

SOLAR ECLIPSE NEWSLETTER



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 (listserv) 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 listserv. Only subscribers can send messages.

Dear Eclipse Chasers
Well dear friends, another month passes and the eclipse comes closer almost into our hands, the light is at the end of the tunnel.

I must apologise for this newsletter being a little later this month, studies prevented me from finishing it earlier. Only one more newsletter to go, and then we will all be travelling to one of the chosen countries, this week I got the children's vaccinations sorted out, but we still have yellow fever to go, which is

recommended for Zambia. Lucky enough the children being older can take the same anti-malaria drugs as us. However, taking the children somewhere different for vacation other than Ibiza or Spain causes a few extra worries as parents.

We will be especially looking forward to seeing as many of you as possible at the meeting arranged after the eclipse "Totality Day", Patrick will be making the announcements very soon on some of the guest speakers.

Totality day will be on the 11th August, which gives people time to process their pictures, lets hope that everyone has clear skies and there is more than enough data and pictures to share with each other.

Take care and hopefully see you around somewhere on the dark continent.

Joanne



SUBSCRIBING TO THE SOLAR ECLIPSE MAILING LIST

THE SOLAR ECLIPSE MAILING LIST IS MAINTAINED BY THE LIST OWNER PATRICK POITEVIN AND WITH THE SUPPORT OF JAN VAN GESTEL

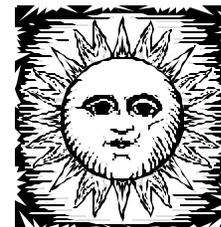
HOW TO SUBSCRIBE:

IN THE BODY OF THE MESSAGE TO listserv@Aula.com SUBSCRIBE SOLARECLIPSES name, country.

ECLIPSE CALENDAR



APRIL 2001



Please find herewith April'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.

April 01, 0637 Total solar eclipse on April's fool day. Beside this date, and the last and next April's fool day total solar eclipses in the years 740 and 2899, are these 3 total solar eclipses the only total solar eclipses on April 1 between 0 and 3000. April 01, 0740 is the last total solar eclipse on April's fool day. April 01, 1764 Annular eclipse visible in Ukkel and on April's fool day. The altitude was 42 degrees. The other central eclipses between 0 and 3000 where partial in Ukkel, Belgium: in 740 (total), 1621 (annular), 2136 (annular), 2899 total) with magnitudes 0.053; 0.553; 0.636; and 0.245. April 01, 1783 was the last solar eclipse on April fools day. This was a partial solar eclipse. The next solar eclipse on this day will be in 2098; also a partial solar eclipse. Next total solar eclipse on April's fool day is April 01, 2899.

April 01, 1764 Probably the first solar eclipse map with the complete eclipse visibility (including the zone of partial phase) drawn by Robert Health in <A General and Particular account of the Annular Eclipse of the Sun of 1763 April 1>. Since 1830, the English yearbook The Nautical Almanac, published eclipse maps. (Ref. SLK 06/99).

April 01, 1764 In a letter Reverend W. Stukely, Rector of St. George in Kent, to the Whitehall Evening Post (out of his dairy, volume XX p. 44): In regard to the approaching solar eclipse of Sunday April 1, I think it advisable to remark that, it happening in the time of divine services, it is desired you would insert this caution in your public paper. The eclipse begins soon after 9, the middle a little before 11, the end a little after 12. There will be no total darkness in the very middle, observable in this metropolis, but as people's curiosity will not be over with the middle of the eclipse, if the church service beordered to begin a little before 12, it will properly be morning prayer, and an uniformity preserved in our duty to the Supreme Being, the author of these amazing celestial movements. (Ref. SLK 06/99).

April 01, 1764 "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."). Ref. SW.

April 02, 1925 Death of Johann Palisa, Austrian astronomer. Discovered 125 minor planets (Ref. A by EE). He gave many names of Minor Planets to solar eclipse related places or persons. He also observed eclipses.

April 02, 1952 Death of Bernard Ferdinand Lyot in Cairo, French astronomer and engineer. Studied polarization of moonlight and planets. Later mainly solar research. Constructed chronograph in 1930 and the 'lyot-filter' or monochromatic polarizing filter.

April 02, 1998 Launch of Trace, American Satellite for research of the sun in UV and XUV.

April 03, 0029 "And I will show portents in the sky above, and signs on the earth below - blood and fire and drifting smoke. The Sun shall be turned to darkness, and the moon to blood, before that great, resplendent day, the day of the Lord, shall come." Peter in Acts of the Apostles. This reference to a blood-red Moon, and the following references in the Gospels to a darkening sky, have been interpreted as placing the date of the crucifixion to 24 November AD 29, when there was an eclipse of the Sun, or Friday, 3 April AD 33, when there was a partial eclipse of the Moon over Jerusalem. Ref. FE 01/01.

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April 04, 1807 Death of Joseph Jerome le Francois de Lalande (1732-1807), French astronomer. Calculated the distance of the sun in 1771 to 154,198 mio km. (Ref. Rc 1999)

April 06, -647 (648BC) "Zeus, the father of the Olympic Gods, turned mid-day into night, hiding the light of the dazzling Sun; and sore fear came upon men." Archilochus (c680-c640 BC), Greek poet. Refers to the total solar eclipse of 6 April 648 BC. Ref. FE 01/01

April 06, -647 (648BC) "Nothing can be surprising any more or impossible or miraculous, now that Zeus, father of the Olympians has made night out of noonday, hiding the bright sunlight, and . . . fear has come upon mankind. After this, men can believe anything, expect anything. Don't any of you be surprised in future if land beasts change places with dolphins and go to live in their salty pastures, and get to like the sounding waves of the sea more than the land, while the dolphins prefer the mountains." May refer to a total solar eclipse of 6 April 648 BC. Archilochus, Greek poet (c680-640 BC). Quoted in Historical Eclipses and Earth's Rotation, by F. Richard Stephenson, Cambridge University Press, 1997, page 338. Partly quoted in Encyclopaedia Britannica CD 98. Ref. FE 01/01

April 06, 1852 Sir Edward Sabine (1788-1883) mentioned a correlation between sunspots and magnetic disturb on earth. (Ref. Rc 1999).

April 06, 1916 Minor Planet Glasenappia 857: Discovered April 6, 1916 by S.I. Belyavskij at Simeis. Named in honor of Sergej Pavlov Glasenapp (1848-1937). Glasenapp observed transits of Venus and Mercury and several solar eclipses. He was a founder of the Russian Astronomical Society, director of the Observatories in Pulkovo (1870-1877) and St. Petersburg (1893). (Ref. VK 7/97)

April 08, 1652 ". . . [the Sun was reduced to] a very slender crescent of light, the Moon all at once threw herself within the margin of the solar disc with such agility that she seemed to revolve like an upper millstone, affording a pleasant spectacle of rotatory motion." Dr Wyberg, observing the total solar eclipse of 8 April 1652 at Carrickfergus, Scotland. Ref. SW.

April 08, 1947 Largest sunspot group ever observed. Surface 18.1 billion square km.

April 08, 1968 Death of Harold Delos Babcock, American astrophysics. Studied laboratory spectra, magnetic field of the sun, constructed solar magnetograph.

April 09, 1046 <Ch'ing-li reign period, 6th year, 3rd month, day hzin-szu, the first day of the month. The Sun was eclipsed by 4 1/2 divisions. At 3 marks in the hour of shen it was restored> Wen-hsien, T'ung-k'ao, chap283 (Ref. PG 3/99)

April 09, 1567 Christoph Clavius (1537-1612) witnessed two spectacular Eclipses of the Sun in the space of 7 years. <The other I saw at Rome in the year 1567 also about midday in which although the Moon was placed between my sight and the Sun it did not obscure the whole Sun as previously but a narrow circle was left on the Sun, surrounding the whole Moon on all sides.>. Clavius 1593 p 508 In sphaeram Ioannis de Sacrobosco, Commentarius. (Ref. EJ 98, PG 3/99)

April 09, 2043 The only non-central total solar eclipse in that century. The central line of this total solar eclipse is missing the surface of the earth near the North Pole. This century there are 3 such total solar eclipses: 19 May 1928, 23 October 1957 and 2 November 1967 all near the South Pole. The years 1957 and 2043 do have two non-central solar eclipses while also the central line of the annular eclipse does miss the earth. (Ref. SLK 6/99).

April 10, 0628 <36th year of Empress Suiko, spring, 2th month, 27th day. The Empress took to her sick bed. 3rd month, 2nd day. There was a total eclipse of the sun. 6th day. The Empress' illness became very grave and death was unmistakably near. 7th day. The Empress died at the age of seventy-five> Translation Aston 1972, p155 (Ref. PG 3/99)

April 10, 1698 This was the last total solar eclipse visible on Tahiti. Not that strange in time, but knowing that the next will be 2 March 2910. Ref. JM 09/99.

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ECLIPSE CALENDAR - APRIL 2001



April 10, 1813 Death of Joseph Louis Lagrange (1736-1813), French mathematician and astronomer. Described the 3 points, later called Lagrange Points.

