

THE ROYAL ASTRONOMICAL SOCIETY OF CANADA

1991 SOLAR ECLIPSE EXPEDITION

7 May 1991

Dear Registrant(s) No.: 110

We are writing to provide an update on the status of the Expedition and to provide additional information to assist in your preparations.

**STATUS OF EXPEDITION**

We continue to be extremely pleased with Expedition planning. The contract between La Tur Airlines (our carrier) and Sunquest Incentive Travel (our travel agent) has been signed, and we have received a guaranteed price for the charter.

Two members of the RASC Solar Eclipse Committee will be travelling to Mexico in June to meet with our hotel and bus company personnel, and with the Mexican government officials with whom we have been dealing, to ensure that the final details of the Expedition are settled. We will also be locating specific back-up observing sites near the eclipse centre line on the Mexican mainland north of Puerto Vallarta in the event that, for any reason, we are unable or choose because of weather not to fly to Los Cabos in Baja California on Eclipse Day.

**EXPEDITION COST AND FINANCIAL ARRANGEMENTS**

Most of the Expedition's final costs have been determined, and it appears that the final per person cost will be \$1,280 (\$1,152 for registrants no. 1-92). If you have to date paid \$700 (as have most participants), then your final payment will be \$580 (\$452 for registrants no. 1-92). If you have paid an amount to date other than \$700 per person (in which case your final payment must be adjusted accordingly), that amount is indicated here: \_\_\_\_\_, and your final per person payment will be \_\_\_\_\_.

Please send your final payment as soon as possible. WE MUST HAVE RECEIVED YOUR PAYMENT, AT THE VERY LATEST, BY 24 MAY. This is in order to allow your cheque to clear the bank in time for us to make the final payment to La Tur Airlines as required by the terms of the contract.

Please make your cheque or money order payable to "The Royal Astronomical Society of Canada". Please send your payment by regular mail or Canada Post Special Letter. DO NOT SEND PAYMENT BY REGISTERED MAIL OR PRIORITY POST, because we are not at home during the day, and it is very difficult for us to pick up mail at the post office during business hours.

**INFORMATION RETURN AND EQUIPMENT LIST**

Enclosed you will find an Information Return and an Equipment List (one for each member of your group) that we ask you to complete and return to us AS SOON AS POSSIBLE. We need this information in order to be able to contact you quickly should the occasion arise, to arrange appropriate hotel accommodation and aircraft seating, and to enable us to send a complete list of all equipment to Mexican customs officials (as is required by Mexican law). It is essential that one copy of each of these forms PER PERSON be completed and returned.

**MEXICAN CUSTOMS AND IMMIGRATION**

For Canadians entering Mexico, a tourist card (to be provided to you on the flight) is required, TOGETHER WITH A VALID PASSPORT OR ORIGINAL BIRTH CERTIFICATE WITH PHOTO IDENTIFICATION. Please obtain these documents now. The formalities upon entering Mexico are simple and straight forward, with the exception that all astronomical and photographic equipment must be approved before arrival, and will be subject to careful inspection.

Citizens of countries other than Canada should consult their local Mexican consulates to determine entry documentation and regulations. THIS IS YOUR RESPONSIBILITY.

Mexican law provides that, if a minor (ie. person under age 18) is accompanied by only one parent (or by neither parent), the other parent (or both parents) must sign a Consent, WHICH MUST BE NOTARIZED, granting

permission for the minor to enter Mexico. If you may fall into this category (as determined by the Releases that you signed and sent to us), two copies per minor of the required Consent are enclosed. THIS IS VERY IMPORTANT. DO NOT RETURN THE CONSENTS TO US. HAVE THEM SIGNED AND NOTARIZED BY A NOTARY PUBLIC, AND KEEP THEM WITH YOU ON THE EXPEDITION.

