SOLAR ECLIPSE NEWSLETTER

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The Solar Eclipse Mailing List

The Solar Eclipse Mailing List (SEML) is an electronic newsgroup dedicated to Solar Eclipses. Published by eclipse chaser Patrick Poitevin (patrick_poitevin@hotmail.com), it is a forum for discussing anything and everything about eclipses.

Thanks to the voluntary efforts of Jan Van Gestel of Geel, Belgium, the Solar Eclipse Mailing List (listserver) has been in operation since 10 December 1997. This is the first mailing list devoted solely to topic of solar eclipses on the internet.

You can send an e-mail message to the list server solareclipses@Aula.com, which will then forward your e-mail to all the subscribers on the list. Likewise, you'll receive e-mail messages that other subscribers send to the listserver. Only subscribers can send messages.

Solar Eclipse Mailing List

Dear Eclipse Chasers

By the time this issue hits the internet you should all be well under way with the preparations. We had a glorious weekend in a local nature beauty spot last weekend trying the tent out. For any of you that don't know, we will be at Eureka camping park, (and lets hope that the eclipse will be), south of Lusaka. So please drop by if you happen to be in the area. Except for some excursions we will mainly be there. At least we know we will not be missing any tent poles, well, that's assuming all the baggage arrives in Zambia. But I must not tempt fate! As you can also see by the pictures, the sun decided to make a rare appearance in England, enough for us to hurriedly take all the equipment out into the garden and give a final try before the big day. I hope to get the next issue out before we leave for Africa, so keep checking out the web page. The children have already started their malaria drugs, giving enough time to ma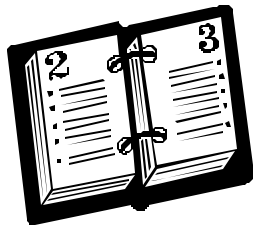ke changes if they are unsuitable. The jabs didn't cause any ill side effects, so its almost time to go, and wonder what awaits us, Victoria Falls, and Game parks. Names that you look at as a child in books and wonder, well in two weeks the waiting is over, and the adventure begins.
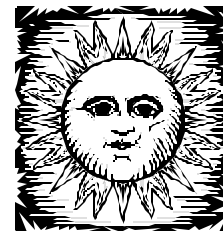
Regards

Joanne & Patrick

ECLIPSE CALENDAR

APRIL 2001

Dear All,

Please find herewith May's solar eclipse calendar. If you have remarks or additional items, please send me a message. If you are interested in the source, please let me know and I send you the list of the abbreviations.

May 01, 0664 "In this year the Sun was eclipsed on the 5th of the Nones of May; and Earcenbryht, the King of the Kentish people died and Ecgbryht his son succeeded to the Kingdom."   Refers to the total solar eclipse of 1 May AD 664.   From: The Anglo Saxon Chronicles. Ref SW Solar Eclipses from Year 1.

May 01, 1185 "On the first day of the month of May, on the day of the Saint Prophet Jeremiah, on Wednesday, during the evening service, there was a sign in the Sun. It became very dark, even the stars could be seen; it seemed to men as if everything were green, and the Sun became like a crescent of the Moon, from the horns of which a glow similar to that of red-hoot charcoals was emanating. It was terrible to see this sign of the Lord." From: Lavrentievskaya Letopis. "On the first day of the month of May, during the ringing of the bells for the evening service, there was a sign in the Sun. It became very dark for an hour or longer and the stars were visible and to men everything seemed as if it were green. The Sun became like a crescent of the new Moon and from its horns a glow like a roasting fire was coming forth and it was terrible to see the sign of the Lord. Then the Sun cleared and we were happy again." From: Novgorodskaya II Letopis Both of these quotations refer to a total solar eclipse in Novgorod, Russia, of 1 May 1185. Ref. FRS 1997, page 395.

May 03, -1374 (1375 BC) Syria: A clay tablet found at that site notes that "the day of the New Moon in the month of (Apr-May) was put to shame. The sun went down with Mars in attendance. This means the overlord will be attacked by his vassals." Ulysses 3/97" But: "was put to shame" was also translated as "on the sixth" (day) and again differently by others. "went down" is the same word as that used for "to set". Ref. ENB013. This is no solar eclipse, although mentioned by several references. Ref. SENL July 1999.

May 03, 1715 Probably the first map of a path of totality, drawn by the English astronomer Edmond Halley (1656-1742 or 1743). On a copper plate he engraved the totally paths of the total solar eclipses of 3 May 1715 and 11 May 1724. On top of the map, the date 22 April 1705 (i.o. 3 May) is mentioned, but that is because the Gregorian Calendar in England was introduced in 1751.

May 03, 1715 Edmond Halley (1656-1742 or 1743) England, during an eclipse in England, is the first to report the phenomenon later known as Baily's Beads; also notes bright red prominences and the east-west asymmetry in the corona, which he attributes to an atmosphere on the Moon or Sun. Halley observed from London (John Flamsteed (1646-1719) observed from Greenwich).

May 03, 1715 "A few seconds before the sun was all hid, there discovered itself round the moon a luminous ring about a digit, or perhaps a tenth part of the moon's diameter, in breadth. It was of a pale whiteness, or rather pearl-colour, seeming to me a little tinged with the colors of the iris, and to be concentric with the moon." Refers to a total solar eclipse of 3 May 1715. From: Edmund Halley.   Ref. Popular Astronomy by Newcomb, and in UK Solar Eclipses from Year 1 by Williams.

Edmund Halley

ECLIPSE CALENDAR

May 03, 1769 "It will be Eclipse first, the rest nowhere." Dennis O'Kelly (at Epsom, 3 May 1769) (Quoted in The Penguin Dictionary of Quotations by Cohen and Cohen. In UK Solar Eclipses from Year 1, Sheridan Williams says: "One of the world's most successful racehorses was born around the time of this [annular eclipse of 1 April 1764] and was named Eclipse. The Eclipse Stakes, named after that horse, are still run today, and the horse of the year awards in the U.S. are called Eclipse Awards after him.")

May 03, 1880 Death of Jonathan H. Lane, American physics and astronomer. Studied temperature and physics of the Sun and density of Sungas.

May 03, 1981 Hess 2844 (1981 JP): Minor planet discovered May 03, 1981 by Edward L.G. Bowell at Anderson Mesa. Named in honor of Frederick Hess, Prof. of natural sciences at the State Univ. of NY at Fort Schuyler and long time lecturer at the Hayden Planetarium-American Museum in NYC. Hess has directed a number of Solar Eclipse expedition and has accumulated more than 30 min in the shadow of the Moon. MPC 9215. Name proposed by the discoverer. Ref. VK6/97

May 05, 0840 "In the third year of the Indiction, the Sun was hidden from this world and stars appeared in the sky as if it were midnight, on the third day before the Nones of May (May 5) during the Litanies of Our Lord. There was great distress, and while the people beheld it, many thought that this age would last no longer. But while they were contemplating these simple things, the Sun shone again and tremb ling as it were began to escape from its former shade." Refers to a total solar eclipse of 5 May AD 840. From: Andreas Bergomatis Chronicon. Ref. FRS 1997, page 387.

May 05, 1361 " Chih-cheng reign period, 21st year, 4th month, day hsin-szu, the first day of the month. As the Sun was about to sink (i.e. set) suddenly it lost its light. It took the shape of a plantain leaf. The sky was as dark as night and the stars were shining brightly. For a short time (literally: for the duration of a meal)., the sky became bright again. Then in a short time (the light) disappeared once more."   Refers to a total solar eclipse of 5 May 1361. From: Sung-chiang Fu-chih (History of the town of Sung-chiang, south-west of Shanghai). Ref. FRS 1997, page 259.

May 06, 1883 Carolina 235: Minor planet discovered 1883 November 28 by Johann Palisa at Vienna. Named for an atoll of the Line Islands, 450 miles northwest of Papeete, Tahiti, where the discoverer observed the Total Solar Eclipse of May 6, 1883. Palisa observed the solar neighborhood in order to find an intra-Mercurian planet. BAJ CIR 218. Ref. VK 6/97

May 06, 1883 Oceana 224: Minor planet discovered 1882 March 30 by Johann Palisa at Vienna. Named for the Pacific Ocean. The discoverer communicated from Honolulu on return from the solar eclipse expedition of May 6, 1883 that Governor von Dessarts of Tahiti has named this planet. BAJ CIR 210 (1883). Ref. VK 6/97

May 07, 1819 Birth of Otto Wilhelm von Struve (1819-1905) in Dorpat, Russian astronomer. Discovered 547 double stars, studied rings of Saturn and parallax of the Sun.

May 11, 1904 Merapi 536: Minor planet discovered 1904 May 11 by G. H. Peters at Washington. Named after a mountain in west central Sumatra, site of the U.S. Naval Observatory and other expeditions to the Solar Eclipse of May 18, 1901. It gives off smoke more or less continuously and the name means "with fire". The discoverer was a member of the Eclipse expedition. Ref. VK 6/97

May 11, 1916 Death of Karl Schwarzschild, German astronomer. Explained the difference in light intensity of the edge of the Sun in 1906.

May 11, 1924 Birth of Antony Hewish, British physicist and astronomer. Studied Solarwind. Got Nobelprice of physics in 1974.

May 11, 1956 Death of Walter S. Adams, American astronomer. Studied spectra of Sunspots and stars.

May 12, 1706 An English ship captain named Stannyan, on vacation in Switzerland, reports a reddish streak (chromosphere? prominence?) along the rim of the Sun as the eclipse becomes total.

May 12, 1706 If Duillier's account is to be trusted, the Moon's shadow was first seen in its swift approach. (ref. Total E of the S, Todd, 1894)

ECLIPSE CALENDAR

May 13, 1733 Birger Wassenius (Sweden), observing an eclipse near Göteborg, is the first to report prominences visible to the unaided eye; he attributes them to the Moon.

May 13, 1733 As per Patrick Moore, Guiness Book of Astronomy (1983), the shadow bands have been reported for the first time by H. Goldschmidt in 1820. The description is also mentioned in the book of Mabel Todd, Total Eclipses of the Sun, 1894. But during the total solar eclipse of 13 May 1733 (2 May 1733 Julian date), observations have been coordinated and collected by Celsius. The eclipse was visible in the north of Europe. In Forsheim, Sweden, the duration was a little more then 3 minutes. The Transactions of the Royal Society of Sweden do have the most physical nature observations of a solar eclipse of that time and before. Edmond Halley (1656-1742 or 1743) was the only whom noted a physical observation during the eclipse of 1715. Rydhenius, pastor of Forshem noted following: when the sun was about to lose his light, and also when he was about to recover it, he emitted rays that undulated like the aurora borealis, and were of a fiery red color. At the same eclipse, the pastor of Flo noted: towards the total obscuration stars were visible, and also a singular fluctuation in the air. (ref. History of Physical Astronomy)

May 13, 1733 The first person who makes mention of earthshine during totality is Bigerus Vassenius the Swedish astronomer. In the account of that eclipse which he transmitted to the royal Society, he asserts that with the telescope of 21 feet focal length, he perceived several of the principal spots on the moon during the total obscuration. Ferrer also states, that during the total eclipse of 1806, the irregulations of the moon's surface were plainly discernible. (ref. History of Physical Astronomy).

May 14, 1230 "On the 14th May, which was the Tuesday in Rogation Week, the unusual eclipse of the Sun took place very early in the morning, immediately after sunrise; and it became so dark that the labourers, who had commenced their morning's work, were obliged to leave it, and returned again to their beds to sleep; but in about an hour's time, to the astonishment of many, the Sun regained its usual brightness." Refers to the total solar eclipse of 14 May 1230. From: Rogerus de Wendover, Flores Historiarum, vol. ii. p.235. Ref. FRS 1997, 425.
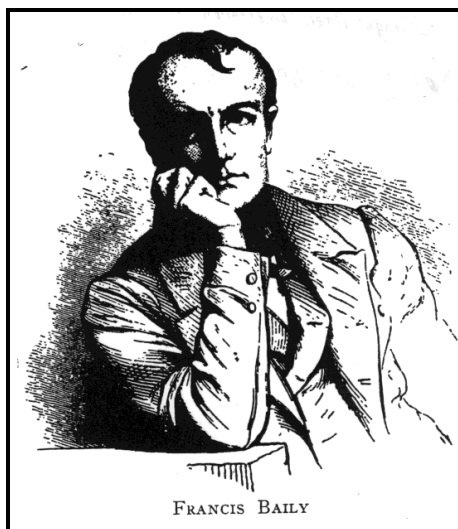
FRANCIS BAILY

May 14, 1973 Launch of Skylab, American spaceship. Got 3 times visitors of each time 3 astronauts. Research of the sun.

May 15, 1836 Francis Baily (1774-1844) UK, during an annular eclipse in Scotland, calls attention to the brief bright beads of light that appear close to totality as the Sun's disk is blocked except for the sunlight streaming through lunar valleys along the limb. This phenomenon becomes known as Baily's Beads.

May 15, 1921 First record of Aurora Borealis observation during day time? Aurora have been seen in New Zealand and surrounding islands. September 18, 1941, in the north, Michigan, Aurora Borealis have been reordered during daytime. (ref. SaT 3/1954 and 12/1953)

May 17, 1836 Sir Joseph Norman Lockyer (1836-1920), British physicist and astronomer was born at Rugby on May, 17th 1836 to Mr. Joseph Hooley Lockyer, a lecturer on scientific subjects at Rugby School and his wife Anne Norman. Sir Joseph Norman Lockyer (1836-1920) founded the magazine Nature in 1869. Observed the sun and discovered one unknown line in the spectra: helium. Observed 8 total solar eclipses.