April 11, -0368 (369 BC) <Artaxeres II, year 35, month XII. In 6 deg daytime 1/3 of the disk was covered> British Museum tablet 37097 and 37211 (Ref. PG 3/99)

April 11, 1176 (Sunday) <In this year 1487 (Seleucid), on New Sunday, the 11th of the month of Nisan, at daybreak, at the end of Office, that is, after reading the Gospel, the Sun was totally obscured, night fell and the stars appeared, the Moon itself was seen in the vicinity of the Sun. This was sad and terrifying sight which caused many people to lament with weeping, the sheep, oxen and horses crowded together in terror. The darkness lasted for two hours, afterwards the light returned. Fifteen days after, in this month of Nisan at the decline of Monday, at dusk, there was an eclipse of the Moon in the part of the sky where the eclipse of the Sun had taken place> Chronicle of Michael the Syrian, book XX, chap 3, translation from the rendering into French by Chabot (1905, vol3, p367). Ref. PG 3/99

April 11, 1176 "In this year the Sun was eclipsed totally and the Earth was in darkness so that it was like a dark night and the stars appeared. That was the forenoon of Friday the 29th of

Ramadan at Jazirat Ibn 'Umar, when I was young and in the company of my arithmetic teacher. When I saw it I was very much afraid; I held on to him and my heart was strengthened. My teacher was learned about the stars and told me, 'Now, you will see that all of this will go away', and it went quickly." Refers to a solar eclipse of 11 April 1176. Jazirat Ibn 'Umar is now Cizre in Turkey. From: Ibn al-Athir.. Ref. FE 01/01.

April 11, 1176 "In this year 1487 (Seleucid), on New Sunday, the 11th of the month of Nisan [April], at daybreak, at the end of Office, that is, after the reading of the Gospel, the Sun was totally obscured; night fell and the stars appeared; the Moon itself was seen in the vicinity of the Sun. This was a sad and terrifying sight, which caused many people to lament with weeping; the sheep, oxen and horses crowded together in terror. The darkness lasted for two hours; afterwards the light returned. Fifteen days after, in this month of Nisan at the decline of Monday, at dusk, there was an eclipse of the Moon in the part of the sky where the eclipse of the Sun had taken place . . ." Refers to a total solar eclipse at Antioch of 11 April 1176. From: Chronicle of Michael the Syrian. Ref. FRS 1997.

April 11, 1176 "The Sun was eclipsed and it became dark in the daytime. People were frightened and stars appeared." Refers to the solar eclipse of 11 April 1176. From: Imad al-Din, Islamic. Chronicle of the crossing of the Orontes River, near Hamah (in present-day Syria) by Saladin and his army. Quoted in Encyclopedia Britannica CD 98. Ref. FE 01/01.

April 11, 1862 Birth of William Wallace Campbell (1862-1938), American astronomer. Studied spectra of comets, corona and atmosphere of the sun. (Ref. Rc 1999).

April 11, 1875 Death of Samuel Heinrich Schwabe (1789-1875), German amateur astronomer. Searched for the planet in the orbit of Mercury. Discovered in 1843 the sunspot cycles. (Ref. Rc 1999)

April 12, 1851 Birth of Edward Walter Maunder F.R.A.S. in Middlesex, England. Died 1928, March 21, Greenwich, London, England. Ref. MK 5/99

April 12, 1889 Death of Warren de la Rue (1815-1889), UK. Royal Society also mentions 12 or 19 April 1889. Warren de la Rue (1815-1889), UK and Angelo Secchi (1818-1878), Italy, use photography during a solar eclipse in Spain to demonstrate

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ECLIPSE CALENDAR - APRIL 2001

that prominences (and hence at least that region of the corona) are part of the Sun, not light scattered by the Earth's atmosphere or the edge of the Moon, because the corona looks the same from sides 250 miles apart. (Ref. Rc 1999)

April 13, 1763 The only central eclipse which will be visible in Mecca (21.4333N and 39.8166E) and in the (mathematical) Ramadan month is the annular eclipse of Wednesday 13 April 1763 or on 29 Ramadan 1176.

April 14, 1905 Death of Otto Wilhelm von Struve (1819-1905) in Karlsruhe, Russian astronomer. Discovered 547 double stars, studied rings of Saturn and parallax of the Sun. (Ref. Rc 1999)

April 14, 1972 Launch of Prognoz 1, Russian satellite for research of the sun and X-rays.

April 14, 1976 Helios 2, German Solar mission comes close to the sun at 43,4 million km.

April 15, -0656 (657 BC) <On the 28th day, at 2 1/2 double hours of the day in the west it also covered 2 fingers towards it made an eclipse> Assyrian British Museum tablet, translation Hunger 1992, p63 (Ref. PG 3/99)

April 15, -0135 (136 BC) <Year Se 175, month XII. the 29th, at 24 deg after sunrise, solar eclipse, when it began on the south-west side, in 18 deg day towards noon it became entirely total> British Museum tablet 34034 and 45745, translation Hunger (Ref. PG 3/99)

April 15, 1707 Birth of Leonhard Euler (1707-1783), Swiss mathematician and astronomer. Observed the transit of Venus in 1769 and concluded that the sun has a distance of 151.225.000 km. (Ref. Rc 1999)

April 15, 1997 Dr. Richard Tousey, a physicist and long-time employee at the Naval Research Lab, died of pneumonia at Prince Georges Hospital Center on 15 April 1997; he was 88. One of his experiments involved an expedition to Peru to observe a Solar Eclipse at sunset from an airplane. The experiment came to nothing because the 4 engine airplane lost 2 engines over the Andes mountains. Fortunately the airplane managed to return safely.

April 16, -1177 (1178BC) ". . . and the Sun has perished out of heaven, and an evil mist hovers over all." Said to refer to a total solar eclipse of 16 April 1178 BC. From: Homer (Greek), The Odyssey (8th century BC).

April 16, 1893 As per E.S. Holden, Schaeberle discovered a comet like object on the plates of the eclipse from Chili. The comet was 0,8 moondiameters from the moon. In May 1894 Schaeberle identified the comet on the plates of the British eclipse expeditions to Brazil and Africa, and the measured distances were respectively 1,15 en 1,5 moondiameters.

April 17, 1912 Last central solar eclipse in Belgium. This eclipse of April 17, 1912 was annular (nearly total) in Belgium.

April 18, 1955 Death of Albert Einstein (1879-1955), American theoretical physicist, mainly known for his relativity. (Ref. Rc 1999)

April 21, 1697 Of the 14 summits, higher then 8000 meter, this total solar eclipse is visible on 7: Mount Everest, Lothse, Makalu, Cho Oyu, Dhaulagiri, Manaslu, and Annapurna.

April 24, 1967 Images of Surveyor 3 have been made of the 24 April 1967 lunar eclipse. This was a lunar eclipse across East Asia, Australia and the Pacific. Surveyor 3 made unusual views of a lunar eclipse: A total solar eclipse as seen from the moon. (Ref. OE by R, S, 1995). The crew of Apollo 12 visited Surveyor III in 1969. They brought back the *Streptococcus mitis* bacterium which was 31 months on the moon. Surveyor III camera system operated by having a TV camera aim up through a tube to a rotating mirror, which can be turned by radio command on Earth. Because the spacecraft tilted, a view of the earth was visible (which was not foreseen). The lunar eclipse of 24 April 1967 was video filmed. Surveyor III, and Jet Propulsion Lab scientists saw a beautiful scintillating ring of sunlight, refracted through the Earth's atmosphere. Very colorful and splendid. The halo was broken into beads. These beads have been measured by filters and their colors plotted on a chromatically diagram. Temperature took a plunge from 100 Fahrenheit to - 150 Fahrenheit (minus).

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ECLIPSE CALENDAR - APRIL 2001

There was another eclipse of the sun by the Earth on October 18, 1967 and Surveyor V was functioning then. Unfortunately, the mirror could not be tilted to see the Earth, although temperature measurements were obtained. Apollo 12 also brought back its TV mirror, the first human artifact to catch light from a lunar eclipse on the moon, to its makers on Earth. (Ref. S, LE O 1943-1993, FG)

April 25, 0822 <C'hang-ch'ing reign period, 2nd year, 4th month, day hsin-yu. The first day of the month. The Sun was eclipsed> Chiu-t'ang-shu, chap36 (Ref. PG 3/99) This eclipse was also visible on 4 of the 14 summits, higher than 8000 meter: Mount Everest, Lhotse, Makalu, and Cho Oyu. Ref. PA 06/00.

April 26, 1957 Patrick Alfred Caldwell Moore launched his first program, the longest running show on television The Sky at Night. He is host of the program without a break. He observed many solar eclipses and he showed them many times in his program. (Ref. A-S 3/98)

April 28, 1774 Birth of Francis Baily (1774-1844), British astronomer and Co-founder of the Royal Astronomical Society. Baily's beads have been named to him although Edmond Halley (1656-1742 or 1743) did notice them before. Baily studied the phenomenon more in detail. (Ref. Rc 1999)

April 29, 1921 Birth of Cornelis de Jager, Dutch astronomer. Studied the Sun and solar eclipses. Still active astronomer and gives many lectures.

April 29, 2019 Next annular solar eclipse which will not be a central solar eclipse on earth. This limit solar eclipse is like the one of 3 October 2043 a miss, the two only exceptions next century. The central line of the solar eclipse will not be visible on earth. Both central lines are near the South Pole. This century there were as well two misses, 18 March 1950 near the North Pole and 30 April 1957 near the South Pole. (Ref. SLK 6/99).

April 30, -0462 (463 BC) In his book, Les Eclipses de Soleil, M.G. Bigourdan mentioned four eclipse comets. Besides the ones of 418, 1882 and 1893, he notes that Posidonius did observe a comet during the eclipse in -462. No other references have been found.

April 30, -462 (463BC) "Beam of the Sun! O thou that seest from afar, what wilt thou be devising? O mother of mine eyes! O star supreme, reft from us in the daytime! Why has thou perplexed the power of man and the way of wisdom by rushing forth on a darksome track? Art thou bringing a sign of some war, or wasting of produce, or an unspeakably violent snow-storm, or fatal faction, or again, some overflowing of the sea on the plain, or frost to bind the earth, or heat of the south wind streaming with raging rain? Or wilt thou, by deluging the land, cause the race of men to begin anew? I in no wise lament whate'er I shall suffer with the rest!" "God can cause unsullied light to spring out of black night. He can also shroud in a dark cloud of gloom the pure light of day" Both these quotations probably refer to the solar eclipse of 30 April 463 BC, which was nearly total at Thebes. Pinder (Greek poet) Ninth Paean, addressed to the Thebans. Quoted in Historical Eclipses and Earth's Rotation, by F Richard Stephenson, Cambridge University Press, 1997, page 344, and, in part, in Encyclopedia Britannica CD 98. Ref. FE 01/01.

