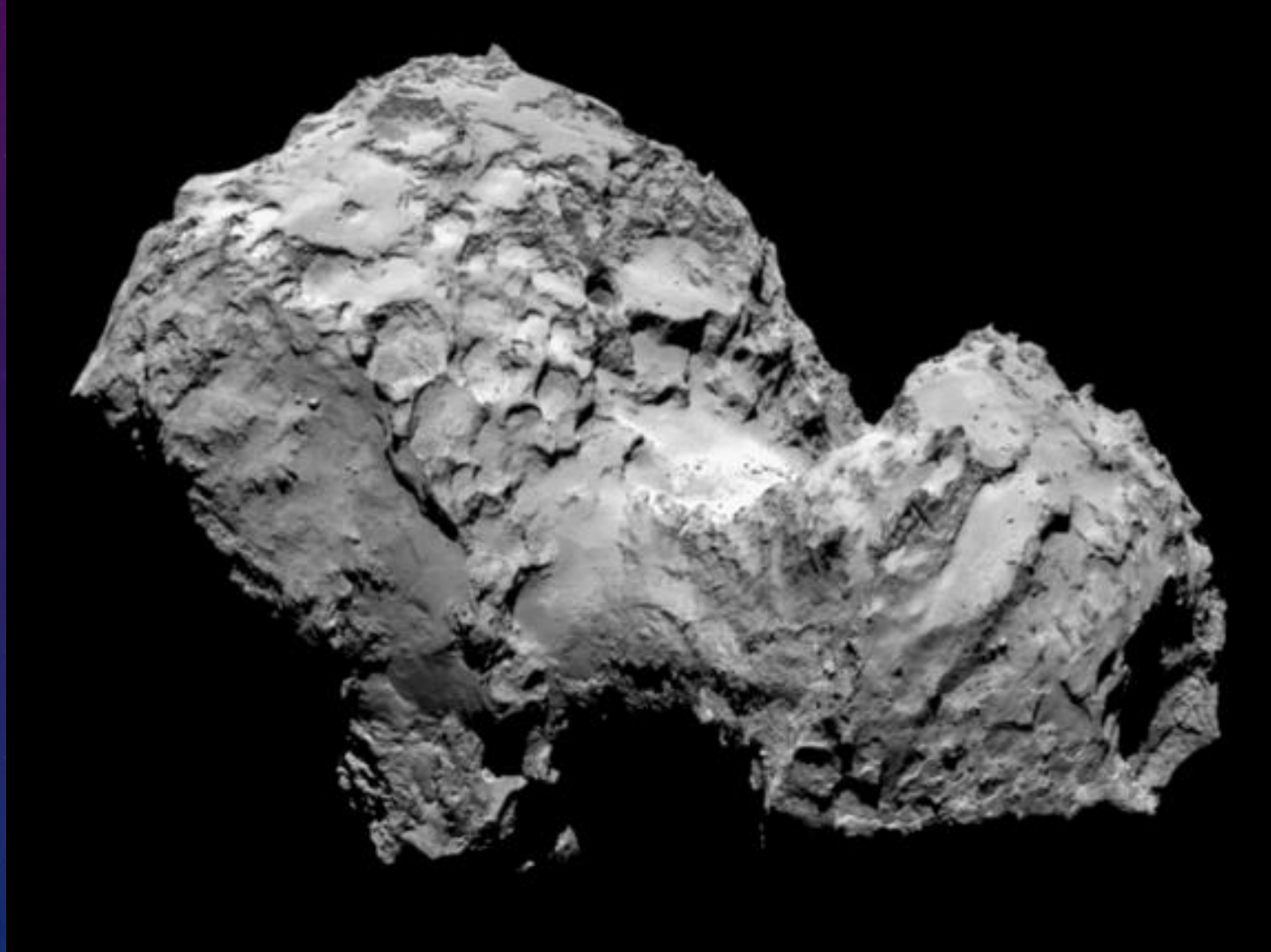
The background features a dark blue gradient with a starry field. Overlaid on this are several faint, light-colored circular diagrams and arcs, some with tick marks and numbers, resembling astronomical charts or orbital paths. The text is centered and rendered in a clean, white, sans-serif font.

COMETS – ANCIENT RELICS OF THE SOLAR SYSTEM'S FORMATION

COLD, BEAUTIFUL, SPOOKY...

