"The Planets"
Astro/EPS C12 (CCN 17045 or 32505)

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PLUTO'S LIGHTCURVES

Fig. 2.2: The change in Pluto’s lightcurve over almost 30 years, from 1954 to 1982.

PLUTO'S OBLIQUITY

- first estimated using the changes in Pluto’s lightcurve

OBLIQUITY
ECLIPSE SEASON

...is when system is seen edge-on

Total Lunar Eclipse of 2007 Aug 28
Greatest Eclipse = 10:37:22.3 UT  J.D. = 2454340.94262

Eclipse Contacts
P1 = 07:52:11 UT
U1 = 08:50:57 UT
U2 = 09:52:00 UT
U3 = 11:22:45 UT
U4 = 12:23:50 UT
P4 = 13:22:29 UT

Eclipse Semi-Durations
Penumbral = 02h45m09s
Umbral = 01h46m27s
Total = 00h45m23s

LUNAR PHASES

- what would eclipses look like from Pluto’s surface?
LUNAR ECLIPSE

SOLAR ECLIPSE
MENTAL EXERCISE

If the lunar orbit had an eccentricity of exactly zero, what would be true?

A. Annular OR total solar eclipses would occur, but not both.
B. Solar eclipses would never happen.
C. Solar eclipses would happen during every new moon phase.
D. Solar eclipses would happen during every full moon phase.

CCDs

- charge-coupled device
- used in digital cameras
- this one destined for WFC3 on HST

MAPS

- can be created from occultation lightcurves, rotational lightcurves, and HST observations
**PLANETARY INTERIORS**

- the terrestrial planets are differentiated
- core-mantle size ratios are different for the different planets

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**PLANETARY DENSITIES**

<table>
<thead>
<tr>
<th>Planet</th>
<th>Observed Density (g/cm³)</th>
<th>Uncompressed Density (g/cm³)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mercury</td>
<td>5.44</td>
<td>5.4</td>
</tr>
<tr>
<td>Venus</td>
<td>5.24</td>
<td>4.2</td>
</tr>
<tr>
<td>Earth</td>
<td>5.50</td>
<td>4.2</td>
</tr>
<tr>
<td>Mars</td>
<td>3.94</td>
<td>3.3</td>
</tr>
<tr>
<td>(Moon)</td>
<td>3.36</td>
<td>3.35</td>
</tr>
</tbody>
</table>

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**VELOCITY and DENSITY**

![Graph showing velocity and density variations with depth](image)