Best regards,

Patrick



LATEST NEWS—TOTALITY DAY 2001

From: Patrick Poitevin <patrick_poitevin@hotmail.com>
 To: SE Mailing List <SOLARECLIPSES@AULA.COM>
 Sent: Monday, March 26, 2001 7:38 PM Subject: [SE]
 Totality Day 2001

TOTALITY DAY 2001

11 August 2001 - Open University of Milton Keynes, England

The Solar Eclipse Mailing List (SEML) and the Solar Eclipse Newsletter (SENL) has been successful as a vehicle in bringing together solar eclipse enthusiasts, professional and amateurs alike. The Solar Eclipse Conference in Antwerp (SEC2000), last year October, was an extension of the electronic contacts and was for sure a success. In two days over 35 lectures had been presented to 155 participants from 22 different countries. The Solar Eclipse Conference will be repeated at non-central eclipse years. The next one will be in 2004 and will be announced as SEC2004. Venue and date will be briefed later.

In continuation of the De Duistere Dag (The Dark Day), which we organized in Belgium since 1995, we want to introduce to you TOTALITY DAY. TOTALITY DAY will be organized after each total solar eclipse. To give the participants the time to evaluate their data, TOTALITY DAY will be one or two months after a total solar eclipse. To avoid confusion with the Solar Eclipse Conference, Totality Day is a one-day meeting. Three main subjects will be lectured and the remaining time of the day will be completed with short lectures and presentations about the last total solar eclipse.

We are pleased to announce that we have been able to arrange TOTALITY DAY 2001. Totality Day 2001 will be on Saturday 11 August 2001 in the Berrill Lecture Theatre of the Open University of Milton Keynes, England. Doors open at 8h00, closing at 20h00 and lectures from 10h00 to 12h00 and from 14h00 to 18h00. At lunchtime, the attendees can bring a pack-lunch. However, we might arrange some sandwiches for sale.

We have invited three guest speakers, to give a lecture on their own specialized subject. These three lectures are expected to last maximum 45 minutes and the smaller presentations from others to last maximum 15 minutes. We are currently waiting for a few confirmations, but we can ensure they are the three masters in their discipline.

The Open University is central located in England and has a wonderful theatre that can hold 300 participants. All technical facilities are available for the lectures. There

will be large display areas, where everyone can present any interesting collections. This area is also dedicated for trade stands. If you want to present something about the 2001 Total Solar Eclipse, present a poster, or want to trade related to solar eclipses, please let us know. Thanks to the Open University of Milton Keynes, more particularly Dr. Barrie Jones, attending TOTALITY DAY 2001 is free of charge. It is necessary to make prior arrangements with us if you wish to make a presentation, lecture, or poster display.

It will be possible to meet from Friday evening. No official solar eclipse activities, though, an informal meeting in Milton Keynes. Saturday night, after Totality Day 2001, as well. No official activity either, though, it is the intention to have dinner together. Please contact us for more details on accommodation and the leisure program.

I hope you will take this opportunity to bring your 2001 solar eclipse experience over to a broad audience of eclipse chasers. Joanne and myself would be very happy to meet you all. Maybe for some of you again, maybe for some others the first time. If you require any further information please do not hesitate to contact us for the latest update.

Warm regards, Patrick and Joanne

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TOTALITY DAY



COME AND SHARE YOUR AFRICAN EXPERIENCE WITH EVERYONE

HOT NEWS

From: FRED ESPENAK <u32fe@lepvax.gsfc.nasa.gov> To: <SOLARECLIPSES@AULA.COM>; <eclipse@hydra.carleton.ca> Sent: Wednesday, March 14, 2001 3:28 PM Subject: [eclipse] SENL March 2001 NOW ONLINE!

Joanne Edmonds has prepared a new issue of the SENL (Solar Eclipse Newsletter). The March 2001 issue is now online in pdf format and can be accessed via the SENL index page of MrEclipse.com:

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

Other 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*)

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.

Thanks for the hard work Joanne! - Fred Espenak

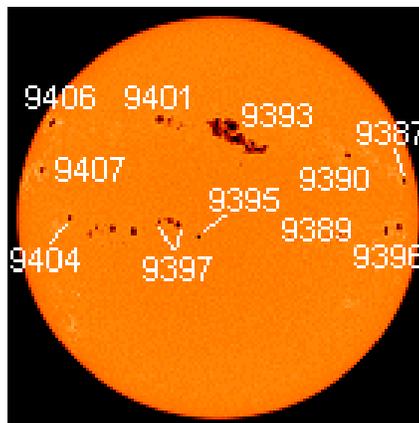


From: Olivier Staiger <olivier.staiger@span.ch> To: <SOLARECLIPSES@AULA.COM> Sent: Thursday, March 29, 2001 10:00 AM Subject: [SE] I:

An aurora alert, plus the biggest sunspot in 10 years!

not directly related to eclipses, but since we watch the sunspots during the partial eclipse phases, check out the sun now for the biggest sunspot for a decade ! www.spaceweather.com
Olivier "Klipsi" Staiger ,
Geneva Switzerland

Thanks to Olivier for alerting the mailing list to the biggest Sunspot for 10 years.



BIGGEST SUN SPOT IN 10 YEARS

SpaceWeather.com -- News and information about meteor showers, solar flares, auroras, and near-Earth asteroids
SpaceWeather.com

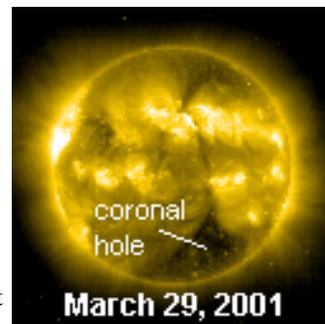
Science news and information about the Sun-Earth environment.

SPACE WEATHER Current Conditions

Solar Wind velocity: 453.5 km/s; density: 1.9 protons/cm³; Updated: Today at 0547 UT

X-ray Solar Flares 6-hr max: M1 0540 UT Mar30; 24-hr: X1 1015 UT Mar29; Updated: Today at 0545 UT

Daily Sun: 29 Mar '01 The large sunspot group 9393 exhibits a delta magnetic field that likely harbors energy for X-class solar flares. Sunspot groups 9396 and 9397, with a beta-gamma magnetic field, are also a threat for M-class flares.



Sunspot Number: 315 More about sunspots; Updated: 29 Mar 2001; Radio Meteor Rate 24 hr max: 29 per hr; Listen to the Meteor Radar! Updated: 29 Mar 2001; Interplanetary Mag. Field; Btotal: 4.7 nT; Bz: 0.6 nT north ; Updated: Today at 0548 UT

Coronal Holes: The only coronal hole on the Sun today is near the south pole; it is not favorably positioned to send solar wind streams toward Earth. Image credit: SOHO Extreme UV Telescope. More about coronal holes

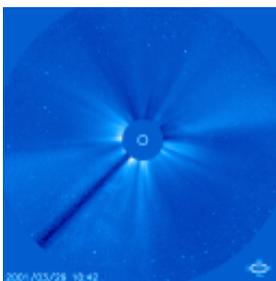
SPACE WEATHER NOAA Forecasts Solar Flares: Probabilities for a medium-sized (M-class) or a major (X-class) solar flare during the next 24/48 hours are tabulated below. Updated at 2001 Mar 29 2200 UT

FLARE24 hr48 hr CLASS M80 %80 % CLASS X30 %30 %

Geomagnetic Storms: Probabilities for significant disturbances in Earth's magnetic field are given for three activity levels: active, minor storm, severe storm Updated at 2001 Mar 29 2200 UT Mid-latitudes 24 hr48 hr ACTIVE30 %20 % MINOR40 %50 % SEVERE20 %25 %

High latitudes 24 hr48 hr ACTIVE20 %10 % MINOR40 %40 % SEVERE30 %40 %

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From: Jean Meeus <JMeeus@compuserve.com>

On 2001 February 1, the value of Delta T (the difference between Dynamical Time and Universal Time) was 64.11 seconds. Jean Meeus

GENERAL TOPICS

Ari Belenkiy wrote:

ALEXANDRIAN YEAR

What is known about "Alexandrian year"? It looks that it was equal to the Julian year though all the months were of 30 days. Then when additional five-six days were intercalated? Are these days the same as "ides" of Julius Caesar?

From: Herbert Prinz <hprinz@ATTGLOBAL.NET> To: <HASTRO-L@WVNVM.WVNET.EDU> Sent: Monday, March 12, 2001 8:25 PM Subject: Re: Questions, questions...

Ari, You will probably be able to find the exact answer in Ideler, Christian Ludwig, Handbuch der mathematischen

und technischen Chronologie. Berlin, 1825-1826.

There is also a somewhat younger one by Ginzler on the same subject. I have not seen either, but they are quoted frequently in matters of chronology.

R. Wolf, Handbuch der Astronomie, 1890, reprinted Amsterdam 1973, while having only a few paragraphs on chronology, may be more accessible to you.

According to the latter, the Alexandrian year is an improvement on the Egyptian year ($12 \times 30 + 5 = 365$ days), inserting an additional day every 4 years. This would fix the start of the year on Aug. 29. Apparently the use of the method can be dated back to 238BC.



