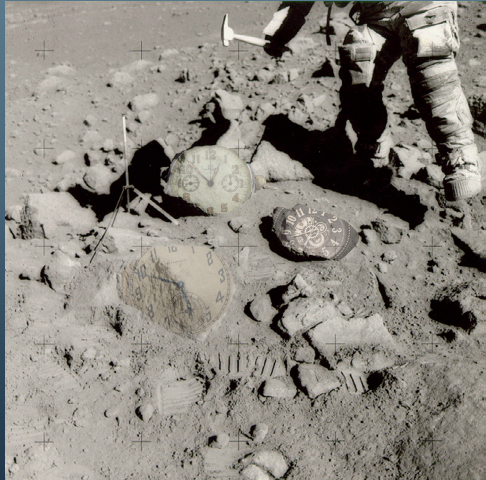


NASA

*Apollo brought us
history in their gloved hands:
Tiny rocky clocks. #winning*



A GLINT OF LIGHT ON BROKEN GLASS: SOLAR SYSTEM BOMBARDMENT HISTORY FROM APOLLO SAMPLES

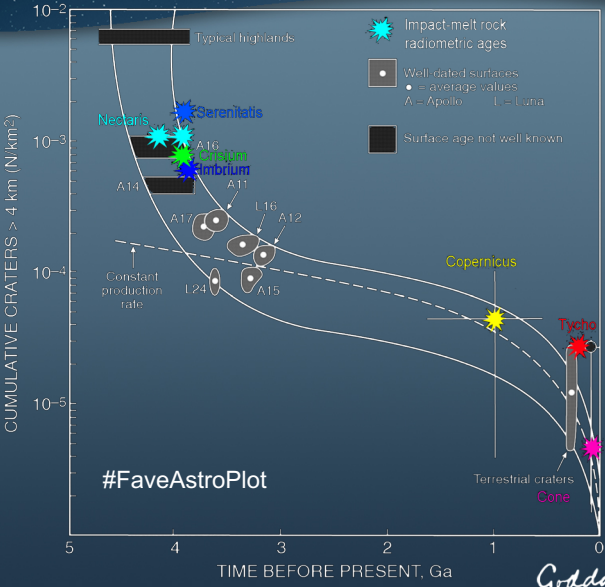
Barbara Cohen (she/her)
NASA Goddard Space Flight Center
and a cast of thousands

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The Apollo legacy: An absolute planetary timescale

NASA

- Legacy of the Apollo samples is the link forged between radiometric ages of rocks and relative ages from crater counts.
- Lunar impact history in numerous reviews, including NVM-2.

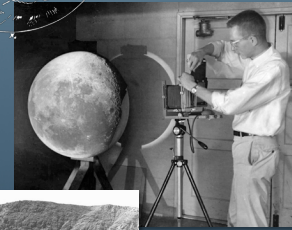
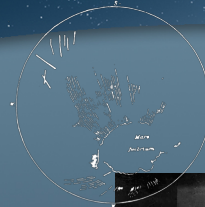


#FaveAstroPlot

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Pre-Apollo expectations

- Gilbert, Opik, Urey, Baldwin, et al. developed the impact hypothesis for craters on the Moon – *go read To A Rocky Moon by Don Wilhelms*
- Shoemaker, Hartmann, Dietz, et al. prepared astronauts for exploring and sampling impact craters
- **Pre-Apollo Expectations:**
 - The lunar surface is ancient.
 - The large circular mare fill in ancient basins.
 - Impact craters can be sampled using their ejecta.



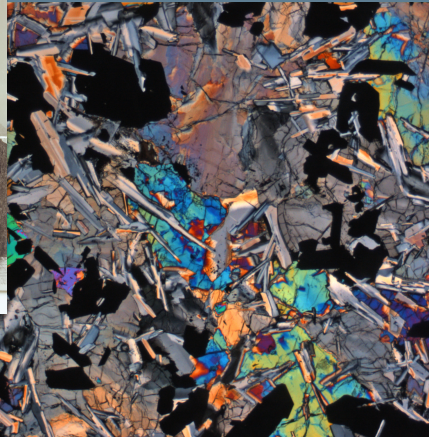
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Don't tell me the Moon is shining; show me a glint of light on broken glass. - Chekhov