AND IN SUMMER '20, WE HAVE THE BEST
NORTHERN HEMISPHERE COMET OF THE
21ST CENTURY TO ENJOY!

RELIQS OF THE KUIPER BELT AND VIOLENT COLLISIONS

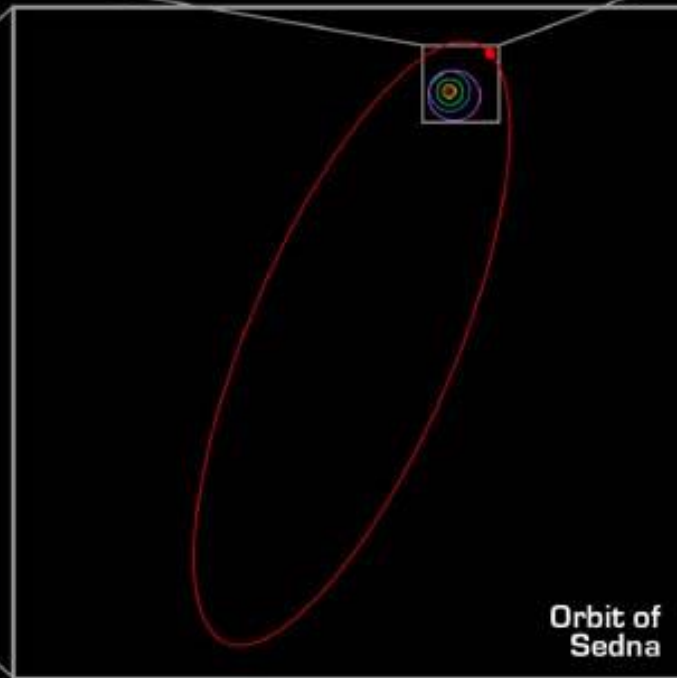
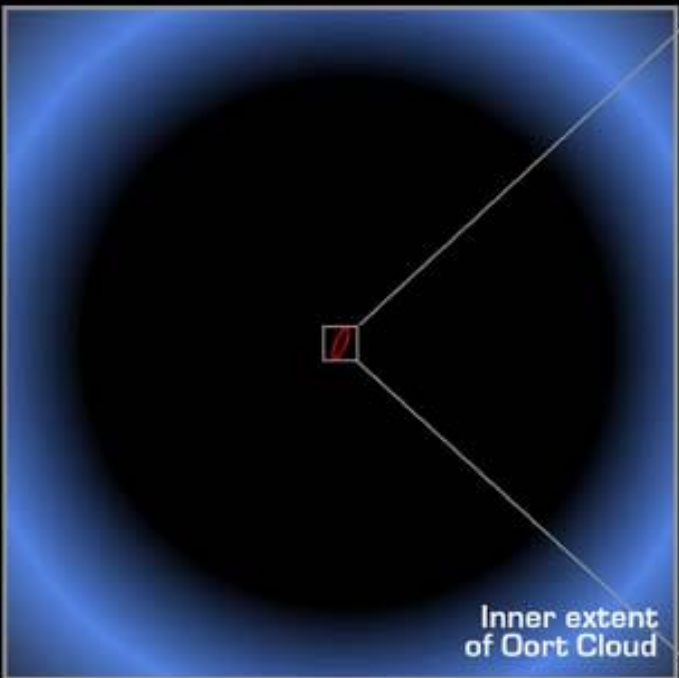
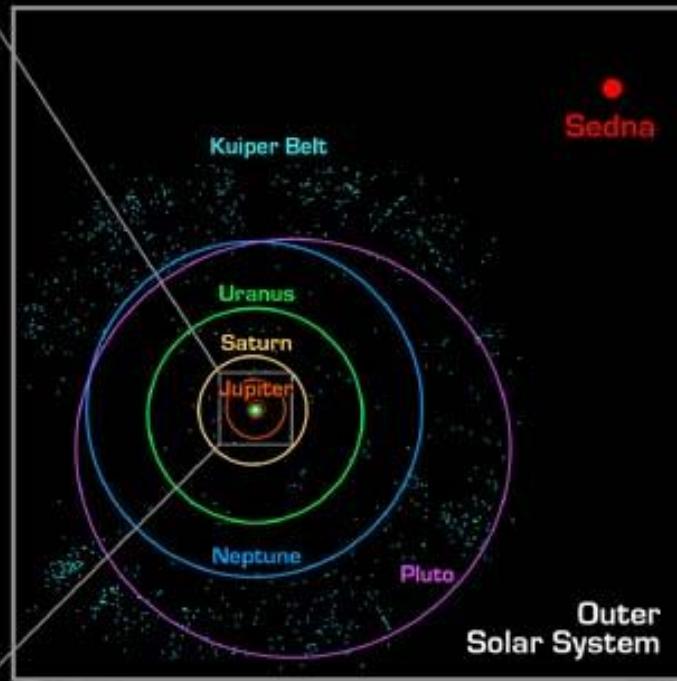
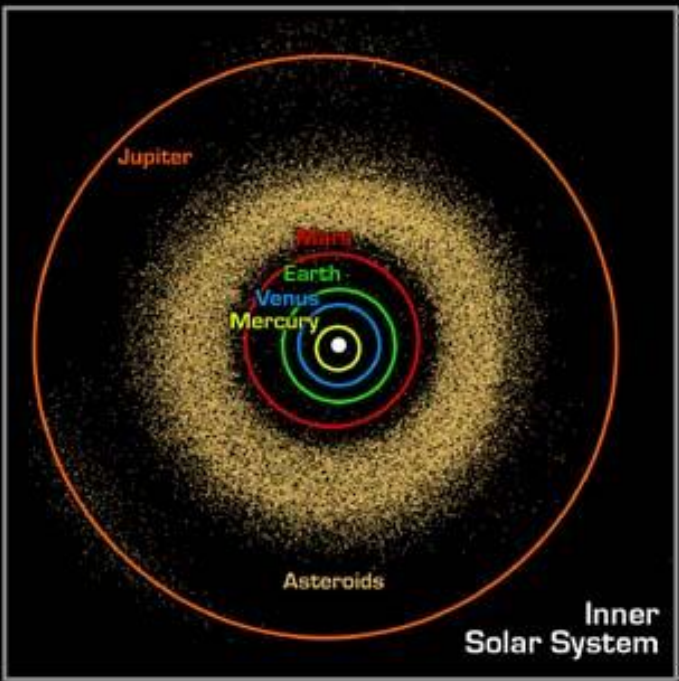