May 17, 1882 A comet is discovered and photographed by Sir Arthur Schuster (1851-1934), Germany/UK, during an eclipse in Egypt: first time a comet discovered in this way has been photographed. The Total Solar Eclipse had been observed by Sir Joseph Norman Lockyer (1836-1920), Ranard and Schuster from England, Tacchini from Italy, Trépied, Thollon and Puiseux from France. Observation from Sohag at the Nile.

May 18, 1901 Rainbow observed during the total solar eclipse on Mauritius. Early in
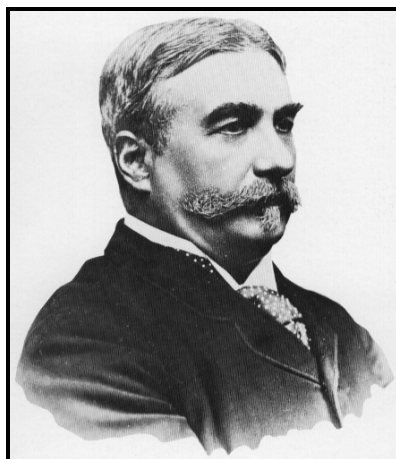
Norman Lockyer

ECLIPSE CALENDAR

the morning the eclipse was accompanied by a rainbow. It was unearthly, containing a bright pink line, a spectrum of the sun's chromosphere. (ref. The Under-standing of eclipses, Ottewell, 1991)

May 18, 1901 Merapi 536: Minor planet discovered 1904 May 11 by G. H. Peters at Washington. Named after a mountain in west central Sumatra, site of the U.S. Naval Obs and other expeditions to the Solar Eclipse of May 18, 1901. It gives off smoke more or less continuously and the name means "with fire". The discoverer was a member of the Eclipse expedition. Ref. VK 6/97

May 19, 1985 Dr. Rudolf Gulyaev, once made attempt to carry out photographic observation of the partial solar eclipse below the horizon (May 19, 1985). He put the task to estimate how much the sky brightness at the horizon is reduced during the eclipse occurring under the horizon. Maximum eclipse magnitude was about 0.8 by the Sun altitude of minus 3 degrees. The observations were made at elevation more than 2000 meters above the sea level (Mondy, near Irkutsk, Siberia). Regretfully, the sky was cloudy above the horizon, however there were small gaps between the clouds. Visually, it seemed that the sky above the horizon (towards the Sun) was more dark than at zenith on the contrary to normal conditions prior the sunrise. (ref. personal mail 7/98)

May 20, 1947 George Van Biesbroeck did observe a comet the day of the total solar eclipse of May 20, 1947. The comet was of magnitude 4 to 5. Several sources do mention as he observed this comet during the eclipse. This is wrong. He observed the comet on the morning of eclipse day, before dawn.

May 22, 0133 Solar eclipse which is the nearest with Whitsunday (25 May 133). A solar eclipse can never be on Whitsunday. Easter is on a Sunday, 21 days after full moon. Whitsunday is 49 days after Easter. The age of the moon can only be between 5 to 11 days, or short before first quarter of short before full moon. On Whitsunday, or on Easter there will never be a solar eclipse. Whitsunday of 133 is only 3 days after new moon, or the solar eclipse of 22 May 133.

May 22, 1724 Giacomo Filippo Maraldi (Italy/France) concludes that the corona is part of the Sun because the Moon traverses the corona during an eclipse.

May 23, 1221 "On the first day of the fifth month (May 23), at noon, the Sun was eclipsed and it was total. All the stars were therefore seen. A short while later the brightness returned. At that time we were on the southern bank of the river. The eclipse (began) at the south-west and (the Sun) reappeared from the north-east. At that place it is cool in the morning and warm in the evening; there are many yellow flowers among the grass. The river flows to the north-east. On both banks there are many tall willows. The Mongols use them to make their tents. [Later] (Ch'ang-ch'un) asked (an astronomer) about the solar eclipse on the first day of the month (May 23). The man replied: 'Here the Sun was eclipsed up to 7 fen (6/10) at the hour of ch'en (7-9 h)'. The Master continued, 'When we were by the Lu-chu Ho (Kerulen River), during the hour wu (11-13 h) the Sun was seen totally eclipsed and also south-west of Chin-shan the people there said that the eclipse occurred at the hour szu (9-11 h) and reached 7 fen. At each of these three places it was seen differently. According to the commentary on the Ch'un-ch'iu by K'ung Ying-ta, when the body (of the Moon) covers the Sun, then there will be a solar eclipse. Now I presume that we must have been directly beneath it; hence we observed the eclipse to be total. On the other hand, those people on the sides (of the shadow) were further away and hence (their view) gradually became different. This is similar to screening a lamp with a fan. In the shadow of the fan there is no light or brightness. Further away from the sides (of the fan) then the light of the lamp gradually becomes greater." Refers to a total solar eclipse of 23 May 1221. From: Ch'ang-ch'un Chen-jen Tao-ts'ang('The Journey of the Adept Ch'ang-ch'un to the West'). Ref. FRS 1997, page 254.

May 25, 1267 "At that time the Moon obscured the Sun when it was in the 4th part (degree) of Gemini, at the 3rd hour before midday on the 25th day of May in the year 6775 (AD 1267). It was a total eclipse of about 12 digits or points. Also, such darkness arose over the Earth at the time of mid-eclipse that many stars appeared. No doubt this portended the very great and destructive calamities which were soon to be vented on the Romans by the Turks." Refers to a solar eclipse in Constantinople of 25 May 1267. From: Nicephori Gregorae Byzantinae Historiae. Ref. FRS 1997, page 404.

May 25, 2142 Next total solar eclipse in Ostend, Belgium. The last total solar eclipse took place more than 11 centuries ago, 29 September 878. But only 9 years later, on 14 June 2151, there will be another one. Ref. JM 9/99.

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May 27, -0668 (669 BC) "If the Sun at its rising is like a crescent and wears a crown like the Moon: the king wll capture his enemy's land; evil will leave the land, and (the land) will experience good . . . " Refers to a solar eclipse of 27 May 669 BC. Rasil the older, Babylonian scribe to the king. FRS 1997, page 125.

May 28, -0584 (585 BC) A total eclipse in the midst of a battle between the Lydians and Medes scares both sides; hostilities are suspended, according to the Greek historian Herodotus (several other dates are possible).

May 28, -0584 (585 BC) The first known prediction was made by the Greek philosopher Thales, who forecast the eclipse of May 28, 585 BC (by year, day, place, time?). This occurred at sunset in the Mediterranean area, and is said to have put an end to a battle between the forces of King Alyattes of the Lydians and King Cyaxares of the Medes. It was in the midst of their battle and scared both sides. Ref. ENB013

May 28, -0584 (585 BC) ". . . there was war between the Lydians and the Medes five years. . . . They were still wa r-ring with equal success, when it chanced, at an encounter which happened in the sixth year, that during the battle the day turned to night. Thales of Miletus had foretold this loss of daylight to the Ionians, fixing it within the year in which the change did indeed happen. So when the Lydians and Medes saw the day turned to night, they ceased from fighting, and both were the more zealous to make peace." Probably refers to the total solar eclipse of 28 May 585 BC in Asia Minor. Herodotus, (c485-c420 BC) History I, 74. Ref. FRS 1997, page 242. The Encyclopaedia Britannica CD 98 says that this eclipse must have been predicted by means of the Saros and the eclipse of 18 May 603 BC.

1999/09/07 11:42

May 28, 1900 Total Solar eclipse where Mercury is very close or touching the corona or only 7 radii from the eclipsed sun. For a Mercury corona transit you have to wait till 3269 and 3853. (ref. ENB 9/1998)

May 28, 1900 ". . . the semi-darkness, for there was no real blackness, came on suddenly, and during totality, computed to last 1m 28s., everything terrestrial took on a cold iron hue, altogether different from the gloom of evening. The distant town and more distant mountains were almost blotted out from view, whilst in the heavens above round the moon's black disk, as if by the touch of a magician's wand, there flashed out the corona in grandeur of form and of pearly whiteness. Mercury, too, in close proximity, shone with the brilliance of a miniature sun, and enveloping the whole was a halo of soft white light; a spectacle whose unique beauty words fail utterly to describe." Refers to a total solar eclipse at Navalmoral, Spain, of 28 May 1900. From: T Weir, a member of the British Astronomical Association eclipse expedition. Ref JH and RT Chasing the Shadow.
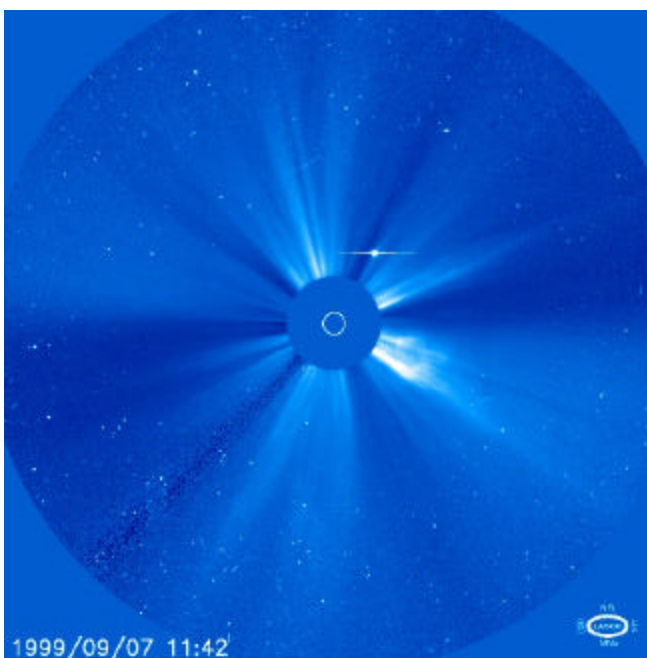
May 29, 1919 Albert Einstein (1879-1955) predicted that light passing the Sun would be bent a certain amount by the object's gravitational field. The Solar Eclipse of this date gave the light from the stars in Hyades were bent by the gravity of the Sun according to Einstein's theory. Thus Einstein was propelled into permanent and worldwide celebrity. Prediction of Einstein confirmed by Eddington, Cottingham, Crommelin and Davidson.

May 29, 1919 Arthur S. Eddington (UK) and Co-workers, (Cottingham, Crommelin and Davidson) observing a total solar eclipse from Principe, an island W of Africa and Sobral, NE coast of Brazil, confirm then bending of starlight by gravity as predicted by Einstein in his general theory of relativity. Pictures of the stars near the sun compared with star pictures months later.

May 31, 1921 Death of John Herschel. During the eclipse of 18 August 1868 from the Red Sea through India to Malay-

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sia and New Guinea, prominences are first studied with spectroscopes and shown to be composed primarily of hydrogen by James Francis Tennant (1829-1915), UK, John Herschel (1837-1921, UK - son of Sir John Frederick William Herschel 1792-1871, grandson of Sir William Herschel 1738-1822), Jules Pierre Jules Cesar Janssen (1824-1907, France), George Rayet (France), and Norman Pogson (UK/India). (Ref Rc 1999)

May 31, 2003 Some central eclipses are so extreme, so they do not have a northern or southern limit. An example is the annular eclipse of 31 May 2003.

Best regards, Patrick

From: Gerard M Foley <gfoley@columbus.rr.com>

>May 28, -0584 (585 BC) ". . . there was war between the Lydians and the

Since totality of the eclipse of 18 May 603 BCE should have been one-third of the way around the world from that of 28 May 585, this seems to argue good communication. Gerry K8EF

John Herschel

From: Frank ROUSSEL <rousself@hotmail.com> To: <SOLARECLIPSES@AULA.COM> Sent: Monday, April 02, 2001 9:11 AM Subject: [SE]

Archive of SEML on the web

Hi all, does an archive of tbe messages published on Solar Eclipses Mailing List exist anywhere (on the web) ?

If not, is it planned to do so in the (near) future ? Thanks Frank ROUSSEL

From: FRED ESPENAK <u32fe@lepvax.gsfc.nasa.gov>

Yes indeed! You will find an index to monthly archives of SEML messages in the form of the SENL (Solar Eclipse Newsletter) posted at MrEclipse.com:

http://www.mreclipse.com/SENL/SENLinde.htm

Recent issues currently online from the above page include:

SENL - August 2000 (Old Format, 65 Kb pdf file*)
SENL - September 2000 (Old Format, 93 Kb pdf file*)
SENL - October 2000 (Old Format, 62 Kb pdf file*)

SENL - November 2000 (1.4 Mb pdf file*)
SENL - December 2000 (995 Kb pdf file*)

GENERAL TOPICS

SENL - January 2001 Special A (1.2 Mb pdf file*)
SENL - January 2001 Special B (0.9 Mb pdf file*)
SENL - January 2001 Special C (1.1 Mb pdf file*)
SENL - February 2001 Part A (1.0 Mb pdf file*)
SENL - February 2001 Part B (1.1 Mb pdf file*)
SENL - March 2001 (1.1 Mb pdf file*)

Note that all these files are in Adobe pdf format and can only be read with Adobe Acrobat Reader. This software is free and can be downloaded from Adobe's web site (http://www.adobe.com/).

The old format issues have no color, no figures or photos while the newer issues contain graphics, photos and illustrations.
 Special thanks to Joanne Edmonds for the hard work of preparing these files! - Fred Espenak

From: Patrick Poitevin <patrick_poitevin@hotmail.com>
Dear Frank, dear all, All messages of the SEML do appear in the monthly Solar Eclipse Newsletter. Beside SEML messages, there are also solar eclipse related messages from other sources, pictures and account of every one.