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Potassium-argon age of Apollo 11 rock 10003

P. Eberhardt, J. Geiss, N. Grögler, U. Krähenbühl, M. Mergeli, A. Stettler

Show more

[https://doi.org/10.1016/0012-821X\(71\)90171-3](https://doi.org/10.1016/0012-821X(71)90171-3)

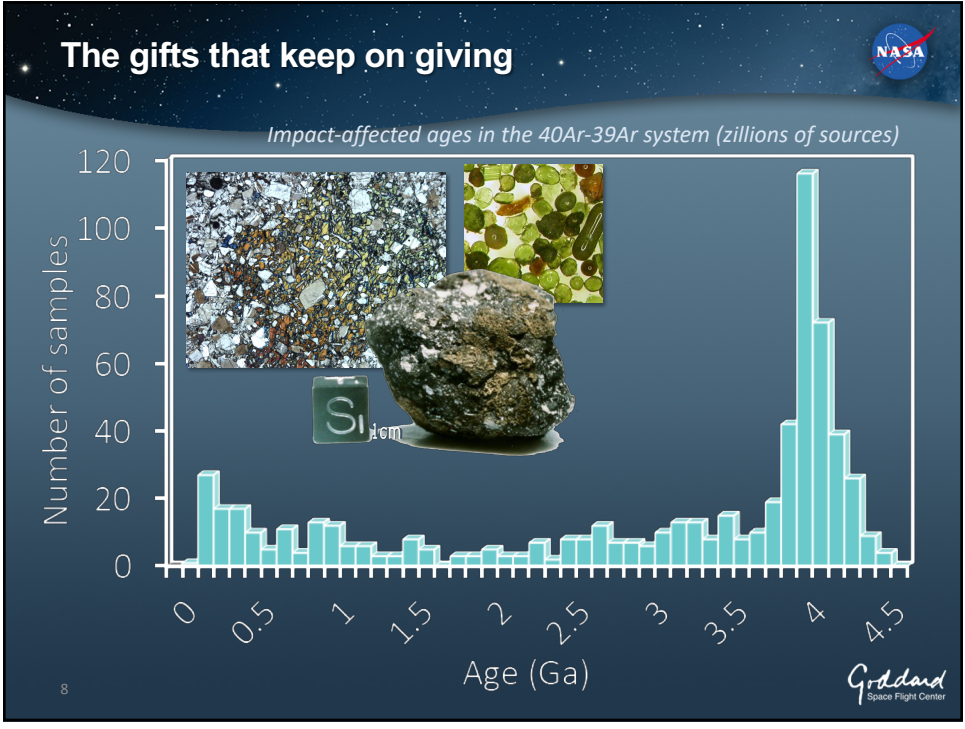
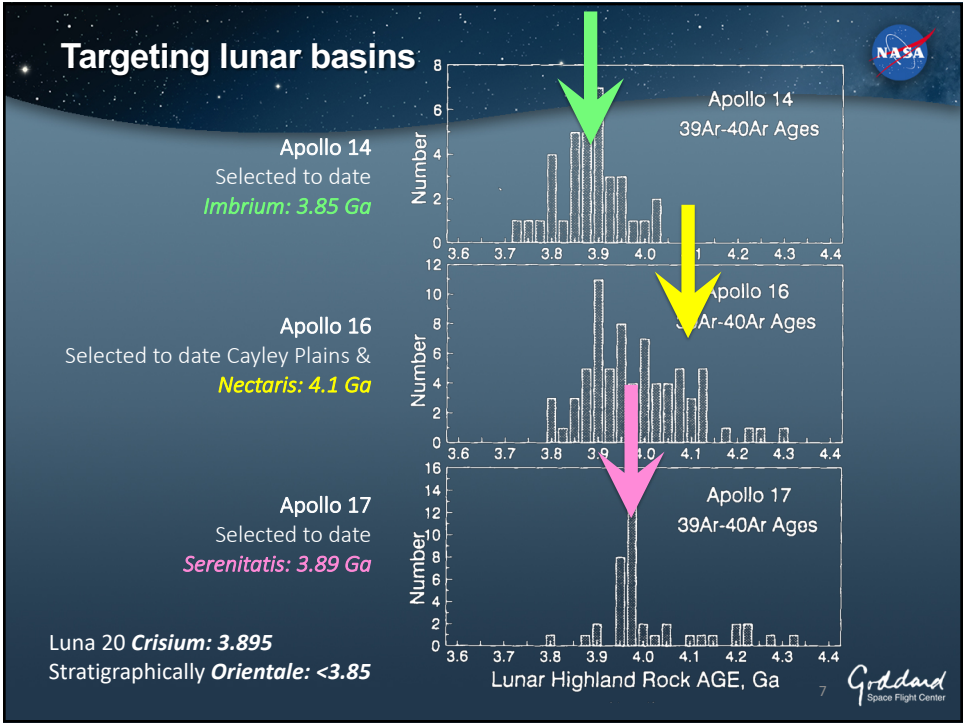
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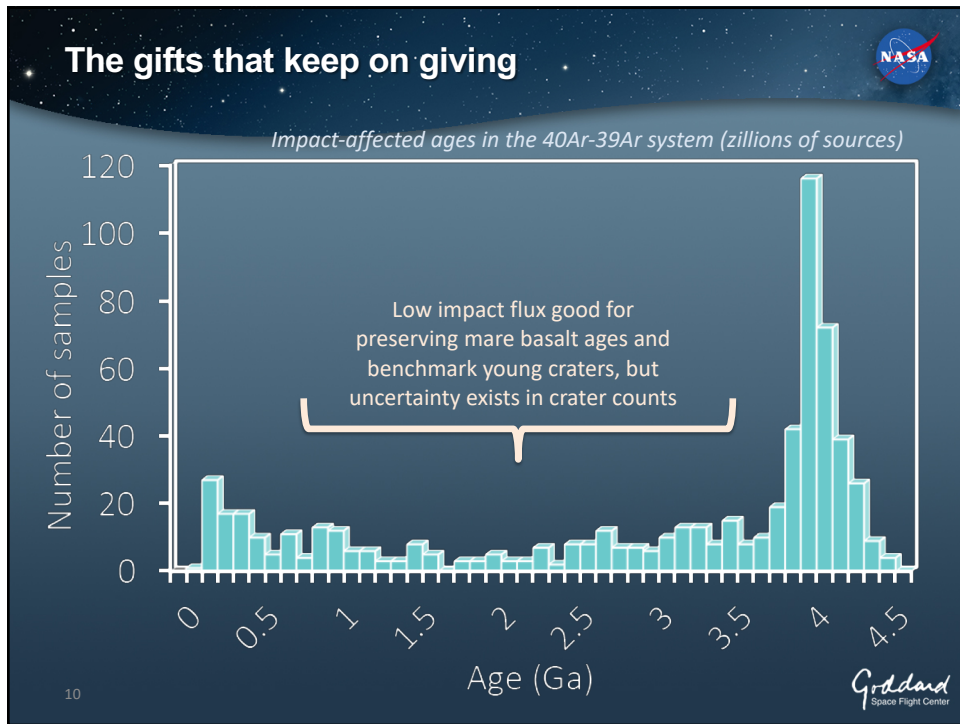
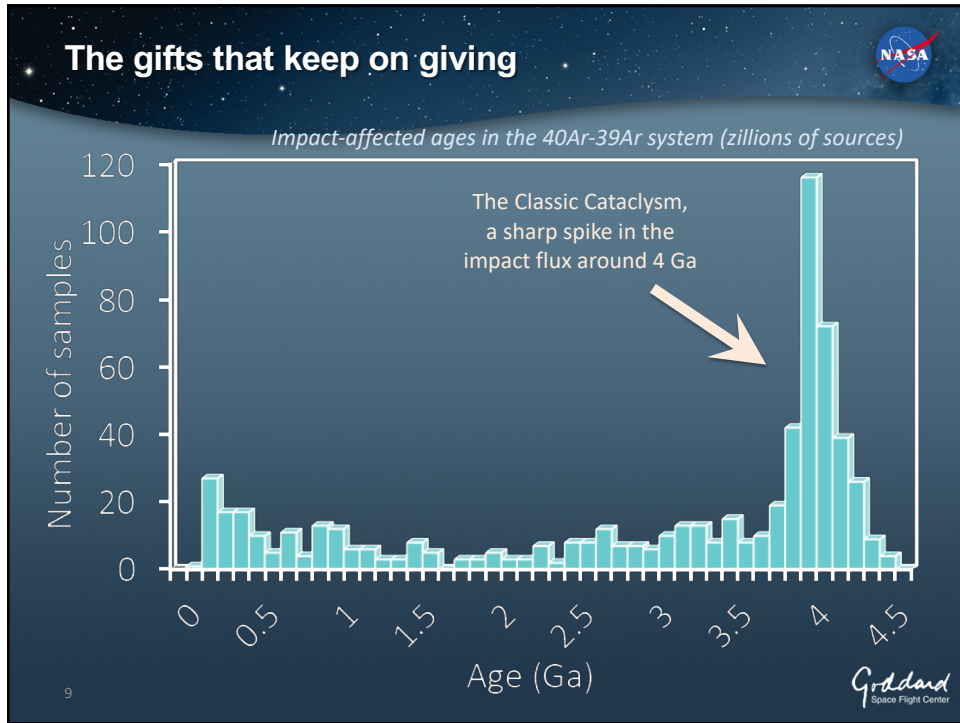
Abstract