GERARD KUIPER: REASONED THE “WHY” OF COMETS, WAY BACK IN THE 1950’S

- Looked at outgas rates of short-period comets like Halley’s Comet
- Realized even large comets like Halley’s could last only a few million years before melting away
- There must be a continuous creation of new short period comets, but how?
- The most likely source, collisions between much larger (100 km or bigger) objects out beyond Neptune
- This could well be a region too diffuse to have assembled itself into planets, and still be ancient molecules from the interstellar cloud out of which stars form, frozen into ...
- Icy dirt-balls?? Or Dirty Ice-balls? Deep questions! (or semantics!)

COMET ATLAS, "SHE'S BREAKING UP! SHE'S BREAKING UP!
(REMEMBER THE OLD TV SERIES "SIX MILLION DOLLAR
MAN"?)

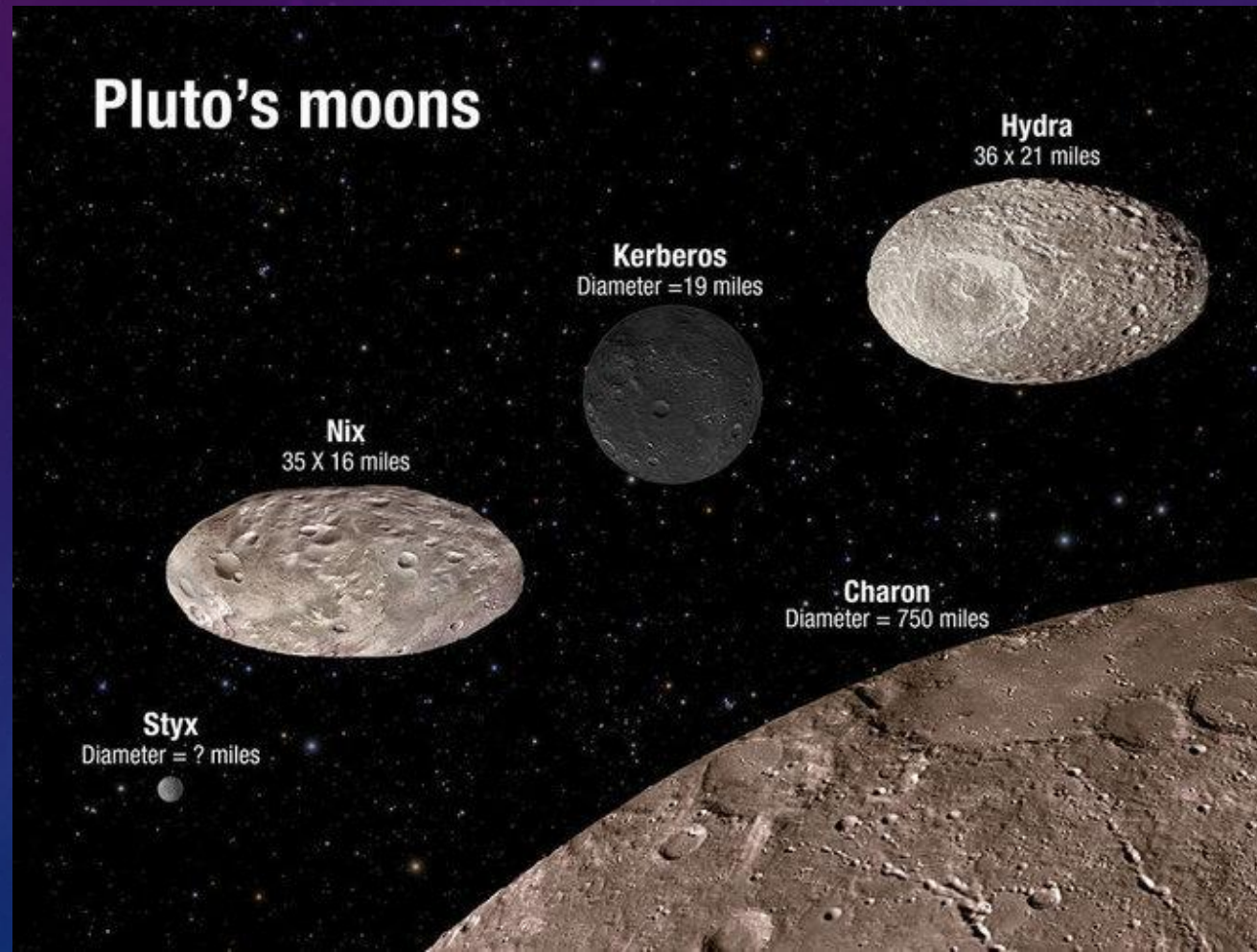




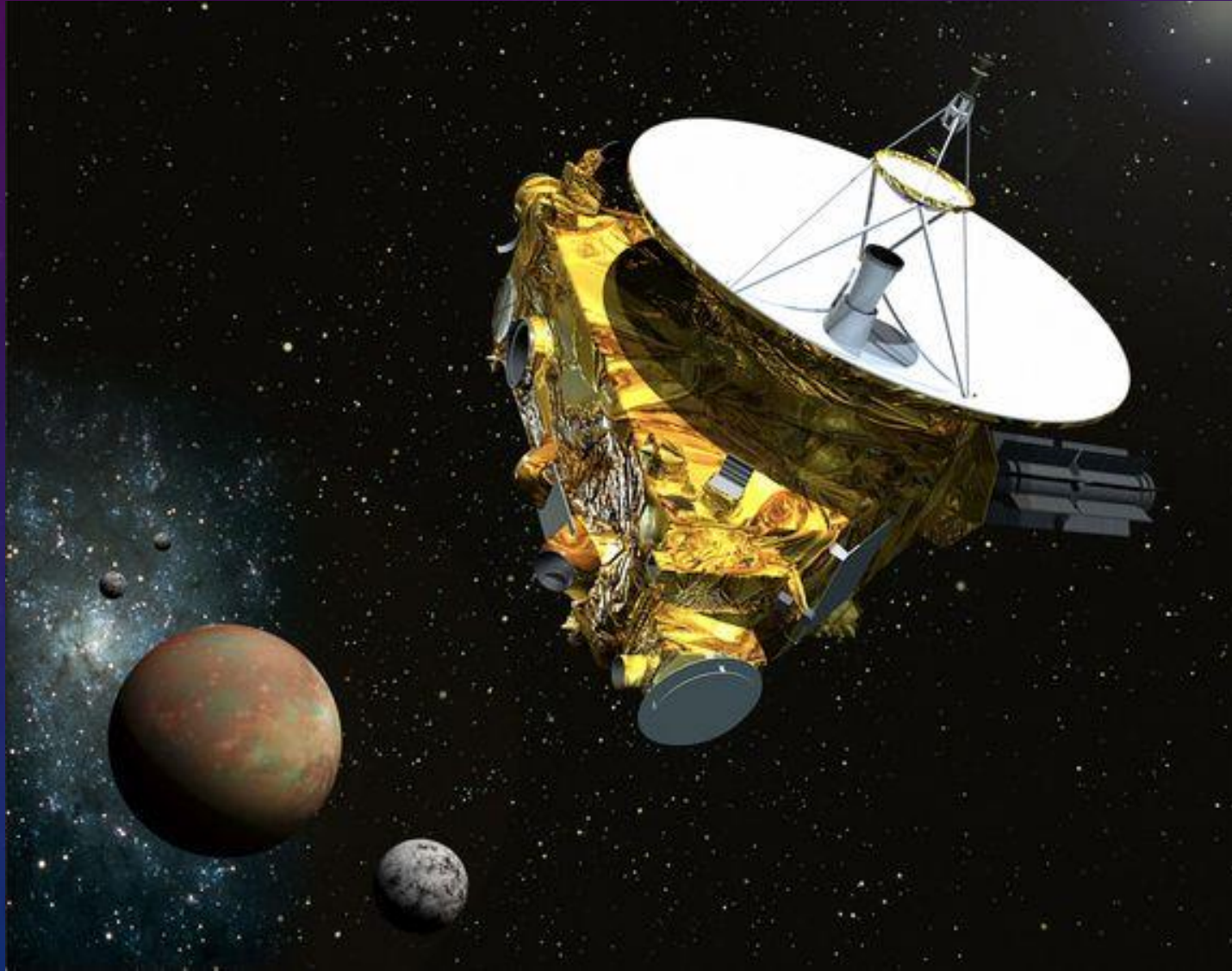