Browse and read archived SEML messages from http://www.MrEclipse.com/SENL/SENLinde.htm

Day to day messages can be seen on the archive: Archive Solar Eclipse Mailing List: www.astroarchive.com

If further info wanted, please let me know. Best regards, Patrick

From: Daniel Fischer <dfischer@astro.uni-bonn.de> To: <SOLARECLIPSES@AULA. COM> Sent: Wednesday, April 04, 2001 4:26 PM Subject: Re: R: [SE]

Libya 2006 Eclipse

I've discussed the issue briefly with representatives at Libya's booth at EXPO 2000 in Hannover last year, and according to them travelling the Libyan desert is no problem. HOWEVER, I've recently learned that this general area is 'famous' for the highest number of landmines, beating even Angola - so don't book your camels yet ... Daniel

From: Michael Gill <eclipsechaser@yahoo.com> To: Patrick Poitevin <Patrick_Poitevin@Hotmail.Com> Sent: Wednesday, April 04, 2001 6:11 PM Subject: **Eclipses on Mars (by Phobos) in February 2004**

Patrick & Joanne, Since I've seen no mention on the SEML about the Beagle 2 mission to Mars and the eclipses it will experience (by Phobos in February 2004), perhaps you could include something in the Newsletter if you feel it would be of interest.

More details are available here (under the January 10th press release):

http://www.beagle2.com/resources/press-release.htm

More general information about the Mars Express/ Beagle 2 mission:

http://www.beagle2.com

http://sci.esa.int/home/marsexpress

Best regards, Michael.

GENERAL TOPICS

April 17, 1912 eclipse

From: Bob Morris <morris@sce.carleton.ca> To: SE from LRM <solareclipses@Aula.com> Sent: Monday, April 02, 2001 3:44 PM Subject: [SE] April 17, 1912 eclipse

Patrick: Your calendar underplays this eclipse by simply stating it was "near total in Belgium."
 I believe that Paris and London in 1912 may have been the two largest cities of the western world.
The line of centrality went just west of Paris.
The weather in Paris and London (and also in the surrounding areas) was absolutely perfect.
This may have been, in 1912, the most observed eclipse in history.

The Paris and London newspapers certainly indicate that it caused a sensation, and in both cities dominated the news on April 17, only one day after the Titanic sinking grabbed both cities by the throat.

On April 16, in London, people swarmed Trafalgar Square outside of the White Star Lines headquarters. The next day, people swarmed Trafalgar Square to view the eclipse.

Also, in Nature one can read that three or four indpendent groups calculated the razor thin line of centrality and each came up with a different result. Professional observers atttempted to determine who was correct. I would guess that this was related to estimates of delta T.

And, in a major Paris newspaper, as I reported earlier, an observer likened one phase of the eclipse to "an engagement ring." Since an engagement ring traditionally has diamonds, unless anyone can find an earlier reference, this is the very first eclipse at which what we now know as Bailey's Beads were liked to "diamonds."
As we know, the diamond ring effect (one big bead) was first reported at the 1925 eclipse in New York.

Finally, the fact that the 1912 Nautical Almanac, available in Feb 1911, and present in quantities of about a dozen onboard every large ship (including Titanic), had a two page foldout of the eclipse path which caused the almanac to almost fly open to the page, and an announcement of the eclipse on page 1, mean that as soon as the sailing date of Titanic was announced as April 10, the capt would have been very aware that he would have no moon in the night sky during the voyage.

When officer Lightoller was put in front of the enquiry and asked why Titanic had collided with the iceberg, he answered "In the first place, there was no moon."
These circumstances were immortalized in the Broadway musical "Titanic."

The writers, who I'm sure were unaware of the eclipse link, have the following song, entitled "No Moon":

No moon
No wind
Nothing to spy things by
No wave
No swell
No line where sea meets sky
Stillness
Darkness
Can't see a thing says I
No reflection
Not a shadow
Not a glint of light
Meets the eye ...
    Bob Morris

From: Evan Zucker <ez@MrTotality.com>
Close. It appears that London was first, New York City was second, and Paris was third (then Berlin in Chicago). The 1900 figures are at http://www.sru.edu/depts/artsci/ges/discover/d-6-8.htm. -- EVAN

From: Bob Morris <morris@sce.carleton.ca>
 Thanks. So with the 1st and 3rd largest cities in the world all watching, plus the rest of England and western France at least (under ideal conditions -- I have weather maps) probably the most widely observed eclipse in history until that date. :-) Bob Morris

From: Bob Morris <morris@sce.carleton.ca>
Given the numbers referenced by Evan, over 10 million people saw this eclipse in London (92% total) and Paris (99.9% total) alone!
Remember, the weather was perfect over all of Western Europe. So perfect in fact that newspaper reports remarked upon its perfection!

After my article was published on this eclipse I found dozens of pictures in archives showing masses of people observing this eclipse at Paris and London landmarks, and in the streets of London and Paris.
It is instructive to look through the National Geographic archives on eclipses. The articles mainly tell tales of trips to remote places of the world to view eclipses.

Surely the April 17, 1912 eclipse was the first "urban" eclipse and the most watched eclipse ever up to that point in time. Bob Morris

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From: Larry Ely <ldely@CROCKER.COM> To: <HASTRO-L@WVNVM.WVNET.EDU> Sent: Tuesday, May 01, 2001 5:55 PM Subject
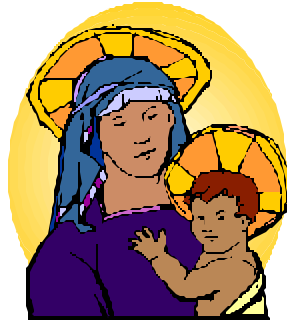
Birthdate of Jesus

Hi Owen, Thank you very much for the reference to Georges Declercq, *Anno Domini: the Origins of the Christian Era*, Prepols, 2000, and your review of it in the February 2001 JHA. You referenced a work back on March 20 this year in response to my post "Kepler question", but I had not time to respond.

I have worked on the question of the birth of Jesus off and on for the past several years, generally around Christmas time. In my March 20 posting I gave strong supportive evidence that he was born in 1 BC as Dionysius Exiguus assumed or understood via perhaps an oral tradition. I am hoping Declercq casts light on Exiguus' source of information. But the strong presumption that the year 1 BC is correct rests, as I stated in my post, upon the astronomical evidence of a lunar eclipse referenced by the "Moon turning blood red" at the crucifixion and the age of Jesus at the time. The astronomy comes from Fotheringham (1934), and then Humphreys and Waddington (1983). The year of the crucifixion was given by the prior and independent clairvoyant observations of Anne Catherine Emmerich (c. 1824), a famous Catholic nun and stigmatic, and of Rudolf Steiner (1912), who was a scientist as well as a conscious clairvoyant. (Steiner purported to be able to see into the past while he was awake in his modern, five-sense consciousness; he was not in a state of unconsciousness when making such observations, as was, for example, Edgar Cayce when he made his accurate and confirmed pronouncements).

The accepted date for Jesus' birth, 4 BC, rests on incorrect information about Herod's death. Herod died early in 1 BC, as has been shown by the ground-breaking scholarship of Ormond Edwards, *The Time of Christ*, Floris Books, 21 Napier Road, Edinburgh, 1986. Edwards cites coin and astronomical data, including the prior confusion among historians about two different calendrical starting times (ecclesiastical and legal) of the year. Edwards gives the death of Herod as "probably on Shebat 2, January 28, 1 BC" (p. 59), "not long after the lunar eclipse mentioned by Josephus, which is now identified as the total eclipse on January 10, 1 BC" (p. 15).

The explanation for Jesus' birth following Herod's death, given the story in the Gospel of Matthew about Herod's attempt to have Jesus killed, is that, according to Steiner, there was a second Jesus child, and he was "born several months before" the one born on December 25. This was the Jesus that the Magi from the East with astrological knowledge came to honor. Matthew gives a wholly different biography from Luke, and the above facts are the explanation for this: we are talking about two separate human beings at this stage.

Steiner said that the Matthew Jesus was the wisest of the wise of the world, which is why Herod felt threatened, whereas the Luke Jesus was the kindest of the kind of the world, reflected in his unambitious life as a carpenter, etc. At age twelve in the Temple according to Steiner the intelligence, the spirit, of the Matthew Jesus passed over into the body of the Luke Jesus, and this explains the puzzlement and alarm on the part of the Luke Jesus' parents when he seemed so out of character in saying he would not return with them, as he was concerned with important things (he was amazing the priests with his knowledge). Steiner said that reincarnation is a fact, and that he could observe this with spiritual sight. He said that the Matthew Jesus had earlier been Solomon, the wise King of Israel from c. 975 BC. The knowledge and intelligence one acquires through a life goes on into the next incarnation. And before being the personality Solomon, this same individuality, this same ego (the part of the human being that reincarnates) was the personality that history knows as Zarathustra, who was a guide for humanity many thousands of years earlier. The Luke Jesus had no sin (karma), the accumulation of wrongs against other human beings through word and deed. The composite human being after age twelve had the wisest head on the kindest shoulders, as representative of man. Steiner said that it was necessary for this sort of human being to be constructed spiritually, otherwise the incarnating Christ being at age 30 would not be able to dwell in a human being on the earth. And Steiner further said that it was the mission of the Jewish race to construct such a human being, as the Jews from time many thousands of years earlier were the most developed race in consciousness and intelligence. Steiner said that the Jewish priests had a mistaken idea of what the Messiah would do when he came. He said that it was known through an initiatic oral tradition, a tradition made available only to the most developed intellectually AND morally, that a Messiah (the being from the Sun) would come to earth, and that his advent was necessary for the turning point in time, when humanity would be reintroduced to its true spiritual nature and roots. I picture this as a parabolic descent, where at the time of the Messiah, the parabola has reached its minimum. At this time we were at our darkest spiritually, as we had been coming to identify with the earth and the earthly more and more in our historic development. According to Steiner the Christ, the Messiah, represented a mass potential initiation of all of

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humanity into the nature of the spiritual world. But like the game of saying a sentence to one person, and his repeating it to the next person, etc. through many people, and its eventually getting quite garbled, the knowledge about the laws of the spiritual world and about what the Messiah would do when he came had become quite garbled amongst all peoples of the earth. The Jewish priests that the Messiah would immediately rebuild Jerusalem on the spot, and since he did not, they thought he was not the Messiah. It is unfortunate that we have had to suffer such misunderstandings and antagonisms through these centuries of disagreement, but it is all part of a divine plan, and things will change for the better. I am a caucasian, racially non-Jewish American who was not raised in any religious tradition, but I came to knowledge of religion and the spirit through astronomical and astrological studies over a thirty year career as an independent thinker and researcher.

Let us consider that we could take a date around December 25, 1 BC as a hypothesized date for the birth of the Luke Jesus. We then can test this hypothesized date for correctness in a variety of ways astrologically. If this date, or approximately this date withing a few weeks is correct, then we can study rhythms from this date involving the planet Uranus, looking for those dates when Uranus returns to the same geocentric ecliptical longitude that it had on December 25, 1 BC. These dates would be at successive periods of about 83.75 years, Uranus's period in the equinox of date, measured from the Vernal equinox. As Uranus has been observed empirically to have a revelatory, revolutionary character, we would expect the historic character of these successive periods to have such a character when we look to religious and spiritual developments in the world. I have done this, and I have found repeatedly the information I was looking for. But if I choose other years for the birth of Jesus, I do not find this palpable rhythm!

This mechanism or technique and others, which it would require too much space to describe here, lend the definite result that this particular day, December 25 of 1 BC is the correct day. Incidentally, these techniques when properly handled and understood form the basis of objective knowledge, and others will get the same result if they are in fact correctly trained in the tradition. This day was apparently decided upon by making it the same date as the ancient Roman festival known as Sol Invictus, the celebration of the Winter Solstice, which was an occasion of merriment, as the days began to get longer again at this time. It has been argued that the church was acting a bit like Madison Avenue in capturing attention, in coopting movements. Be that as it may, the so-called pagans were actually spiritually developed people and believed in one God. They just had different language and manner of dress, etc. from the burgeoning Christians, who thought themselves different. And let us

remember that the Sun, according to Steiner, is spiritually where the Christ dwelt before he came down to dwell in the Luke Jesus body, born at this conspicuous time defined astronomically and physically by the Sun's path. In parallel with this is the fact that Steiner said that the Christ came at the midpoint in all of human evolution. The Winter Solstice may be viewed as the midpoint in the yearly cycle of the Sun, the beginning point being the Summer Solstice. This is plainly a harmonic, spiritual analogy for those with eyes to see. And to make a trinity out of this astronomical, time patterning, the birth of the Luke Jesus was said by Steiner to have been at midnight, which is the midpoint in time on the daily cycle of the day, the darkest time of the day mirroring the darkest time of the year. So we have the midpoint of the day, the midpoint of the year, and the midpoint of the year of man's total evolution: a reference to a trinity in time.

We can test the date of the Luke Jesus with historical astrology in the way I have indicated. But we cannot test Steiner's statement that we are now in the middle of all human evolution. To test that would require his consciousness. But he said that as time went on people would develop the consciousness he spoke about and having done that they could test whether what he said was true. He holds that we can do science and make objective knowledge about matters of the spirit in analogous fashion to how we do science with the physical sciences. He said that we should not feel prompted to make quick value judgements based on our feeling reaction to statements he made, but rather hold his ideas and statements in our consciousness until such time as we can get corroborating evidence. What amazes me about him is that with my best judgement, that I trust, his words have the same ring of truth and absolute conviction that one gets in those particularly moving words of the Old and New Testaments.