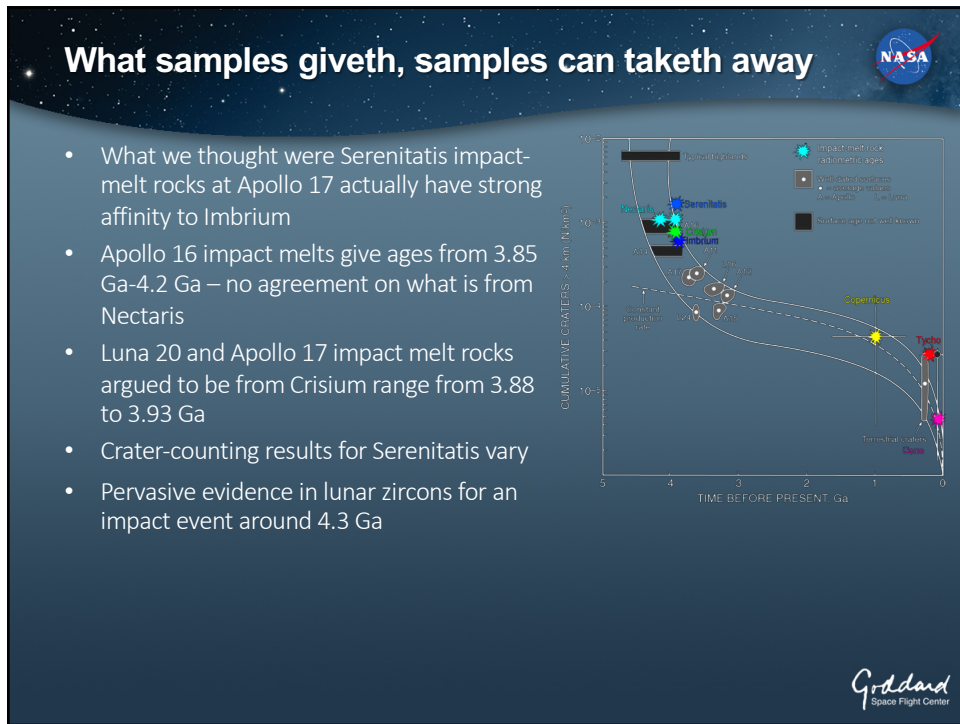
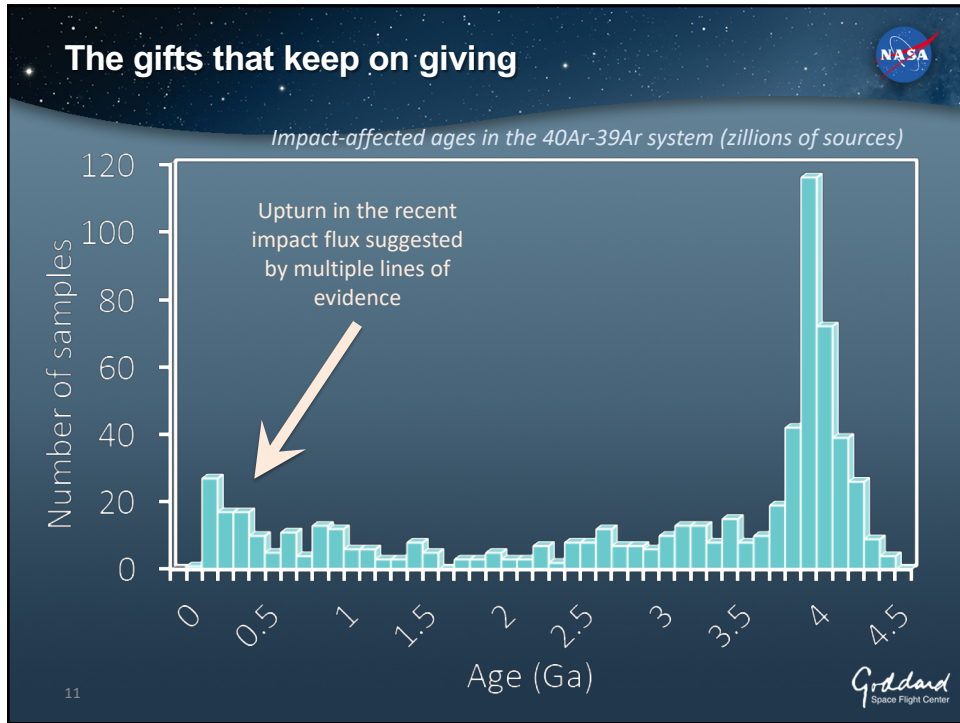
The K-Ar ages of a whole rock sample and a feldspar concentrate from lunar rock 10003 were determined as $(3.74 \pm 0.06) \times 10^9$ and $(3.82 \pm 0.05) \times 10^9$ respectively. The K-Ar age of the feldspar concentrate is in essential agreement with the high temperature K-Ar age of $(3.92 \pm 0.07) \times 10^9$ obtained by Turner [1] with the $^{40}\text{Ar}/^{39}\text{Ar}$ dating technique. Our results thus confirm the relatively high age of the low-K Apollo 11 rock 10003.