#### **LUGGAGE**

Because of the need to maximize the amount of space available for telescopes and other astronomy equipment, all clothes and personal effects must be taken on as carry-on luggage aboard the aircraft, and not as checked luggage. Remember, all checked luggage will remain on board the aircraft overnight in Puerto Vallarta, and will not be accessible until Eclipse Day. Please pack all telescopes and tripods in boxes or bags. When completing the Equipment List, DO NOT UNDERESTIMATE THE WEIGHT OF YOUR EQUIPMENT AS FULLY PACKED, or else we risk being overweight and having to leave equipment behind.

#### **ARRIVAL IN AND DEPARTURE FROM TORONTO BEFORE THE ECLIPSE**

The flight will depart from TERMINAL 2 at Toronto International Airport at 08:30 EDT on Wednesday, 10 July 1991. All members with luggage to be checked should arrive at Terminal 2 by 06:30 a.m. Members with only carry-on bags should arrive by 07:00. Proceed to the Sunquest booth in Terminal 2 to obtain your ticket and boarding pass, before checking in at the La Tur counter. The early morning departure time will probably require that all non-Toronto (and immediate region) participants arrive in Toronto on the day before (that is, Tuesday, 9 July). There are many hotels close to the Toronto airport. If you wish assistance in making a hotel reservation, we will be pleased to help you. Please get in touch with the undersigned as soon as possible.

#### **WEATHER IN MEXICO - AVAILABILITY OF WATER, ETC.**

You can expect the weather on the Mexican mainland to be hot (32° - 38° C.) and humid. The weather in Baja may also be very hot, but extremely dry and therefore not at all uncomfortable. YOU WILL NOT NEED TO CARRY EXTRA WATER OR REFRESHMENTS. We are arranging for pack lunches, water, soft drinks, beer and fruit to be available with us on the buses and therefore at the observing site.

#### **FURTHER INFORMATION**

We are enclosing as well, for your review, the following information: (a) suggested packing list; (b) articles on solar eclipse photography and solar observing safety; (c) an Itinerary for the trip; and (d) a suggested reading list. Please read all these enclosures as soon as possible.

As is indicated in the Itinerary, we plan to hold a one to two-hour group meeting at the hotel in Puerto Vallarta in the late afternoon before the eclipse. At that time, there will be talks and discussions concerning various matters related to the eclipse, including a question and answer session. This will be an excellent opportunity for everyone to become acquainted.

We hope that the information contained in this letter is sufficient. If you have further questions, please do not hesitate to contact us. We look forward to seeing all of you in July, and we thank you for joining our Expedition.

Yours very truly,

Michael S. F. Watson  
Expedition Leader  
1991 RASC Solar Eclipse  
Expedition

Tel. (416) [REDACTED] (Bus.)  
(416) [REDACTED] (Res.)

THE ROYAL ASTRONOMICAL SOCIETY OF CANADA

1991 SOLAR ECLIPSE EXPEDITION

ITINERARY

WEDNESDAY, 10 JULY 1991

- 06:30 - Expedition members arrive at Toronto International Airport,  
07:00 Terminal 2
- 07:00 - Check-in at airport  
08:00
- 08:30 Departure from Toronto airport for Puerto Vallarta
- 12:00 Arrival in Puerto Vallarta; clear Mexican customs and  
immigration
- 13:00 - Bus transfer to Plaza Vallarta hotel; check-in at hotel  
13:30
- 13:30 - Afternoon at leisure  
17:00
- 17:00 - Program in hotel meeting room for entire Expedition  
19:30
- 19:30 - Balance of evening at leisure; dinner (on your own);  
photographing sunset (19:52 local time) and evening planets  
in twilight

THURSDAY, 11 JULY 1991

ECLIPSE DAY

- 03:00 - Wake-up; pack
- 03:30 - Buffet breakfast at hotel (provided); check-out  
04:30
- 04:30 - Bus transfer to airport; check-in  
05:00
- 06:00 Departure from Puerto Vallarta for Los Cabos  
(or north toward centre line on mainland, if necessary)