The intellectually inclined medieval and renaissance astrologers, such as Girolamo Cardano, who made great contributions in algebra, or Pierre D'Ailly, a great Catholic theologian and intellectual, thought the Luke Jesus was born just after midnight on December 25, the very beginning of December, where midnight starts the day calendrically. (All the dates I have been giving in this post are in the Julian calendar. In the Gregorian calendar the dates in 1 BC are two days less.) These writers have made an error of almost one full day for the birth of the Luke Jesus. He was born in the very last minutes of December 25, almost December 26. From various reckonings I find that his Local Apparent Time of birth was 11:47:30.0 pm LAT (UT = 21:30:56.8 using a special equation for the speed of rotation of the earth determined by Robert Newton, *The Moon's Acceleration and Its Physical Origins, Vol. 2*, The
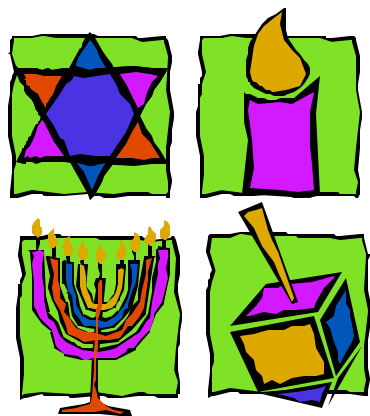
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Johns Hopkins University Press, Baltimore, 1984, p. 11). At geographic longitude -35:12.0 this calculates an ecliptic longitude of the Meridian plane of 90:18.7. The Ascendant, the intersection of the ecliptic with the horizon circle towards the East is 180:17.5. This is 0 degrees 17.5 minutes of the sign Libra, the sign of the Golden Rule, and the Ascendant is the definer of the person's social environment and destiny. (The value for the obliquity of the ecliptic is from Robert Newton, Op. Cit., and differs from Newcomb.)

Steiner's "several months earlier" than December 25 must be before Herod's death on about January 28, 1 BC. Ormond Edwards substantiates tradition for the date (in terms of the date in January, but not the year) of Epiphany or Three Kings Day, and gives January 6, 1 BC for the birth of the Matthew Jesus. As tradition via Dionysius Exiguus and others was very close for the date of the Luke Jesus, it is likely that the traditional date for Epiphany is correct or very close. However, tradition does not> understand there being two Jesuses, and tradition has it that the Three Kings visited Jesus twelve days after the birth and visitation by the shepherds on December 25. So tradition has Three Kings Day as January 6, 1 AD.

One can choose a time on January 6, 1 BC such that exactly 12 lunations of 29.53.. days each will have elapsed when one comes to the birth of the Luke Jesus on December 25, 1 BC. Counting back this time period, I arrived at a time of birth of the Matthew Jesus of UT = 5:45:53.7. I arrived at a time actually differing by a few seconds of civil time, and then I saw that minor alterations in the UT were required to fit certain patterns in subsequent events with planetary positions, required by proven astrological timing theory, called transits (coinciding longitudes involving harmonic divisions of the circle). The longitude of the Meridian plane is 227:02.0 and the longitude of the Ascendant is 298:53.7.

The Matthew Jesus is the wise Jesus, both scientifically and philosophically, politically. It is no accident that Isaac Newton's Sun position when he was born is exactly the same as the Matthew Jesus Sun, within about 17' arc. The alignment of the Sun between these two charts is the cause of the divine inspiration that Newton was consciously aware of. Newton was a hand-maiden of the Matthew Jesus. Newton could not see this relationship specifically; rather he was aware of there being some kind of divine in-

spiration and guidance for his creative tasks in seeing into the secrets of the natural world. The difference between Newton and Steiner, both geniuses, is that Steiner could see the specifics of the relationships between human beings and divine beings, just as you and I can acknowledge the specifics in a relationship between ourselves and other HUMAN beings.

Newton was born December 25, and on account of that and on his own internal realization, accounted himself divinely inspired. But the spiritual-physical reality behind such inspiration lay in another source. Newton's date of birth in the Julian calendar of the time translates to January 4 by the Gregorian calendar that we use. The January 6 date for the birth of the Matthew Jesus is in the Julian calendar, as I have said; its corresponding Gregorian date is January 4, 1 BC.

I am off to the Amherst College in Amherst, Massachusetts, USA, to finish reading in the special collections room Isaac Newton's *Chronology of Ancient Kingdoms Amended*, published in 1728, a year after his death, but under his direction. Newton had studied chronology for some 40 years. Much of his reasoning is given to precession of the equinoxes, which continually brings the Vernal Point to different locations (sidereal longitudes) in the constellational (sidereal) zodiac. The fact that Newton used a sidereal zodiac of 12 equal width, 30-degree sidereal signs is telling testimony to the fact that he was doing astrology. (another testimony is the fact that he used the astrological glyphs [character symbols] to represent the signs of Taurus, Leo, Scorpio, and Aquarius.) Newton said that he accepted that the Vernal Point was located in 15 degrees of Sidereal Aries in 936 BC, and that after 504 years (7 degrees times 72 years per degree precessional speed) the Vernal Point was at 8 degrees of Sidereal Aries. One sees by this that his sign of Aries has 30 degrees. The constellational, irregular-sized constellations puts Aries at 18 or 20 degrees of width, according to which version of the constellational zodiac one uses.

Only astrologers have conceived and used an equal-width sidereal zodiac. Knowledge of this, Steiner tells us, goes via Plato, and before him to the wise Solon of Egypt, via the oral tradition. This ancient oral tradition spoke about the extreme importance in understanding the march of history laid out in 2,160-year periods, called ages, which is the time it takes the Vernal Point to traverse through one of these Sidereal Signs. The Sidereal Sign which the Vernal Point occupies determines, by the psychological qualities and spiritual characteristics of that sign, the themes and tenor of that 2,160-year long period in history. Writing and the living in large cities, with complex currency and laws

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was what the Taurus period 4320 BC to 2160 BC brought. This highly-prescribed time was tantamount to living in the regulated world of the Catholic Church. Via spiritually aware priest kings humanity was guided to have its civilization built around the principles of the spiritual world, down to particulars like units of measure and buildings. But then a time of freedom and danger followed, the age of Aries, the Promethean hero, the sign of being alone. We were left to our own then, not directed by priest kings. Abraham and the Jewish covenant is one stream that measures this quality. The Jews exercised collective heroism, pited as they were against standing armies and nations into developing power on the earth. We have the expression of individual heroism in the Greek Iliad and Odyssey. The change from Taurus to Aries was exemplified by going from the Bull to the Ram in the Old Testament, but also, one sees a whole shift in art-historical sytle, from the static, profiles of Egyptian art to the lively, dynamic movement of Minoan art circo 2000 BC in Crete. The next sign after Aries is Pisces, the Fish. In the Gospels we see all kinds of references to fish and also to feet, that part of the body correlating to Pisces. Christians wore a fish symbol to identify themselves. In art, there is the shift to an impressionistic style, indicative of the vaguesness of Pisces, and away to the earthly reality of the Aries style, exemplified in Greek art.

By Newton's reckoning the age of Pisces started in 144 AD (half of an age of 2160 years minus 936 BC when the Vernal Point was at 15 degrees Aries). Other thinkers have put the start of the Pisces age at 27 BC (Steiner), circa 20 BC (Vergil), an initiate of the mysteries and knowledgeable about the oral tradition, and Rome's greatest poet, 0 AD (Yeats), the 20th century's greatest English poet, 0 AD (Jung), an innovative psychologist and contemporary of Freud. From 26 years of study, incorporating accurate precessional movement and studying subperiods of 180 years for lots of data, I put it early in the year 15 BC. (I have struggeled with my disagreement with Steiner, but he was not concerned with precise statements mathematically, as his interest was in the very broad spiritual concepts and their significance.)

Well, off to the library. I hope this will register with a few of you out there. Larry Ely, Amherst, Massachusetts, USA

From: Dribalz@aol.com To: SOLARECLIPSES@aula.com Sent: Wednesday, April 11, 2001 12:44 AM Subject: [SE]
eclipse book

Can anyone tell me the name of that new big eclipse book that was discussed on this list about 1.5 - 2 months ago. I think it was available on amazon.com but I haven't been able to find it. Thanks, Andrew Hans

From: <Jay.M.Pasachoff@williams.edu>
You mean "Glorious Eclipses," recently published in translation by Cambridge University Press. I wrote a review of it in the latest NATURE. It is a beautiful book and good on expeditions and on art but woefully inadequate on science done at recent eclipses. Serge Koutchmy had a similar evaluation in a review he wrote.

I hope everybody also looks at my own new book on the sun, of which I just received the first copy. It is: Leon Golub and Jay M. Pasachoff, Nearest Star: The Exciting Science of Our Sun, Harvard University Press. see www.williams.edu/ astronomy/nereststar Jay Pasachoff

From: Olivier Staiger <olivier.staiger@span.ch>
I have not seen the english translated version of the book, but I have a copy of the original , in french. The book is by Serge Brunier and J-P Luminet. You can buy the french original version on : http://acheter.geoman.net/livres/eclipses.html I met Serge, he's a french eclipse chaser. Actually I am very honoured because Serge's book covers all forms of lunar occultations (a solar eclipse basically is a lunar occultation !) and he used some of my photos of the historic double occultation of 1998 (Venus, Jupiter, Ascension Island, http://eclipse.span.ch/live. htm) :-) And it is in his book that I found note of a wonderful event to observe in 2518: when Venus will cover Saturn and you'll see Saturn's rings around Venus ! see http://eclipse.span.ch/2518. htm for my animation .
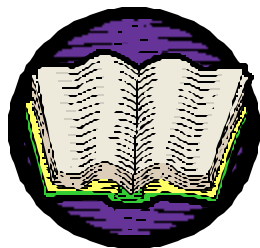
one little note: he shows Fred's maps of the upcoming eclipse paths, there is a small error in the map of the 2003 TSE (at least in the original french version - I don't know if he made the correction for the english version of the book) : he mixed up the area of first and last umbral contact. The

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eclipse will start in the southern Indian Ocean, then rush across parts of Eastern Antarctica, to finally end at the coastline of the Atlantic Ocean . Olivier "Klipsi" Staiger , Geneva Switzerland

From: F.Podmore <podmore@science.uz.ac.zw>
The review of Glorious Eclipses by Serge Koutchmy appears in the April 2001 edition of the magazine PHYSICS WORLD. You can read a shortened version on http://www.physicsweb.com - I did a week ago. Francis

From: Evan Zucker
You can buy the English translation of "Glorious Eclipses" at http://www.amazon.com/exec/obidos/ASIN/0521791480/o/qid=987005375/sr=8-1/ref=aps_sr_b_1_1/002-1481846-7017644.

So far, the only review posted there is by me, based upon my browsing through the book at a bookstore. I'm looking forward to receiving it as a birthday present (I hope!) this Sunday. Evan H. Zucker

From: Evan Zucker <ez@MrTotality.com>
 I just went to that web site but couldn't find links to much of anything, including that book review. -- EVAN

From: J.P. van de Giessen <jpvdgiessen@gelrevision.nl>
Evan, See: http://www.physicsweb.org/article/reviews/14/4/3 Jan Pieter

From: <Jay.M.Pasachoff@williams.edu>
The brief paragraphs that appear there do not include the substantial criticisms that Koutchmy had of the book and seem misleading overall. You might ask your local library to get you the review through interlibrary loan.

In message <3AE488EE.5F486061@autocode.com> you write:

Jay, I was reading your write up on the Lusaka expedition (cool). But what interested me more was your new book announcement. Amazon says available in May, but shipping now, so is it available now? Do you recommend any other works detailing our best current understanding of solar physics?

I have just finished reading "Guide to the Sun" and found it interesting. But it predates SOHO and others so I know much of what we know has changed in these few short years since its publication. Thanks, Bill Kramer

From: <Jay.M.Pasachoff@williams.edu> To: <solareclipses@aula.com> Sent: Monday, April 23, 2001 10:42 PM Subject: [SE] sun books

Thanks for asking. It won't be officially published for a week but I do have a copy in my hands, so it exists. You can find it specifically at www.williams.edu/astronomy/neareststar or, along with my other astronomy books, at www.solarcorona.com. As for up-to-date books, my book and one to come out in the fall by Jack Zirker will be the ones to cover all of solar physics. Sten Odenwald has a recent book out on solar activity.

Yes, there is a lot of great new solar stuff available from eclipses, from spacecraft (SOHO and TRACE, for example), and from solar telescopes on mountaintops (GONG). Jay

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From: Marc Weihrauch <marc.weihrauch@student.uni-halle.de> To: Finsternisliste <solareclipses@aula.com> Sent: Thursday, April 12, 2001 9:17 PM Subject: [SE] **Eclipse calculation**

Dear shadow-chasers, after the vaccination-discussion I'd like to ask a more directly eclipse-related question, although I think the vaccination wasn't too far off-topic, since it's of importance to the many list members who are going to travel to Africa in a few weeks.

I know I can calculate many interesting facts (such as area of visibility, type, center line, local circumstance) about an eclipse on a given date by applying certain algorithms and formulas on the given Besselian Elements, say from the "Elements of Solar Eclipses" by Jean Meeus. But how does one find out when an eclipse occurs and what the Besselian Elements are? How does one calculate an eclipse "from the bottom"?

Of course I have some ideas how it could be done: I believe the elements can be calculated quite straight from the positions of sun and moon. I also believe that one simply tries every new moon to see whether or not an eclipse takes place. But I might be SOOO wrong.

