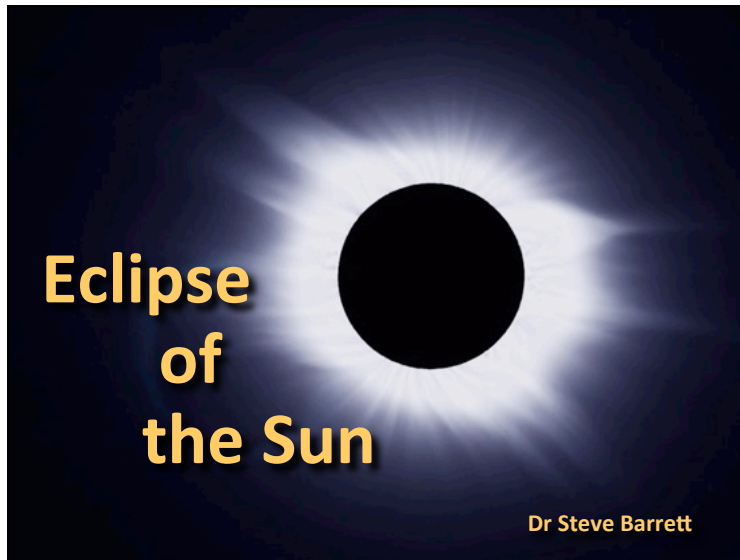


# Eclipse of the Sun



### Eclipse of the Sun

Eclipses	Why do they happen? When do they happen?
Total Eclipse in March 2006	Where was it seen? What was it like?
Future Eclipses	When can I see one?

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### Safety

Remember that you should **NEVER** look at the Sun without using special eclipse glasses like these:

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A pair of orange and black eclipse safety glasses with 'ECLIPSE SAFETY' printed on the side.

### Safety

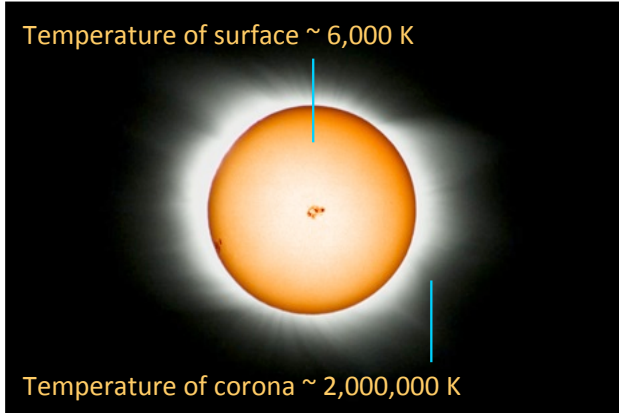
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4

A collage of images showing people and a dog wearing eclipse safety glasses. The dog is a brown and white mix wearing colorful glasses.

# Eclipse of the Sun

The Sun



Temperature of surface  $\sim 6,000$  K

Temperature of corona  $\sim 2,000,000$  K

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Aurora



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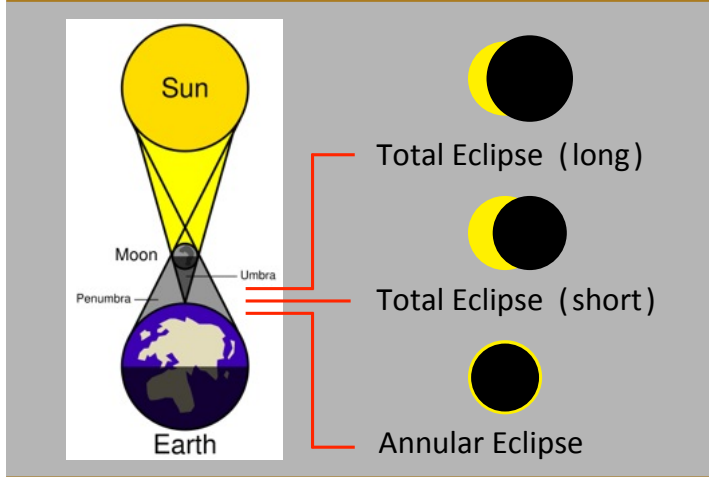
6

Our closest neighbour can be fascinating ...

... watching the shadows of the craters and mountains change from night to night



Sun, Moon and Earth



8

# Eclipse of the Sun

### Sun, Moon and Earth

The Moon crosses the plane of the Earth's orbit (the Ecliptic) at a node. When the node points towards the Sun we see an eclipse.

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### How Long is a Month?

