg. See enlarged image on this page [2] As officer-in-charge of the United States Navy office in Washington, DC , called the "Depot of Charts and Instruments" the young lieutenant became a librarian of the many unorganized log books and records in The product of his work was international recognition and the publication in of "Wind and Current Chart of the North Atlantic. Maury was one of the principal advocates for the founding of a national observatory, and he appealed to science enthusiast and former US President, Representative John Quincy Adams for the creation of what would eventually become the Naval Observatory. Maury occasionally hosted Adams, who enjoyed astronomy as an avocation, at the Naval Observatory. As a sailor, Maury noted that there were numerous lessons that had been learned by ship-masters about the effects of adverse winds and drift currents on the path of a ship. The captains recorded the lessons faithfully in their logbooks, but they were then forgotten. His dream was to put that information in the hands of all captains. Whalers at the time went to sea, sometimes for years, without knowing that whales migrate and that their paths could be charted. The reasoning behind that was sound. Logs of old whaler ships indicated the designs and the markings of harpoons. Harpoons found in captured whales in the Atlantic had been shot by ships in the Pacific and vice versa at a frequency that would have been impossible if the whales had traveled around Cape Horn. Maury, knowing a whale to be a mammal, theorized that a northern passage between the oceans that was free of ice must exist to enable the whales to surface and breathe. That became a popular idea that inspired many explorers to seek a reliably-navigable sea route. Many of the explorers died in their search. Their duty was always temporary at the Observatory, and new men had to be trained over and over again. Maury was working with astronomical work and nautical work at the same time and constantly training new temporary men to assist in those works. He always had able assistants even though they constantly changed, as they were reassigned as part of their duties. In , Maury spoke out on the need for a transcontinental railroad to join the Eastern United States to California. He recommended a southerly route with Memphis, Tennessee as the eastern terminus, as it is equidistant from Lake Michigan and the Gulf of Mexico. He argued that a southerly route running through Texas would avoid winter snows and could open up commerce with the northern states of Mexico. Maury also advocated construction of a railroad across the Isthmus of Panama. Having charted the seas and currents, he worked on charting land weather forecasting. Congress refused to appropriate funds for a land system of weather observations. Maury early became convinced that adequate scientific knowledge of the sea could be obtained only by international co-operation. He proposed for the United States to invite the maritime nations of the world to a conference to establish a "universal system" of meteorology, and he was the leading spirit of a pioneer scientific conference when it met

in Brussels in Within a few years, nations owning three fourths of the shipping of the world were sending their oceanographic observations to Maury at the Naval Observatory, where the information was evaluated and the results given worldwide distribution. As a result of the Brussels Conference, a large number of nations, including many traditional enemies, agreed to co-operate in the sharing of land and sea weather data using uniform standards. The Pope established honorary flags of distinction for the ships of the Papal States, which could be awarded only to the vessels that filled out and sent to Maury in Washington, DC, the Maury abstract logs. Maury thought the Amazon might serve as a "safety valve" by allowing Southern slaveowners to resettle or sell their slaves there. The expedition aimed to map the area for the day when slave owners would go "with their goods and chattels to settle and to trade goods from South American countries along the river highways of the Amazon valley. Maury knew, when he wrote in the news journals of the day, that Brazil was bringing in new slaves from Africa. He proposed that moving the slaves in the United States to Brazil would reduce or eliminate slavery in time in as many areas of the United States as possible. He also hoped to stop the bringing of new slaves to Brazil, which only increased slavery by the capture and enslavement of more Africans. It was mindful of the background of previous US territorial annexations of parts of Mexico: Brazil thus acted diplomatically and through the press to avoid, by all means, the colonization proposed by Maury. By , the project had certainly failed. Brazil authorized free navigation to all nations in the Amazon in but only when it was at war against Paraguay and free navigation in the area had become necessary. Because he was an international figure, he was ordered to go abroad for many reasons, including disseminating propaganda for the Confederacy, pursuing peace, and purchasing ships. He went to England, Ireland, and France, acquiring ships and supplies for the Confederacy. By speeches and newspaper publications, Maury tried desperately to get other nations to stop the American Civil War, carrying pleas for peace in one hand and a sword in the other, both to deal with whatever the outcome. Maury was elected by the Confederate Congress a commissioner of Weights and Measures in association with a mathematics professor, Francis H. Smith, of the University of Virginia. Maury had experience with the transatlantic cable and electricity flowing through wires underwater when working with Cyrus West Field and Samuel Finley Breese Morse. The torpedoes, similar to present-day contact mines, were said by the Secretary of the Navy in "to have cost the Union more vessels than all other causes combined. Thus, returning there was not immediately considered. After the war, after serving Maximilian in Mexico as "Imperial Commissioner of Immigration" and building Carlotta and New Virginia Colony for displaced Confederates and immigrants from other lands, Maury accepted a teaching position at the Virginia Military Institute , holding the chair of physics. Maury advocated the creation of an agricultural college to complement the institute. Maury considered becoming president of St. Lee in Lexington from statements that Maury made in letters. Maury served as a pall bearer for Lee. He had once been a gold mining superintendent outside Fredericksburg and had studied geology intensely during that time and so was well equipped to write such a book. Maury later gave talks in Europe about co-operation on a weather bureau for land, just as he had charted the winds and predicted storms at sea many years before. He gave the speeches until his last days, when he collapsed giving a speech. He was exhausted from traveling throughout the nation while he was giving speeches promoting land meteorology. Maury asked his daughters and wife to leave the room.