THIS WAS BEFORE WE HAD THE BIG TELESCOPES OF TODAY. WE HAD NO EVIDENCE FOR THIS VAST NUMBER OF ICY OBJECTS

THEN IN THE 1990'S, WITH THE KECK TELESCOPES, WE BEGAN DISCOVERING THEM DIRECTLY, DIM AND FAINT AS THEY ARE

WE THEN REALIZED WE HAD ALREADY DISCOVERED THE BIGGEST (SO FAR) MEMBER OF THE KUIPER BELT: WE THOUGHT IT WAS A PLANET, BUT NO – ITS PLUTO!



IN 2015, THE NEW HORIZONS SPACECRAFT FLEW THROUGH THE PLUTO SYSTEM, FIRST CLOSE UP VIEWS



SOME OF THE LARGER KBO'S (ARTISTIC LICENSE ON THE SURFACE FEATURES)





False Color

PLUTO – SURPRISING
VOLCANISM FROM CRYO-
VOLCANOS OF AMMONIA-
WATER, FROZEN NITROGEN
PLANES, AND MOUNTAINS
AS HIGH AS THE SIERRA.

AND A GIANT HEART TO
GREET US. SOOOO SWEET



PLUTO'S
LARGEST
MOON –
CHARON.
ALSO
SURPRISINGLY
TECTONIC



NEW HORIZON PHOTO'S
PLUTO'S RAZOR-THIN
ATMOSPHERE REFRACTING
SUNLIGHT. NITROGEN
MOLECULAR ATMOSPHERE
BY VASTLY LESS DENSE
THAN EARTH'S.