Synodic Month	
New Moon to New Moon	29.53 days
Draconic Month	
Node to Node	27.21 days
Anomalistic Month	
Perigee to Perigee	27.55 days

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### Periods Between Eclipses

223 Synodic months	=	6585.32 days
242 Draconic months	=	6585.36 days
239 Anomalistic months	=	6585.54 days

Over this time period, the so-called **saros** cycle, the Moon's orbital periods are back in 'synch'.

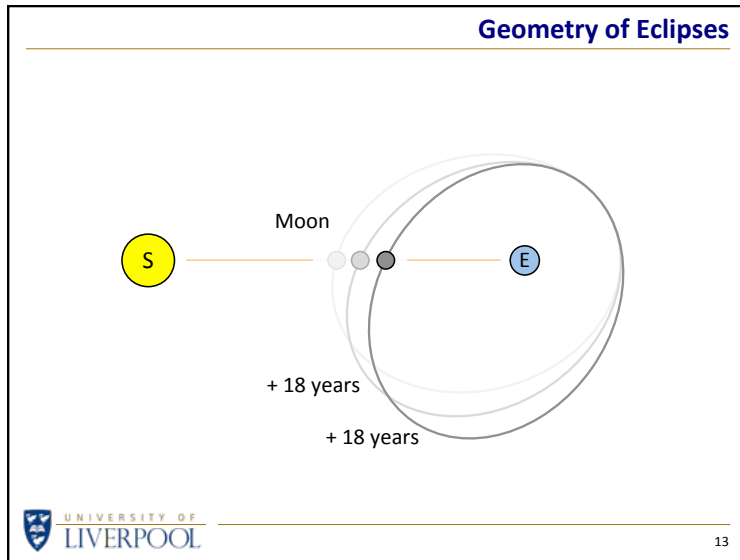
Two eclipses separated by one saros cycle have similar geometries and so the eclipses repeat.

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### Periods Between Eclipses

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# Eclipse of the Sun



### Saros 139

Date	$\phi M/\phi S$	Length	Seen from
1988 Mar 18	1.046	3 <sup>m</sup> 46 <sup>s</sup>	Asia
2006 Mar 29	1.052	4 <sup>m</sup> 07 <sup>s</sup>	Africa
2024 Apr 08	1.057	4 <sup>m</sup> 28 <sup>s</sup>	Americas
2042 Apr 20	1.061	4 <sup>m</sup> 51 <sup>s</sup>	Asia
2060 Apr 30	1.066	5 <sup>m</sup> 15 <sup>s</sup>	Africa
2078 May 11	1.070	5 <sup>m</sup> 40 <sup>s</sup>	Americas
2096 May 22	1.074	6 <sup>m</sup> 06 <sup>s</sup>	Asia

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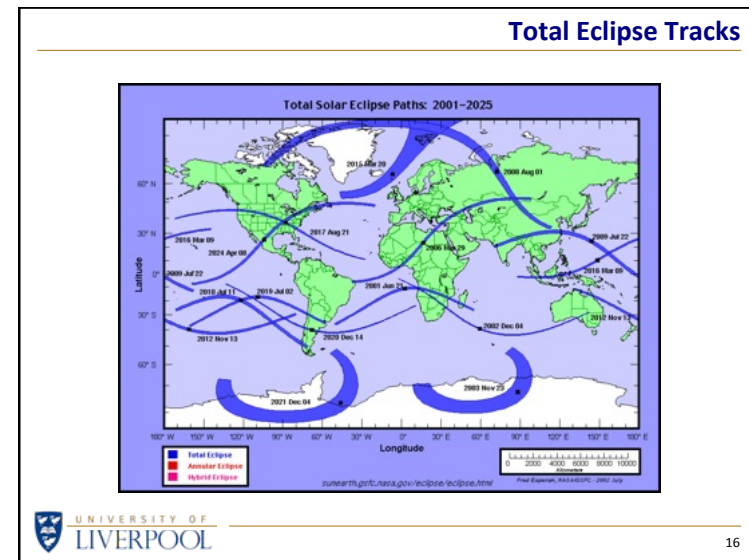
14

