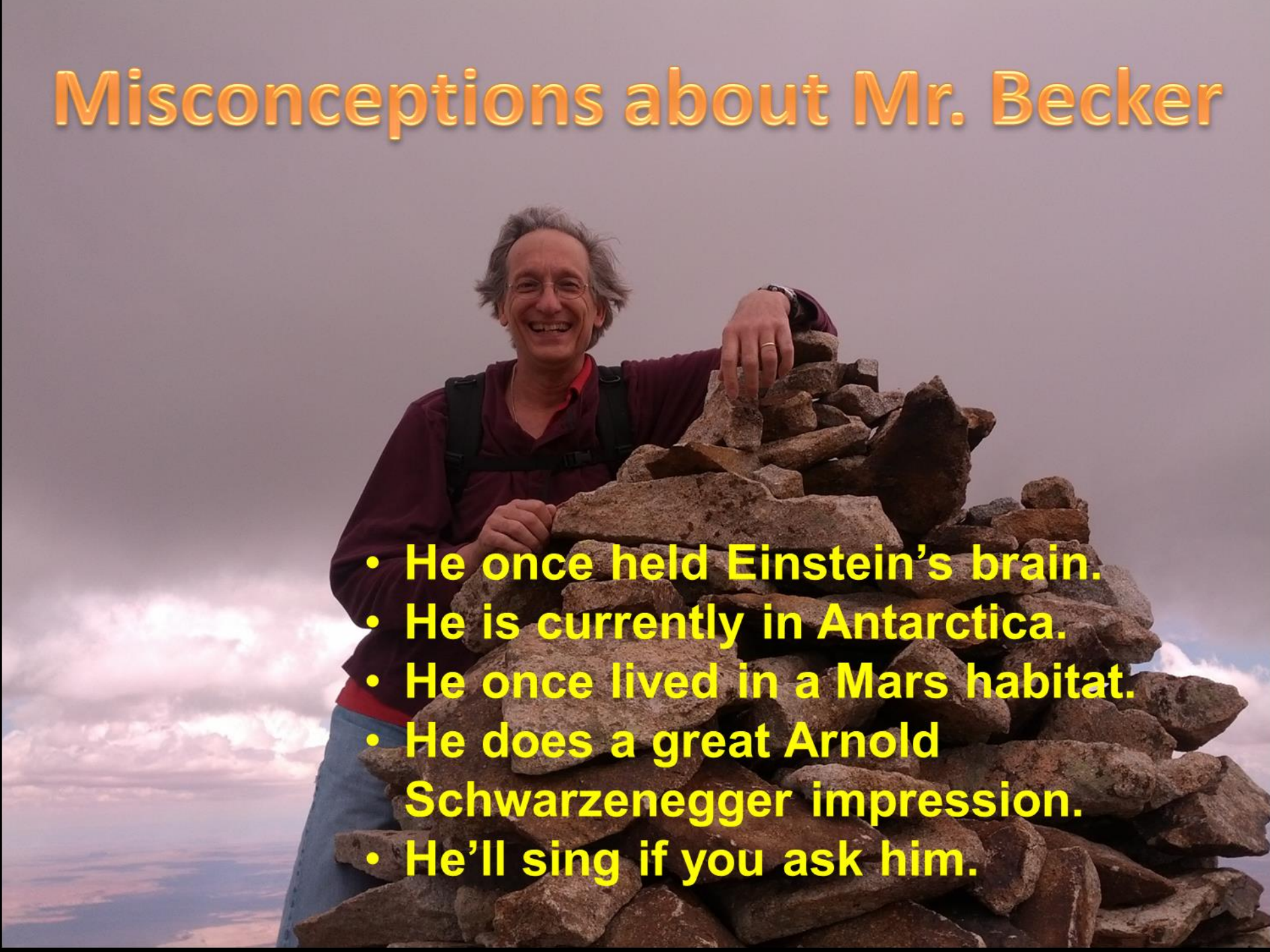
Session Two

Popular Misconceptions in Astronomy

Misconceptions about Mr. Becker



- He once held Einstein's brain.
- He is currently in Antarctica.
- He once lived in a Mars habitat.
- He does a great Arnold Schwarzenegger impression.
- He'll sing if you ask him.

SESSION TWO: POPULAR MISCONCEPTIONS IN ASTRONOMY

Name _____ Date _____ Moravian College

PROJECT STAR ACTIVITY-Harvard University/revised Moravian College Astronomy
A Basic Test of Astronomical Facts and Concept

1. One night we looked at the moon and saw:

A few days later, we looked again and saw this:

What do you think best describes the reason for this change?

a. Clouds block the moon.
b. The moon moves into the sun's shadow.
c. The moon moves around the Earth.
d. The moon passes the planets and goes in and out of their shadows.
e. The moon moves into the Earth's shadow.
f. The moon is black and white and rotates.
g. The Earth moves around the moon.

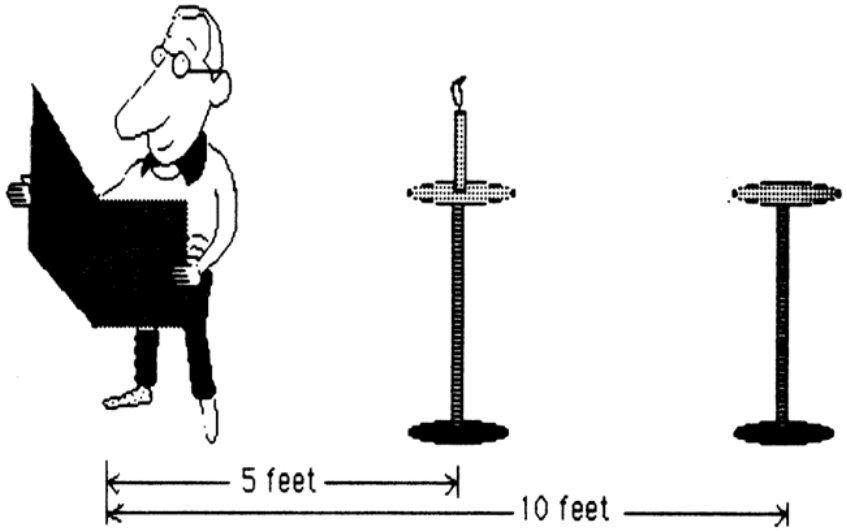
2. What causes night and day?

a. The Earth spins on its axis.
b. The moon blocks out the sun's light.
c. The sun goes around the Earth.
d. The Earth moves around the sun.
e. The Earth moves into the sun's shadow.

Gary A. Becker image

3. True Story: On October 17, 1604, Johannes Kepler went outside, looked up, and saw a bright new star in the foot of the constellation of Ophiuchus the Serpent Holder, what astronomers call a supernova. When do you think the star exploded?
   a. Before October 17, 1604.
   b. On October 17, 1604.
   c. After October 17, 1604.

4. The man is reading a newspaper by the light of a single candle five feet away. Indicate the number of candles necessary to light up the paper to the same brightness, if the candleholder was moved to a distance of 10 feet from the newspaper.
   a. 1 candle
   b. 2 candles
   c. 3 candles
   d. 4 candles
   e. 5 candles
   f. more than 5 candles



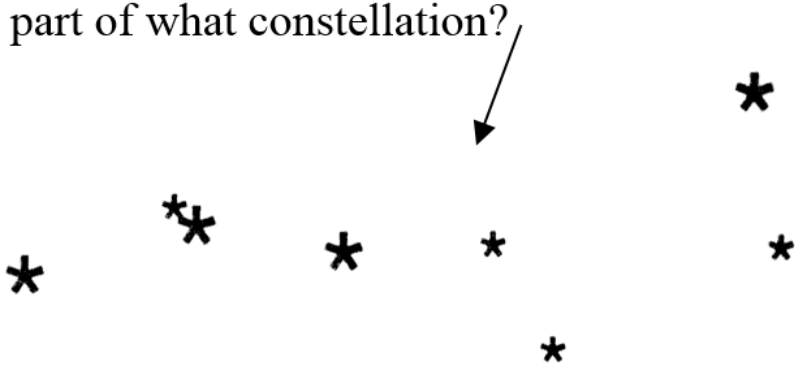
5. What causes the seasons?
   a. The Earth's distance from the sun...
   b The Earth's axis flipping back and forth as it travels around the sun…
   c. The sun's motion around the Earth…
   d. A tilted axis pointing in the same direction…
   e. The shifting seasons on the Earth…
   f. The change in the amount of daylight…

Gary A. Becker image

6. Which answer goes from smallest size to largest size?
   a. sun < Earth < moon
   b. Earth < moon <sun
   c. moon <sun < Earth
   d. sun < moon < Earth
   e. Earth < sun < moon
   f. moon < Earth <sun

7. What time could it be if you saw a thin crescent moon near the western horizon?
   a. sunrise
   b. noon
   c. anytime of day or night
   d. sunset
   e. midnight
   f. not possible

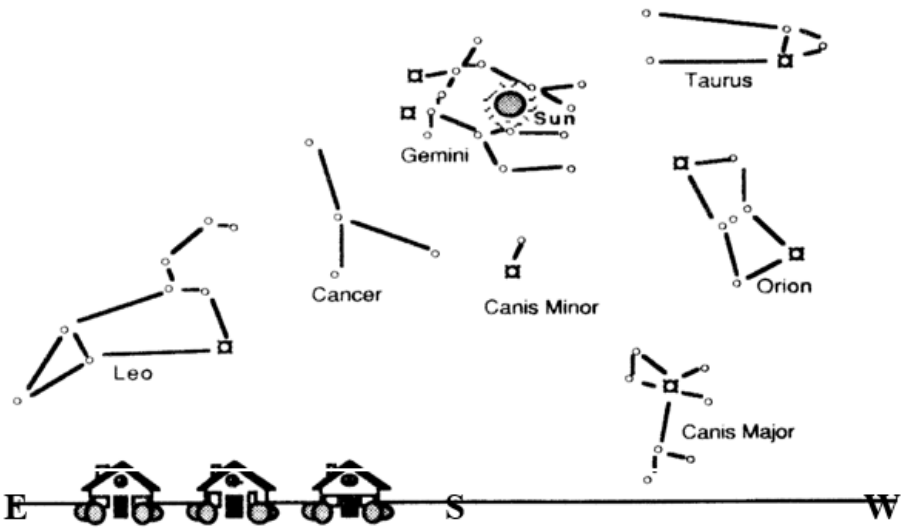
8. These stars are a part of what constellation?
   a. Orion
   b. Ursa Major
   c. North Star
   d. Pleiades
   e. Big Dipper