**TIME ZONE CHANGE (SET WATCHES BACK 1 HOUR)**

- 06:00 Land in Los Cabos, unload equipment onto buses

07:30 - Bus ride to Santiago (40 km north of airport), or to  
08:30 back-up site on Baja west coast (depending on weather)

08:30 Arrive in Santiago; unload buses; set up equipment

10:24.6 First contact; partial phase of eclipse starts  
(at Santiago, our primary observing site)

11:49.3 Total phase of eclipse begins

11:56.2 Total phase of eclipse ends

13:20.7 Last contact; partial phase ends

13:00 - Pack up equipment; load buses  
14:00

14:00 - Brief tour of Santiago  
14:30

14:30 - Bus ride to Cabo San Lucas; stop at Tropic of Cancer marker  
15:00 for photograph

15:30 - Afternoon at leisure (swimming, walking tour, shopping);  
21:00 Dinner (on your own)

21:00 - Depart Cabo San Lucas; bus drive to airport  
22:00

22:00 Arrive at Los Cabos airport; check-in

23:50 Depart Los Cabos for Toronto; snack on board flight;  
breakfast on board flight before landing

**FRIDAY, 12 JULY 1991**

07:20 Arrive at Toronto airport

07:21 Begin planning next eclipse trip!

**SUGGESTED PACKING LIST**  
**(TRAVEL LIGHT!)**

1.

1. Shorts (1 pr.)
2. T-Shirts (2) (remember, you will probably buy some as souvenirs)
3. Pyjamas
4. Extra underwear (1 pr.)
5. Toiletries
6. Sweat pants or jeans (1)
7. Sweater or light jacket (1)
8. Sun hat
9. Sunglasses
10. Close toed running shoes or sneakers (1 pr.)
11. Bathing Suit
12. Sunscreen Lotion

**Other**

13. Blanket to lie down on to observe eclipsed sun in zenith
14. 1 square metre piece of carpeting to kneel on to photograph eclipse
15. White sheet to protect telescope from heat and dust
16. White sheet for shadow band observations (optional)
17. Sun filter
18. Fresh batteries for all equipment

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**SOLAR ECLIPSE READING LIST**

**SOLAR ECLIPSE**

**Books**

- |   |  |
|---|--|
| ECLIPSE                                       | Brian Brewer, 1978, Earth View, Seattle Washington               |
| ECLIPSE                                       | David and Carol Allen, 1987, Allen & Unwin, Boston               |
| TOTAL ECLIPSES OF THE SUN                     | J. B. Zirker, 1984, Vos Nostran Reinhold Company                 |
| FIFTY YEAR CANON OF SOLAR ECLIPSES: 1986-2035 | Fred Espenak, NASA REFERENCE Publication                         |
| TOTALITY: ECLIPSES OF THE SUN                 | Mark Littman and Ken Wilcox (see May '91 SKY & TELESCOPE p. 539) |
| THE UNDERSTANDING OF ECLIPSES                 | Guy Ottewell (see May '91 SKY AND TELESCOPE p. 557)              |

**Periodicals**

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|--|--|
| HOOR OF THE MIDDAY NIGHT                             | Jay M. Pasachoff, ASTRONOMY, August 1973         |
| SPERLING'S EIGHT SECOND LAW -                        | Norman Sperling, ASTRONOMY, August 1980          |
| ALL TOTAL SOLAR ECLIPSES LAST EIGHT SECONDS          |  |
| NORTH AMERICAN SOLAR ECLIPSES - THE NEXT FIFTY YEARS | Fred Espenak, ASTRONOMY, November 1980           |
| AN ECLIPSE CHASER'S NOTEBOOK                         | Fred Espenak, ASTRONOMY, June 1982               |
| SOLAR ECLIPSE DIARY: 1985 - 1995                     | Jean Meeus, SKY & TELESCOPE, October 1984        |
| CONFESSIONS OF AN ECLIPSE ADDICT                     | Joel K. Harris, ASTRONOMY, January 1988          |
| WHEN THE SUN AND MOON EMBRACE                        | Leif J. Robinson, SKY & TELESCOPE, November 1988 |
| ECLIPSE PROSPECTS FOR THE 1990'S                     | Jay Anderson, ASTRONOMY, February 1989           |