From: FRED ESPENAK <u32fe@lepvax.gsfc.nasa.gov> To: <SOLARECLIPSES@AULA.COM>; <eclipse@hydra.carleton.ca> Sent: Thursday, March 15, 2001 4:15 PM Subject: [SE]

Druckmüller's 1999 Eclipse CD-ROM

I have recently been sent a CD-ROM of remarkable images of the 1999 total solar eclipse. The CD-ROM is the work of Miloslav Druckmüller of the Czech Republic. Druckmüller is a professor at the Brno University of Technology, at the Institute of Mathematics of the Faculty of Mechanical Engineering. His main specialization is image processing and numerical image analysis. It also happens to be one of the subjects he lectures on at the University. His expert knowledge in image processing methods was fundamental in creating this CD.

Druckmüller photographed the eclipse from a little village in Hungary using an MTO lens with a focal length 1.1 meters. He then used all his skills and knowledge to reveal remarkable coronal details. The full story is described on the CD-ROM which is in English and Czech. It is written in HTML so any web browser can be used to explore the images with either a Macintosh or Windows PC.

The CD-ROM is available for sale on Druckmüller's home page. You will also see samples of some of Druckmüller's beautiful eclipse the images there. The page is in Czech so you'll have to contact Druckmüller for more information on ordering the CD-ROM. Here is the contact information:

CD home page : <http://www.zatmenislunce.cz> (page contains order form)
 e-mail of publisher : sales@aion.cz (e-mail for direct ordering)
 tel/fax of publisher : +420 67 7217811 (fax for direct ordering)
 e-mail of author : druck@mat.fme.vutbr.cz (more information about CD)

Everyone with a love of eclipses will want to get a copy of this excellent CD-ROM!- Fred Espenak

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

As Fred says, the images are quite beautiful. It is not easy to notice the little Union Jack on the middle right at the top of the Czech page. Clicking it gets you a very well written English page with beautiful images and an order form. The URL of the English page is

<http://www.zatmenislunce.cz/edefault.htm>

The estimated price for the CD-ROM is \$18.95 plus \$5 postage.

GENERAL TOPICS

From: Olivier Staiger <olivier.staiger@span.ch> To: <SOLARECLIPSES@AULA.COM> Sent: Thursday, March 29, 2001 11:34 PM Subject: R: [SE]

LYBIA MARCH 29TH 2006

allright, here we go: in exactly 5 years, March 29 2006 we'll have a total solar eclipse - a pretty long one ! - across parts of Africa, with longest eclipse in Lybia, and then into Turkey and Asia. Has anybody already given a thought about where to go ? I guess most people will choose Turkey. But I dream of going into the southern Lybian desert. My belief is this will be possible. I work in Geneva with a limousine service company (www.prc.ch) and I got some Lybian clients occasionnaly (Pssst! don't tell anybody :-). We even have a travel agency in Geneva specializing in tours to Lybia and the great desert . If the political situation allows it, we'll have a great 4 minutes of total eclipse in the middle of the Sahara. so what will YOUR preferred destination be ? Do you think Lybia sounds impossible to travel to ? Come on ! In 1999, several Americans observed the total eclipse from Iran ! Olivier "Klipsi" Staiger , Geneva Switzerland

From: Crocker, Tony (FSA) <Tony.Crocker@transamerica.com>

My vote would be NW corner of Egypt: same weather advantage, less political hassle. Good time of year to visit the Nile Valley attractions, too.

From: Harvey Wasserman <onsite@gate.net>

Actually, I had given this some thought, at least in passing. I came across somebody's web site where they presented pics and a travelogue about their experience driving across Libya. Sounds possible, and the pics were stunning. They seemed to enjoy the country and people.

Perhaps things have changed. Last time I was in this part of the world - 1972(!) - I drove from Morocco through Algeria to Tunisia, but had to stop there due to closed borders. As we have seen/are seeing in Africa, political situations can change quickly. Harvey Wasserman

From: Dale Ireland <direland@drdale.com>

as one of the world's leaders in terrorism why would you want to give them your travel dollars, marks, etc, if there are other options

From: Mike Simmons <msimm@ucla.edu>

I have. Mt. Elbrus, the tallest mountain in Europe at 5600 meters, is right on the centerline, though it may not be a good location because of questionable weather in the Caucasus in March. It's not for everyone anyway, obviously, but I did something similar in Bolivia in 1994 and I was one of the Americans that traveled to Iran in 1999. I seem to have a non-conformist gene. ;-)

I haven't announced my new web page but I have added a report on the Bolivia eclipse/climb with a few photos (with many more to come once I get the slides scanned) at <http://webpages.charter.net/msimm/Eclipses.html> Mike Simmons

From: Chris Malicki <kmalicki@idirect.com>

Yes, of course I've thought about all the total eclipses for at least the next 10 years. Because personal reasons prevent me from travelling to Africa this June - very depressing :(, I have certainly thought that Africa - Libya or Egypt will be the best in 2006. I've already been to Turkey in 1999 and wish to go to another country in 2006. Libya is opening up to the world and is certainly an option to me. Good luck to all of you lucky ones going to Africa in June this year. Chris Malicki

(Continued on page 12)

GENERAL TOPICS

From: Govert Schilling <mail@govertschilling.nl>

Olivier: I will go to Sivas, Turkey. I was there in August 1999, and the town is at the intersection of the two totality zones. Actually, I chose Sivas in 1999 with the specific aim of going back there in less than 7 years' time to see another TSE... --
Govert, Govert Schilling

From: Olivier Staiger <olivier.staiger@span.ch>

the country is changing, the people is great (not all of its politics, but that can be said for all country, including the U.S. and Switzerland :-). Give them a chance. I would actually love to invite Gaddaffi to come see the eclipse in person. I am convinced it has great powers on evil minds, turning angry people to gentle folks.

actually, it would be great if Congo's Kabila and his enemies came to Lusaka for June 21. Sign peace right then and there !
Olivier "Klipsi" Staiger , Geneva Switzerland

From: Normal user <turkey@qatar.net.qa>

Definitely Patrick I will be there, it seems that I know Libya more than anybody of this list. Let me say all what you here about it is very much an exaggeration or somebody who never know the Libyan people and effected so much with the politics of the area. Any way, I know some of Libyan professional astronomer friends in Libya who can help us to arrange many things, any way it is early to talk about it now. Regards, K.alsubai

From: Assoc Prof J R Huddle <huddle@usna.edu> To: <SOLARECLIPSES@AULA.COM> Sent: Friday, March 30, 2001 7:06 PM Subject: [SE] TSE 29 Mar 06

Here is a clip from the most recent U. S. State Department Travel Warning on Libya, dated September 14, 1999. You can surf to this document (one click) from http://travel.state.gov/travel_warnings.html. (I added the ALL CAPS for emphasis.)

"Without the requisite validation, use of a U.S. passport for travel to, in, or through Libya may constitute a violation of 18 U.S.C. 1544, and MAY BE PUNISHABLE BY A FINE AND/OR IMPRISONMENT. The categories of individuals eligible for consideration for a special passport validation are set forth in 22 C.F.R. 51.74. Passport validation requests for Libya can be forwarded in writing to"

I certainly hope things change in 5 years. An unexpected effect that chasing eclipses has had on me has been to raise my awareness of conflict in the world. This depresses me and makes me weary.

Like some, a minor consideration on my choice of location is whether or not I get a new stamp in my passport, and how exotic that stamp is. This criterion would give Libya a couple extra points. Libya also has some Ancient Ruins, which I like, but which may not turn you on. And IF I am able to make a trip to Antarctica happen in 2003, "possible temperatures below the triple point of water" will become a nearly automatic veto, so Mt. Elbrus may hold no interest for me....

Turkey in 1999 was totally cool; my sister (her first TSE) and I had a wonderful time. If you have not been, I recommend it very highly. I was captivated by Mt. Nemrut, and fascinated with Troy. The beer was good, although I failed to find a decent Margarita the whole time I was there. Cappadocia was mesmerizing, and the Museum of Anatolian Civilizations in Ankara is one of the best there is. And Istanbul is STILL full of intrigue, even to this day. Make a point of planning to steal The Dagger from Topkapi; it cannot be done, but it is GREAT fun to think about.

Egypt has lots to recommend it. Not only Giza, but Luxor and Alexandria. Cairo is almost as mysterious as Istanbul. I have not been to Egypt since 1966 - I was 14 then - so what memories I have are faded and badly in need of reinforcement. And I got a new passport in 1997, so Egypt is not in there. But why wait until 2006? I'm considering Egypt for the Transits of Mercury in 2003 and of Venus in 2004; anyone who is interested in going along should contact me off-list at huddle@usna.edu.

GENERAL TOPICS

LYBIA MARCH 29TH 2006

BOTTOM LINE: In my humble opinion, IT DOESN'T MATTER where you go for the 29 March 2006 TSE: You're gonna have a good time. Kinda reminds me of 26 February 1998, when everybody who went anywhere in the zone of totality went home with wonderful memories. Best regards, Jim Huddle

From: Ted Saker Jr. <ted@saker-law.com>

According to 22 CFR 51.74(c) (4/00), the standards for obtaining a special passport validation for travel to Libya are:

(c) An application may be considered if:

- (1) The applicant is a professional reporter, the purpose of whose trip is to obtain, and make available to the public, information about the restricted area; or
- (2) The applicant is a representative of the American Red Cross; or
- (3) The applicant establishes that his or her trip is justified by compelling humanitarian considerations; or
- (4) The applicant's request is otherwise in the national interest.

Under subparagraph (b):

The special validation shall be granted only when such action is determined to be in the national interest of the United States.

JR, would umbraphilia be considered part of the national interest?

From: Yvonne Jacobs <ylj70@yahoo.co.uk>

Does anyone know if the path of totality crosses any of the greek islands, or somewhere a little more on the beaten track, and fairly easy to get to? Thanks...Yvonne

From: Michael Simmons <msimm@ucla.edu>

<http://sunearth.gsfc.nasa.gov/eclipse/SEplot/SE2006Mar29T.gif> Mike Simmons

From: Bob Morris <morris@sce.carleton.ca>

The 96 eclipse passes east of Crete, perhaps 200 miles or so.