Gary A. Becker image

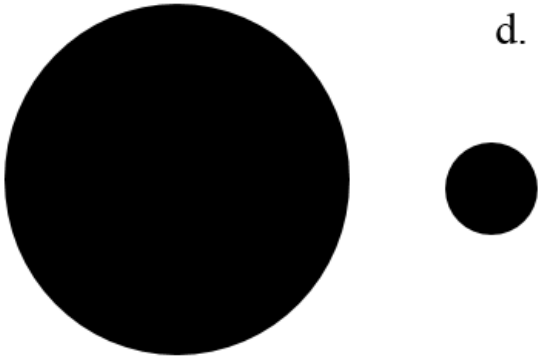
9. If you could see stars during the day, this is what the sky would look like at noon on a given day. The sun is in the constellation of Gemini. In what constellation would the sun be located at sunset?

a. Leo
b. Canis Major
c. Gemini
d. Cancer
e. Taurus



10. Assume these circles represent two objects in the solar system with their diameters drawn to scale. Which objects could they represent?

a. Earth and moon
b. sun and Earth
c. Jupiter and Earth
d. sun and Jupiter



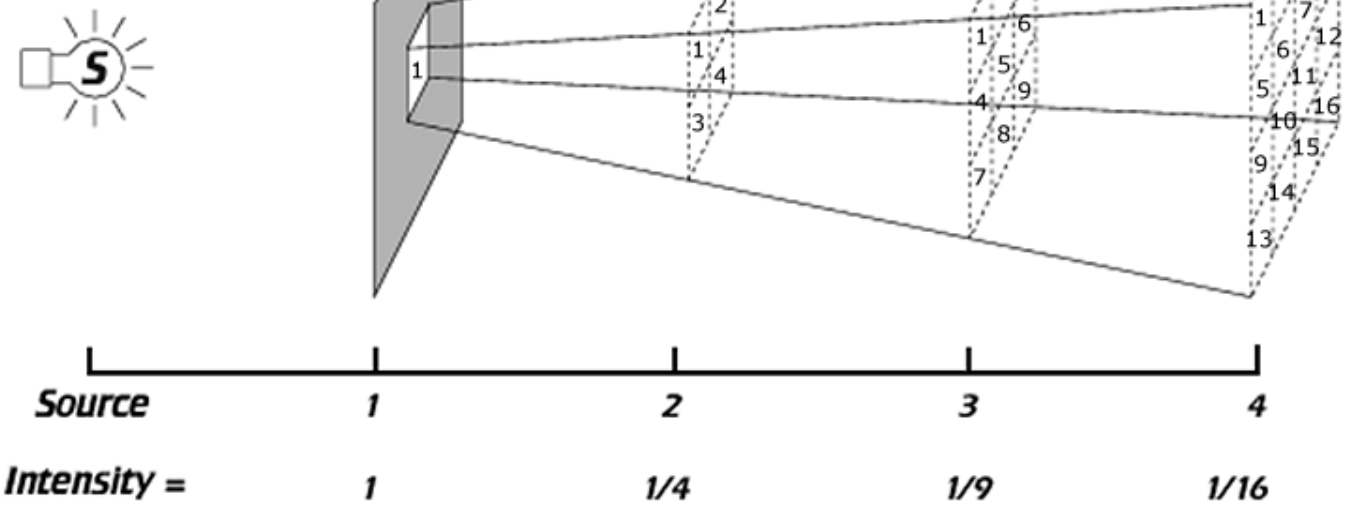
11. What is the brightest star of the nighttime sky?

