Blue Marble the Uniform Image
The Sun and the Moon a Riddle in the Sky

The Sun and the Moon a Riddle in the Sky

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DOI: 10.13140/RG.2.2.36021.01760

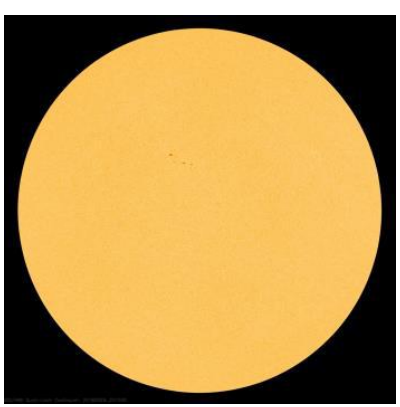
Poster presented at the IPS conference 17-02-20

Calculation based on fundamental principles is presented to clarify the uniformity of the full-moon image, as well as of other celestial and terrestrial bodies, regardless of the observed object and its surface properties. The uniformity is a direct outcome of a single sunlight scattering by the object surface, and there is no need of further assumptions or models to justify it.

Ref: https://arxiv.org/ftp/arxiv/papers/1808/1808.01024.pdf
Full-Moon and the Opposition Effect

Nature phenomena that do not have reasonable explanation in the scientific literature.

The uniform image of the full moon and other bodies



Sun

Moon

Earth

Venus

All the planet images, and the planet moons images, are nearly uniform with sunlight backward illumination

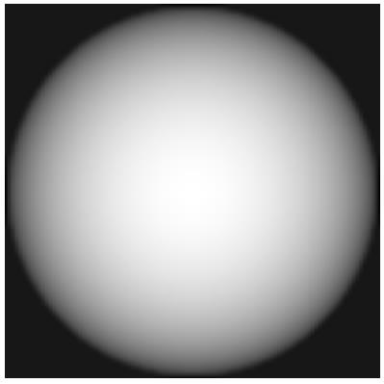
Lambert's light scattering Cosine law: The light brightness is maximal at the center, and falls off to zero toward the periphery by the Cosine function

There are thousands upon thousands photos with similar background illumination.

Not a single true photo follow this cosine law

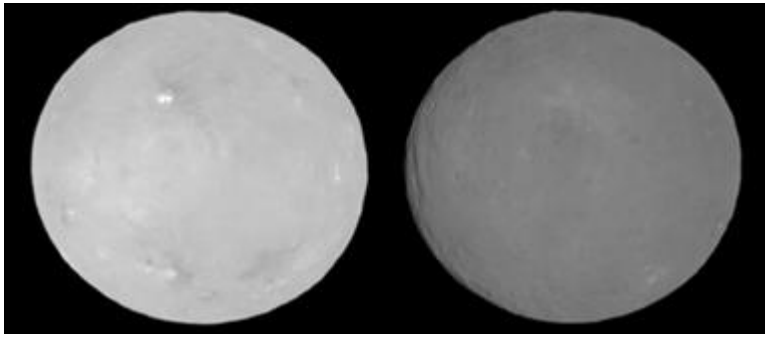
Photos that comply with the law are all rendered.

That is, at least partly simulated.

Rendered image:  .

Rendering: If the theory does not comply with reality, change reality.

Opposition Effect: Enhanced 180 degrees backward light scattering

An asteroid at opposition:  Brightness enhanced ~50%.

Similar observation with the moon.

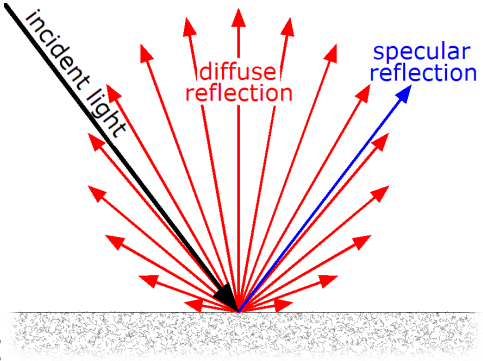
Opposition effect  on Saturn rings.



