Our Corner of the Universe
AST 101, Fall 2007
LUNAR TOPOGRAPHY
Week of October 30

Preparation:

Apparatus: Xerox photo, millimeter rule, photographic print of Mare Imbrium.

Purpose: This exercise will show you how we can make actual measurements of lunar features such as length, diameter, and height and even estimate the age of some features from the photograph.

The lunar surface:

Features on the Moon are quite different from those on the Earth. Consequently it may take a few moments to familiarize yourself with the relationship between a map and a photograph. Turn to the map. Now look at the photograph. Locate the following on the map and the photograph. Mark an X on the xerox copy the location of:

1. Montes Alpes — The Alp Mountains
2. Valles Alpes — Alpine Valley
3. Crater Aristillus
4. Crater Cassini
5. Montes Caucasus.

Activity:

1. Locate a crater on the photograph that is obviously very old. Describe it and give its position on the xerox copy. Explain how you can be certain it is old. Recall the history of the Maria.

2. Now locate an obviously young crater and describe it.

The size of lunar features:

The photograph has a "scale" of 2.5 km/mm (kilometers per millimeter). This means that an object 1 mm long on the photograph is 2.5 km long on the Moon. As you examine objects on the photograph, notice that some have been foreshortened due to the curvature of the Moon. This makes round craters look elliptical. We will not concern ourselves with this problem except always to measure the longest diameter of a crater that appears elliptical.

Activity:

Locate the following features and measure their size and then calculate their actual size in kilometers.

(a)	Aristoteles (diameter)	mm	km
(b)	Alpine Valley (length)	mm	km
(c)	Alpine Valley (width)	mm	km
(d)	Crater Plato	mm	km
(e)	How big is the smallest crater you can detect on this photograph?	mm	km

The height of lunar features:

Locate the crater Aristillus and the Alpine Valley. About half way between lies a single mountain called Piton, rising up from the floor of Mare Imbium. Piton is a good name for this mountain since a piton is a sharp metal spike used by mountain climbers. Note that the mountain, Piton, appears to be a sharp spike.

When this photograph was taken the Sun was only 7.2° above the horizon as seen from Piton. If we ignore the curvature of the Moon's surface we can draw the mountain at the moment the photograph was taken.

Refer to Figure 1. If we know the length S of the shadow as seen from the Earth, then we can find the height H of the mountain.

1. (a) Use a millimeter rule to measure the length of the shadow of Piton on the photograph.
   $S =$ _____ *mm.*

   (b) Use the scale of the photograph, 2.5 km/mm to convert this to km.
   $S =$ _____ *km.*

   (c) Now draw the diagram of the mountain and its shadow to scale. The angle has already been drawn for you in figure 2.

   (d) Determine the height of the Mountain from your drawing.
   $H =$ _____ *km.*

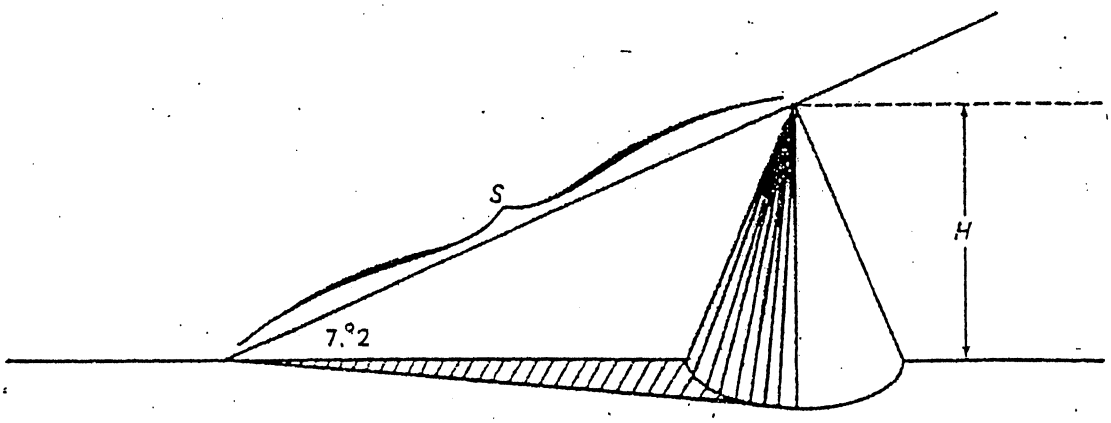


Figure 1. Mountain and its shadow with the Sun 7.2° above the lunar horizon.