In fact, using Emapwin and the CIA map base, a reasonable portion of the path of totality is on the Egyptian side of the Egypt/Libya border near the Mediterranean. No need to go to Libya.

There's a road from Cairo to the eclipse site.

Whether that road will be safe in 1996, well who knows? :-)

I suspect I will be on a boat from Crete, or on the road from Cairo, depending upon what happens in the Middle East between now and then. Bob Morris

From: Bob Morris <morris@sce.carleton.ca>

My crude estimates based upon a 1970s Times atlas shows that the eastern 1/3 of the path of totality is in Egypt and that the western edge of the path passes only 100 km east of Crete!

Have the Egypt/Libyan borders changed since then? I know that Crete hasn't moved. :-) LRM

From: <JohnLX200@aol.com>

> Bob,

Delta T

Delta T

Delta T

:-) John Hopper

From: Olivier Staiger <olivier.staiger@span.ch>

>Have the Egypt/Libyan borders changed since then?

I'm actually thinking more of southern Lybian, at the point of greatest eclipse. The desert will be in interesting opposition to the 2003 TSE in Antarctica.

Olivier "Klipsi" Staiger,
Geneva Switzerland

GENERAL TOPICS

From: F.Podmore <podmore@science.uz.ac.zw> To: <solareclipses@aula.com> Sent: Friday, March 02, 2001 4:54 PM Subject: [SE]

Brightness of moonlight

Although not directly eclipse-related, can anyone help?

A friend has asked me "What is the average brightness of Full Moon?"

Which I am extending to: What is the illumination on the ground at Full Moon, in Harare? How much does it vary (from moon rise to moonset, and through the year? What is the variation of moonlight as the moon goes through it's phases?

I am not after six-digit accuracy (:)) And I am assuming a clear cloudless sky. Thanks very much, Francis

From: Glenn Schneider <gschneider@mac.com>

Francis, I had looked into this in some detail for a paper I published a dozen years ago in, of all things, the "Journal of Climate". If you are interested in detail see:

<http://nicmosis.as.arizona.edu:8000/PUBLICATIONS/JOC/JOC.html>

However, to immediately answer your question:

The illuminance level on the surface of the Earth due to the moon is a function not only of the lunar elongation, but instantaneously and topocentrically it's altitude above the local horizon. Since from Harare (if I have the latitude right) the full moon can transit the zenith, it can go from 0 to 90 degree zenith distance. So, here is a table of illuminance levels, and you can read off (or interpolate) what you need. Note this IS for "clear" skies at sea level. The illuminance is given in lux (i.e., lumens per meter⁻²)

FULL MOON	
Altitude (Deg)	Illuminance
0	0.0015
5	0.010
10	0.025
20	0.06
30	0.10
40	0.13
50	0.18
60	0.19
70	0.20
80	0.205
90	0.210

Variation with phase: I have measures for first and third quar-

ter, and for an elongation of 60 degrees. Unfortunately I have no data for a smaller crescent or gibbous phases. It's not exactly symmetric for +/- elongations because of the variation in albedo features on the Moon, but it is very close, so I'll just give the mean:

For elongation +/-90 degrees (1st, 3rd quarter) multiply the illuminance values in the above table by 0.25. (divide by 4).

For elongation angles +/-60 degrees multiply the illuminance values in the above table by 0.12. I hope this helps. Glenn Schneider

From: Glenn Schneider <gschneider@mac.com>

Francis, I also intended (but forgot) to mention... for comparison the mean illuminance due to airglow-plus-starlight varies between about 0.0007 to 0.0022 lux. And, the unobscured Sun at the zenith gives rise to an illuminance of ~ 120000 lux.



Gives you a nice feeling about the dynamic range of sensitivity of the human eye! Glenn Schneider

From: Jeff Batten <jeff.batten@csun.edu> To: <solaRECLIPSES@AULA.COM> Sent: Thursday, March 29, 2001 8:33 PM Subject: [SE]

Photographs of Corona for each TSE?

Does a web site exist with a page that has a gallery of TSE corona shots grouped by year?

Why not have thumbnails for each year on a single page, click for a close up for that year. That would be great. Thanks, Jeff

From: FRED ESPENAK <u32fe@lepvax.gsfc.nasa.gov> I have many photos arranged chronologically on my eclipse Gallery web pages:

<http://www.mreclipse.com/SEphoto/SEgallery1.html>
<http://www.mreclipse.com/SEphoto/SEgallery2.html>
<http://www.mreclipse.com/SEphoto/SEgallery3.html>

For more photos of TSE 1998, see:
<http://www.mreclipse.com/TSE98reports/TSE98Espanak.html>

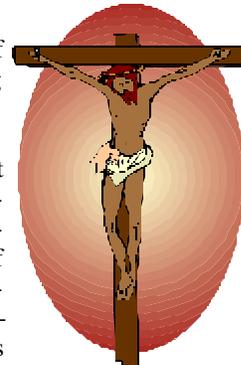
Finally, for photos of TSE 1999, see:
<http://www.mreclipse.com/TSE99reports/TSE99Espanak.html> - Fred Espanak

GENERAL TOPICS

From: Larry Ely <ldeley@CROCKER.COM> To: <HASTRO-L@WVNVM.WVNET.EDU> Sent: Tuesday, March 20, 2001 8:48 PM Subject: Re:

Kepler question

Nick, The monk Dionysius Exiguus thought that Jesus was born in 1 BC, but we do not know the source of his information. Was he truly divinely inspired, which as a scientist I think is possible, or was he putting in print something that had been carried by an oral tradition?



Post Kepler we have the statement by Rudolf Steiner (1861-1925) through purported divine inspiration that the crucifixion occurred on April 3, 33 AD (Kalendar 1912/13 (Berlin: Philosophisch-theosophischer Verlag, 1912), entry: April 3). Steiner's 1912 statement was subsequently supported in 1934 by F. K. Fotheringham, "Evidence of Astronomy and Technical Chronology for the Date of the Crucifixion", Journal of Theological Studies 35 (1934), pp. 146-162, and in 1983 by the astronomical work with eclipses and references to the moon turning "blood red" by two Oxford scholars in 1983: Humphreys, C. J., and Waddington, W. G., 'Dating the Crucifixion', NATURE, 306, 743-46, December 22/29, 1983. If the Luke Gospel is correct that Jesus was about 30 years old at the baptism (Luke 3:23, NRSV), and if his ministry until his crucifixion was about 3 years as most think it was, then Jesus's life span was about 33 years. The 33-year lifespan is also supported by divine inspiration by Rudolf Steiner (Et Incarnatus Est, Eng. transl., lecture of December 23, 1917, Basel, Switzerland, Mercury Press, Spring Valley, NY, 1983, p. 10, and by Anne Catherine Emmerich (1774-1824) The Life of Jesus Christ, 4 vols., Tan Books, Rockford, IL, 1979. Scholarship and divine inspiration both support the idea that the original author of the birth date of Jesus, Dionysius Exiguus, was closer to the mark than was Kepler, great scientist though he was, in his theorizing that the birth date of Jesus as signalled by the star of Bethlehem, was occasioned by a conjunction of Mars, Jupiter, and Saturn in March of the year -5 (or 6 BC).

The 794-year cycle between Jupiter and Saturn, when they come to near occultation, is not that rare an astronomical event. Why did not the magi make their journey in 794 BC or in 794 AD? Much rarer is the movement via precession of the vernal point onto the boundary between the constellation of the Ram and that of the Fishes. The time of the ancient Jews was the time of the Ram, and the references in Isaiah and elsewhere to the "seas" and "oceans" is a kind of guarded, technical talk, metaphorical talk, of the age of the Fishes. This particular cycle of the Platonic or precessional year may also have been witness to the planar coincidence of the ecliptic with the sidereal zodiac (which has an inclination and an ascending node on the ecliptic), due to the hundreds-of-thousand-year rotation cycle of the ecliptic above and below the invariable plane due to the gravitational pull of the planets on the oblate earth. The coincidence or very near coincidence of the ecliptic with the sidereal zodiac, and the vernal point entering the Fishes was, I think, the "star" that the magi "saw". Larry Ely

>At 10:39 AM 3/20/01 +0000, you wrote: Does anyone know of an English translation of this?: In Linz Kepler published first a work on chronology and the year of Jesus's birth, in German in 1613 and more amply in Latin in 1614: "De Vero Anno quo Aeternus Dei Filius Humanam Naturam in Utero Benedictae Virginis Mariae Assumpsit" ("Concerning the True Year in which the Son of God assumed a Human Nature in the Uterus of the Blessed Virgin Mary"). In this work Kepler demonstrated that the Christian calendar was in error by five years, and that Jesus had been born in 4 BC, Nick Campion

From: <KCStarguy@aol.com> To: <eclipse@hydra.carleton.ca> Sent: Wednesday, March 07, 2001 5:25 AM Subject: [eclipse] **interesting question**

Someone sent me this? I will search for an answer but I thought I'd throw it out to you all.

Is there any evidence of eclipses at the beginning of the 1st Century until about 71 A.D.? Not sure how far back records have been kept. Actually, I was reading in the Bible that at the time Jesus died there was a darkness "over all the earth" from the 6th to the 9th hour. Guessed since the Jews started their time around morning must mean from about noon until 3 p.m. Wondered if there was any secular recording of such an event. (Should be around 33 A.D.) It also made me wonder if anything similar may have happened near the time the Romans destroyed Jerusalem in 70. Have you heard of anything of the sort?