### Eclipses Coming Soon

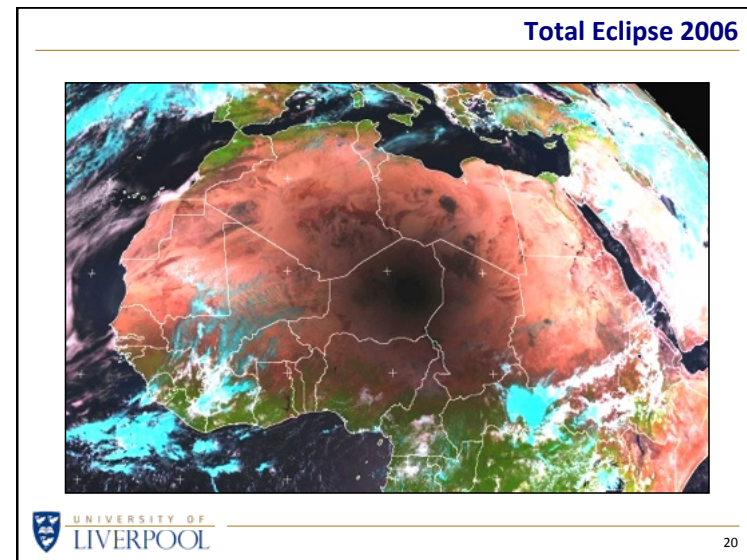
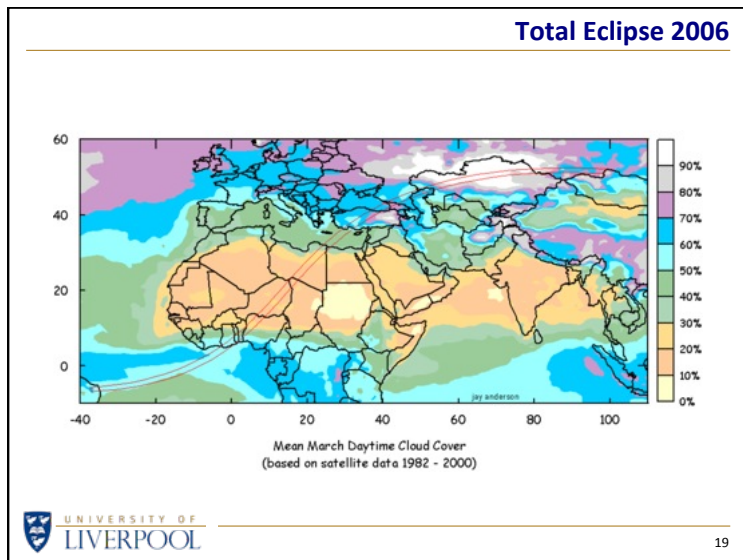
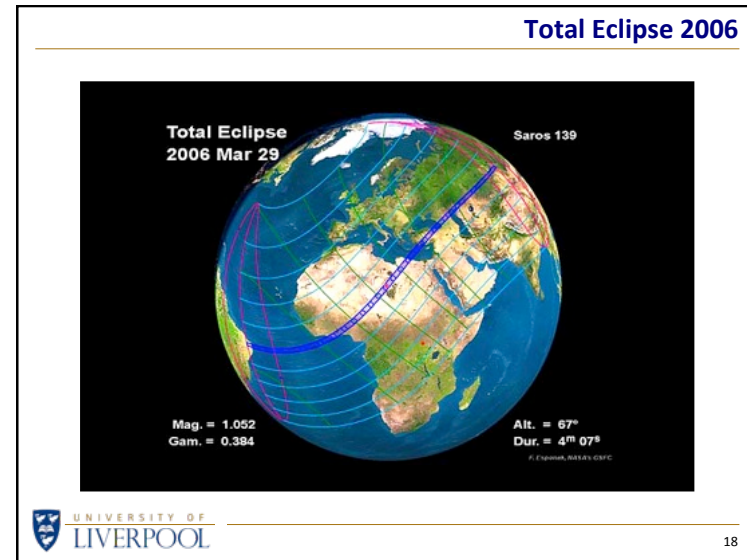
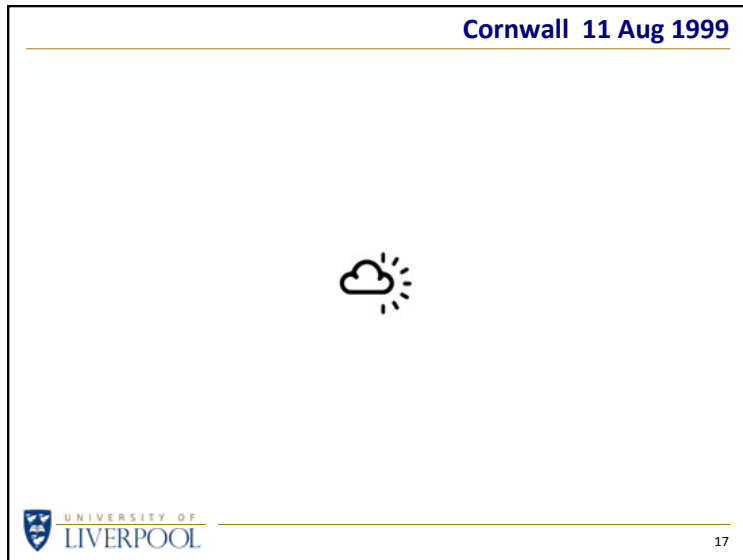
Date	$\phi M/\phi S$	Length	Seen from
2019 Jul 02	1.046	4 <sup>m</sup> 33 <sup>s</sup>	S America
2020 Dec 14	1.025	2 <sup>m</sup> 10 <sup>s</sup>	S America
2021 Dec 04	1.037	1 <sup>m</sup> 54 <sup>s</sup>	Antarctica
2023 Apr 20	1.013	1 <sup>m</sup> 16 <sup>s</sup>	Australia
2024 Apr 08	1.057	4 <sup>m</sup> 28 <sup>s</sup>	N America
2026 Aug 12	1.039	2 <sup>m</sup> 18 <sup>s</sup>	W Europe
2027 Aug 02	1.079	6 <sup>m</sup> 23 <sup>s</sup>	S Europe