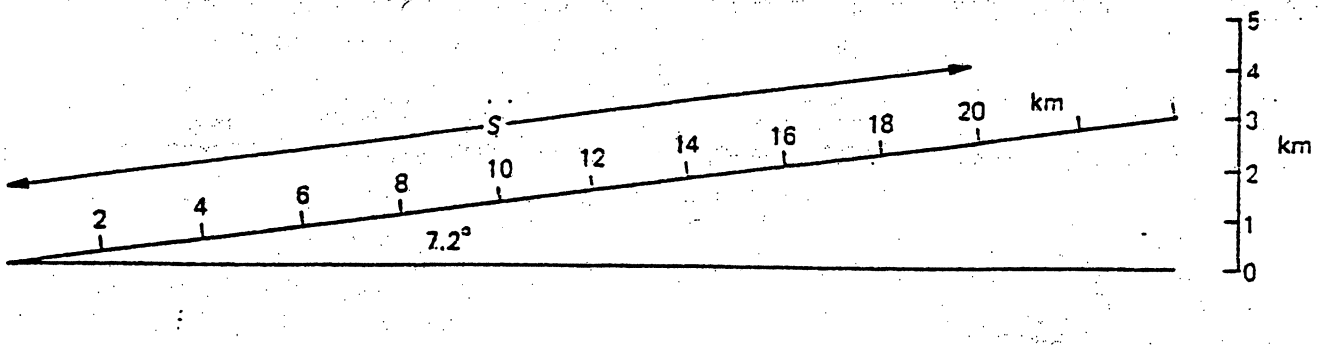
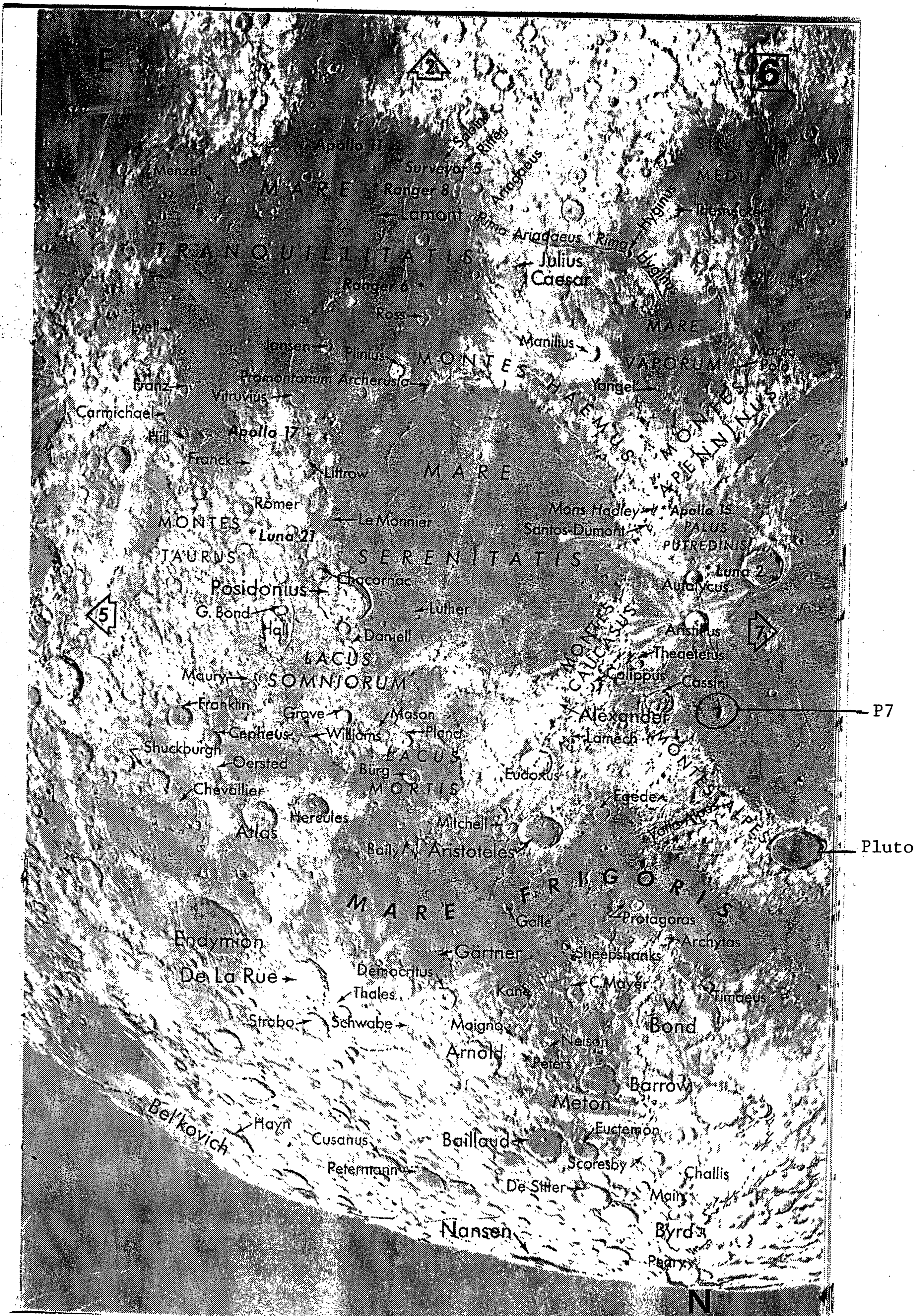