Rugged cratered terrain

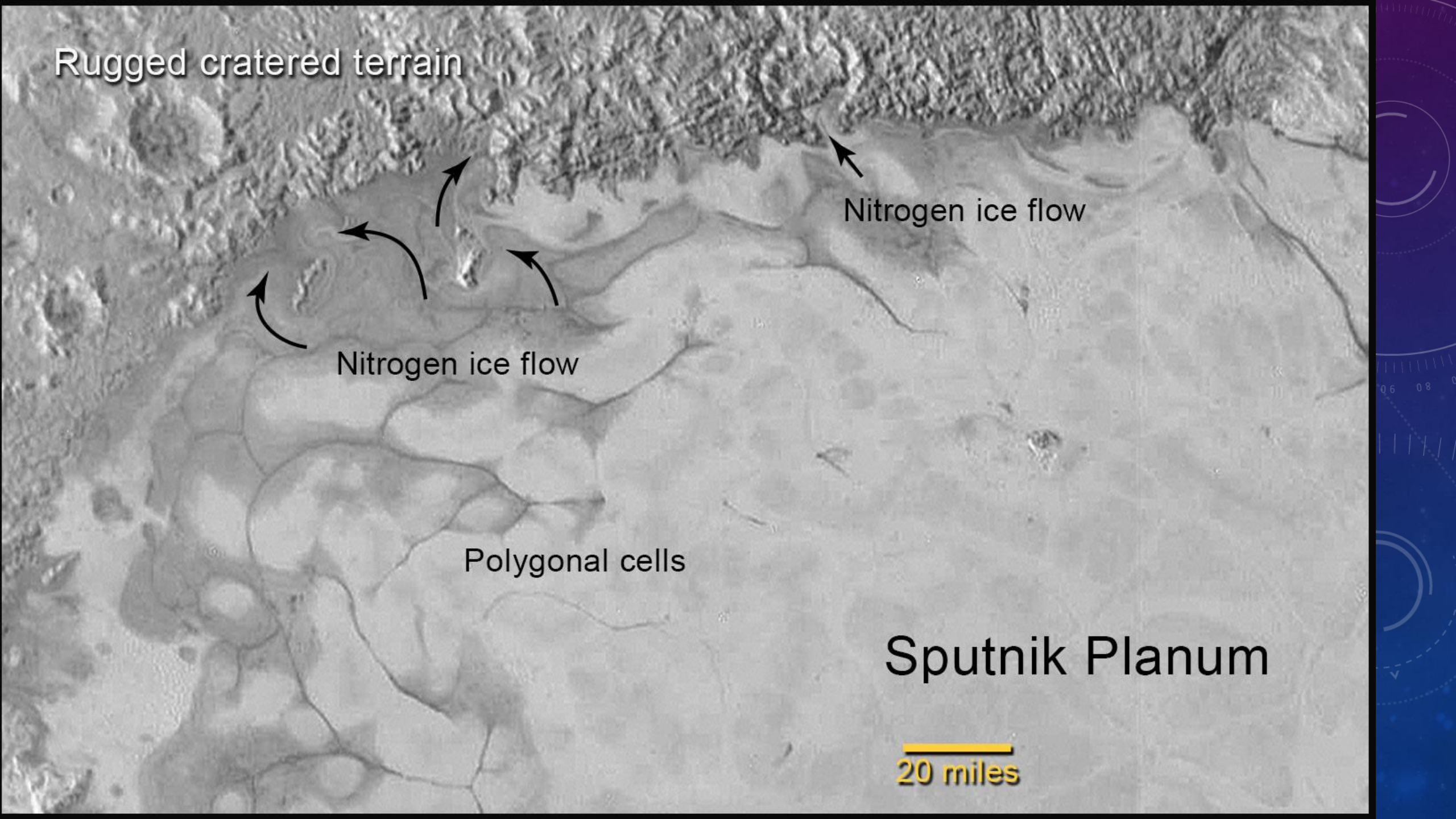
Nitrogen ice flow

Nitrogen ice flow

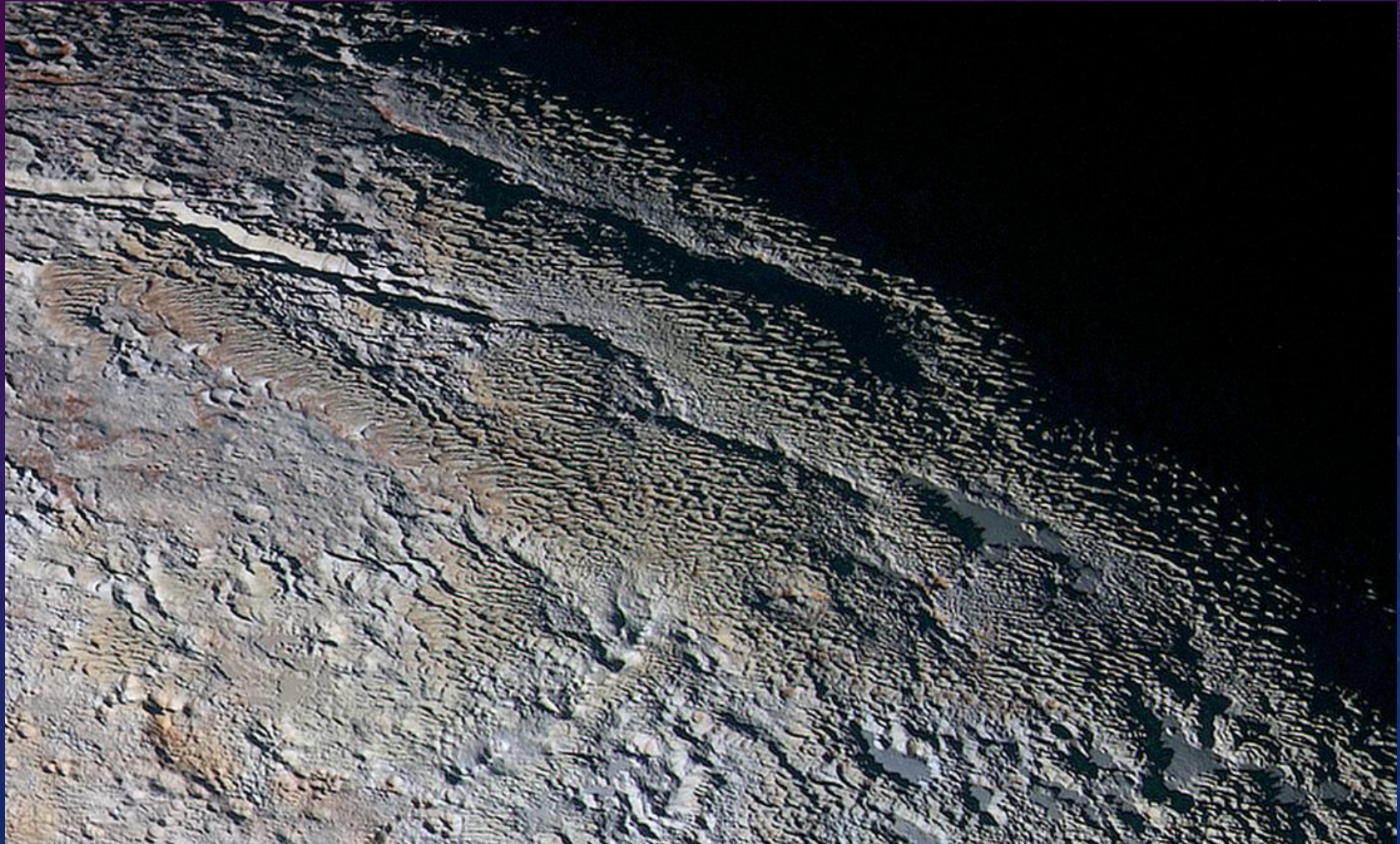
Polygonal cells