I'd love to hear some hints from one of the experts. I'm not searching for a complete and detailed algorithm, I'm just curious about the general line. Have a happy Easter! Marc

From: John Tilley <john@tilley.demon.co.uk>

Marc - I would recommend a copy of the "Explanatory Supplement to the Astronomical Ephemeris and American Ephemeris and Nautical Almanac" - now out-of-print - originally published in 1960 and reprinted - my copy is 1974. Chapter 9 "Eclipses and Transits" (66 pages) contains all that you are asking. It has many worked examples and the mathematics is similar to that used by Meeus in "Elements of Solar Eclipses".

This reference book was replaced in 1992 by the "Explanatory Supplement to the Astronomical Almanac" - edited by P K Seidelmann - University Science Books. Chapter 8 (53 pages) covers the same ground as the earlier reference work. The mathematics here uses vector and matrix notation and there are no worked examples. There are also at least three errors in the equations - which makes it much harder to program from - but some of the equations are more rigorous than the earlier book - so you may need both volumes.

You should be able to find both in a University Library.

If you decide to write your own program and start by calculating the Besselian Elements yourself - then in order to read the JPL CD-ROM I would recommend "Fundamental Ephemeris Computations" by PJ Heafner. (Willmann-Bell) - its a great help and it covers all the other supportive calculations - eg astronomical co-ordinate system transformation - which is essential. It too uses vector and matrix notation - but its fairly accessible. It doesn't address the eclipse calculations though - for that you need one of the two books mentioned earlier.

>Of course I have some ideas how it could be done: I believe the elements can be calculated quite straight from the positions of sun and moon. If you know the apparent geocentric position vectors for the sun and moon - then vector subtraction will give you the vector for the centre of the moon's shadow and you can transform this to a new co-ordinate system - the fundamental plane - hence you can get the Besselian elements.

You can use one of several ephemeris to get accurate positions of the sun, earth and moon. I have used the JPL 6000 year ephemeris - which is available on CD-ROM - which is what EMAP Windows uses. If you use older ephemeris - eg the Improved Lunar Ephemeris 1954 - then five very short partial eclipses in 6000 years are eclipses according to one ephemeris but not the other and vice versa. (these are all the first/last eclipse in a Saros)

> I also believe that one simply tries every new moon to see whether or not an eclipse takes place.

Yes you can

>I'd love to hear some hints from one of the experts. I'm not searching for a complete and detailed algorithm, I'm just curious about the general line.

1 - Get accurate positions of Sun and Moon for each new moon from the JPL CD-ROM - you need apparent right ascension, declination and distance of both Sun and Moon - so you have to read the JPL CD-ROM and get the co-ordinates. For the moon these are the XYZ co-ordinates at the start and end of a 4 day period. You have to interpolate these to the exact date/time you want using the supplied Chebyshevian polynomials to get the exact positions - these interpolated XYZ co-ordinates are solar system barycentric co-ordinates and these must be transformed to apparent co-ordinates - which also involves allowing for precession, nutation and light time travel to earth - luckily you don't have to allow for relativity!
2 - Decide whether to make corrections for centre of mass of Moon not being co-incident with centre of figure of

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Location	Country	Latitude S			Longitude E			"Alt (m)"
		d	m	d.ddd	d	m	d.ddd	
Bimbe	ANG	-11	49	-11.817	15	49	15.817	
Huambo	ANG	-12	44	-12.733	15	47	15.783	
Luanda	ANG	-8	48	-8.800	13	14	13.233	59
Chibango	ANG	-13	38	-13.633	21	56	21.933	
Kuito	ANG	-12	22	-12.367	16	56	16.933	
Antananarivo	MAD	-18	55	-18.917	47	31	47.517	
Morombe	MAD	-21	45	-21.750	43	22	43.367	
Ambahakily	MAD	-21	36	-21.600	43	41	43.683	
Mahabo	MAD	-23	40	-23.667	46	8	46.133	
Befotaka	MAD	-21	29	-21.483	44	44	44.733	
Beira	MOZ	-19	49	-19.817	34	52	34.867	9
Maputo	MOZ	-25	58	-25.967	32	35	32.583	59
Chinde	MOZ	-18	37	-18.617	36	24	36.400	
Tete	MOZ	-16	13	-16.217	33	35	33.583	
Zumbo	MOZ	-15	36	-15.600	30	25	30.417	
Lusaka	ZAM	-15	25	-15.417	28	17	28.283	1277
Ndola	ZAM	-12	58	-12.967	28	38	28.633	
Kafue	ZAM	-15	47	-15.783	28	11	28.183	
Rufunsa	ZAM	-15	5	-15.083	29	40	29.667	
Chingola	ZAM	-12	32	-12.533	27	52	27.867	
Harare	ZIM	-17	50	-17.833	31	3	31.050	1472
Rusambo	ZIM	-16	35	-16.583	32	12	32.200	
Bulawayo	ZIM	-20	9	-20.150	28	36	28.600	1343
Makaha	ZIM	-17	17	-17.283	32	37	32.617	
Mtoko	ZIM	-17	24	-17.400	32	13	32.217	
Johannesburg	SAF	-26	15	-26.250	28	0	28.000	
Durban	SAF	-29	55	-29.917	30	56	30.933	5
Cape Town	SAF	-33	55	-33.917	18	22	18.367	17
Kimberley	SAF	-28	43	-28.717	24	46	24.767	1197
Port Elizabeth	SAF	-33	58	-33.967	25	40	25.667	58
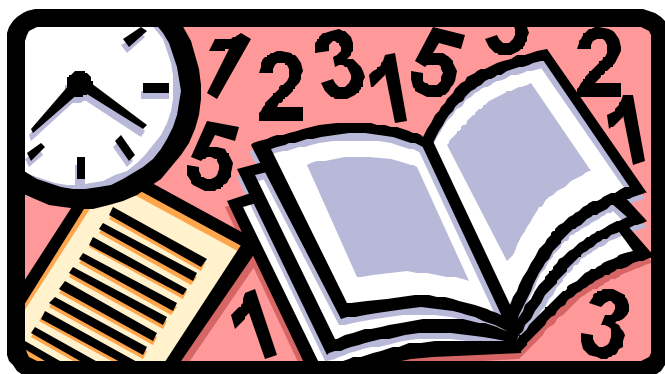
GENERAL TOPICS

Local Circumstances for Selected Locations in Southern Africa "Predictions by F Espenak, NASA"   DT = 65.0

Location	Country	1st	2nd	Mid	3rd	4th	Mag	Alt	Duration
Bimbe	ANG	110353	124152	124356	124558	141215	1.014	46	246
Huambo	ANG	110334		124330		141148	0.989	46	
Luanda	ANG	105635		123737		140823	0.961	51	
Chibango	ANG	112310	125733	125842	125951	142045	1.004	39	138
Kuito	ANG	110724	124524	124646	124807	141355	1.005	45	163
Antananarivo	MAD	122026		133139			0.900	10	
Morombe	MAD	121202	132548	132659	132809	143201	1.010	13	142
Ambahakily	MAD	121238	132600	132720	132839		1.018	12	159
Mahabo	MAD	121510		132752			0.992	9	
Befotaka	MAD	121424	132723	132815	132906		1.005	11	103
Beira	MOZ	115634		131858		142935	0.964	22	
Maputo	MOZ	115003		131131		142207	0.784	21	
Chinde	MOZ	120024	132009	132135	132301	143109	1.014	21	172
Tete	MOZ	115500		131901		143040	0.996	25	
Zumbo	MOZ	114715	131252	131428	131605	142842	1.014	29	193
Lusaka	ZAM	114134	130919	131056	131233	142700	1.013	31	194
Ndola	ZAM	114324		131226		142803	0.961	32	
Kafue	ZAM	114109	130952	131035	131117	142642	1.002	31	85
Rufunsa	ZAM	114526	131205	131327	131448	142818	1.008	30	162
Chingola	ZAM	114125		131112		142729	0.957	33	
Harare	ZIM	114810		131430		142807	0.976	27	
Rusambo	ZIM	115127	131511	131650	131830	142936	1.021	26	199
Bulawayo	ZIM	114123		130907		142417	0.890	28	
Makaha	ZIM	115213	131554	131708	131822	142933	1.007	25	149
Mtoko	ZIM	115112		131629		142913	1.000	26	
Johannesburg	SAF	113935		130345		141700	0.735	25	
Durban	SAF	114612		130532		141508	0.677	20	
Cape Town	SAF	111746		123651		134928	0.513	27	
Kimberley	SAF	113158		125531		140914	0.653	26	
Port Elizabeth	SAF	113515		125221		140132	0.552	22	

GENERAL TOPICS

Local Circumstances for Selected Locations in Southern Africa   Predictions by Emapwin ver 1.21   DT = 65.0

Location	Country	1st	2nd	Mid	3rd	4th	Mag	Alt	Dur
Bimbe	ANG	110354	124153	124356	124559	141216	1.014	46	246
Huambo	ANG	110334		124330		141149	0.989	46	
Luanda	ANG	105636		123737		140823	0.961	51	
Chibango	ANG	112311	125734	125842	125952	142045	1.004	39	138
Kuito	ANG	110724	124525	124646	124807	141355	1.005	45	162
Antananarivo	MAD	122026		133139			0.900	10	
Morombe	MAD	121202	132548	132659	132810	143202	1.010	13	142
Ambahakily	MAD	121239	132601	132721	132840		1.018	12	159
Mahabo	MAD	121510		132753			0.992	9	
Befotaka	MAD	121424	132724	132816	132907		1.005	11	103
Beira	MOZ	115634		131859		142936	0.964	22	
Maputo	MOZ	115003		131131		142208	0.784	21	
Chinde	MOZ	120024	132010	132136	132302	143110	1.014	21	172
Tete	MOZ	115500		131902		143040	0.996	25	
Zumbo	MOZ	114715	131252	131429	131605	142842	1.014	29	193
Lusaka	ZAM	114134	130919	131056	131233	142700	1.013	31	194
Ndola	ZAM	114325		131226		142804	0.961	32	
Kafue	ZAM	114110	130953	131035	131117	142643	1.002	31	84
Rufunsa	ZAM	114526	131206	131327	131448	142818	1.008	30	162
Chingola	ZAM	114125		131113		142730	0.957	33	
Harare	ZIM	114811		131430		142808	0.976	27	
Rusambo	ZIM	115128	131511	131651	131830	142936	1.021	26	199
Bulawayo	ZIM	114122		130906		142416	0.890	28	
Makaha	ZIM	115214	131554	131709	131823	142934	1.007	26	149
Mtoko	ZIM	115113		131630		142914	1.000	26	
Johannesburg	SAF	113936		130346		141701	0.735	25	
Durban	SAF	114612		130532		141508	0.677	20	
Cape Town	SAF	111746		123652		134929	0.513	27	
Kimberley	SAF	113158		125531		140914	0.654	26	
Port Elizabeth	SAF	113515		125222		140133	0.552	22	

GENERAL TOPICS

Local Circumstances for Selected Locations in Southern Africa Predictions by Solar Eclipse ver 1.40 DT = 65.0

Location	Country	1st	2nd	Mid	3rd	4th	Mag	Alt	Dur
Bimbe	ANG		110353	124151	124355	124559	141215	1.015	46	247
Huambo	ANG	110334		124330		141148	0.990	46	
Luanda	ANG	105635		123737		140822	0.961	51	
Chibango	ANG	112310	125731	125842	125953	142044	1.004	39	142
Kuito	ANG	110724	124522	124646	124809	141355	1.005	45	167
Antananarivo	MAD	122026		133139		143348	0.899	10	
Morombe	MAD	121202	132547	132659	132810	143201	1.011	13	143
Ambahakily	MAD	121238	132601	132720	132840	143211	1.019	12	159
Mahabo	MAD	121510		132752		143122	0.992	9	
Befotaka	MAD	121424	132725	132815	132905	143228	1.005	11	100
Beira	MOZ	115634		131858		142935	0.964	22	
Maputo	MOZ	115002		131131		142208	0.785	21	
Chinde	MOZ	120024	132009	132135	132301	143109	1.014	21	172
Tete	MOZ	115500		131901		143039	0.995	25	
Zumbo	MOZ	114715	131252	131428	131604	142841	1.014	29	192
Lusaka	ZAM	114133	130918	131056	131233	142700	1.013	31	195
Ndola	ZAM	114324		131226		142803	0.960	32	
Kafue	ZAM	114109	130949	131035	131120	142642	1.002	31	91
Rufunsa	ZAM	114526	131206	131327	131446	142818	1.008	30	160
Chingola	ZAM	114125		131112		142729	0.956	33	
Harare	ZIM	114810		131430		142807	0.976	27	
Rusambo	ZIM	115127	131511	131650	131830	142936	1.021	26	199
Bulawayo	ZIM	114123		130907		142417	0.891	28	
Makaha	ZIM	115213	131553	131708	131824	142933	1.008	25	151
Mtoko	ZIM	115112		131629		142913	1.000	26	
Johannesburg	SAF	113934		130345		141700	0.735	25	
Durban	SAF	114611		130531		141508	0.678	20	
Cape Town	SAF	111745		123651		134929	0.513	27	
Kimberley	SAF	113158		125531		140914	0.654	26	
Port Elizabeth	SAF	113514		125221		140133	0.552	22	
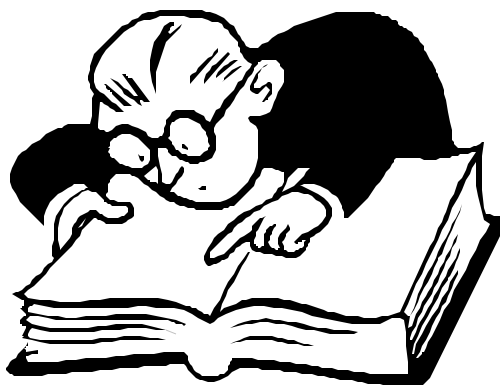
GENERAL TOPICS