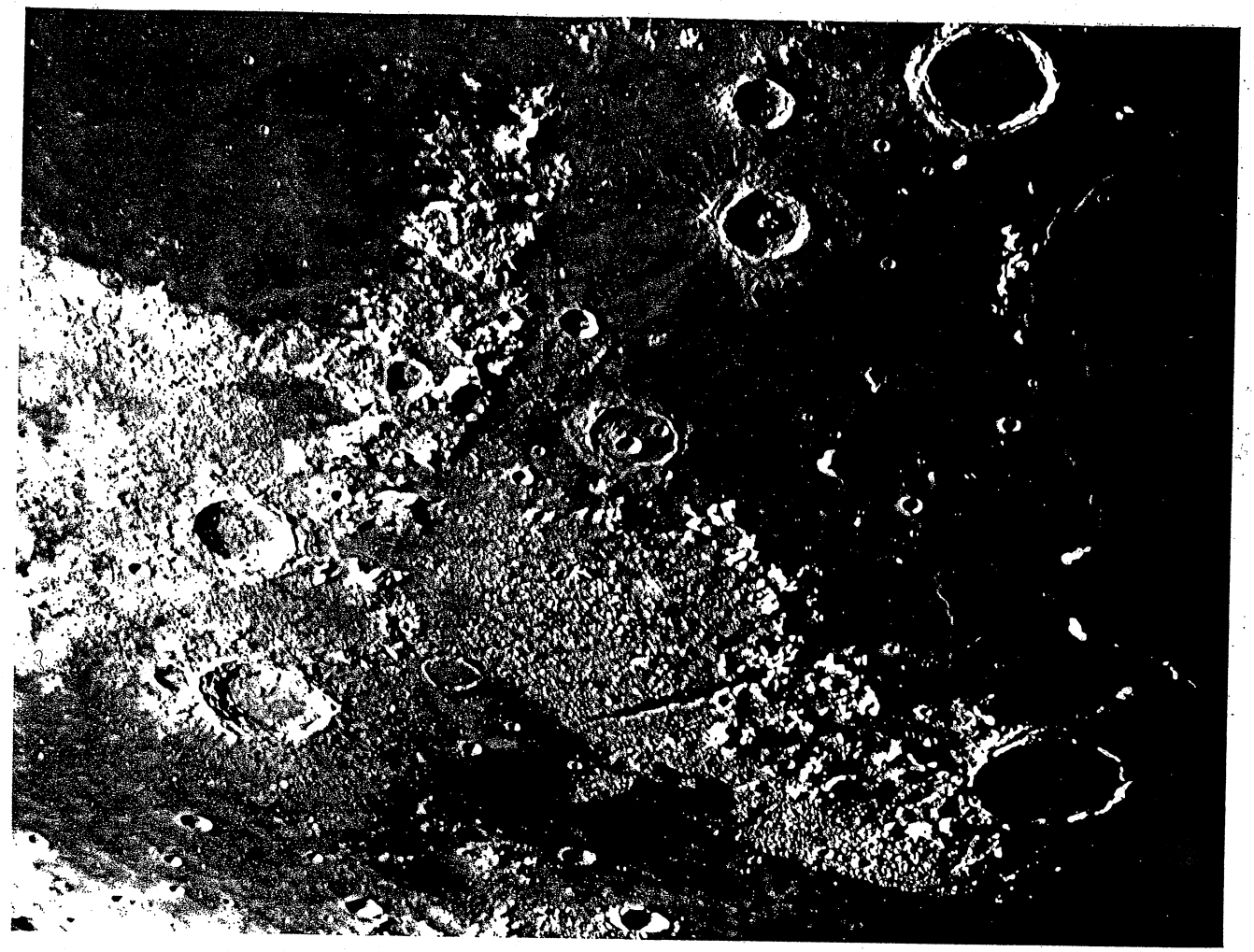