**OBSERVING PARTIAL PHASES SAFELY**

- |                    |  |
|--------------------|--|
| SAFE SOLAR FILTERS | Ralph Chou, SKY & TELESCOPE, August 1981 |
|--------------------|--|



EQUIPPED FOR SAFE SOLAR VIEWING

Richard Hill, ASTRONOMY,  
February 1989

**TOTAL SOLAR ECLIPSE - 11 JULY 1991**

OBSERVERS' HANDBOOK 1991

RASC (pp. 87-109)

THE BIG ONE IS COMING

Leif J. Robinson, SKY & TELESCOPE,  
February 1989

PREDICTIONS FOR THE TOTAL  
SOLAR ECLIPSE OF 1991

Fred Espenak, Journal of The Royal  
Astronomical Society of Canada,  
Volume 83, Number 3, 1989

A JOURNEY INTO DARKNESS

Allan Dyer, ASTRONOMY, July 1990

CHASING THE MOON'S SHADOW

Trudy E. Bell, Science PROBE, April  
1991

THE ENIGMA OF SHADOW BANDS

Johanan L. Codona, SKY & TELESCOPE,  
May 1991

YOUR GUIDE TO THE GREAT  
ECLIPSE OF 1991

Joe Rao (see May '91 SKY & SOLAR  
TELESCOPE p. 539)

**PHOTOGRAPHING SOLAR ECLIPSES**

FILM THE ECLIPSE

Richard Berry, ASTRONOMY, 1978

HOW TO PHOTOGRAPH THE ECLIPSE

Alan Dyer, ASTRONOMY, April 1991

ASTROPHOTOGRAPHY BASICS

1988, Eastman Kodak Company, Kodak  
Publication P-150

**PREVIOUS SOLAR ECLIPSES - SAME SAROS CYCLE**

THE LONG ECLIPSE: 20 JUNE 1955

SKY & TELESCOPE, February 1955

JUNE ECLIPSE OBSERVERS PARTLY  
SUCCESSFUL

SKY & TELESCOPE, August 1955

ECLIPSE IN THE PHILLIPPINES, CEYON

SKY & TELESCOPE, September 1955

SOLAR ECLIPSE: 30 JUNE 1973

SKY & TELESCOPE, March 1973

THE GREAT SOLAR ECLIPSE

SKY & TELESCOPE, September 1973

ECLIPSE VIEWS

SKY & TELESCOPE, October 1973

**PREVIOUS SOLAR ECLIPSES - VARIOUS REPORTS**

7 March 1970

SKY & TELESCOPE  
NATIONAL GEOGRAPHIC

April, May 1970  
August 1970

10 July 1972

SKY & TELESCOPE

September 1972

12 October 1977

SKY & TELESCOPE

January 1978

26 February 1979

SKY & TELESCOPE  
ASTRONOMY  
STAR & SKY

April, May, June 1979  
May, June, 1979  
April 1979

16 February 1980

SKY & TELESCOPE  
ASTRONOMY  
STAR & SKY

May 1980  
May 1980  
May 1980

31 July 1981

SKY & TELESCOPE  
ASTRONOMY

October 1981  
November 1981

11 June 1983

SKY & TELESCOPE  
ASTRONOMY  
DISCOVER

September 1983  
September, October 1983  
August 1983

22-23 November 1984

SKY & TELESCOPE  
ASTRONOMY

February, March 1985  
April 1985

18 March 1988

SKY & TELESCOPE  
ASTRONOMY

June, July 1988  
July, August 1988

## PHOTOGRAPHING A SOLAR ECLIPSE

BY MICHAEL S. F. WATSON

Even novice astrophotographers should not have any difficulty producing acceptable quality photographs of a solar eclipse. A little planning combined with certain basic minimum equipment are all that is required. The following are the major considerations in planning to photograph such an event:

1. The sun and moon both appear approximately 0.5 degrees in diameter as seen from the Earth. A standard 50 mm lens on a 35 mm camera therefore produces an image on the film that is only 0.5 mm in diameter, which is far too small to show any detail at all. In order to produce an image size that is large enough to show detail, a telephoto lens of at least 200 mm focal length is required. Experienced photographers use lenses or telescopes of 1000 - 2000 mm focal length. A lens of 2500 mm focal length will just fill the short dimension of the 35 mm frame with the eclipsed sun's image.

2. It is imperative to mount your camera on a tripod and to use a cable release. It is next to impossible to hold a camera steady enough (particularly when pointing virtually straight up - see page 2) to get a sharp, unblurred picture.

3. Using very long telephoto lenses (ie. longer than 500 mm focal length) is difficult unless your camera is mounted on a telescope mount that is equipped with a motor drive to compensate for the Earth's rotation. If a 500 mm lens is used on a fixed tripod, the Earth's rotation will cause the sun's image to drift completely across the frame of a 35 mm camera in about 15 minutes, constant adjustment is needed to keep the image centred.

4. To photograph the uneclipsed or partially eclipsed sun one must place a safe solar filter in front of the camera lens or telescope. Suitable filters include proper commercial solar filters (available at astronomy supply stores and some photo outlets) and number 14 welder's glass (available at welding supply shops). Neutral density ("ND") photographic filters are unsafe. The filter can be removed reasonably safely a few seconds or so before the total phase of the eclipse actually begins, and the filter should be replaced immediately at the end of totality. During the total phase of the eclipse no filter of any kind is required either to photograph or to observe the eclipse.

5. The solar corona (the delicate outer atmosphere of the sun that is visible only during the total phase of a solar eclipse) is bright enough to photograph using moderate speed, black and white or colour films. Most experienced eclipse photographers use films with ISO speeds of between 50 and 200. Faster films are unnecessary (and can result in excessively grainy images), although they do reduce required exposure times to 1/500 sec. or faster, which may be advantageous if one's tripod or mount is shaky, or if one's camera shutter is noisy and causes the camera/lens assembly to vibrate significantly.

6. The proper exposure for the "diamond ring" effect (at the beginning and end of totality), the solar chromosphere and the innermost corona is approximately 1/125 sec. using ISO 50 film and a lens having a speed of f/8. Other systems will change the required exposure accordingly. For example, if your lens has a speed (or aperture) of f/11 instead of f/8, the required exposure will be twice as long, or 1/60 sec. Faster film will decrease the required exposure time accordingly.

7. The brightness of the solar corona decreases rapidly as one moves radially away from the eclipsed sun. Successively longer exposures will therefore reveal more and more corona, sometimes out to several solar radii. Use a variety of exposures in order to capture as many aspects as possible.

## SUN'S ALTITUDE DURING THIS ECLIPSE

An unusual feature of this eclipse is the extremely high altitude of the sun. During totality the sun's elevation exceeds 80 degrees (that is, within 10 degrees of the zenith). Many camera tripods restrict the movement of their pan heads to not more than about 30 degrees or so above the horizontal, thus making it impossible to aim the camera lens high enough to point it toward the zenith. YOU MUST CHECK YOUR TRIPOD NOW TO DETERMINE WHETHER YOU HAVE THIS PROBLEM. If you do, consider purchasing a tripod that has full 90 degree movement of the pan head in altitude. An alternative is to build, out of 1/2 inch or 3/4 inch plywood, a right-angled block, one side of which can be bolted to the tripod pan head, and to the other side of which your camera body can be mounted pointing straight up.