Variation of Predictions by Solar Eclipse Ver 1.40 from Predictions by F. Espenak

$\Delta T = 65.0$

| Location	Country	1st	2nd	Mid	3rd	4th	Mag	Alt	Duration
Bimbe	ANG	-1	-1	0	-1	-1	0	0	0
Huambo	ANG	0	0	0	0	-1	0	0	0
Luanda	ANG	-1	0	0	0	0	0	0	0
Chibango	ANG	-1	-1	0	-1	0	0	0	0
Kuito	ANG	0	-1	0	0	0	0	0	1
Antananarivo	MAD	0	0	0	0	0	0	0	0
Morombe	MAD	0	0	0	-1	-1	0	0	0
Ambahakily	MAD	-1	-1	-1	-1	0	0	0	0
Mahabo	MAD	0	0	-1	0	0	0	0	0
Befotaka	MAD	0	-1	-1	-1	0	0	0	0
Beira	MOZ	0	0	-1	0	-1	0	0	0
Maputo	MOZ	0	0	0	0	-1	0	0	0
Chinde	MOZ	0	-1	-1	-1	-1	0	0	0
Tete	MOZ	0	0	-1	0	0	0	0	0
Zumbo	MOZ	0	0	-1	0	0	0	0	0
Lusaka	ZAM	0	0	0	0	0	0	0	0
Ndola	ZAM	-1	0	0	0	-1	0	0	0
Kafue	ZAM	-1	-1	0	0	-1	0	0	1
Rufunsa	ZAM	0	-1	0	0	0	0	0	0
Chingola	ZAM	0	0	-1	0	-1	0	0	0
Harare	ZIM	-1	0	0	0	-1	0	0	0
Rusambo	ZIM	-1	0	-1	0	0	0	0	0
Bulawayo	ZIM	1	0	1	0	1	0	0	0
Makaha	ZIM	-1	0	-1	-1	-1	0	-1	0
Mtoko	ZIM	-1	0	-1	0	-1	0	0	0
Johannesburg	SAF	-1	0	-1	0	-1	0	0	0
Durban	SAF	0	0	0	0	0	0	0	0
Cape Town	SAF	0	0	-1	0	-1	0	0	0
Kimberley	SAF	0	0	0	0	0	0	0	0
Port Elizabeth	SAF	0	0	-1	0	-1	0	0	0
Standard Deviation		0.547	0.450	0.568	0.430	0.571	0.000	0.183	0.254
Arithmetic Mean		-0.33	-0.27	-0.43	-0.23	-0.47	0.00	-0.03	0.07

GENERAL TOPICS

Variation of Predictions by Solar Eclipse Ver 1.40 from Predictions by F. Espenak   DT = 65.0

Location	Country	1st	2nd	Mid	3rd	4th	Mag	Alt	Dur
Bimbe	ANG	0	1	1	-1	0	-0.001	0	-1
Huambo	ANG	0	0	0	0	0	-0.001	0	0
Luanda	ANG	0	0	0	0	1	0	0	0
Chibango	ANG	0	2	0	-2	1	0	0	-4
Kuito	ANG	0	2	0	-2	0	0	0	-4
Antananarivo	MAD	0	0	0	0	0	0.001	0	0
Morombe	MAD	0	1	0	-1	0	-0.001	0	-1
Ambahakily	MAD	0	-1	0	-1	0	-0.001	0	0
Mahabo	MAD	0	0	0	0	0	0	0	0
Befotaka	MAD	0	-2	0	1	0	0	0	3
Beira	MOZ	0	0	0	0	0	0	0	0
Maputo	MOZ	1	0	0	0	-1	-0.001	0	0
Chinde	MOZ	0	0	0	0	0	0	0	0
Tete	MOZ	0	0	0	0	1	0.001	0	0
Zumbo	MOZ	0	0	0	1	1	0	0	1
Lusaka	ZAM	1	1	0	0	0	0	0	-1
Ndola	ZAM	0	0	0	0	0	0.001	0	0
Kafue	ZAM	0	3	0	-3	0	0	0	-6
Rufunsa	ZAM	0	-1	0	2	0	0	0	2
Chingola	ZAM	0	0	0	0	0	0.001	0	0
Harare	ZIM	0	0	0	0	0	0	0	0
Rusambo	ZIM	0	0	0	0	0	0	0	0
Bulawayo	ZIM	0	0	0	0	0	-0.001	0	0
Makaha	ZIM	0	1	0	-2	0	-0.001	0	-2
Mtoko	ZIM	0	0	0	0	0	0	0	0
Johannesburg	SAF	1	0	0	0	0	0	0	0
Durban	SAF	1	0	1	0	0	-0.001	0	0
Cape Town	SAF	1	0	0	0	-1	0	0	0
Kimberley	SAF	0	0	0	0	0	-0.001	0	0
Port Elizabeth	SAF	1	0	0	0	-1	0	0	0
Standard Deviation		0.407	0.935	0.254	0.980	0.490	0.001	0.000	1.695
Arithmetic Mean		0.20	0.23	0.07	-0.27	0.03	0.00	0.00	-0.43

Emapwin

Note that the dialog box for ΔT under "> Display > Map" is for the **CORRECTION** value to ΔT; and NOT for the value of ΔT being used. Run the software in standard mode and note the value of ΔT used, and apply the correction wished. E,g, for TSE20010621 "default" ΔT is 65.7s; therefore a correction of -0.7s must be applied to correlate with predictions by Fred Espenak.
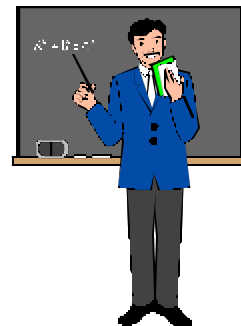
GENERAL TOPICS

(Continued from page 15)

Moon.

3 - Search each new moon for a solar eclipse or not.

4 - Decide what value to use for Moon's radius

5 - Calculate Besselian Elements.

6 - Decide what values to take for delta-T

7 - Calculate general circumstances for the eclipse
  - First and last contact of penumbra
  - First and last conact of umbra
  - First and last positions of North and South limts of umbral shadow

8 - Calculate eclipse curves
  - rising and setting curves
  - max eclipse on horizon
  - central line
  - north and south limit of umbral shadow
  - north and south limit of penumbral shadow

9 - Calculate points where these curves join so that the curves look correct when drawn.

10 - Local circumstances for all places that interest you.

11 - Celebrate with a drink or three......

Happy Easter and Good Luck - John Tilley

From: Jean Meeus <JMeeus@compuserve.com>

I can answer shortly as follows to the question posed by Marc Weirauch.

With a rapid test, it is possible to eliminate at once a large number of New Moons where a solar eclipse is not possible, namely when the absolute value of F is larger than 0.36, where F is the Moon's mean argument of latitude at the time of the *mean* New Moon.

Then, a somewhat longer calculation can give more information. I cannot give the needed formulae here. They can be found in the chapter "Ecmipses" of my "Astronomical Algorithms". Sorry, but please consider this not as a free advertisement for my book! I simply cannot give the formulae here, as that would take too much space.

Finally, the accurate Besselian elements of a given eclipse can be calculated from the *accurate* positions (right ascension, declination, distance) of Sun and Moon. The needed formulae can be found in the astronomical literature, for instance in the excellent (but unfortunately out of print, as far as I know) "Explanatory Supplement to the Astronomical Ephemeris" (1961). This should not be confused to the "Explanatory Supplement to the Astronomical Almanac", published in 1992 and which don't contain much about eclipses. Jean Meeus

From: Jean Meeus <JMeeus@compuserve.com>

In my last message, the test should read :

if the absolute value of *the sine of* the angle F (not the angle F itself) is larger than 0.36, there certainly is no eclipse.

Thanks to Julien Onderbeke, who drew my attention to this typing error. Jean Meeus

From: FRED ESPENAK <u32fe@lepvax.gsfc.nasa.gov> To: <SOLARECLIPSES@AULA.COM>; <eclipse@hydra.carleton.ca> Sent: Wednesday, April 25, 2001 10:26 PM Subject: [SE] Accuracy of Emapwin

>I think those of you with Emapwin can save Fred some work by using Display Mode, Local, then set latitude, longitude and altitude. Latitude and longitude are decimals, not minutes and seconds, and altitude is in meters. I think some earlier postings to SEML have found Emapwin's accuracy to be comparable to Fred's posted data.

It really is no more work for me to generate predictions for 100 cities than it is for ONE city, provided that you supply me with the city and coordinates as specified in my previous message.

However, Tony Crocker brings up an interesting point about the accuracy of Emapwin. Although I have had limited experience with this software, it seems to be quite good. But has anyone done any type of quantitative tests with Emapwin?

I would strongly encourage someone on this list to do a comparison of Emapwin and the NASA 2001 eclipse bulletin. I would do it myself but I'm pretty swamped at the moment. The test should compare local circumstance times for a dozen or more locations in the path of totality and over a range of longitudes (Angola to Madagascar). Throw in half a dozen cities within the zone of partial eclipse as well.

It goes without saying that the test will only be useful if you use the same geographic coordinates as those published in the NASA 2001 eclipse bulletin. You should also use the same value of delta T if possible. I don't know if Emapwin lets you do this. The value of delta T used in the NASA bulletin is 65.0 seconds. The actual value will probably end up being closer to 64.2 seconds, but use 65 seconds for the comparison test.

I hope that someone will take up this interesting challenge and share the results with all of us. It would really be great to have some quantitative data on how Emapwin compares

GENERAL TOPICS

with the NASA eclipse bulletin. - Fred Espenak
From: FRED ESPENAK <u32fe@lepvax.gsfc.nasa.gov>

For anyone entertaining the idea of performing a comparison between Emapwin and the NASA bulletin, I have a few more suggestions.

It would be very useful to calculate the average difference and the standard deviation (dust off your stat textbooks!) between the Emapwin and NASA predictions for each eclipse contact (1st, 2nd, 3rd and 4th), as well as the duration of totality for a number of locations along the eclipse path.

This would give a quick and useful comparison of the two programs. And if more than one person decides to participate, that just improves the statistics since they will undoubtedly use a different selection of cities in their comparison.

So how about it eclipse chasers? How do these predictions compare with each other? - Fred Espenak

From: Peter Tiedt <rigel@stars.co.za>

I'm in. We have a long weekend here in SA (holidays on Friday and Tuesday, and I have take a day's leave on Monday ;-)) so I will leave the text books out of it and shake out Excel which has a SD feature. I also have done some predictions using Solar Version 1.4, which makes it even more interesting,

From: <Rayabrooks2@cs.com> To: <SOLARECLIPSES@aula.com> Sent: Friday, April 27, 2001 2:25 AM Subject: [SE] Eclipse WinMap

Eclipse Win Map is the printable mapping version of EclipseComplete from Zephyr Services in Pittsburgh.

I have been using version 2.0 (still the latest) for six years. It is quite acceptable for most applications and I use it as a sanity check for my own program and for the NASA TP.

Contact times are listed to 0.1 minutes which is 6 seconds time or plus/minus 3.0 seconds time. Curve fitting using the "Local" and the "Centerline" menus can narrow the times to about plus/minus 0.3 seconds

For the 2001 eclipse the best fit I have found is as follows from my notes 3 months ago:

EclipseComplete is skewed over the entire path about 3.5 seconds late, that is, it has the umbra arriving about 3.5 seconds late as compared to Fred's data. It is also skewed

slightly south of the NASA path. The duration is a bit low near Earth umbra arrival 10:37 UTC and departure 13:30 UTC. The latitude errors are less than a half mile, (even less in the vertical fundamental plane)…. pretty good in my book, which would certainly preclude missing totality as did…what noted astronomer missed the path calculation by a 100 miles?

The following error values from my notes indicate how far south and how late vs. Table 7 of the NASA/TP 209484 to compare to true longitude.

Oh yes, EclipseComplete allows changing delta T. I used 1.08333 minutes or 65 secs.

Start of Eclipse path
At longitude west 45.00 deg, 0.56 minutes latitude error south, 3.7 seconds time late, duration a few tenths of a second time low.
At longitude west 40.00, 0.00 minutes lat error south, 3.4 seconds time late, duration statistically same.
At longitude west 30.00, 0.47 minutes lat error south, 3.7 seconds late, duration statistically same.
At longitude west 15.00, 0.27 minutes error south, 3.5 seconds late, duration statistically same.
Mid Path
At longitude east 15.00, 0.48 minutes error south, 3.7 seconds late, duration statistically same.
At longitude east 30.00, 0.45 minutes error south, 3.2 seconds late, duration statistically same.
At longitude east 50.00, 0.51 minutes error south, 3.0 seconds late, duration a few tenths low.
End of eclipse path

Less than two lunar months to go! RAYABROOKS2@CS.COM

From: Peter Tiedt <rigel@stars.co.za>

Hi all, I spent an enjoyable (rainy and cold) Public Holiday crunching through some comparisions between the above. I used a sample of 30 locations in Zambia, Zimbabwe, Angola, Madagascar, Mozambique and South Africa and a mix of locations in and out of totality.

Fred's data is ex NASA/TP 1999-209484 Emapwin ver 1.21 was used with data as supplied. A correction of -0,7s was made to the default value of 65.7s for DeltaT used in the program. Solar Eclipse ver1.40 wa used with a value of 65.0s for DeltaT Latitude and Longitude data is as per NASA/TP 1999-209484

Solar Eclipse 1.40 (which runs happily under DOS,

GENERAL TOPICS

Win3.1, and Win 95/98/NTSP6) is available for download from my website www.eclipse.za.net

My results have been summarised in an Excel spreadsheet, which is available on request - just e-mail me off list at rigel@stars.co.za and it will appear in you inbox. Filesize is 132KB.