a. Venus
b. Sirius
c. North Star
d. sun

Gary A. Becker image

Inverse Square Law

$$\text{Intenstiy} = \frac{1}{d^2}$$

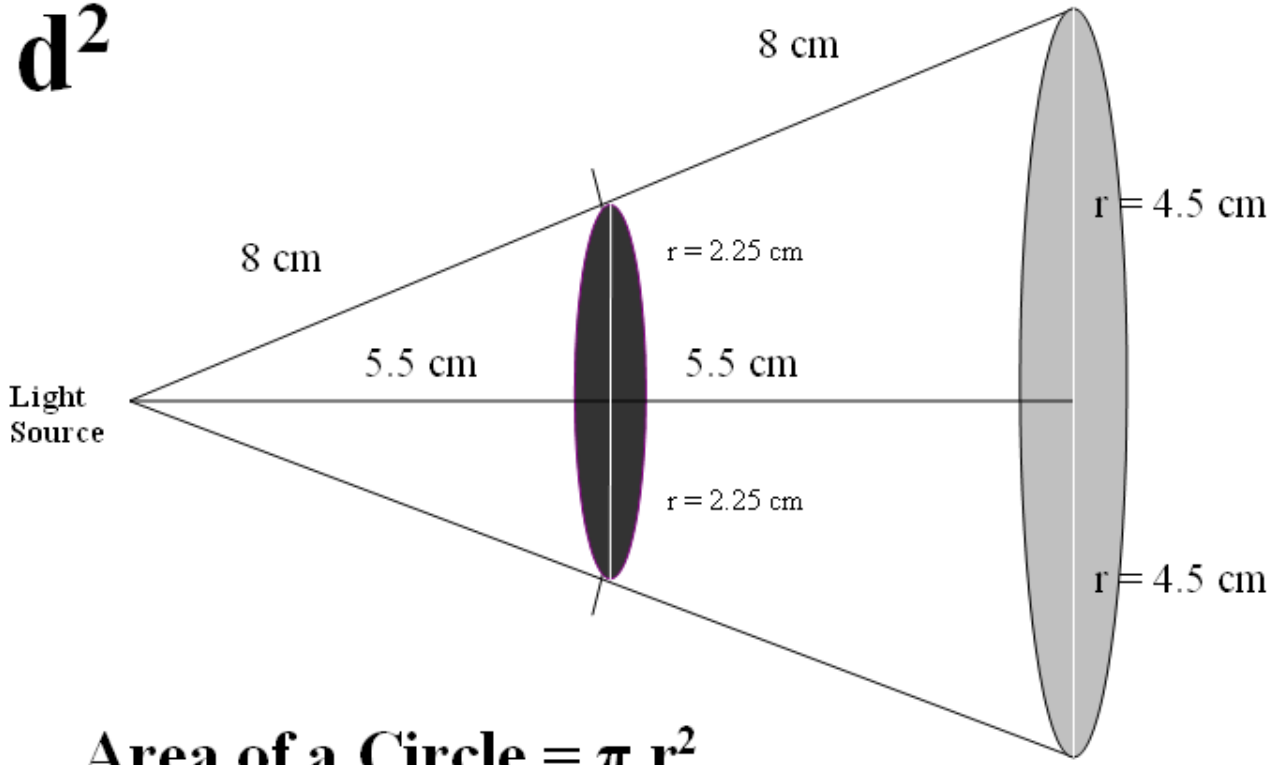


Gary A. Becker slide

Inverse Square Law

Electromagnetic Energy/Magnetism/Gravity

$$\frac{1}{d^2}$$



Area of a Circle = πr^2

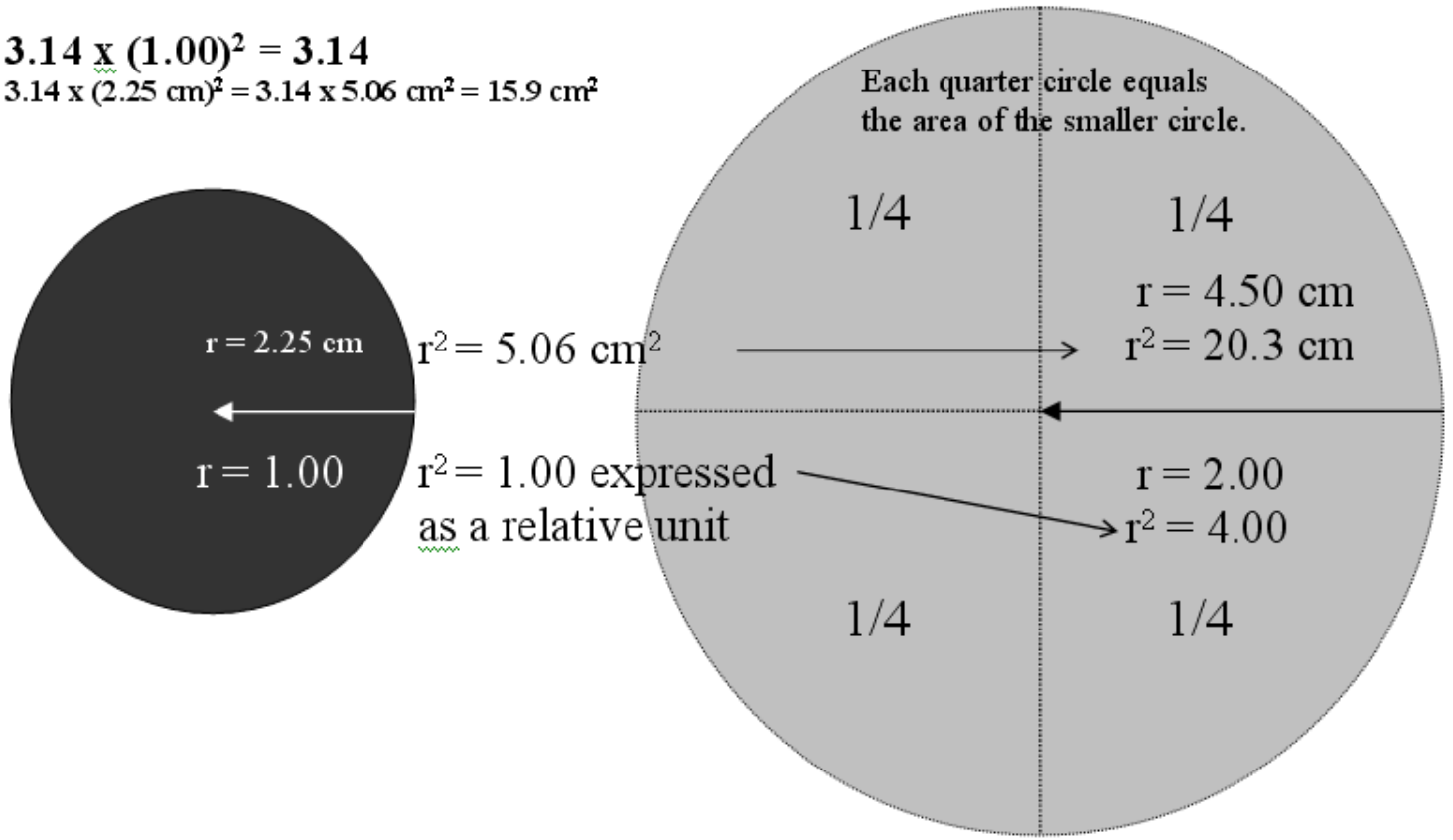
Gary A. Becker slide

Inverse Square Law

Area of a Circle = πr^2
$\pi = 3.14$

$3.14 \times (2.00)^2 = 3.14 \times 4.00 = 12.6$
Size of cone when the distance is doubled
$3.14 \times (4.50\ cm)^2 = 3.14 \times 20.3\ cm^2 = 63.7\ cm^2$

$3.14 \times (1.00)^2 = 3.14$
$3.14 \times (2.25\ cm)^2 = 3.14 \times 5.06\ cm^2 = 15.9\ cm^2$



Gary A. Becker slide

How Does the Intensity of Light Decrease with Distance from the Source?

Reference Image
1 candle/25 inches

1 candle/50 inches

2 candles/50 inches

3 candles/50 inches

4 candles/50 inches

5 candles/50 inches

6 candles/50 inches

7 candles/50 inches

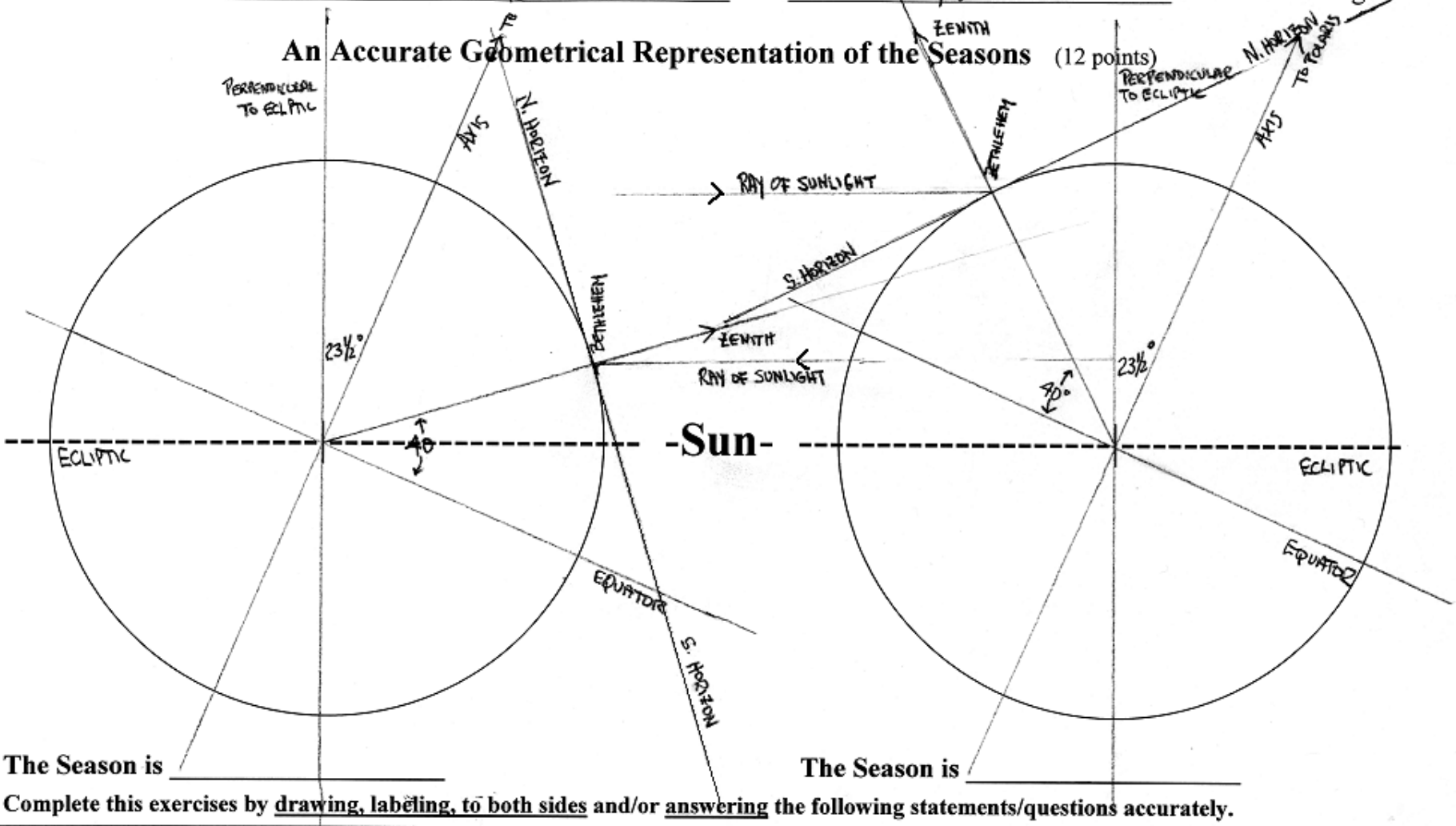
"Sophisticated Apparatus"

All images 10 seconds,
F/11, ASA 1000,
Canon 60D, Nikkor 55 mm
Macro lens

Gary A. Becker image

Name Gary A. Becker Date Jan 31, 2013 Moravian College

An Accurate Geometrical Representation of the Seasons (12 points)



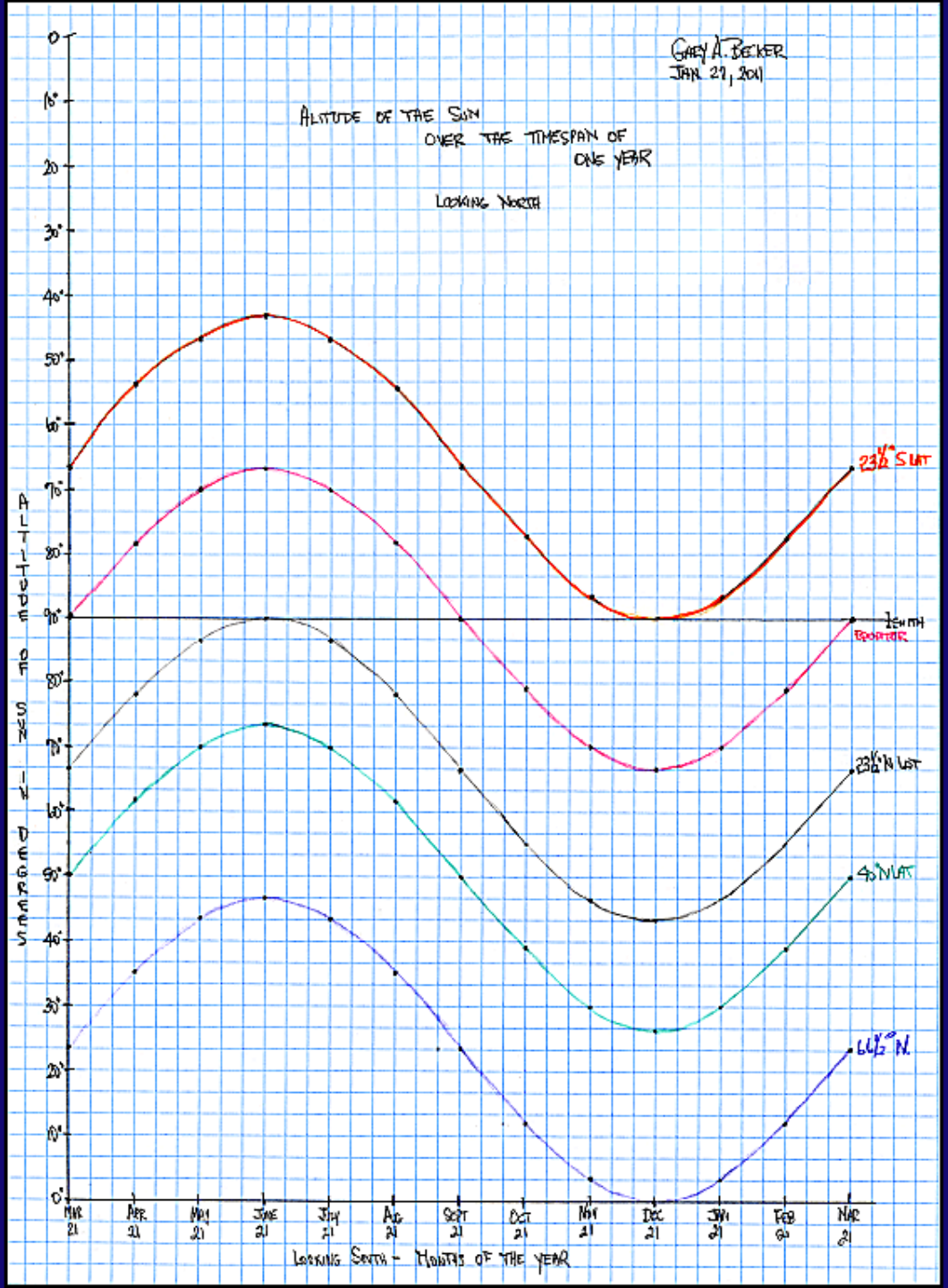
The Season is _____ **The Season is** _____

Complete this exercises by drawing, labeling, to both sides and/or answering the following statements/questions accurately.