From: Grant Leffingwell <leffingwell.6@osu.edu>

A very common question, actually... The account implies divine origin as the source of the darkness--as the execution occurred a few hours before Passover began. The celebration began (begins) with a full Moon, so if the account is accurate and truthful,

(Continued on page 16)

GENERAL TOPICS

there could be no explanation in the form of a solar eclipse. --Grant Leffingwell, www.the-CAS.org, www.astronomy.ohio-state.edu

From: <NinaSandy@aol.com>

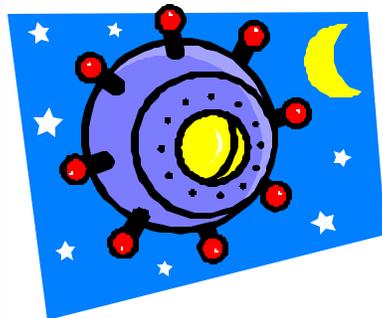
That is an interesting question because there is no way this could be a solar eclipse! The passover was the time corresponding to the Gospels of the crucifixion of Jesus. And that date is 14 Nisan - the Jewish month corresponding to March-April. And the Jewish months began a New Moon - not as we astronomers reckon the new moon but the first tiny crescent visible. Hence, 14 days after that first crescent is nowhere near a new moon. There is therefore no natural explanation for this. (Of course Christians believe that this was a miraculous sign, but there is no way to verify this.)

I do think that the info from our distinguished Egyptian scientist might shed light on whether Kitchen or Rohl is right about the Third Intermediate Period. Better leave that to the experts... Sandy Sanders from Richmond, VA

THE VOYAGE OF BEAGLE 2

And now for an eclipse on Mars B2 PS18 - Released 10 January 2001

After a spectacular show last night when our moon was shadowed by the Earth, we can reveal that a moon of Mars, Phobos, will cast a shadow over Beagle 2 as it sits on the surface of Mars. What's more the eclipse will allow us to pinpoint the place where the Beagle 2 has landed.



Around February 2004, a month or so after Beagle 2 reaches the surface of Mars after a 6 month journey aboard the ESA Mars Express, the shadow of Phobos will pass repeatedly over the landing site in the Isidis Basin. The reduction in light as Beagle 2 is shadowed will be recorded by on-board detectors which form part of the environmental sensors package of the scientific payload. The plan was put forward by Dr A. Christou from the Surrey Space Centre who said "that the timing of the events when the lander is in the shadow will allow computation of the position of Beagle with an accuracy of at least 10 and possibly 100 times greater than the current uncertainty".

Various instruments on the Mars Express orbiting platform will be able to focus their attention on the landing site to maximise the science return; for example accurate determination of the landed position of Beagle 2 will help the high resolution camera on the orbiter to image the landing site.

Beagle 2 Lead Scientist Colin Pillinger said "This is one eclipse we will really be waiting for. It is a very neat way of increasing even further the scientific return from Beagle 2 without any additional call on the very limited mass and power budget of the lander"

Notes to Editors

The two tiny satellites of Mars were discovered during the Mars Earth opposition of 1877 by American astronomer Asaph Hall at the Naval Observatory in Washington. They were named Phobos and Deimos after the horses which pulled the god Mars' chariot in Homer's Iliad. Phobos measures 16.8 x 13.7 x 11.2 miles and orbits at a height of only ca. 3700 miles (little more than the distance from the UK to the USA) above the surface of Mars. Its period is 7h 39m and as the martian surface rotates under it, it appears to rise from the west and set in the east twice a day on average. Mars' other satellite, Deimos, is even smaller at only 9.3 x 7.5 x 6.2 miles, and 12000 miles above Mars. Phobos is not large enough to totally eclipse the Sun but will reduce light levels. Deimos, appearing about the size of Venus from Earth has virtually no effect. Both moons undergo enormous numbers of eclipses as the shadow of Mars blacks out their light, in the case of Phobos some 1300 times a year. Interestingly Phobos can also eclipse Deimos.

The Landing Site: the Beagle 2 landing site on Isidis Planitia has been selected (and will be confirmed shortly) as it offers a location which was most likely a sedimentary basin, the type of environment which offers the best chance of finding the chemical remains of past microbial life. In addition the area has enough rocks and boulders for analysis but is not so rough that it would pose a danger to the gas filled bags as they bounce Beagle 2 safely down to rest. With a low elevation of the Plain, the parachute landing system will benefit from the maximum atmosphere to aid the landing. The location is not at too high a latitude ensuring that the spring temperature of Mars will not be too cold for the lander instruments to function. As John Bridges from the Natural History Museum who is part of the landing site selection team summarised "This is the best site given the landing constraints and scientific aims of Beagle 2".

From: Carton, WHC <Wil.Carton@corusgroup.com> To: <SolarEclipses@Aula.com> Sent: Friday, March 02, 2001 11:51 AM Subject: [SE] **Eclipse puzzle**

Eclipse fans, Here is a puzzle on the subject of eclipse mathematics. Every solar eclipse on earth has its very beginning when the lunar penumbral cone touches down on the globe of the earth, where the cone mantle is astride to the earth's surface. An observer on this location is the first inhabitant of the earth who enjoys the first contact of the advancing eclipse. The puzzle is: For an observer on that location, the position angle V of the first contact has always the same value, for the beginning location of every eclipse. What is that value?

(No calculation is needed to solve this).

2. The same question for the end of the eclipse, for an observer of the last contact on the location where the lunar penumbra leaves the surface of the earth: what value has V ? Wil Carton.

From: <JohnLX200@aol.com>

I got excited at the question, until I realized you said penumbra rather than umbra. My flight in '99 was the first group into the umbra, well after penumbral tangency, and I'll bet there is an analagous question which could be made up for 2nd contact, in which case I was actually that theoretical observer.

At first I thought it would just involve 23.5 degrees and the observer's latitude. Now I've envisioned eclipses at various seasons as viewed from the sun, and conclude it is instead a function of the sun's declination and observer's latitude.

As to exactly what function of them it is, might require concentrated thought using 4-function math, or a pencil and paper to sketch out to get the signs correct, so I'll leave it to others for now. John Hopper

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

Puzzle John Hopper got excited at the question, until he realized I said penumbra rather than umbra. His flight in '99 was the first group into the umbra, well after penumbral tangency, and he will bet there is an analagous question which could be made up for 2nd contact, in which case I was actually that theoretical observer.

Yes, The analogous question is indeed: In the case of a coming Total solar eclipse, when the lunar Umbra mantle is about to enter onto the earth surface (its axis is on that moment still at a distance r_2 above the surface), then the position angle V of the point of second contact for the observer on that terrestrial location has always a value of ??? (this is the analogous puzzle-question). Remember: V is the position angle of the contactpoint, counted from the Vertex(Zenith) point of the solar disc in the anti-clockwise sense. Wil Carton.

From: Glenn Schneider <gschneider@mac.com>

Wil, I presume you really mean the *vertex angle*, "position angle"? If so, then indeed this is a constant. I actually got very close to this point for the 29 April, 1976 eclipse (mentioned on this mail list in another context a few months ago). I won't spoil the fun for others thinking this through, but when they are through take a quick peek at:

http://nicmosis.as.arizona.edu:8000/ECLIPSE_WEB/PARTIAL_76/PARTIAL_1976_PATH.gif

Others: Don't look if you haven't "got it" yet. Cheers, Glenn Schneider

From: Marc Weihrauch <marc.weihrauch@student.uni-halle.de>

Dear Wil, is $V=0$? Marc

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

Yes, Glenn! V is the position angle of the contactpoint, counted from the Vertex(Zenith) point of the solar disc in the anti-clockwise sense up to the contactpoint. Have fun with the puzzle. To the solution of Marc Weihrauch I have already answered him in a private e-mail. I wait till 15th March with posting my solution to the Solar Eclipse Mailing List, because probably

GENERAL TOPICS

WIL'S PUZZLE

Some SEML-subscribers are still thinking through the puzzles of 2nd March. Wil Carton.

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

Eclipse fans, Here is the solution of the puzzle (launched 2d March) on the subject of eclipse mathematics. Every solar eclipse on earth has its very beginning when the lunar penumbral cone touches down on the globe of the earth, where the cone mantle is astride to the earth's surface (penumbral tangency). An observer on this location is the first inhabitant of the earth who enjoys the First contact of the advancing eclipse. The puzzle was: a. For an observer on that location, the position angle V of the First contact has always the same value, for the beginning location of every eclipse. What is that value? (no calculation is needed to solve this).

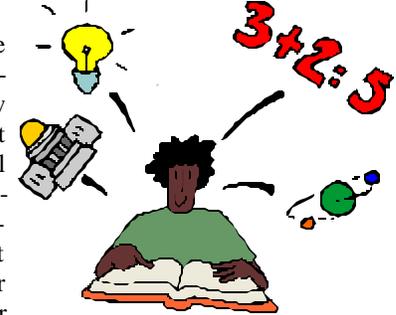
b. The same question for the end of the eclipse, for an observer of the last contact (4th contact) on the location where the lunar penumbra leaves the surface of the earth: what value has V ? Remember: V is the position angle of the contactpoint, counted from the Vertex(Zenith) point of the solar disc in the anti-clockwise sense.

On request of John Hopper (2d March) I extended the puzzle to umbral tangency: second contact and third contact. His flight in 1999 was the first group into the umbra, well after penumbral tangency, and he bets there is an analagous question which could be made up for 2nd contact, in which case he was actually that theoretical observer. This location is often very remote from

Here is the Solution: Not only are the sun and moon tangent and looking like the figure "8" at the time of contact, but the penumbral cone is also tangent to Earth at the observer's location. Externally tangent, of course. The Earth circumference and the penumbra together are also shaping a "8" in the Fundamental Plane. The point of tangency lies on the straight line between the Earth center and the penumbral center in the Fundamental Plane: the crossing point of the "8". The observer there who stands vertically on the Earth surface, has the vertical axis of his body exactly coincide with the line between the Earth center and the penumbral center. So at the instant of First contact, the axis of the penumbra passes through the zenith for the observer, and of course extends from the center of the moon as well. Consequently: the contactpoint is on the top of the apparent solar disc, so $V = 0$. The sun/moon tangency point is exactly on the observer's horizon, with the moon above the horizon and the sun just below the horizon (but is just lifted by refraction). Final penumbral tangency implies for a location on the other side of the Earth the same local position angle $V = 0$.