Generally, the correlation between all three applications is very good, with the SD being in the order of 0.5 sec, and duration SD about 0.25 sec.

Important note for Emapwin users:

The dialog box for DeltaT under "> Display > Map" is for the CORRECTION value to DeltaT; and is NOT for the value of DeltaT being used. Run the software in standard mode and note the value of DeltaT used, and apply the correction wished. E,g, for TSE20010621 "default" DeltaT is 65.7s; therefore a correction of -0.7s must be applied to correlate with predictions by Fred. This I found out the hard way, and only by RTFM, not a popular pastime. Regards, Peter Tiedt

From: Jean Meeus <JMeeus@compuserve.com>

On 2001 March 1, the value of Delta T (the difference between Dynamical Time and Universal Time) was 64.13 seconds.

This is only 0.25 second larger than the value one year earlier, on 2000 March 1. Jean Meeus
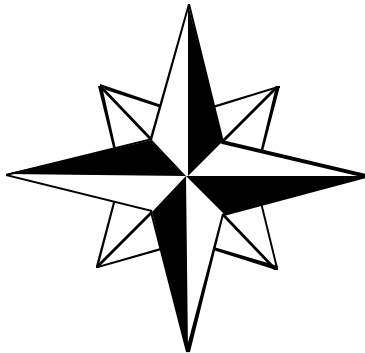
From: Katherine LOW To: SOLARECLIPSES (E-mail) Sent: Monday, April 23, 2001 11:50 PM Subject: [SE] **Eclipse joke: ' Example of "fantastic" communication'**

Something to add to our list of eclipse jokes? Rather poor, but I am just forwarding this only.

Subject: Example of "fantastic" communication

Memo from General Manager to Manager:

Today at 11 o'clock there will be a total eclipse of the sun. This is when the sun disappears behind the moon for two minutes. As this is something that cannot be seen every day, time will be allowed for employees to view the eclipse in the car park. Staff should meet in the car park at ten to eleven, when I will deliver a short speech introducing the eclipse, and giving some background information. Safety goggles will be made available at a small cost.

Memo from Manager to Department Head:

Today at ten to eleven, all staff should meet in the car park. This will be followed by a total eclipse of the sun, which will disappear for two minutes. For a moderate cost, this will be made safe with goggles. The Director General will deliver a short speech beforehand to give us all some background information. This is not something that can be seen every day.

Memo from Department Head to Floor Manager:

The Director General will today deliver a short speech to make the sun disappear for two minutes in the eclipse. This is something that can not be seen every day, so staff will meet in the car park at ten or eleven. This will be safe, if you pay a moderate cost.

Memo From Floor Manager to Supervisor:

Ten or eleven staff are to go to the car park, where the Director General will eclipse the sun for two minutes. This doesn't happen every day. It will be safe, but it will cost you.

Memo from Supervisor to staff:

Some staff will go to the car park today to see the Director general disappear. It is a pity this doesn't happen every day.

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From: Michael Gill <eclipsechaser@yahoo.com> To: <SOLARECLIPSES@AULA.COM> Sent: Tuesday, April 03, 2001 8:53 PM Subject: [SE] **Eclipse References**

Eclipse References: 300 MHz radio observations of the 1999 solar eclipse, by Steve C. Cripps, pages 78-82 Vol.111 No. 2, Journal of the British Astronomical Association.

A millennium of British solar eclipses (1501-2500 AD), by Darren Beard, pages 88-98 Vol.111 No.2 JBAA. Michael Gill

From: Patrick Poitevin <patrick_poitevin@hotmail.com> To: SE Mailing List <SOLARECLIPSES@AULA.COM> Sent: Saturday, April 14, 2001 2:31 PM Subject: [SE] Eclipse references - Astronomy May 2001
Dear All, Following Solar Eclipse related reference came across to me:

Astronomy, May 2001

Hello Darkness my old Friend by Richard Talcott, pages 72 to 75 Hot Shots: A tale of Two Eclipses, pages 113 to 120

Keep those solar eclipse related messages coming ... Best regards, Patrick

From: Patrick Poitevin <patrick_poitevin@hotmail.com> To: SE Mailing List <SOLARECLIPSES@AULA.COM> Sent: Monday, April 23, 2001 8:48 PM Subject: [SE] References Universo and Sky and Telescope

Dear All, Following solar eclipse related references in the magazines:

Astronomia y Universo, April 2001

SOHO analiza un cometa kamikaze, pages 12 to 14
El Sol: Una estrela de pelicula (2) by Jose Carlos del Toro Iniesta, pages 38 to 42
Heliofisica by Al Fargani Ben Azahara, pages 58 to 59

Sky and Telescope, June 2001

Letters: Lasting Impressions by Joe Rao, page 14
25 Years Ago, June 1976: The Sun turned off, page 16
When was Solar Max by D. T., pages 26 and 27
Predicting Fire in the Sky by David Ratledge, page 60 and 62
On the Eclipse Trail by Stuart J, Goldman, page 62
Planetary Silhouettes, review by John E. Westfall, pages 66 and 67
Celestial Awe and Alignments in 2001 by E. C. Krupp, pages 85 to 87
The June 21st Eclipse of the Sun by Roger W. Sinnott, pages 105 and 106
Sky Wise: Green Flash by Jay Ryan, page 110

and ... Keep those solar eclipse related messages coming.... Best regards, Patrick

From: <KCStarguy@aol.com> To: <undisclosed-recipients:;> Sent: Sunday, April 01, 2001 7:32 PM Subject:

[eclipse] eclipse sighting: An Excellent Eclipse Adventure

Eclipse Sightings April issue of Sky & Telescope 2001, page 124 An Excellent Eclipse Adventure by Gary Seronik This is amazing. Ron Danowitz of the Clay Center for Science and Technology in Brookline, Mass succeeded in getting a picture of the International Space Station (ISS). What is amazing is that that it was done during the partial eclipse of Dec 25, 2000. The picture is on p.124 with another picture of the closeup of the station. He calculated that during one of it's passes it would transit the partially eclipsed sun. Read about his adventure to reach the right spot to see it , a 7.6 wide path. Dr. Eric Flescher (KCStarguy@aol.com)

From: Peter D Hingley To: HASTRO-L@WVNVM.WVNET.EDU Sent: Tuesday, April 24, 2001 4:56 PM Subject: Re:

Isaac Newton and chronology, astrology, and theology

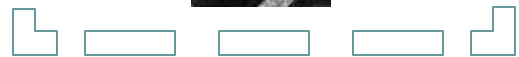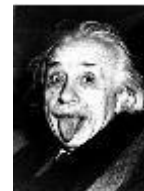I quite like the immortal (?) lines;

Three wonderful people called -stein
There's Gert and there's Ep and there's Ein
Ep's sculpture's perverse
Gert's poems are worse
And nobody understands Ein !!

PDH

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From: Patrick Poitevin <patrick_poitevin@hotmail.com> To: SE Mailing List <SOLARECLIPSES@AULA.COM> Sent: Saturday, April 21, 2001 3:37 PM Subject: [SE]

Free Trial Web Access about Solar Physics, etc.

Dear All,

From the AGU newsletter editor

SPA SECTION NEWSLETTER, Volume VIII, Issue 43

1. Free Trial Web Access to Encyclopedia of Astronomy

From: Eric Priest <eric@mcs.st-and.ac.uk>

The Encyclopedia of Astronomy and Astrophysics has now been published by the Nature Publishing Group and is also available on the web. There is a strong section on Solar System Science with over 600 pages devoted to it.

A key feature of the online encyclopedia is, of course, its inherent updatability. Nature Publishing Group have committed to renewing approximately 20% of the content of EAA every year by updating and expanding existing articles and commissioning entirely new ones. This is a crucial point: unlike traditional works of reference, which date rather quickly, EAA will remain on the cutting edge, expanding and evolving as the fields itself expands and evolves.

You can access the online version at http://www.ency-astro.com (free for anyone for a 24 hour trial).

Current authors will be given a chance to update their articles regularly.

If you would like to offer to write any new articles, please let me know at eric@mcs.st-and.ac.uk.

From: <Jay.M.Pasachoff@williams.edu>

I hope those who check the Encyclopedia like my piece on "Eclipse." (It is vol. 1, 483-518.) Jay Pasachoff

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From: B Yen <byen00@earthlink.net> To: <SOLARECLIPSES@AULA.COM> Sent: Thursday, April 12, 2001 1:13 PM Subject: [SE] Hi8 VS mini-DV (or Digital8)

Hi Don, Well, I'm not sure it qualifies as experience, but I took my brand new DV camera to Hungary for the eclipse, and discovered a few disconcerting things that I should have known but didn't think of. First, digital media is pretty flat compared with analog film, particularly some of the extended range films. (In 1970, we had some special Eastman Kodak film with 3 layers, 400 ASA, 40 ASA and 10 ASA; the B&W image was developed using C-22 chemistry, and that was dynamite!). What I did right was to use the DV camera for mood and general ambiance, but use my still cameras for real photography.

DV(actually Mini DV) compress images to 1/5. So detail of corona is lost unfortunatelly.

This implies that the codec for mini-DV (& Digital 8) can-not handle the fine-detail of coronal streamers. Would the bandwidth of analog Hi8 camcorders be higher, i.e. do a better job? (which are as low as $300, Sony & Canon) Which is preferable for Hi8, Sony (TR818) or Canon (ES60/65)?
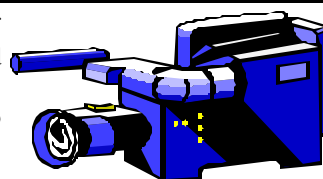
From: Olivier Staiger <olivier.staiger@span.ch>

I think DV is still better. Hi8 has less pixels than D8 or DV. Some DV models now have megapixel photo possibility. One thing however: when using the Hi8 for a LIVE webcast, you can choose to show the time in the image, but not with the D8. With my D8 camera I can only show the time in playback mode, not in live recording mode. For live webcast showing the local time is important. In Lusaka I'll do the live webcam with the Hi8 cam, and I'll use the D8 cam for filming this and that, here and there, for later video-clips. Olivier "Klipsi" Staiger , Geneva Switzerland

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From: Vic & Jen Winter, ICSTARS Inc. <icstars@icstars. com> To: <SOLARECLIPSES@AULA.COM> Sent: Tuesday, April 24, 2001 10:17 PM Subject: [SE]
History changed by an eclipse

I've just returned from a trip through Germany, Austria and a few other places. I discovered something rather interesting while visiting the Abbey of Weltenburg. (Has anyone been?)

The Abbey of Weltenburg (in Kelheim, Germany) is a Benedictine Abbey with the (stunning) sculptures and fresco's done around 1620-1640. What was interesting was in one of the 6 main altar freco's - a depiction of Saint Benedict at his moment of "Enlightenment" witnessing a total solar eclipse. The guide indicated that he was overcome with a sense of enormity of the heavens and humbleness of the human race.

I was struck by the skill with which the painter represented the appearance of the Diamond Ring. It did not appear like what we are accustomed to with modern photography, but was shown with a predominant, brilliant shard of light bursting from one side of the moon. This is one of the most accurate interpretations of the genuine feeling or impression when first witnessing the Diamond Ring Effect. The artist was said to have, himself, seen a total eclipse and the curators speculated that this moment was chosen to depict enlightenment based solely on the artist's personal experience.

However, when later visiting the Melk Abbey in Austria - another Benedictine Abbey, I found another fresco painted in a similar timeframe by a different artist. This was a more generalized image depicting many facets of St. Benedict and his life. It had many unrelated elements, but to his left was another image of the total solar eclipse. This painter had obviously not seen an eclipse for himself and rendered a not very noteworthy image typical of white fuzzy roundish blob with the dark moon in the center. This curator, also noted that the eclipse here depicted St. Benedict's moment of enlightenment.

I am interested in locating more research material on St. Benedict and his history. The majority of the material I have found so far has only reflected on his rules, little on his life. Ultimately, we should be able to track down the actual eclipse that both St. Benedict and the artist painting the Weltenburg Fresco have witnesed.

St. Benedict was a highly influential religious leader in Europe with an entire order founded on his rules and principles... some even claim his teachings held a great deal of political influence through time.

. . . with thousands of lives, towns, laws and history affected by one man's experience viewing a total solar eclipse. - cool! - jen, ICSTARS Astronomy - http://www. icstars.com Editors of the Astronomical League Reflector - http://www.astroleague.org

From: Gerard M Foley <gfoley@columbus.rr.com>

The Catholic Encyclopedia is quoted at

http://www.newadvent.org/cathen/02467b.htm

as saying that St. Benedict of Nursia lived the latter part of his life in Monte Cassino (of W.W.II fame), and:

"St. Gregory and St. Bonaventure say that Benedict saw God and in that vision of God saw the whole world. St. Thomas will not allow that this could have been. Urban VIII, however, does not hesitate to say that "the saint merited while still in this mortal life, to see God Himself and in God all that is below him". If he did not see the Creator, he saw the light which is in the Creator, and in that light, as St. Gregory says, "saw the whole world gathered together as it were under on beam of the sun. At the same time he saw the soul of Germanus, Bishop of Capua, in a fiery globe carried up by the angels to Heaven" (ibid., 35). Once more the hidden things of God were shown to him, and he warned his brethren, both "those that lived daily with him and those that dwelt far off" of his approaching death. "

If this was a TSE, then it should have been total somewhere in southern Italy.