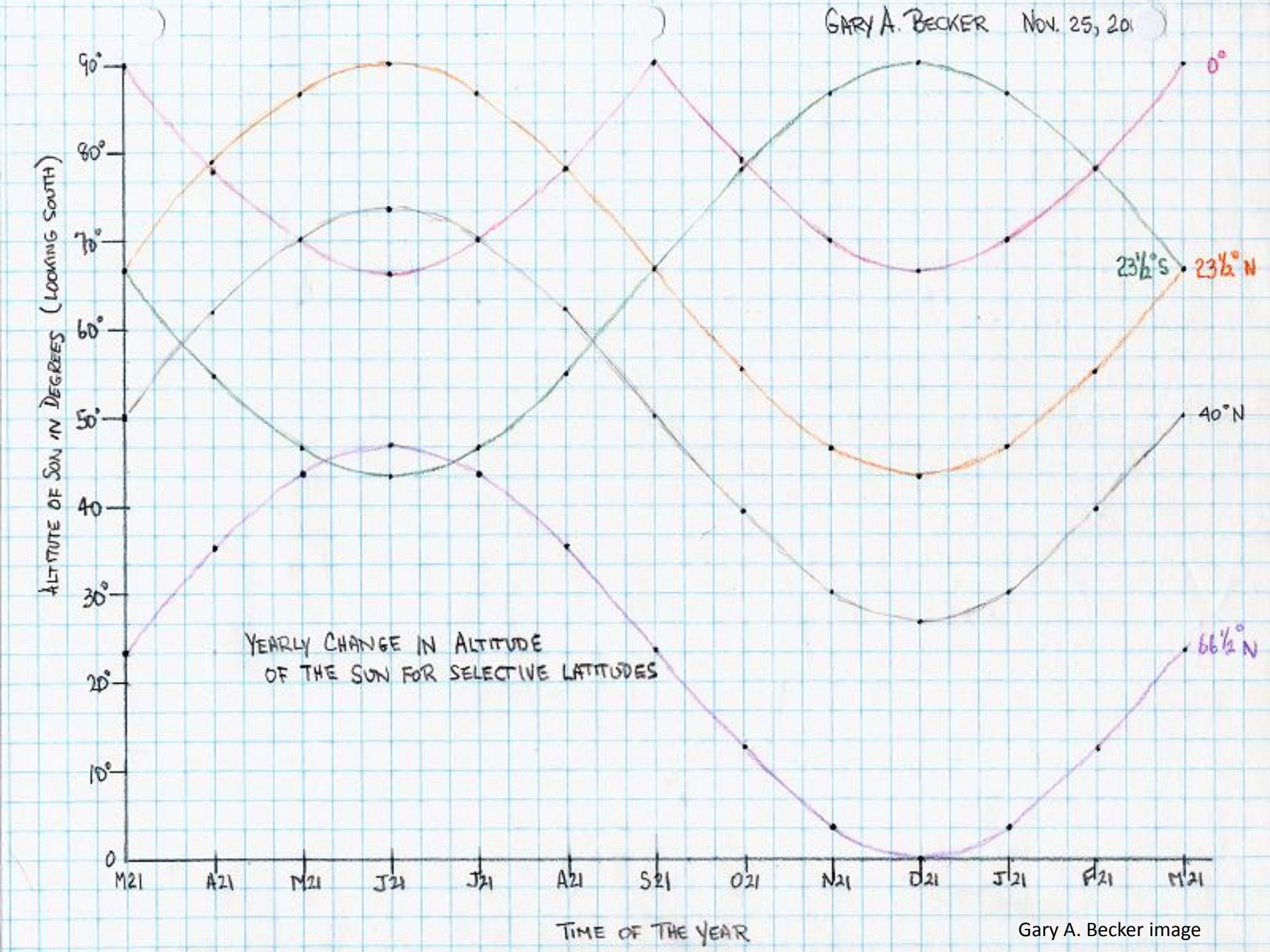
1.	Sketch/label the ecliptic and perpendicular to the ecliptic for each Earth. (2)	6.	Sketch/label Bethlehem's zenith position for both Earths. (1)
2.	Draw/label for each Earth, the axis, tilted 23.5° from the perpendicular to the ecliptic. Indicate the 23.5° angle at the appropriate locations. (1)	7.	Draw and label Bethlehem's north and south horizon positions for both Earths. (1)
3.	Label the direction to the North Star for each Earth. (1)	8.	Draw/label incoming rays of the sun at noon for Bethlehem on both Earths. (1) LABEL WHICH EARTH REPRESENTS SUMMER/WINTER. (1)
4.	For both Earths, draw/label the equator which is located 90° away from the Earth's axis. (1)	9.	_____ Measure the WINTER noontime sun angle for Bethlehem. (1) Note this angle at the appropriate location on the drawing.
5.	Draw/label Bethlehem's 40° north latitude position to the equator for each Earth. (1)	10.	_____ Measure the SUMMER noontime sun angle for Bethlehem. (1) Note this angle at the appropriate location on the drawing.