Umbral tangency: the same shape "8" for the Earth circum-

ference and the small circumference of the umbra in the Fundamental Plane. Now there are two different answers: for a total eclipse the Second contact has $V = 180$ degrees (the bottom point of the apparent solar disc), but for an annular eclipse the Second contact has $V = 0$ degrees. So John Hopper must have observed $V = 180$ degrees on the entrypoint of the 1999-eclipse. The same values apply for the location of finishing totality/annularity on Earth.



Congratulated, friends. Several of you had the right answer! Wil Carton, HOLLAND.

From: Glenn Schneider <gschneider@mac.com>

Hi Wil, A very lucid explanation. I guess this is implicitly "obvious" only if you have been chasing these things for most of a lifetime, and it's hard-wired into your genes (or your jeans for that matter). I was bemused by your puzzle, and posed it to some of my associates here at work (also astronomers by profession, but not eclipse chasers). Amazing to me all three were perplexed for some time about this, more so when I told them it was a thought experiment, and they could not simply dash off and do it on a computer. But each eventually got the "Ah! Ha!" Now that your deadline has passed, you (well, others if they have not peeked before getting it themselves) can see that in 1976 we got VERY close to $V=0$ (as intended), but not exactly there:

http://nicmosis.as.arizona.edu:8000/ECLIPSE_WEB/PARTIAL_76/PARTIAL_1976.html

and be sure to click on the "local geometry and circumstances" link, or,

http://nicmosis.as.arizona.edu:8000/ECLIPSE_WEB/PARTIAL_76/PARTIAL_1976_GEOMETRY.gif

Since the point of tangential contact between the Sun and Moon was 1.2 degrees above the horizon (we DID want to see a few minutes of the eclipse, for if we went to where it was EXACTLY on the horizon it would have been over before we could see anything), your "figure 8" at last contact was very slightly skewed.

I have pointed to these pages before, so I apologize for redundancy, but I believe they nicely illustrate exactly what you have so nicely described.

(Continued on page 19)

General Topics

ALSO: Since I am a nit-picker, $V=0$ is not actually rigorously correct. The point of contact of the line joining the center of the Sun and Moon with the surface of the Earth (i. e., at the extremely of the penumbra) is along a tangent to a spherical approximation to the shape of the earth. The earth, of course, is flattened at the poles, with an obliquity of about one part in 298.5, so the actual "shape" of the geoid (ignoring topology) approximates an oblate spheroid. So, the tangent to the geoidal surface deviates (except at the equator and poles) from a tangent to a sphere, so V is not exactly zero, except at these locations. The same sort of polar flattening is obvious for the gas giant planets, like Jupiter, as their aspherical flattening factors are much greater, but they cannot be ignored for the Earth. Indeed, if they were we could end up out of the path of totality (or annularity) for those short eclipses of only a few km width, such as the 1966 eclipse which Bob Morris recently again reminded us about, or the 1986 over the N. atlantic:

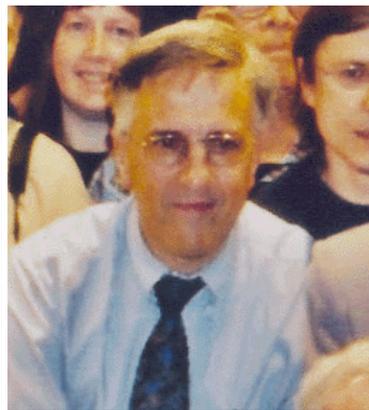
http://nicmosis.as.arizona.edu:8000/ECLIPSE_WEB/ECLIPSE_86/ECLIPSE_86.html

Cheers, and thanks, Wil, for provoking some thought.
Glenn schneider

From: <JohnLX200@aol.com>

Wil, If I'd been AT the umbral tangency point, then yes. Unless the axis is headed for the center of the Earth, though, a centerline observer won't be at the umbral tangency point. And as the umbral diameter is much smaller than the penumbral diameter, a small shift in location can make a huge difference in V at the umbral tangency point, but not at the penumbral tangency point.

I forget the exact angles, but if the axis was descending 30 degrees from vertical, I should have seen V around 150 degrees on the centerline, but actually saw V around 225 degrees at second contact and 255 at third contact for a close graze. This led to around 0.5 umbral radii of totality instead of 2 radii. I'm oversimplifying, as my velocity across the track actually shifted those numbers measurably (4 degrees if I recall correctly) to 229 and 259 for example. It would have been 229 and 251 in this approximate recollection if we'd stopped moving at second contact.



Wil Carton—at the conference

In fact the position angle is a very sensitive indicator of position within the umbral cone, a useful fact I grasped a minute or two after nearly

missing totality due to a timing error by the pilot. Were it not for atmospheric refraction we probably would have missed it entirely.

We were located with the sun over 0.2 degrees below horizontal at mid-totality, which still placed it well above the depressed horizon despite a layer of fairly high clouds around 20,000 feet while we were at 41,000 feet.

All in all, I doubt I'll ever experience as exciting an eclipse again. Which may be good for my life expectancy. It made land and sea-based worries about clouds seem tame by comparison. John Hopper

From: Evan Zucker <ez@MrTotality.com>

I loved reading that story and, especially, seeing the great photos. The clouds were quite reminiscent of what we had here in San Diego on 4 Jan 92. -- EVAN

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

To John Hopper and Glenn Schneider: John, you objected: If I'd been AT the umbral tangency point, then yes. Unless the axis is headed for the center of the Earth, though, a centerline observer won't be at the umbral tangency point. And as the umbral diameter is much smaller than the penumbral diameter, a small shift in location can make a huge difference in V at the umbral tangency point, but not at the penumbral tangency point. My answer: John, you are right. Because of the small UMBRAL diameter, your location is VERY sensitive on the actual value of the position angle (V as well as P too). The lunar umbra enters on the Earth's surface along the Earth terminator with a sharp shape of a cigar ash cone, miles remote from the entrance of the Central line (to the southern path limit for a northerly eclipse like the 1999 TSE was).

Glenn, You had $V = 180$, not $V = 0$ (*) for your Last Contact because you were, during the Solar Eclipse of 29 April 1976, relatively nearby the point of INTERNAL penumbral tangency, where the full entrance of the penumbra in Earth occurred. That was at about 71 degrees Western Longitude and 38 degrees Northern Latitude (just east off the coast of Washington DC) at UT 9h51m47s. So you "saw" the lunar disc apparently below the BOTTOM point of the sun. This INTERNAL tangency can indeed be discussed analogous to my discussed EXTERNAL tangency. (*) the angle V is counted along the SOLAR disk edge, with the angle point in the center of the disc. Not along the lunar disc, that is during a SE invisible except the bite out of the sun. Thank you for your story about your perplexed colleague astronomers. That amuses me.

The puzzle started in my mind after the TSE of 15 Febr 1961: I saw in Italy First contact only 4 minutes after sunrise, with V about 300 degrees (=position 2 o'clock) and I wondered where First Contact generally had occurred.

(Continued on page 20)

General Topics

From the Nautical Almanac eclipse map I saw it was in the Mali Sahara. I wondered what position angle V there occurred. But in that time there were no electronic computers nor electronic calculators, but only logarithm tables. A few years later I awoke on an early morning and instantly my mind had been flash-lightened by the solution. I saw through the geometry, without any calculation.

Yes my friend, you are a nit-picker. $V=0$ (you mean $V=180$) is not actually rigorously correct. The non-spherical, but elliptical shape of the Earth makes that in rigorous eclipse computations we have to distinguish between GeoGRAPHical latitude and GeoCENTRical latitude. The difference is quite small, I think at most between 5 and 8 arcminutes = 5 and 8 nautical miles. That slants the local horizon with the same small angle of some arcminutes.

Thank you for your compliment, that it was provoking some thought. Wil Carton, (student astronomy 1961-1965, now IT-employee of Corus Steelworks in Holland.)

From: Glenn Schneider <gschneider@mac.com>
I had a problem with email timestamps this morning, which has caused some problems, so I am reposting this and one other note to the [SE] list.

Yes, I know it is not 1904. -- Glenn Schneider

From: Patrick Poitevin <patrick_poitevin@hotmail.com>
To: SE Mailing List <SOLARECLIPSES@AULA.COM> Sent: Monday, March 05, 2001 8:15 PM Subject: [SE]

Eclipse References Magazines

Dear All, Please find herewith some Eclipse References from Magazines:

1. Sky and Telescope, April 2001

Amid the Treasures of Persia by Mike Simmons (SEML subscriber), pages 76 to 81, including the 1999 total solar eclipse in Iran.

An Excellent Eclipse Adventure by Gary Seronik, page 124, including a wonderful picture of the Xmas Eclipse and the ISS transiting the eclipsed Sun. Gallery, page 136 with the Xmas eclipse by Dave Sewell and the Lunar Eclipse by Bengt Ask.

2. Tribuna de Astronomia y Universo, March 2001
El Sol: Una Estrella de Pelicula (1) by Jose Carlos Del Toro Iniesta, pages 70 to 76.

