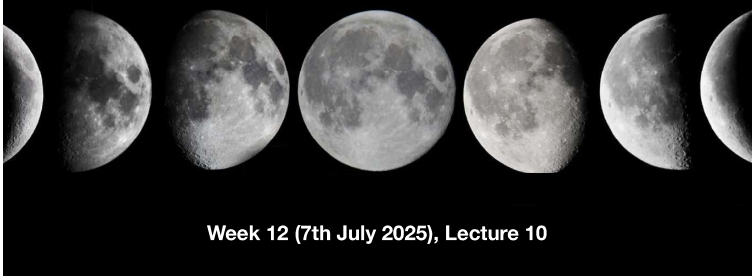
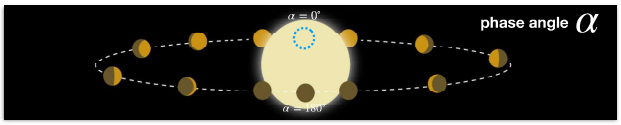
Albedos and Phase Curves of Reflected Light



Week 12 (7th July 2025), Lecture 10

What are albedos and phase curves?



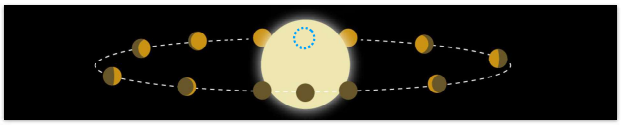
Phase curve: flux from the planet/moon as a function of orbital phase angle

Albedo: fraction of reflected light from planet/moon (various definitions!)

Secondary eclipse depth: *(Seager 2010)*

$$D = A_g \left(\frac{R}{a}\right)^2$$

geometric albedo (**magnitude** of phase curve)



Reflected light phase curve: *(Seager 2010)*

$$\frac{F}{F_\star} = A_g \left(\frac{R}{a}\right)^2 \Psi$$

integral phase function (**shape** of phase curve)

Solve for A_g and Ψ from first principles
(by solving radiative transfer equation)

MONTHLY NOTICES
OF THE
ROYAL ASTRONOMICAL SOCIETY.

VOL. XXI. *May* 10, 1861. No. 7.

George P. Bond (1825-1865)

On the Light of the Sun, Moon, Jupiter, and Venus. By G. P. Bond, Director of the Observatory of Harvard College.

Albedo of Jupiter = 0·967,

or more than double that attributed by Lambert to a surface of the finest white lead (cremnitz white), which gave the highest albedo, viz., 0·423, of any substance experimented upon by him.

This paper indirectly led to the coining of the term "Bond albedo"

Henry Norris Russell (1877-1957)

THE
ASTROPHYSICAL JOURNAL
AN INTERNATIONAL REVIEW OF SPECTROSCOPY AND ASTRONOMICAL PHYSICS

VOLUME XLIII APRIL 1916 NUMBER 3

ON THE ALBEDO OF THE PLANETS AND THEIR SATELLITES

By HENRY NORRIS RUSSELL

phase integral

α	Euler	Lambert	Seeliger	Venus	Moon	Mercury
0°	2.00	1.50	1.64	1.19	0.72	0.42
20°	2.00	1.00	1.77	1.54	1.00	0.83
40°	2.26	1.88	2.08	2.00	1.64	1.63
50°	2.44	2.12	2.32	2.32	2.07	2.28
60°	2.67	2.46	2.64	2.72	2.68	3.21
80°	3.41	3.66	3.60	3.88	4.77	6.41

classic reflection laws (which do not describe real objects very well…)

JOURNAL OF GEOPHYSICAL RESEARCH VOL. 68, NO. 15 AUGUST 1, 1963

A Theoretical Photometric Function for the Lunar Surface

BRUCE W. HAPKE
Center for Radiophysics and Space Research
Cornell University, Ithaca, New York

Bruce Hapke (1931-present)

"Hapke parameters"