Check as well to determine whether you will have difficulty looking through your camera's viewfinder (in order to focus and frame the image) when the lens is pointing virtually straight up. Often the tripod's pan head locking arms get in the way and make it awkward or even impossible for the photographer to look through the camera in such a configuration. If you have this problem, then you may (a) remove the pentaprism from your camera body (if this is possible) so as to be able to frame and focus while looking horizontally on to the ground glass focusing screen, (b) purchase a right-angled viewfinder for your camera (if one is available), or (c) build from plywood an extension plate that will allow you to move your camera body further above and away from the tripod pan head.

## PRACTISING BEFOREHAND

There is no substitute for assembling, disassembling and practising with your intended photographic assembly several times before Eclipse Day. Failure to do so often leaves lurking, undiscovered until the hours or minutes before totality, problems that could have been anticipated and solved with early practice.

As well, take some experimental photos of the unclipped sun using the lens and filter that you will use during the eclipse. Try a variety of exposures, and look for the one that shows a slight darkening at the edge or limb of the sun. This will be within one photographic stop of the correct exposure for the partial phases.

Try some experimental photos of the crescent or first-quarter moon using a cable release and your tripod. Inspect the photos carefully for image shake caused by camera or tripod vibration. If this is a problem, then either reduce the focal length of your lens, or rig up a system of weights (shopping bags filled with earth or stones will do) to suspend from your tripod to increase its stability.

It is a common mistake for first-time eclipse-goers to shoot frantically through an entire roll of film during the first seconds of totality. Resist this temptation if you can! Plan to shoot no more than one-quarter to one-third of a roll during the opening diamond ring phase, so as to leave plenty of frames for totality and the closing diamond ring phase.

Mirror or extra long telephoto lenses may focus beyond infinity. On Eclipse Day, focus on either a distant mountain or on the unclipped sun, then tape down the focusing ring with duct tape, so you will not inadvertently twist the focusing ring away from infinity during the excitement of approaching totality or when you remove your solar filter in the seconds before the total phase begins.

AND FINALLY: Practise ahead of time, think beforehand about how you will make your photographs, but don't forget to stop and watch the eclipse! It is the greatest of all visual spectacles!

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## OBSERVING THE SUN SAFELY; USE OF SOLAR FILTERS

Contrary to popular belief, it is no more dangerous to observe a partial eclipse of the sun (or the partial phases before or after the total phase of an eclipse) than it is to observe the sun at any other time. Such observations, especially with optical aids such as binoculars or a telescope, are EXTREMELY DANGEROUS and must not be made without a safe solar filter. Alternatively, one may build and use a "pinhole camera", which is described in many introductory astronomy handbooks.

You may be either a novice at astronomical observation or unsure of safe methods of observing the sun either with or without optical aid. We strongly urge you to consult any one of a number of astronomy handbooks and textbooks that are available in science and astronomy shops, or at your local library. Safe observation of the sun is simple and easy, provided that the proper precautions are taken.

Solar filters are discussed in paragraph 4 of the enclosed article entitled "Photographing a Solar Eclipse". If you intend to observe or photograph the partial phases of the eclipse, you should investigate and acquire your solar filter(s) now. You must affix your solar filter(s) firmly to the front (not the back) of your binoculars or telescope. If your filter is not firmly attached, it may slip from in front of your binoculars or telescope, allow unfiltered sunlight to enter your eyes (magnified by the binoculars or telescope) and possibly damage your eyes irreparably.

Please do not be alarmed at the foregoing discussion. It is a simple matter to observe the partially eclipsed sun safely using solar filters. If you are inexperienced or have concerns, you may choose to observe the partial phases with only a solar filter, and without any optical aid such as binoculars or a telescope. Remember, the six minute, fifty-two second total phase can be watched perfectly safely without any filter.

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