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

From: Michael Gill <eclipsechaser@yahoo.com> To: <SOLARECLIPSES@AULA.COM> Sent: Tuesday, March 06, 2001 12:10 PM Subject: [SE] Eclipse References
Eclipse References:

International Solar Eclipse Conference (Part 1) - An account of the Antwerp Eclipse Conference by Brian Seales and Chris O'Byrne, pages 16 - 17, March 2001 edition of Astronomy & Space (ISSN 0791-8062). Elsewhere in the magazine are photographs and accounts of the January 9th lunar eclipse.

'Photographing the Elusive Eclipse' by Bob Turner. Pages 184 - 190, 2001 Yearbook of Astronomy. ISBN 0-333-78183-X An account (with photographs) of the author's (UK amateur solar astronomer) activities on August 11th 1999.

The March 2001 issue of Astronomy Now has several photographs and accounts of the January 9th lunar eclipse. Michael Gill.

From: Patrick Poitevin <patrick_poitevin@hotmail.com>
To: SE Mailing List <SOLARECLIPSES@AULA.COM> Sent: Monday, March 26, 2001 8:42 PM Subject: [SE] Solar Eclipse related references
Hi, Please find herewith some solar eclipse related references:

Astronomy Now, April 2001

Your Views: Eclipse fever by Don Bloomfield (page 16)

Space camera action by Nick Devereux (pages 32 to 34)

Picture Gallery: Moonrise on the evening of the lunar eclipse by Tony Bates (page 76)

Sky and Telescope, May 2001

Letters: A Christmas Present by Rev. George S. Galea (page 18)

Superior moments for inferior Planets by Mark Gingrich (pages 62 to 66)

Dropping In by Ed Krupp (pages 86 to 88)

Gallery: Capitol Eclipse by Tom Wachs (page 142) and Lunar Eclipse Mosaic by Giovanni Dal Lago (pages 142 to 143)

Astronomy, April 2001

Talking Back: Christmas Light by John W. Flyte (page 14)

Here Comes the Sun by Phil Harrington (pages 72 to 75)

Hot Shots: The Christmas Eclipse Comes Alive by Jack Newton (page 111)

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

ART AND ECLIPSES

From: Nello Soldà <n.solda@eclipse2001.it> To: <SOLARECLIPSES@AULA.COM> Sent: Thursday, March 08, 2001 12:59 PM
Subject: [SE] eclipses and art

Is there a link between eclipses and art? Are there artists, especially of the 19° / 20° century, who have painted eclipses? Thank you very much.

From: barr derryl <dbarr@nque.com>

The American portrait painter Howard Russell Butler was commissioned to paint the solar eclipses of 1918 and 1923 from direct observations of the events. A copy of his "Total Solar Eclipse of June 8, 1918" is opposite the title page of the US Naval Observatory's Second Series, Volume X, Part II -- Appendix: Total Solar Eclipses of August 30, 1905, and June 8, 1918." Another reproduction of this work, along with details of prominence, and a painting of the September 10, 1923, solar eclipse may be found in Mitchell's Eclipses of the Sun, 2nd Ed. along with a lengthy description by Mr. Butler of his method of creating the 1918 work. His 1918 work, according to Mitchell, was mounted in the Astronomical Room of the American Museum of Natural History, and according to those who had witness the 1918 eclipse presented a worthy likeness.

However, a "worthy likeness" certainly isn't the limitations or goal of art. Certainly like many other list members I have found and purchased representations of eclipses by inhabitants of regions where eclipses occurred. Many are terrible, commercial, and completely wrong. But occasionally prints, paintings or other renderings have captured something of the people whose land is experiencing totality for the first time in centuries. Frequently the "eclipse art" is headline-scientific-commercial and phony as hell. But occasionally, one discovers a work that captures not only the pulse of the eclipse, but the subtle rhythm of the peoples and the person whose cultural necessity has reconciled the monumental event into a comprehensible occurrence. This is truly Eclipse Art. Derryl Barr

From: Glenn Schneider <gschneider@mac.com>

Nello, I can testify that there is indeed a link between eclipses and art, as I have collected three wonderful pieces of eclipse art, which I proudly display in my home. These mean more to me than most photographs I have seen, or taken for that matter. None of these are paintings, though.

The first is an 18" diameter, very heavy ceramic bowl glazed in off-white white and blue made by a native American artist in Montana. In the interior of the bowl, around the periphery are arrayed the stages of partial eclipse ingress and egress, and in the center a darkened] corona-enshrouded Sun. He made it in commemoration of the 1979 eclipse. It is simple, elegant, and beautiful - and I knew I had to have it the moment I saw it. To me, it's a Mona Lisa.

The second is a batik of a total eclipse with prominences in a dark blue sky with a Javanese hut in backlit against a chromospherically reddened golden-hugh horizon. This was made by an Indonesian artist in remembrance of the 1988 eclipse.

The third, is hanging on my wall up above my computer, and I'm looking at it now as I type. It is a Mexican loom-woven rug of a total eclipse over a range of darkened hills against a color-graded horizon of gold, red, indigo, blue, and nearly-black with a single Suharo cactus in the foreground. A Mexican artist made this for me right after the 1991 eclipse.

Why I treasure these so much, apart from the fact that I think they are beautiful in their simplicity and honesty, is that they are true folk art and bespeak of the impression these eclipses made on the artists. I am sure that there must be many more such pieces around, but this very small collection always makes me smile - and remember - just how profoundly moved people can be by the experience of totality.

From: Evan Zucker <ez@MrTotality.com>

I have a beautiful poster I bought in southern Baja California for the Big One of 11 July 1991. It's a painting of a lizard wearing sun glasses watching the total solar eclipse.

I used to hang it prominently in my office along with a beautiful photo of that eclipse. Now that I work at home, I'm sorry to report they have both been relegated to hanging in one of our bathrooms, but I still love seeing them.

(Continued on page 22)

ART AND ECLIPSES

All pictures are shown with the kind permission of David Hardy and are copyrighted. We thank David for his kindness in allowing us to publish them in our newsletter.

David will be attending the totality day, and will be exhibiting and selling his paintings.

We hope you enjoy this section of Eclipses and Art.

Space Art & Mysteries - David A. Hardy's WebPages

This is the eclipse of August 1999 as it should have been seen from St Michael's Mount, which was on the line of totality, given some, but not too much, cloud. Sadly, for most people, on the day there was too much. . . Even so, totality was a magical experience, with the Moon's shadow sweeping over the clouds and a weird, golden light along the horizon (rather as I showed it here!) The angle and height here are accurate, as seen off the coast of Marazion, Cornwall, with Venus, Mercury, Regulus and Procyon visible. (courtesy Astronomy Now)

More images are available on CD, as a slide show or a digital portfolio, for Mac or Windows, on request. JPEGs etc. can also be easily sent as an e-mail attachment if required urgently.

I'm looking forward to receiving the beautiful book "Glorious Eclipses" for my birthday next month. (http://www.amazon.com/exec/obidos/ASIN/0521791480/o/qid=984124513/sr=8-1/ref=aps_sr_b_1_1/107-5400418-7618931) From my quick browse of it in a book store I'm pretty sure there are some eclipse paintings in it, and if they are they are sure to be wonderful reproductions. Evan H. Zucker

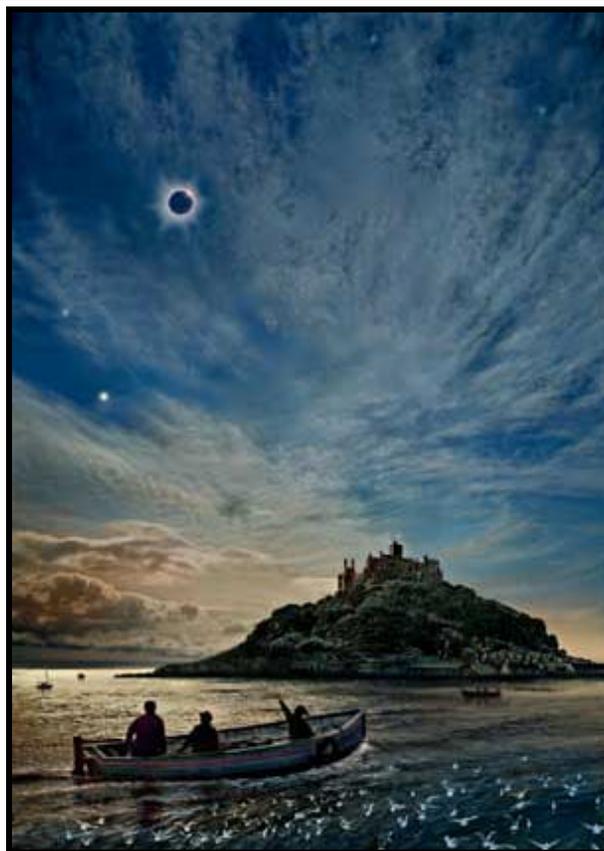
From: Vic & Jen Winter, ICSTARS Inc.

We picked up a beautiful wall-hanging when we were on a return trip to Bolivia last summer. We were wandering the markets in downtown La Paz and happened into a shop reselling goods of a cooperative artisans' group.

We found a wonderful quilted tapestry vividly depicting totality in the altiplano. Obviously the eclipse was an experience which left a clear impression of totality on the artist who depicted the scene so clearly. It naturally came home with us, but the most amazing details were something I noticed only later.

The depiction showed farmers in the country around small campfires. A city resembling La Paz was visible in the distance with the eclipse overhead, but it could have been another town with tall buildings. The fires were obviously lit because of the darkness of the eclipse..... so ... how did these indians know in advance of the eclipse that they would need to light fires at this time of day?

This poses several questions and causes one to theorize a great deal about ancient anticipation and predictions for eclipses. Surely, news around the community warned even isolated indians about the coming eclipse... however, none had the ability to accurately tell time. We know that the indians already had a term to describe the eclipse, so it was well-



**David A Hardy's
AstroArt Pages**

-WELCOME TO MY WORLDS!

(Continued on page 23)