The death is said to be in 543CE. I only found seven total eclipses during the period 538-549CE. The list I found,

http://sunearth.gsfc.nasa.gov/eclipse/SEcat/SE0501-0600. html

gives only the position of maximum eclipse. With no more than that to go on, I eliminated those whose maxima were far north or south, in the western hemisphere or very far to the east, and found these:

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538 Feb 15 Saros 97 35.5N 27.6E
540 Jun 20        84 43.8N 45.1E
547 Feb 6         78 17.8N 58.2E
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If anyone can tell whether the paths of totality of any of these passed through southern Italy, great.

Note, however, that the quotation above puts the apparition many years after Benedict left Rome and began founding a

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number of monasteries, the last at Monte Cassino. Thus this particular apparition would not have been the inspiration for his later life. Gerry K8EF http://home.columbus.rr.com/gfoley/

From: barr derryl <dbarr@nque.com>

Certainly the eclipse in question is saros 84, 540 June 20. At Subiaco totality lasted 3 minutes 59 seconds.

From: Carton, WHC <Wil.Carton@corusgroup.com>

Yes sir, The program Wineclipse shows that the eclipse of 20 June 540 was total in a large belt through Italy, between Rome within the northern pathlimit and Sorrento within the southern pathlimit. The path came from the Street of Gibraltar, contained Sardinia Island, crossed Central-Italy, the northern Balkan and the Crimea peninsula. In Italy the total phase reached 5 minutes and 13 seconds, but near the Caspian Sea the maximum reached 6 minutes 07 seconds totality. Regards, Wil Carton, Castricum, Netherlands.

From: Schambeck, Christian <C.Schambeck@medizin.uni-wuerzburg.de>

I love my country (Bavaria) and its history and I'am fascinated about the world of astronomy. Both came together when the moon's shadow touched Bavaria two years ago. I searched for old documents, frescos which reproduce impressions of people who witnessed a TSE in Bavaria. I know the altar painting (it is not a "fresco") in Weltenburg that shows Benedict's "Enlightenment". Cosmas Damian Asam painted it in 1735 (not 1620-40). Asam completed frescos and paintings with the same subject in Weingarten near Lake Constance (1718-20) and Einsiedeln, Switzerland (1724-27). In Kladruby, Poland (1726) and Legnickie Pole, Poland (1733) Asam omitted the rays. Benedict seems to be enlightened by the "naked moon" only. A corona-like feature appears in the crucifixion fresco of Legnickie Pole. It is very likely that Cosmas Damian Asam witnessed a TSE. The skies were clear at 12 May 1706 when a TSE could be observed in Bavaria. Asam was a 20 years old apprentice in his father's workshop. The family lived in Upper Bavaria (Benediktbeuren and Tegernsee) at that time. There is another interesting feature. Asam probably witnessed even the TSE of 22 May 1724 when the setting sun was hidden by the moon. I don't know whether the clouds enabled the observation in Switzerland or not. I contacted P. Joachim Salzgeber from the Einsiedeln monastery where Asam worked a long time (for 31 weeks in 1724-1727). However, there is no evidence for his stay in May 1724 (no record in documents like the

"Rechnungsbuch des Abtes" and the "Speisgadenrechnung"). Not only Cosmas Damian Asam but also other artists painted a corona-like feature. Ignaz Baldauff painted a crucifixion scene in Maria Beinberg, a church near Augsburg. His fresco of 1767 is very impressive. Born in 1715, he did not experience very likely a TSE. In Ettal near Linderhof (one of King Ludwig's castles) I discovered a comparable altar painting completed by another artist. Whether Asam saw the eclipse of 1706 or not, this subject was a more or less traditional one used by few artists at that time. Christian M. Schambeck

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From: <Rayabrooks2@cs.com> To: <SOLARECLIPSES@aula.com> Sent: Wednesday, April 04, 2001 2:18 AM Subject: [SE]

Epilogue - Longest Total

Let me tidy things up about the issue of longest total solar eclipse TSE duration being 7:31.

Stepping back: The Moon is not really in orbit around the Earth, it is in orbit around the Sun; the Moon always tracing a concave curve about the Sun. If we stopped the solar system orrery and pinned the Sun, Moon and Earth to the construction paper of space and then unpinned only the Moon (with new moon between Earth & Sun) it would accelerate to the Sun, not to Earth! The sun is the key player. The sun's gravity field is 2.2 times stronger on the Moon than is Earth's gravity field (at 240,000 miles). Tides are mostly lunar because the Sun pulls almost equally on the near and far sides of Earth…since they are basically the same distance from the Sun. The near and far sides of Earth are more than 3.6% different distances from the perigee moon, 7.4% differential moon field strength; 1/r squared.

Analogy: the Sun whirls a little red wagon around….with the Earth and Moon just secondarily dancing with each other while they ride on the wagon. (To me that is the biggest statement that Earth did not capture the Moon…to design a capture takes extremely tight parameters)

So my question last week (which should have keyed me back to reality), "Is there some kind of solar system harmonic that would preclude close (TSE) perigees (as opposed to the more common mediocre perigees) from occurring during or near aphelion?" was pertinent but the answer was straightforward, one harmonic is Earth aphelion/perihelion itself and the other harmonic is the monthly swing of the Moon (more below). The sun again is the key player. (the Woody Allen movie scene of him

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slapping his own forehead regretfully comes to mind)

This aspect of the bodies really being in orbit about the Sun also plays into launches from Earth to the Moon and helps me to somewhat understand the Moon's motion. I recall 40 years ago surreptitiously being crouched in the corner of the locker room in prep school (radios were forbidden) with a tiny Japanese (was it 6-transistor?) 9 volt radio listening to moon Surveyor landings - not understanding why the spacecraft got captured so early by the Moon with one-sixth of the trip still remaining versus only one-ninth. After all, the Moon is 81 times lighter than Earth and 9 squared is 81. (at 240,000 miles distance the static balancing point between Earth & Moon is 216,000 miles from Earth, between Earth & sun is 161,000 miles from Earth, between sun & Moon 18,000 miles from the Moon) Capture by the Moon of satellites occurs at about 200,000 miles from Earth, not at the 216,000 mile marker.

I believe the reason is: with the Earth & Moon orbital trajectory really being a tangential free fall toward the Sun, the Surveyor (or Apollo) was also freefalling toward the Sun but timed so that it essentially intercepted the Moon on its way in. Again, the Sun is the key player. (Earth 18 miles per second tangent to orbit, Surveyor initially 7 miles per second radially (basically) inward.) Most of the nine Apollo missions to the Moon's neighborhood (3 did not land) were launched shortly after new moon, so they moved generally toward the Sun. The point is the Sun is running the show from a location of about 161,000 miles out and 'capture' by the Moon is a combination of the Sun's gravity field and the Moon's field and the centripetal force of the satellites trajectory.

Now back to the Earth-Moon system: keeping in mind the dominating effect of the Sun, how do you get a very close lunar perigee to Earth (from an orbital mechanics viewpoint)?…just start with a very far apogee on the opposite side of the lunar orbit. How to get an extreme far apogee?…put the Moon nearer the Sun so it is pulled most from Earth, meaning new moon. The extreme apogees do occur at new moon. Almost makes you wonder how there can be an apogee at Full Moon; well, a Full Moon is a "New Earth" which is that time of the lunar month when Earth is nearest the Sun and in a sense can be pulled away from the Moon causing apocynthion (max distance from the Moon). New Earth is a much smaller effect than New Moon since the barycenter is inside Earth.

Jean Meeus' reply stating the closest perigee is Jan 1 2257 immediately prompted the thought, "Makes sense, and I bet it's a Full Moon." Sure enough, Full Moon is only 23 minutes later, a third of a moon diameter later. The apogees (near new moon) 2 weeks before and after that perigee full moon are very near the maximum apogee values. And I assume if we had God's computer, the computed corresponding value for apogee at the instant of the actual minimum perigee would be maximal. The plot that Guy Ottewell shows in his yearly calendar of the Moon's 'rubber-banding' in and out illustrates that nicely and makes it plain that the close perigees are near January (perihelion) and near full Moon. To expect (which was my implied critically faulted expectation) the absolute closest perigee at new moon in order to fabricate a superlong eclipse intuitively does not make sense…the Sun pulls the new moon away from Earth, it does not push on it; very far apogees at new moon make sense that result in a close perigee 2 weeks later at full moon not vice versa. The sun's static field is slightly more than one percent stronger at apogee new moon versus perigee full moon. Thus very close perigees at full moon make sense as a result of the preceding far apogee new moon. Absentmindedly ignoring that to "design" a long TSE has me now shaking my head in both annoyance and amusement. Headstrong to "prove" a point.

Over the last week I looked at multiple perigee "present-era" new moons near the time of aphelion and the corresponding Earth-Sun distances and I cannot "design an eclipse longer than 7:31". There are many seemingly good candidates, new moon July 6, 2062 is only 1.5 hours from perigee; it is 150 km closer and the Sun is 19,000 miles farther than the July 16 2186 eclipse so it would seem to have more duration potential but it does not because the lunar angular velocity is rather fast (0.25% larger shadow but 0.45% greater relative speed). July 15 2053 is slower angular speed but far away yielding a small shadow. If I manipulate the July 16 2186 eclipse with tilt, hour angle and site latitude as mentioned in my previous analysis, duration would be 7:31.

How can the new moon of July 6, 2062 be closer and not produce more duration when fitted into the 2186 eclipse? Isn't a closer new moon always better? Most of the time but not under all circumstances. I am not satisfied with the way I have described this in the past so here is (hopefully) a much better description. Let's put the site at the North Pole to eliminate

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site speed from the mix. A close (big) fast moon will "eclipse" a star for less time than a far (small) slow moon due to the Kepler speed law. If we look at this star eclipse the same way we look at a solar eclipse it still makes sense. The moon's shadow cone for a star (4 light-years away) eclipse extends 16 times past Pluto so for that eclipse the diameter of the umbra at Earth's location is essentially constant regardless of our distance from the Moon. That means the eclipse duration (stellar occultation) is mainly a function of Moon speed not distance.

Consider a total solar (almost annular) eclipse that is very short duration with let's say a 1 mile diameter shadow roughly 100 miles from the end of the umbra cone, a small change in Moon distance can significantly increase shadow size. Bringing the moon only 200 miles closer would triple duration and the size of the shadow without much of a moon angular speed change. In this case the eclipse duration increase is mainly a function of Moon distance not speed.   But these super long eclipses I am trying to "design" are very deep into the cone, over 17,000 miles into it so they are more like the stellar occultation. The same ratio applies of "200 miles deeper would make the shadow 2 miles larger" but the shadow would only grow about 1% from 160 miles to 162. Big penalty in speed, small gain in size.

The distance of apogee does not vary by much month to month although the value of perigee can change quite a bit. Minimum vs. maximum apogee is a 0.6% spread and minimum vs. maximum perigee is a 3.9% spread. If Newton couldn't solve the three-body problem I certainly can't, but I look at the pendulum effect of a child's swing to help me through.   The Moon is forever swapping potential energy (higher apogee) and kinetic energy (faster perigee) in an exact analogy of pendulum effect. Imagine the child's swing but not moving simply back and forth; add a little side motion, swinging a bit to the right moving forward and a little to the left returning back.   The apogee could be purely straight back and high (extreme apogee) or it could have some sideways speed (some added side kinetic energy) and be not quite so high (but total energy is the same).

The key here is the only means to adjust distance and speed is by pulling; axiom: "You can't push on a rope". As the swing moves down through the arc you could easily shorten it and have a slower, higher than normal perigee at the (temporarily higher) bottom of the arc. And still have the same apogee at the top because although the swing has less speed to get there, it now needs less vertical height to accomplish that. So it is easy to change the perigees (low point of the swing) but not much you can do about the apogees.

And Venus, Jupiter & Sun can't push on the rope either, only pull. But the above generalization is not entirely true. Apogees do not follow the rule of "closer to Earth is faster angular speed". There are fast and slow (angular velocity) apogees at equal distances from Earth and some apogees with the same angular speed at different distances. How so, if energy is constant?(ignoring tides) The energy is constant for the sum of all the energies of all the bodies including Sun, Venus, Jupiter, etc. The Earth-Moon system perturbs all those other bodies too. Just like those whirligig desktop gadgets with 3 or 4 chrome balls zinging around, when one ball exceptionally speeds up another one or two exceptionally slows down; total energy is constant.

Although perigees have more variability of distance they rather strictly follow the rule of "closer to Earth is faster angular speed".   Evection, variation, Great Venus Term, etc. prevent the Moon's angular velocity from being exactly a function of 1/r squared. I do not have sufficient formal training to assiduously explain the differences between apogee and perigee but I do have a consistent analogy. At the instant reaching the top of the arc of the child's swing, ideally there is zero speed but perturbations (like Venus on the Moon) could slightly accelerate or decelerate it; a small acceleration on a body at zero speed is conspicuous. At the bottom of the arc when speed is fastest small accelerations seem overshadowed.

Now I too have swung to the opposite side of my conclusion last week: I found it somewhat surprising (considering it is a new moon) that the perigee associated with the July 2186 eclipse is only about 500 miles (one-quarter of the Moon's diameter) from being near absolute minimum perigee! The distance quoted by Jean Meeus is even a few kilometers closer than that which I quoted from JPL. But looking at the next 75 years (a random selection) I found that the full moons average 380,943 miles and new moons average 381,434, again about 500 miles closer. So new moons tend to be farther, although that is not absolute. Years 2058 through 2064 the average is the opposite…381,250 miles for the full moons and 381,180 for new moons.