Gary A. Becker slide

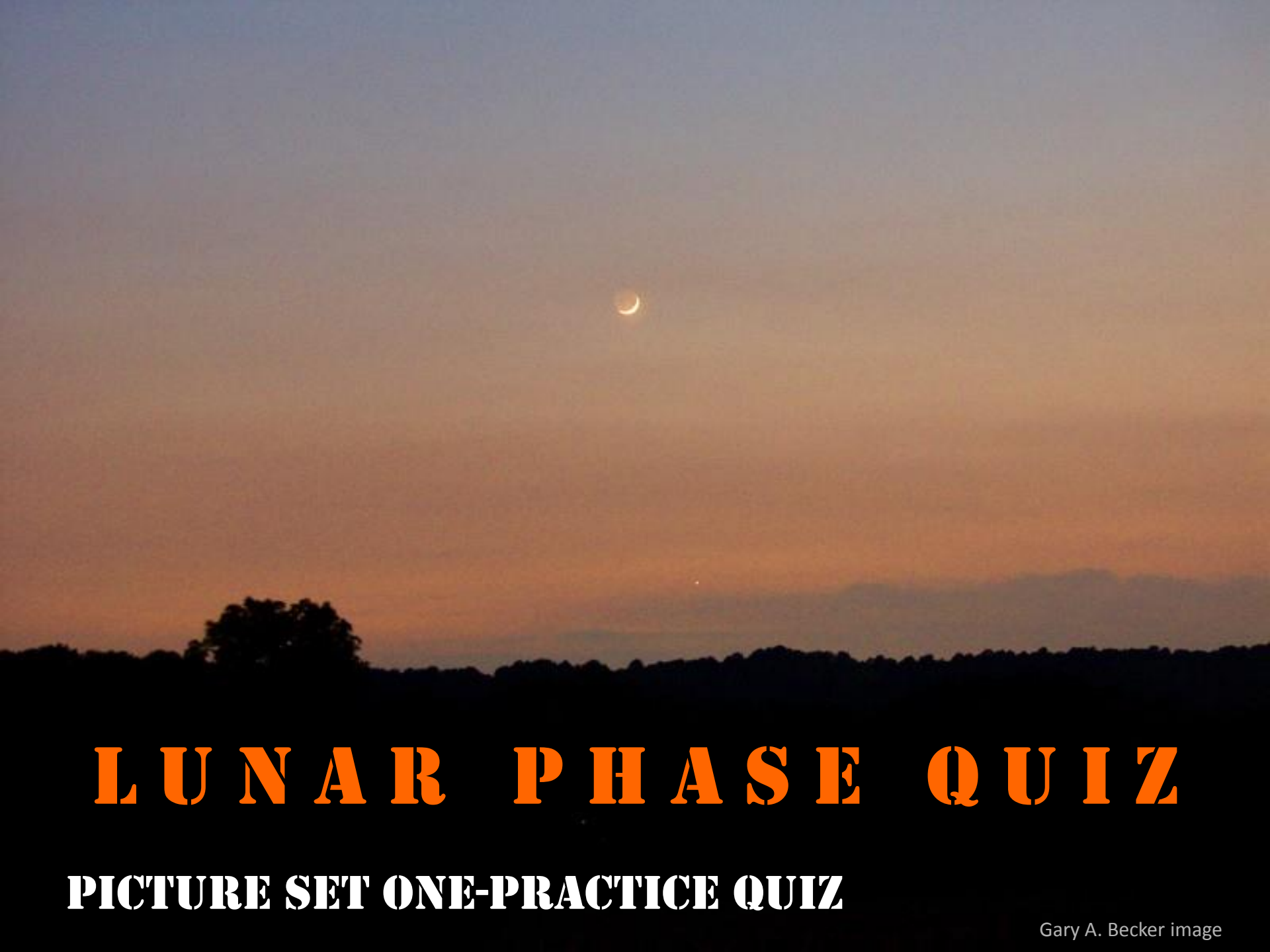
Seasons Sun Altitude Graph



Gary A. Becker slide



Gary A. Becker image



LUNAR PHASE QUIZ

PICTURE SET ONE-PRACTICE QUIZ

Gary A. Becker image

Gary A. Becker image

l

Gary A. Becker image

2

Gary A. Becker image

3

Matt Gustantino image

4

Gary A. Becker image

5

Gary A. Becker image

6

Gary A. Becker image

7

Gary A. Becker image

8

Gary A. Becker image

9

Gary A. Becker image

10

Gary A. Becker image

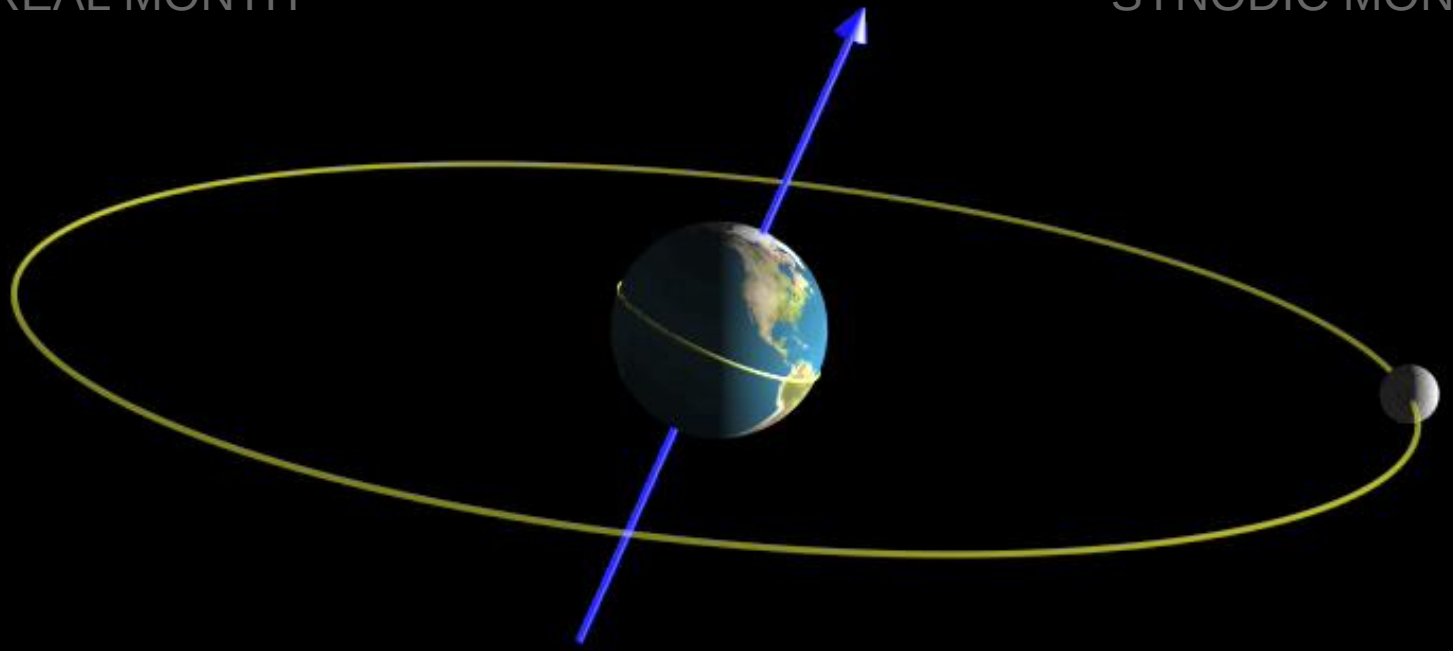
THE END

PICTURE SET ONE

The Moon does not produce any light of its own; its glow is due to the reflection of sunlight off its surface – *we only see the area of the Moon that is lit up by the Sun.*

SIDEREAL MONTH

SYNODIC MONTH

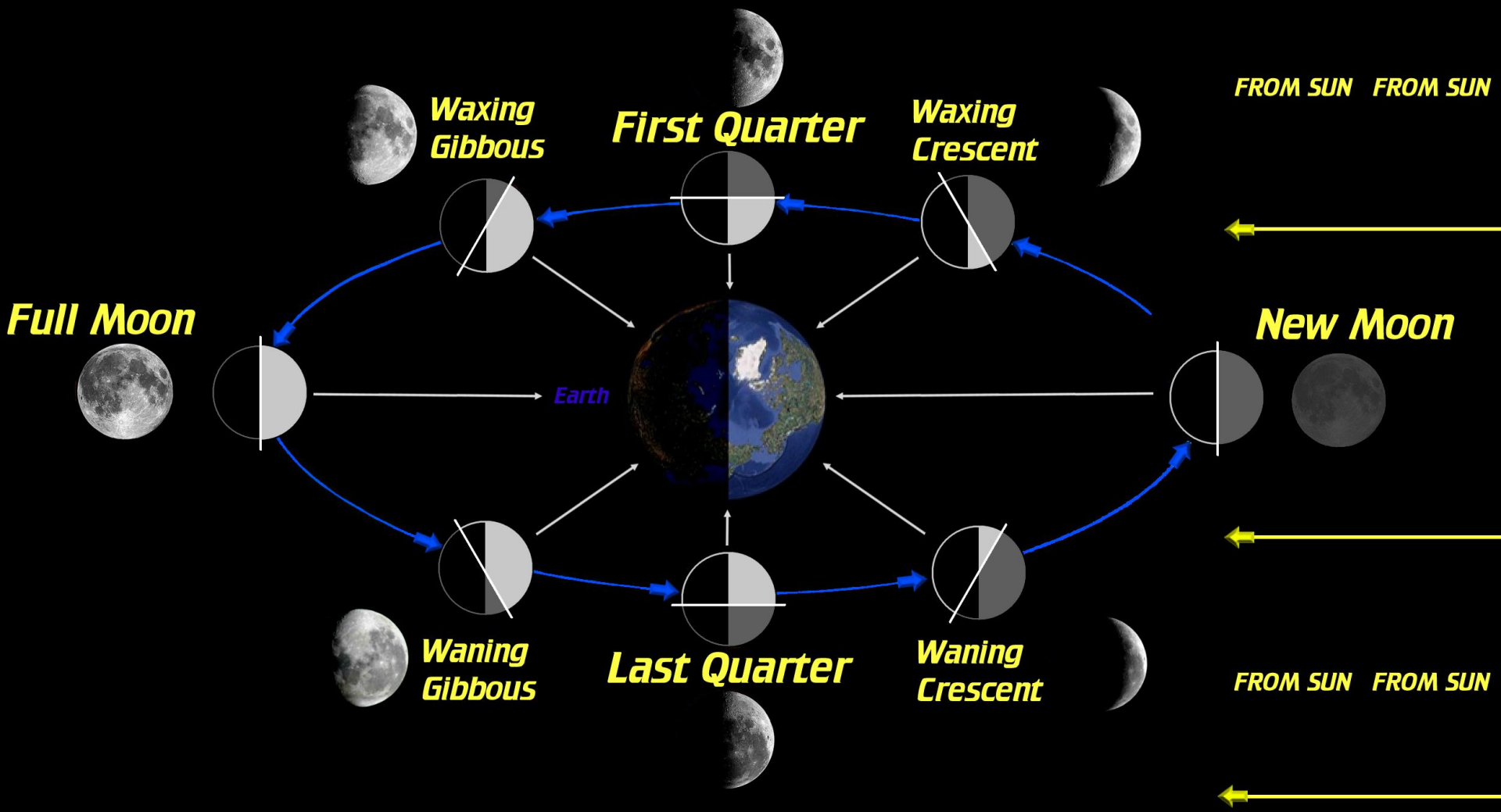


It takes 27.32 earth days for the moon to make one complete orbit around the Earth.