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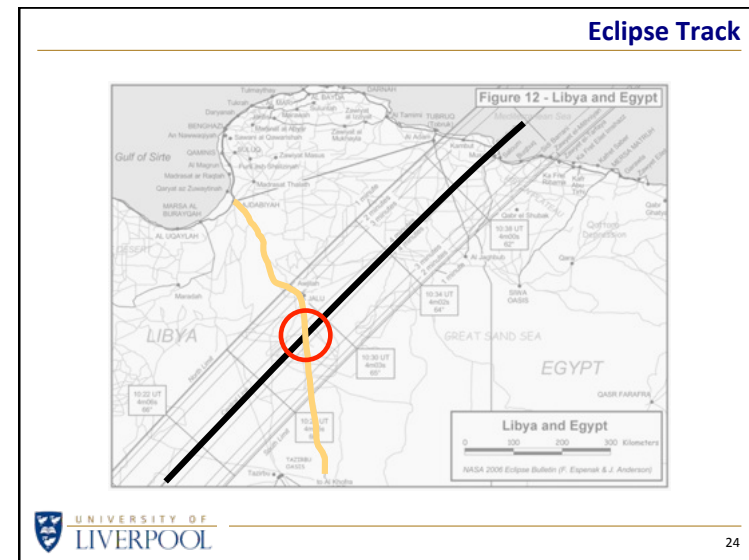
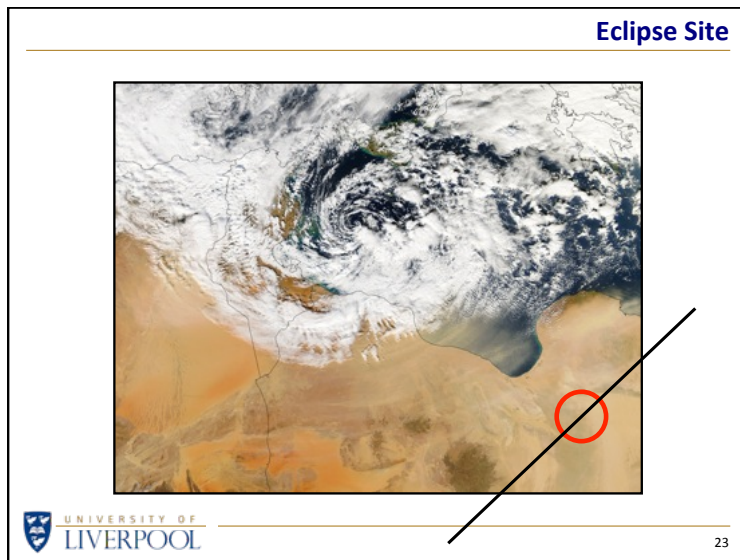
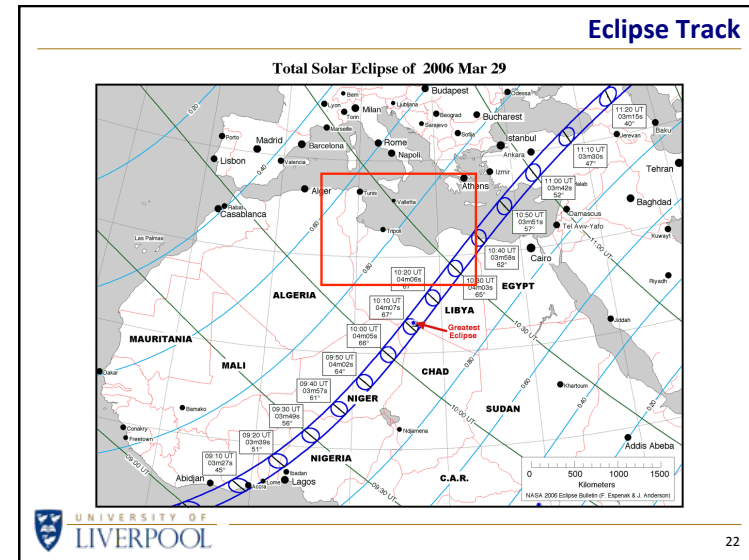
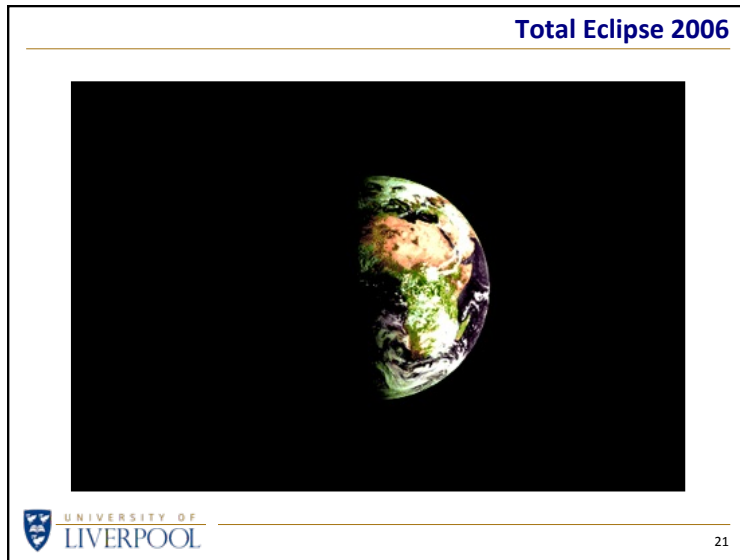
15