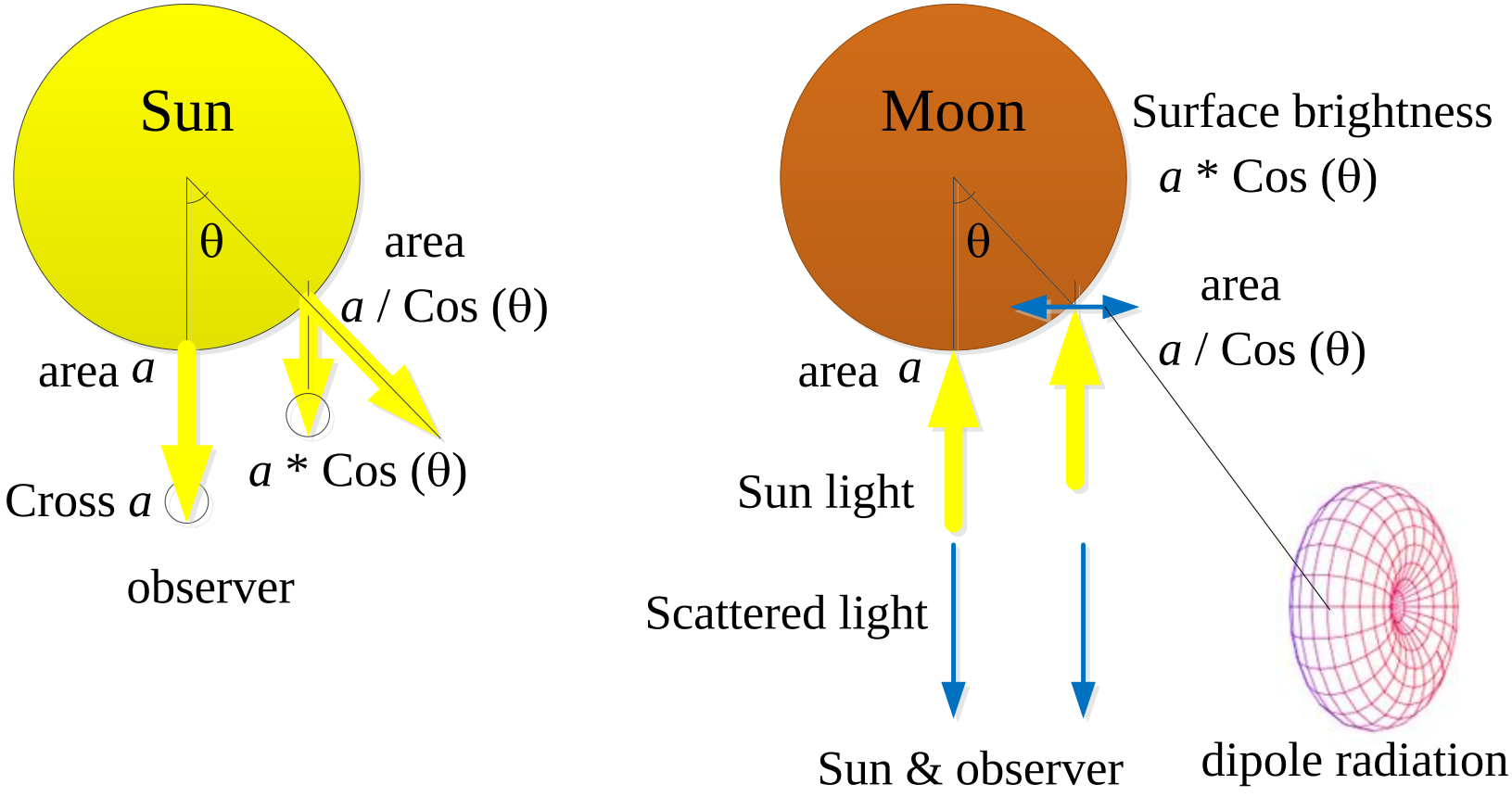
Opposition effect on the moon and on earth

In 180 degree back scattering, the opposition effect, all the scattering dipoles are coherently synchronized by the incoming wave. No need for further mechanism.

Incorrect light scattering diagram:



Light Scattering



Light Scattering Theory

Electromagnetic wave travels in a medium and polarizes its matter

Each polarized dipole is a source of electromagnetic wave

In a uniform material the dipole fields cancel each other in all the directions in space except the forward direction, where the effect is refraction.

Scattering comes from non-uniform fluctuations of material density.

Scattered light is the sum of the intensities of the scattering centers.

Each dipole oscillate in the electric field direction of the coming sunlight, in a plane perpendicular to the wave direction.

The maximal emission of a dipole is perpendicular to its direction of oscillation: Back to the sun.

The mean equivalent moonlight is directed back to the sun, in full moon, also back to an observer on earth.

Summary - Single 180º back scattering: The scattered light conserves the polarization plane of the coming light and lead to uniform surface image and to image enhancement.

Literature search: Nothing like this work in the scientific Literature.

Z.K. Kopal, *An Itroduction to the Study of the Moon*, (Springer, 1966), p. 330
http://pdf.to/bookinfo/an-introduction-to-the-study-of-the-moon.pdf/

Michael K. Shepard, Introduction to Planetary Photometry,
Contemporary Physics, 59(1):1-1 · October 2017, (Cambridge, 2017)

Author request: This work is a "hot potato". Nobody wants to touch it. If you think that the work is correct, please spread it. Thanks, the author.

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Moral of the story:

The scattered light is considered in the literature as a diffusive light, light that passed a number of scattering events before it left the scattering material. Diffusely scattered light must obey Lambert's Cosine scattering law. In the case of unidirectional light scattered backward from a surface of a sphere, the meaning is maximum scattering intensity in the middle of the sphere surface, and a decline to zero toward the periphery by the cosine law.

The full moon looks uniform, people continue to assume that the light is diffusely scattered from it, and make double saltas and backward flick-flacks in order to try to explain the uniformity, in my opinion, without success.

More than that. The nearly uniform sphere image, is common to all the planets and their moons, including the earth as observed from the moon. Out of thousands upon thousands true photos, there is no single true photo that obeys Lambert's Cosine law. The only photos that do obey the law are rendered photos, photos that are at least partly simulated. Rendering: If the theory does not comply with reality we'll change the reality.

Contrary to all that, if the scattering is assumed to be mainly a single event, then all the scattering dipoles are directly stimulated by the light radiation on the illuminated scattering material. Then scattering by them must be coherent, and then the full moon and all the other illuminated bodies, with similar illumination geometry, must be uniform, at least approximately. The full moon tells us that single event scattering is dominant. Maybe with small corrections of multiple scattering.

Why is the single event dominant? It seems that the effect is geometrical and statistical. If we consider one event scattering, two event scattering, multiple event scattering, then the event probability will decline with an increasing number of scatterings. The single event has a probability of at least 50% and it is the strongest event. Assume that someone can make more accurate statistical calculation.

Nearly all the background landscape that surrounds us is a singly scattered light. A true diffusely scattered light is rather rare

In summary, the full moon tells us how to remove undesirable incoherent stray light from coherent scattered light, for example, in optical absorbance measurements.

Added, April 2020