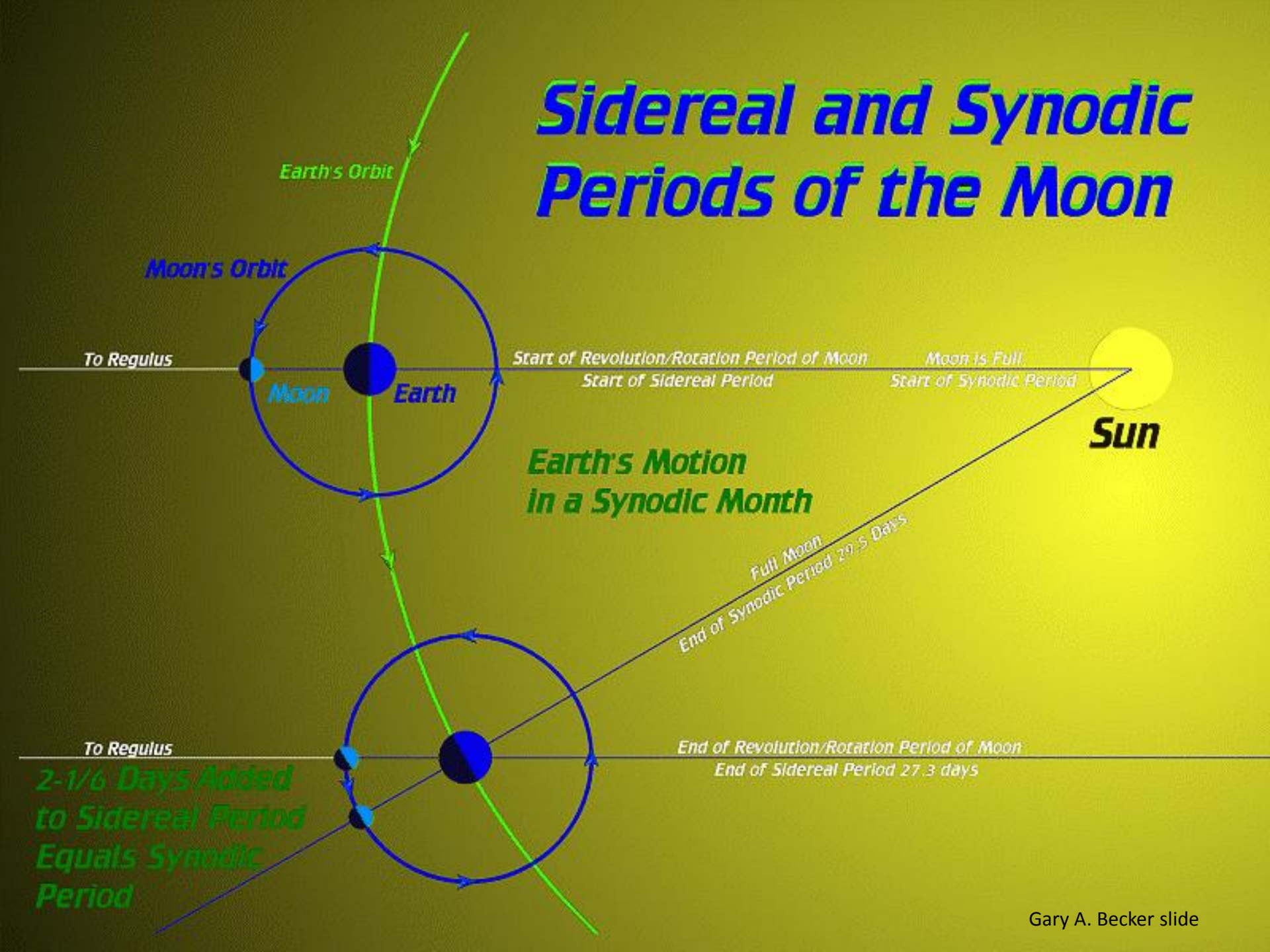
NASA

Phases of the Moon

Synodic Period of the Moon equals 29.53059 days

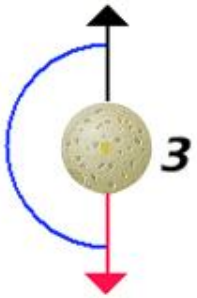


Gary A. Becker graphics

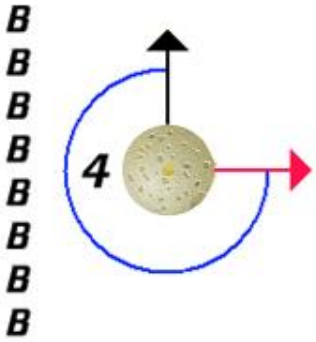


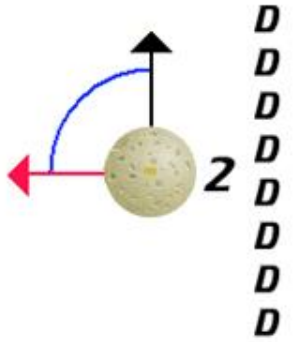
Gary A. Becker slide

Does the Moon Rotate?



The letters represent different parts of the sky that the moon would be seen against as it revolves around the Earth.

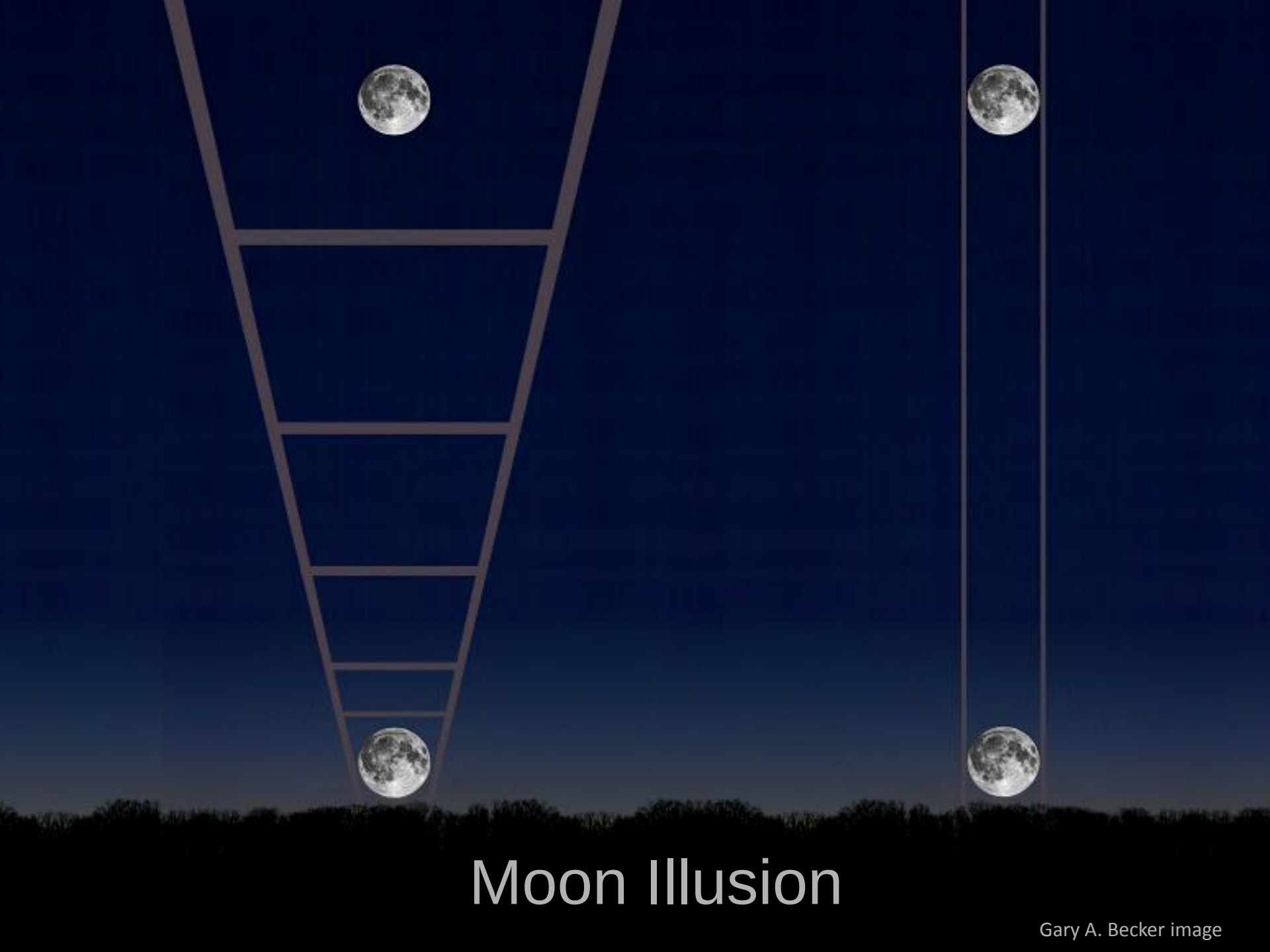




The moon always shows its same face towards the Earth.

CCCCCCCCCCCCCCCCC

Gary A. Becker and Peason Education



Moon Illusion

Gary A. Becker image

StarWatch

Sky Watching from a Suburban Environment

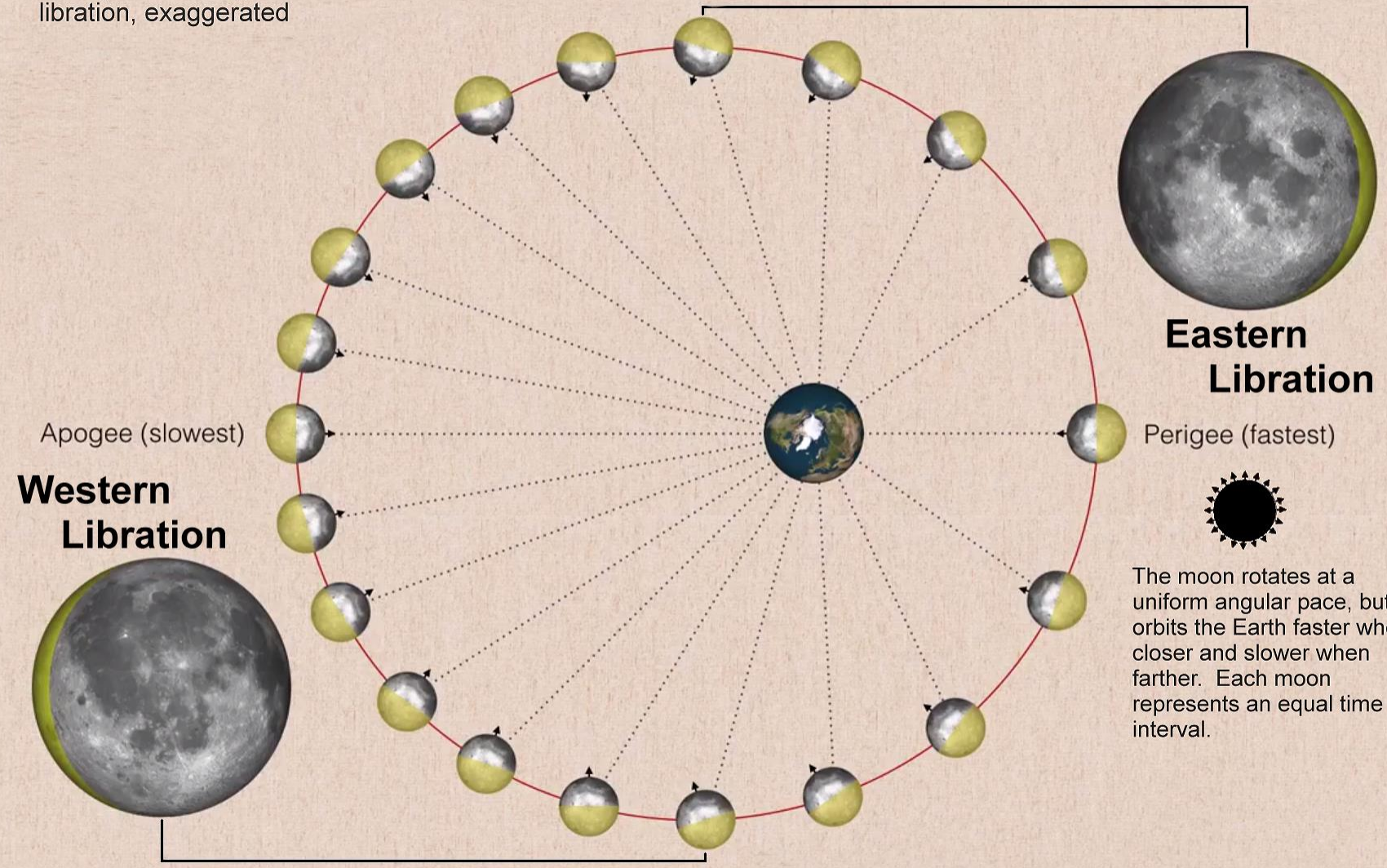
OCTOBER 2020

OCTOBER STAR MAP | *MOON PHASE CALENDAR* | **STARWATCH INDEX** | **NIGHT SKY NOTEBOOK**

Print Large Sky Charts For 10 p.m. EDT: *NORTH* | *EAST* | *SOUTH* | *WEST* | *ZENITH*

Libration in Longitude

scale, eccentricity, libration, exaggerated



The moon rotates at a uniform angular pace, but orbits the Earth faster when closer and slower when farther. Each moon represents an equal time interval.