# Eclipse of the Sun



# Eclipse of the Sun



# Eclipse of the Sun

Setting Up in the Desert



... and So It Begins



Totality!



Catching the Corona



1/4000 s

1/1000 s

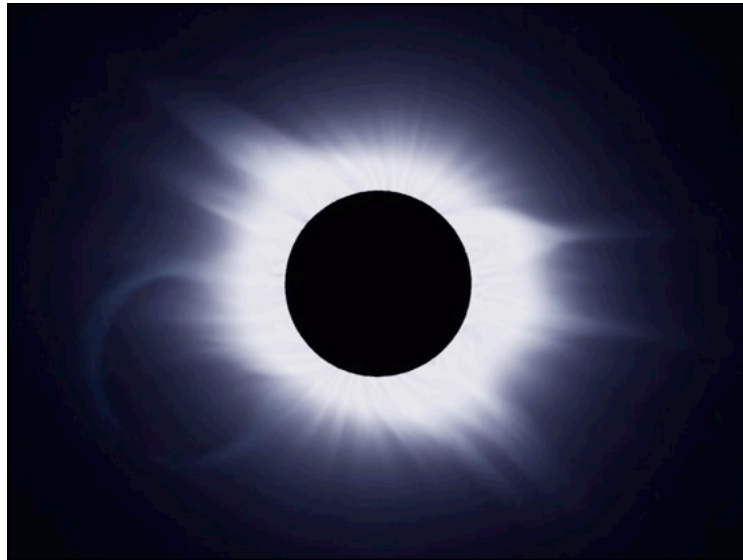
1/250 s

1/60 s


1/15 s

1/4 s

# Eclipse of the Sun




**Viewing Totality**

A collage of several photographs showing people in a desert landscape observing a solar eclipse. Many are using tripods and cameras to capture the event. The photos are arranged in a staggered, overlapping layout.

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**An African Experience**

A collage of images related to an African experience. It includes a zebra, a lion's face, a bird of prey in flight, a group of people in a desert setting, a boat on a river, and a central image of a total solar eclipse.

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[www.liverpool.ac.uk/~sdb/Talks](http://www.liverpool.ac.uk/~sdb/Talks)

A photograph of a total solar eclipse, showing a black circle (the Moon) completely obscuring the Sun, surrounded by a bright white corona of solar plasma.

Dr Steve Barrett

26 Feb 2019