- Apollo 11 sampled multiple basalt flows
- Well-defined surfaces for crater counting
- As suspected, the mare basalts are old (3.6-3.9 Ga) and basins are even older
- *This means early solar system history is recorded on the Moon*


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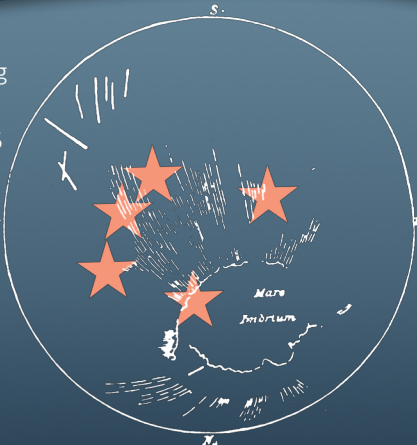





What samples giveth, samples can taketh away




- What we thought were ~~Serenitatis~~ impact-melt rocks at Apollo 17 actually have strong affinity to Imbrium
- Apollo 16 impact melts give ages from 3.85 Ga-4.2 Ga – no agreement on what is from ~~Nectaris~~
- Luna 20 and Apollo 17 impact melt rocks argued to be from ~~Crisium~~ range from 3.88 to 3.93 Ga
- Crater-counting results for Serenitatis vary
- Mounting evidence in lunar zircons for an impact event around 4.3 Ga
- *Samples thrown from basins don't come tagged with their origin.*
- *Imbrium has a pervasive influence throughout the Apollo sample collection*





Continuing the Apollo legacy



- Develop and explore new methods and criteria for recognizing and dating impact products
- Moar samples moar
 - Pristine lunar samples (ANGSA)
 - Resolve the middle-age uncertainty
 - Date the melt sheet of a well-known, ancient basin! SPA, Crisium
- Asteroid and planetary samples
- *Diversity of approaches and community to build a framework for the solar system*