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Chapter 4 : Browse subject: Parallax -- Stars | The Online Books Page

Get this from a library! The U.S. Naval Astronomical Expedition to the southern hemisphere, during the years '" [J M Gilliss; United States Naval Astronomical Expedition].

Stellar Parallax and Parsec Stellar parallax motion from annual parallax. Half the apex angle is the parallax angle. The most important fundamental distance measurements come from trigonometric parallax. As the Earth orbits the Sun, the position of nearby stars will appear to shift slightly against the more distant background. Astronomers usually express distances in units of parsecs parallax arcseconds ; light-years are used in popular media. Because parallax becomes smaller for a greater stellar distance, useful distances can be measured only for stars which are near enough to have a parallax larger than a few times the precision of the measurement. Parallax measurements typically have an accuracy measured in milliarcseconds. For a group of stars with the same spectral class and a similar magnitude range, a mean parallax can be derived from statistical analysis of the proper motions relative to their radial velocities. For stars in the Milky Way disk, this corresponds to a mean baseline of 4 AU per year, while for halo stars the baseline is 40 AU per year. After several decades, the baseline can be orders of magnitude greater than the Earthâ€"Sun baseline used for traditional parallax. However, secular parallax introduces a higher level of uncertainty because the relative velocity of observed stars is an additional unknown. When applied to samples of multiple stars, the uncertainty can be reduced; the uncertainty is inversely proportional to the square root of the sample size. Only open clusters are near enough for this technique to be useful. In particular the distance obtained for the Hyades has historically been an important step in the distance ladder. Other individual objects can have fundamental distance estimates made for them under special circumstances. If the expansion of a gas cloud, like a supernova remnant or planetary nebula , can be observed over time, then an expansion parallax distance to that cloud can be estimated. Those measurements however suffer from uncertainties in the deviation of the object from sphericity. The common characteristic to these methods is that a measurement of angular motion is combined with a measurement of the absolute velocity usually obtained via the Doppler effect. The distance estimate comes from computing how far the object must be to make its observed absolute velocity appear with the observed angular motion. Expansion parallaxes in particular can give fundamental distance estimates for objects that are very far, because supernova ejecta have large expansion velocities and large sizes compared to stars. Further, they can be observed with radio interferometers which can measure very small angular motions. These combine to provide fundamental distance estimates to supernovae in other galaxies. Standard candles[edit] Almost all astronomical objects used as physical distance indicators belong to a class that has a known brightness. These objects of known brightness are termed standard candles. The brightness of an object can be expressed in terms of its absolute magnitude. This quantity is derived from the logarithm of its luminosity as seen from a distance of 10 parsecs.

Chapter 5 : Expeditions and Voyages

to determine the solar parallax James M. Gilliss, astronomer at the newly founded U.S. Naval Observatory, enthusiastically adopted this idea and pro- netic observations and measurements.