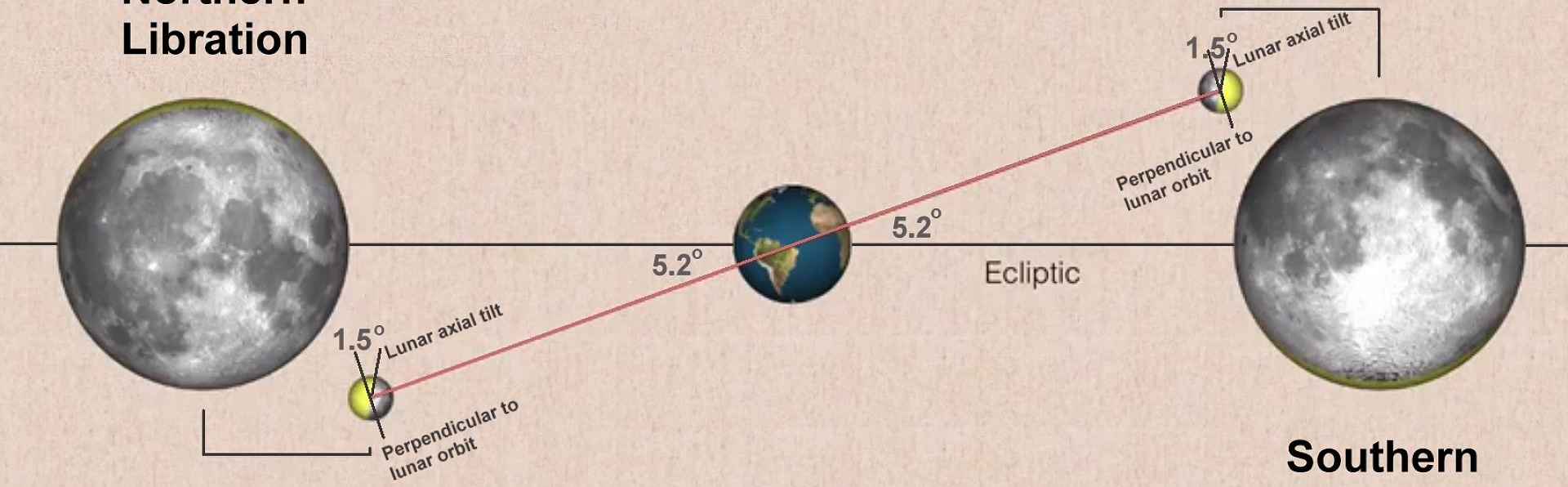
Adapted from Launch Pad Astronomy

Libration in Latitude

scale, inclinations,
libration, exaggerated

Northern Libration

We can observe beyond the lunar South Pole.



We see beyond the lunar North Pole.

Southern Libration

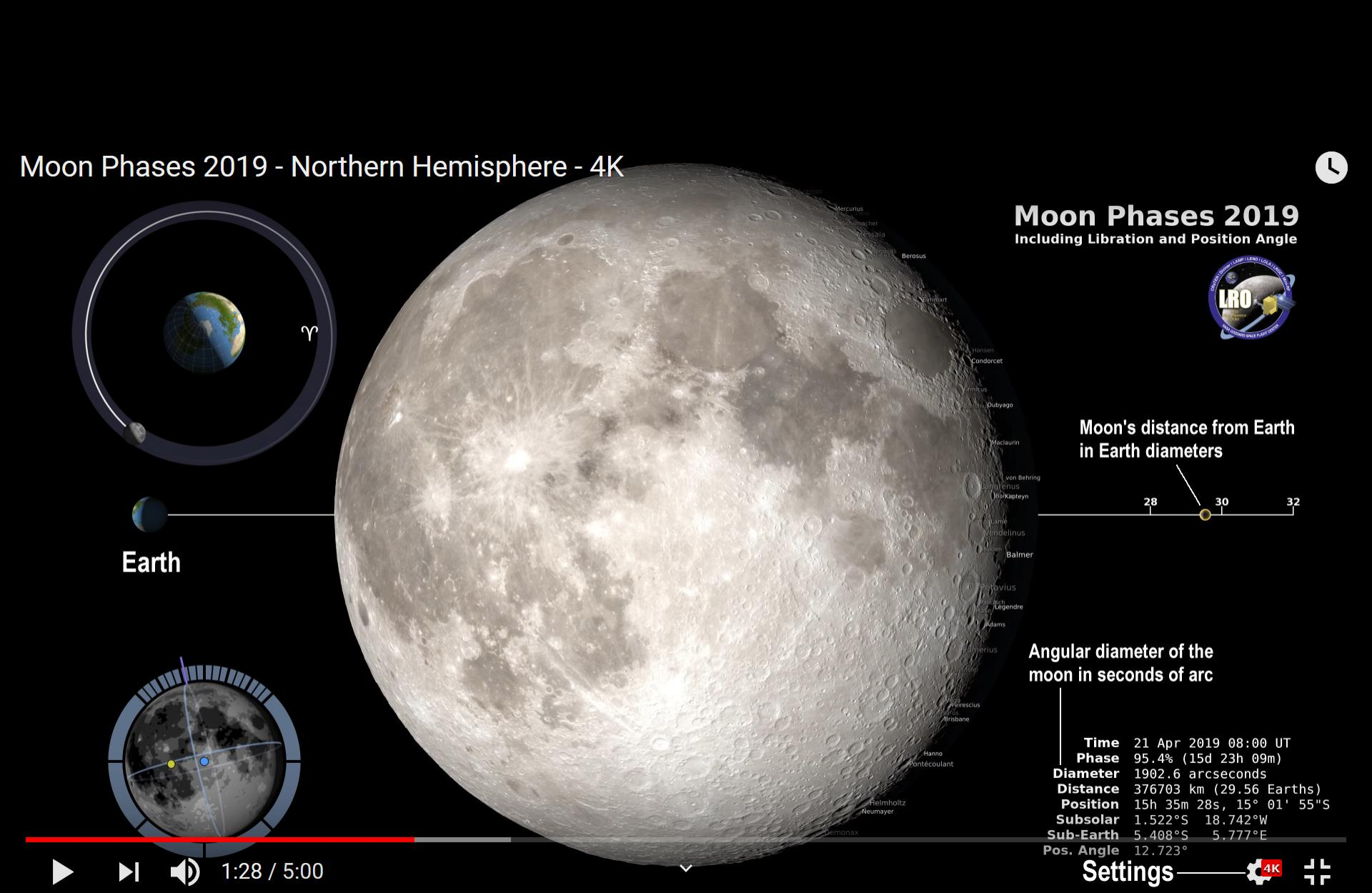
The total monthly libration in latitude is equal to 6.7 degrees, the sum of the lunar axial tilt plus the inclination of the moon's orbit to the plane of the ecliptic.

Adapted from Launch Pad Astronomy

Lunar Phases, Changing Distances, and Librations

All slides are set for 12:01 a.m.
24 hours apart.

This series of phases was created when Earth was near **aphelion,**
farthest from the sun