Figure 2. Diagram for the determination of the height of Piton.

2. (a) From the photograph measure the diameter of the mountain and convert to kilometers.
Diameter = _____ km.

(b) Make a sketch of the mountain. You know its base diameter and height. Is it really as sharp a peak as it looks?


E
2
6
Apollo 11
Surveyor 5
Sabine
Ritter
Menzel
MARE
Ranger 8
Lamont
Ariadaeus
Rima Ariadaeus
Rima Hyginus
Hyginus
SINUS
MEDII
TRANQUILLITATIS
Julius
Caesar
Ranger 6
Ross
Lyell
Jansen
Plinius
Manilius
MARE
VAPORUM
MONTES HAEMUS
Yangel
Franz
Promontorium Archerusia
Vitruvius
Carmichael
Hill
Apollo 17
Franck
Littrow
MARE
MONTES APENNINUS
Römer
Le Monnier
Mons Hadley
Apollo 15
Santos-Dumont
PALUS
PUTREDINIS
MONTES
Luna 21
TAURUS
SERENITATIS
Luna 2
Autolycus
Chacornac
Posidonius
Luther
5
G. Bond
Hall
Daniell
Aristillus
7
LACUS
SOMNIORUM
MONTES CAUCASUS
Theaetetus
Maury
Calippus
Cassini
Franklin
Grove
Mason
Alexander
Cepheus
Williams
Plana
Lamech
Shuckburgh
LACUS
Oersted
Bürg
MORTIS
Eudoxus
Chevallier
Egede
MONTES ALPES
Hercules
Mitchell
Atlas
Baily
Aristoteles
Pluto
P7
FRIGORIS
MARE
Galle
Protagoras
Endymion
Archytas
Gärtner
Sheepshanks
Democritus
De La Rue
C. Mayer
Thales
Kane
Timaeus
W.
Bond
Strabo
Schwabe
Arnold
Neison
Peters
Barrow
Meton
Bel'kovich
Hayn
Cusanus
Baillaud
Euctemon
Petermann
Scoresby
Challis
De Sitter
Main
Nansen
Byrd
Peary
N



Photograph print of Mare Imbirum