Richard Schmidt anti-tail pointed to the Sun, and the head of the comet of the 18th. That discovered by Mr Bond on the was arrayed with rapidly shifting jet-like rays. The evening of [3 July]. Tuttle and Asaph Hall observed it for launching a dispute with Tuttle over priority that position with the Great Equatorial and each computed would last four decades. Tuttle generated more excitement and media coverage at Harvard. Only two other Americans had ever discovered minor planets: On the evening of 6 April , Tuttle instituted a systematic search for new minor planets. Against the backdrop of the outbreak of civil war in America, The Boston Courier in its editorial, commented: It is with great pleasure that we record the discovery of a new planet at Cambridge by Mr. This is the first planet ever discovered in this vicinity, and while the discovery confers great honor on the discoverer, our ancient Fig. For centuries the the Cambridge Observatory. Naval Observatory admiration should now occur among us. The noble science of The object which you saw on the evening of 15th astronomy rises to a loftier height, through the was most probably the Comet announced by Prof. Tuttle on the evening from its serene eminence proclaims its immortality Issue 6, January 94 The Antiquarian Astronomer amidst the ruins of empires, and preserves a people The Search for Planet Vulcan from oblivion. Bond measured its position with the Great Equatorial, with some difficulty due to clouds. Ingersol Bowditch, Observatory patron and member of the Visiting Com- mittee, was selected to name the planet, and he chose Clytie, spurned lover of Apollo now known by the German form, Klytia. Tuttle left some fine drawings of Jupiter in the Equatorial logs for March and April This observation from 27 April shows how he was Fig. Alexander Strahan, , Fig. Another transit was predicted for March comet hunters catalogued new diffuse and extended Herrick, librarian and treasurer at objects. Tuttle contributed several, including in- Yale College wrote to G. Tuttle, Staff Photographs, U. Conclusion For the Harvard College Observatory, the years 62 were nights and days of labour and occasional Fig. The Tuttles, as tireless observers, Isaac Smith Homans â€” His battle sword was recovered by Confederate across the country had often sung the praises of the forces and eventually returned to his twin brother, Harvard College Observatory and its astronomers. Three of Horace P. He struggled showers, and for these alone his name endures. Tuttle, never married, had Asaph Hall discovered the moons of Mars at the U. Hall retired in and In , Mrs. He died in November He had a beard like Santa Claus, Truman Henry Safford was expected to succeed and he used to sit out in his chair and tell us stories G. Bond as third director of the Observatory, but of the stars in the heavens. He called me was not chosen. Tuttle left the its funding evaporated in the great fire of He Harvard College Observatory, not another comet or spent the next several years as astronomer with the minor planet would be discovered at Cambridge, Mas- Wheeler survey of the western states. In he sachusetts. He was appointed U. Commissioner, and practiced Acknowledgements before the U. He served for years as The author wishes to acknowledge the invaluable a board member of the New England Historic Genea- assistance of the staff of the Harvard-Smithsonian logical Society, authoring many works of genealogical Center for Astrophysics, Cambridge, MA, in history. His wife Astronomical Photographs, and Dr. Owen Gingerich, Mary Parks survived him nearly six years. On senior astronomer emeritus. He served for over ten years as Genealogical Society, Boston, provided generous paymaster in the U. Navy, helped capture the British access to the papers of Charles Wesley Tuttle. Naval Observatory in College awarded him an honorary degree Master of Arts in Science in Newetowne, Massachusetts became Cambridge the U. Page, Lucius returned to Washington, D. With his own Brashear reflecting comet 2. Seeley, Burn- New York: Appleton and Company, , side, and Seeley, , Fifty years later p. Folsom, Wells and Thurston, , p. Dean , p. Evidently it was a polite 4. Jones and Boyd , pp. Hoyt, Albert Harrison, Capt. Associated University Presses, , ; Connecticut , 21 March , p. Equatorial, at the Observatory of Harvard Jones and Boyd , p. Leverington, David, Babylon to Voyager and

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In John Hadley observed the dusky Cambridge: Tuttle a shadow of one of the bright rings. Privately printed, , p. Bro- England, sailed on the galleon Angel Gabriel, therton, , The elusive English galleon, Bristol, College Observatory Memorandum Book - Freeman , [hereafter HCO] M. Bond, William Cranch, , p. His stepsister was Sarah B. Visiting Committee of the Board of Overseers of Quinquennial Catalogue of the Officers and Graduates of Harvard University, On 29 August Bond discovered comet Cambridge: Harvard University Press, , II. Tuttle Papers MSS Avery Special Collections Department, New Theodor Brorsen , at the observatory Fifty-one clocks were carried on the later trips. Bartky, Ian, Selling the true time Stanford: Astronomical Journal , 2 32 , p. Stanford University Press, , p. Dean , pp. Tuttle spent most of his life unaware of his true Astronomical Journal , 2 41 , p. In and Tuttle Pension Office admitting that , p. Astronomical Journal 3 56 , p. The Harvard Catalogue does not list M. Tuttle as a student of Harvard, nor of the New York Times, 3 May , p. Lawrence Scientific School, nor of the Astro- Harwood, Margaret, Bond Zones of Faint Cranch Bond, director of the Harvard College Observatory, , and of his son, George Issue 6, January The Antiquarian Astronomer For longitude determination from lunar

Chapter 6 : National Astronomical Observatory (Chile) | Revolvy

Abstract: Between and the U.S. astronomer J.M. Gilliss led an expedition to Santiago, Chile, aimed at improving the accepted value for the solar parallax. Although this particular research project was not a success, the.

Chapter 7 : Parallax | Revolvy

Abstract. Vols. 4 and 5, designed to contain the results of the astronomical observations, were not published. The material was published later by the U.S. Naval observatory in its Astronomical and meteorological observations.

Chapter 8 : Catalog Record: The U. S. Naval Astronomical Expedition to | Hathi Trust Digital Library

The U. S. Naval Astronomical Expedition to the Southern Hemisphere, During the Years '"52 Observations to Determine the Solar Parallax by J. M. Gilliss Vol. 3 Observations to Determine the Solar Parallax.