NASAs Lunar Reconnaissance Orbiter

Gary A. Becker slide

Day 01

Gary A. Becker slide

Day 02

Gary A. Becker slide

Day 03

Gary A. Becker slide

Day 04

Gary A. Becker slide

Day 05

Gary A. Becker slide

Day 06

Gary A. Becker slide

Day 07

Gary A. Becker slide

Day 08

Gary A. Becker slide

Day 09

Gary A. Becker slide

Day 10

Gary A. Becker slide

Day 11

Gary A. Becker slide

Day 12

Gary A. Becker slide

Day 13

Gary A. Becker slide

Gary A. Becker slide

Day 15

Gary A. Becker slide

Day 16

Gary A. Becker slide

Day 17

Gary A. Becker slide

Day 18

Gary A. Becker slide

Day 19

Gary A. Becker slide

Gary A. Becker slide

Gary A. Becker slide

Day 22

Gary A. Becker slide

Day 23

Gary A. Becker slide

Day 24

Gary A. Becker slide

Day 25

Gary A. Becker slide

Day 26

Gary A. Becker slide

Day 27

Gary A. Becker slide

Day 28

Gary A. Becker slide

Day 29

Gary A. Becker slide

Day 30

Gary A. Becker slide

Day 31

Gary A. Becker slide

Day 32

Gary A. Becker slide

Day 33

Gary A. Becker slide

Day 34

Gary A. Becker slide

Day 35

Gary A. Becker slide

Day 36

Gary A. Becker slide

Day 37

Gary A. Becker slide

Day 38

Gary A. Becker slide

Day 39

Gary A. Becker slide

Day 40

Gary A. Becker slide

Day 41

Gary A. Becker slide

Gary A. Becker slide

Day 43

Gary A. Becker slide

Day 44

Gary A. Becker slide

Day 45

Gary A. Becker slide

Day 46

Gary A. Becker slide

Day 47

Gary A. Becker slide

Day 48

Gary A. Becker slide

Day 49

Gary A. Becker slide

Gary A. Becker slide

Day 51

Gary A. Becker slide

Day 52

Gary A. Becker slide

Day 53

Gary A. Becker slide

Day 54

Gary A. Becker slide

Day 55

Gary A. Becker slide

Day 56

Gary A. Becker slide

Day 57

Gary A. Becker slide

Day 58

Gary A. Becker slide

Day 59

Gary A. Becker slide

Day 60

Gary A. Becker slide

Day 61

Gary A. Becker slide

Day 62

Gary A. Becker slide

Day 63

Gary A. Becker slide

Day 64

Gary A. Becker slide

Day 65

Gary A. Becker slide

Day 66

Gary A. Becker slide

Day 67

Gary A. Becker slide

Day 68

Gary A. Becker slide

Day 69

Gary A. Becker slide

Day 70

Gary A. Becker slide

Gary A. Becker slide

Day 72

Gary A. Becker slide

Day 73

Gary A. Becker slide

Day 74

Gary A. Becker slide

Day 75

Gary A. Becker slide

Day 76

Gary A. Becker slide

Day 77

Gary A. Becker slide

Day 78

Gary A. Becker slide

Gary A. Becker slide

Day 80

Gary A. Becker slide

Day 81

Gary A. Becker slide

Day 82

Gary A. Becker slide

Day 83

Gary A. Becker slide

Day 84

Gary A. Becker slide

Day 85

Gary A. Becker slide

Day 86

Gary A. Becker slide

Day 87

Gary A. Becker slide

Day 88

Gary A. Becker slide

Day 89

Gary A. Becker slide

Day 90

Gary A. Becker slide

Day 91

Gary A. Becker slide

Day 92

Gary A. Becker slide

Day 93

Gary A. Becker slide

Day 94

Gary A. Becker slide

Day 95

Gary A. Becker slide

Day 96

Gary A. Becker slide

Day 97

Gary A. Becker slide

Day 98

Gary A. Becker slide

Day 99

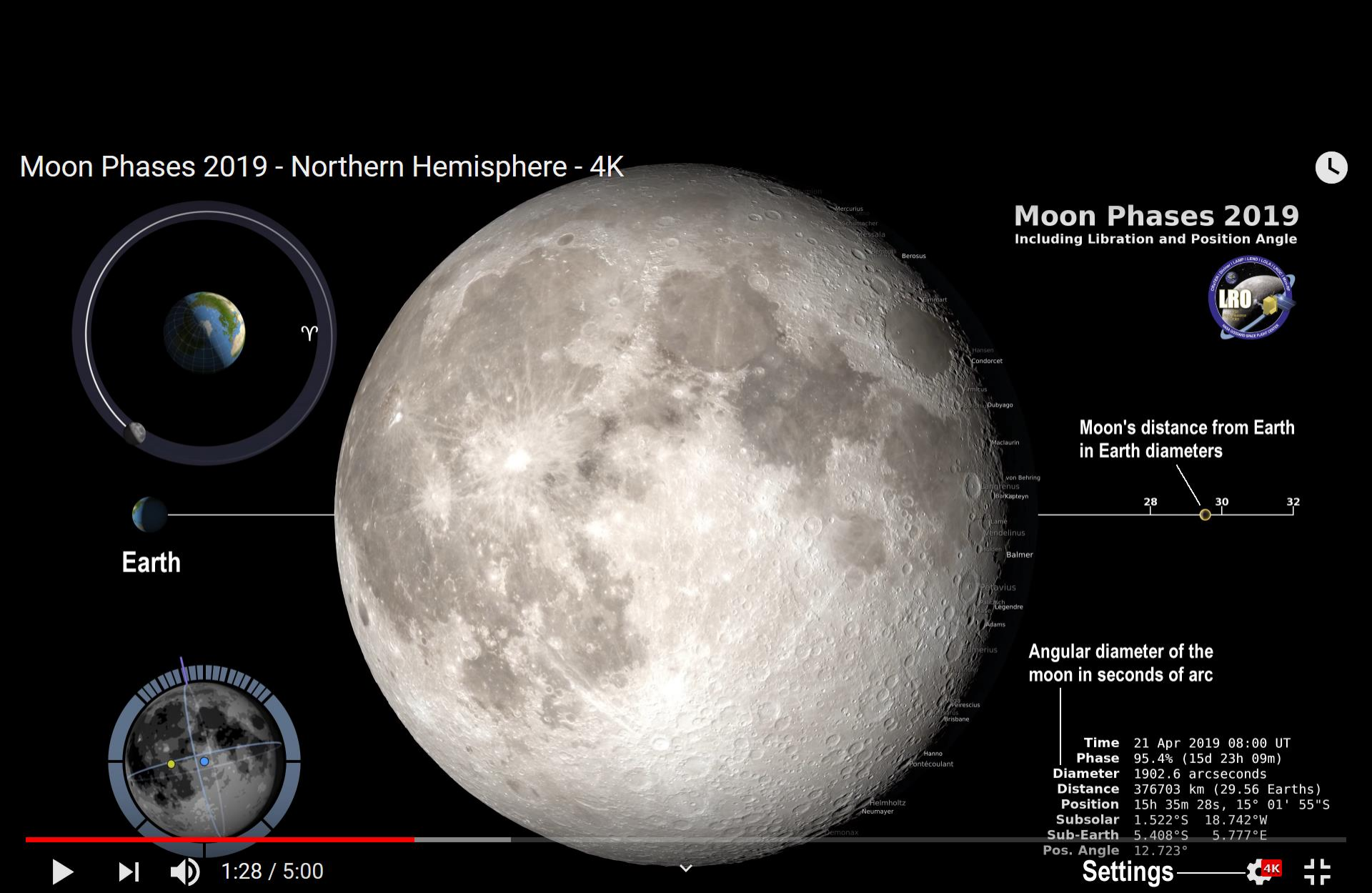
Gary A. Becker slide

Stop

Lunar Phases, Changing Distances, and Librations

All slides are set for 12:01 a.m.
24 hours apart.

This series of phases was created when Earth was near **perihelion**,
closest to the sun.



NASAs Lunar Reconnaissance Orbiter

Gary A. Becker slide

Day 100

Gary A. Becker slide

Gary A. Becker slide

Day 102

Gary A. Becker slide

Day 103

Gary A. Becker slide

Day 104

Gary A. Becker slide

Day 105

Gary A. Becker slide

Day 106

Gary A. Becker slide

Day 107

Gary A. Becker slide

Day 108

Gary A. Becker slide

Day 109

Gary A. Becker slide

Day 110

Gary A. Becker slide

Day 111

Gary A. Becker slide

Day 112

Gary A. Becker slide

Day 113

Gary A. Becker slide

Day 114

Gary A. Becker slide

Day 115

Gary A. Becker slide

Day 116

Gary A. Becker slide

Day 117

Gary A. Becker slide

Day 118

Gary A. Becker slide

Day 119

Gary A. Becker slide

Day 120

Gary A. Becker slide

Day 121

Gary A. Becker slide

Day 122

Gary A. Becker slide

Day 123

Gary A. Becker slide

Day 124

Gary A. Becker slide

Day 125

Gary A. Becker slide

Day 126

Gary A. Becker slide

Day 127

Gary A. Becker slide

Day 128

Gary A. Becker slide

Day 129

Gary A. Becker slide

Day 130

Gary A. Becker slide

Gary A. Becker slide

Day 132

Gary A. Becker slide

Day 133

Gary A. Becker slide

Day 134

Gary A. Becker slide

Day 135

Gary A. Becker slide

Day 136

Gary A. Becker slide

Day 137

Gary A. Becker slide

Day 138

Gary A. Becker slide

Day 139

Gary A. Becker slide

Day 140

Gary A. Becker slide

Day 141

Gary A. Becker slide

Day 142

Gary A. Becker slide

Day 143

Gary A. Becker slide

Day 144

Gary A. Becker slide

Day 145

Gary A. Becker slide

Day 146

Gary A. Becker slide

Day 147

Gary A. Becker slide

Day 148

Gary A. Becker slide

Day 149

Gary A. Becker slide

Day 150

Gary A. Becker slide

Day 151

Gary A. Becker slide

Day 152

Gary A. Becker slide

Day 153

Gary A. Becker slide

Day 154

Gary A. Becker slide

Day 155

Gary A. Becker slide

Day 156

Gary A. Becker slide

Day 157

Gary A. Becker slide

Day 158

Gary A. Becker slide

Day 159

Gary A. Becker slide

Gary A. Becker slide

Day 161

Gary A. Becker slide

Day 162

Gary A. Becker slide

Day 163

Gary A. Becker slide

Day 164

Gary A. Becker slide

Day 165

Gary A. Becker slide

Day 166

Gary A. Becker slide

Day 167

Gary A. Becker slide

Day 168

Gary A. Becker slide

Day 169

Gary A. Becker slide

Day 170

Gary A. Becker slide

Day 171

Gary A. Becker slide

Day 172

Gary A. Becker slide

Day 173

Gary A. Becker slide

Day 174

Gary A. Becker slide

Day 175

Gary A. Becker slide

Day 176

Gary A. Becker slide

Day 177

Gary A. Becker slide

Day 178

Gary A. Becker slide

Day 179

Gary A. Becker slide

Day 180

Gary A. Becker slide

Day 181

Gary A. Becker slide

Day 182

Gary A. Becker slide

Day 183

Gary A. Becker slide

Day 184

Gary A. Becker slide

Day 185

Gary A. Becker slide

Gary A. Becker slide

Gary A. Becker slide

Gary A. Becker slide

Gary A. Becker slide

Gary A. Becker slide

Gary A. Becker slide

Day 192

Gary A. Becker slide

Day 193

Gary A. Becker slide

Day 194

Gary A. Becker slide

Day 195

Gary A. Becker slide

Day 196

Gary A. Becker slide

Day 197

Gary A. Becker slide

Day 198

Gary A. Becker slide

Day 199

Gary A. Becker slide

Day 200

Gary A. Becker slide

Day 201

Gary A. Becker slide

Day 202

Gary A. Becker slide

Day 203

Gary A. Becker slide

Day 204

Gary A. Becker slide

Day 205

Gary A. Becker slide

Day 207

Gary A. Becker slide

Day 208

Gary A. Becker slide

Day 209

Gary A. Becker slide

Day 210

Gary A. Becker slide

The End