Sputnik Planum

20 miles



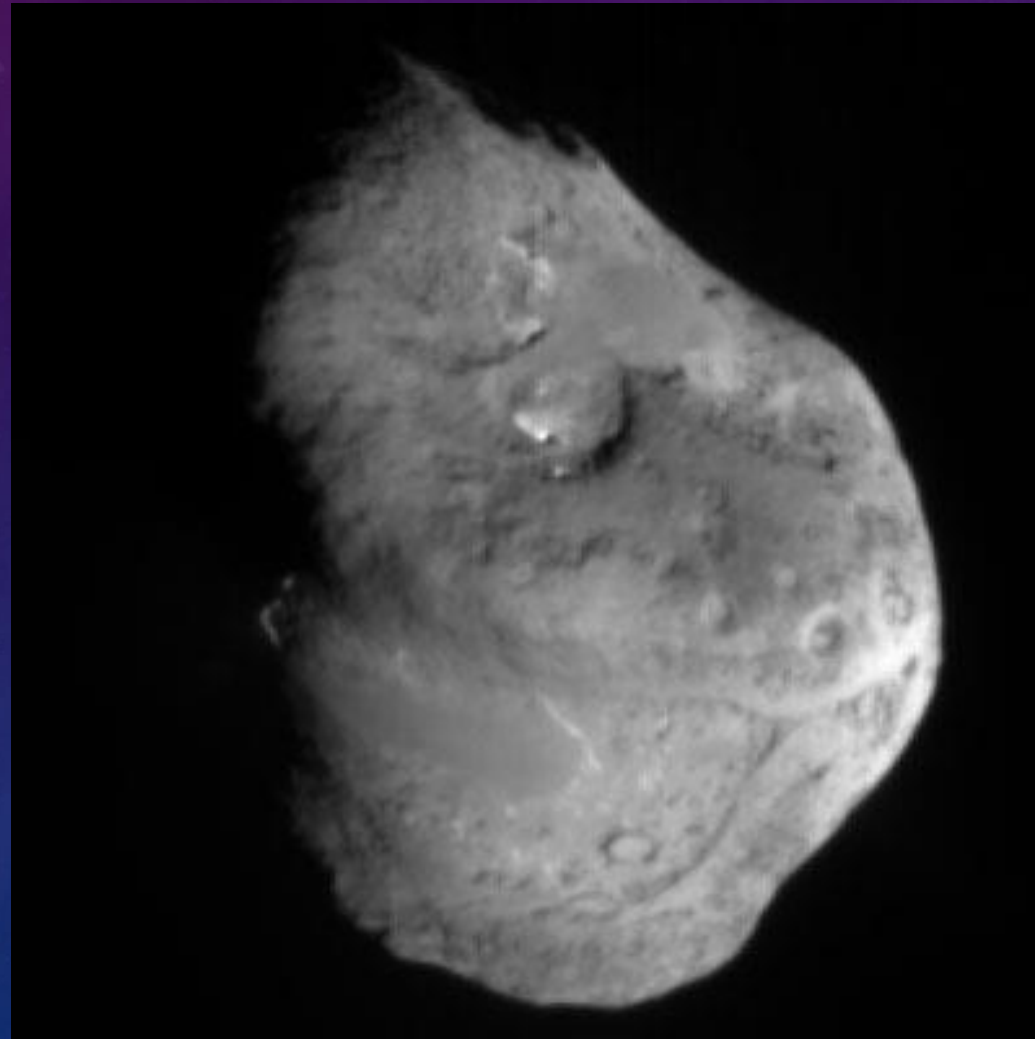
BIZARRE "SNAKESKIN" SURFACE OF PLUTO



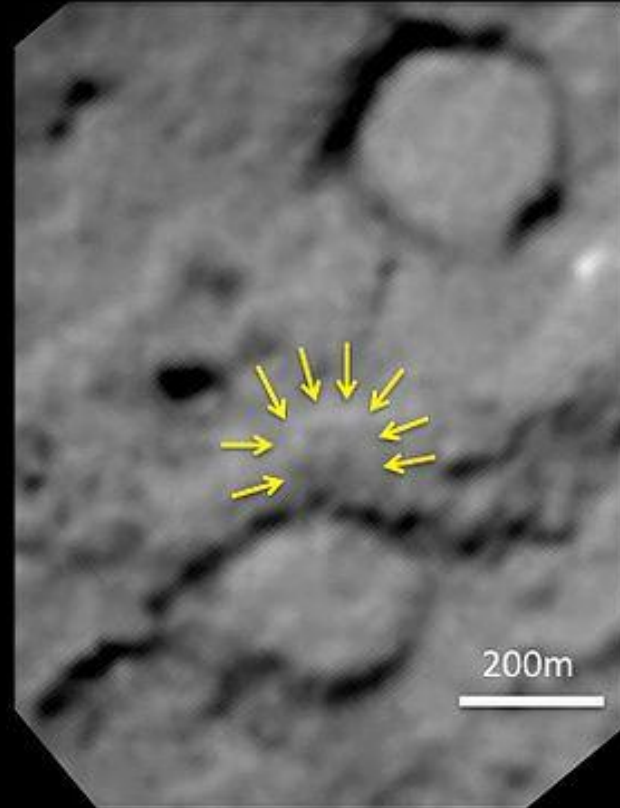


MOUNTAINS POKE
ABOVE A VAST FROZEN
OCEAN OF NITROGEN
COVERED AMMONIA-
WATER

COMET TEMPLE I. "HEY, LETS THROW A BIG
ROCK AT IT AND SEE WHAT HAPPENS!"



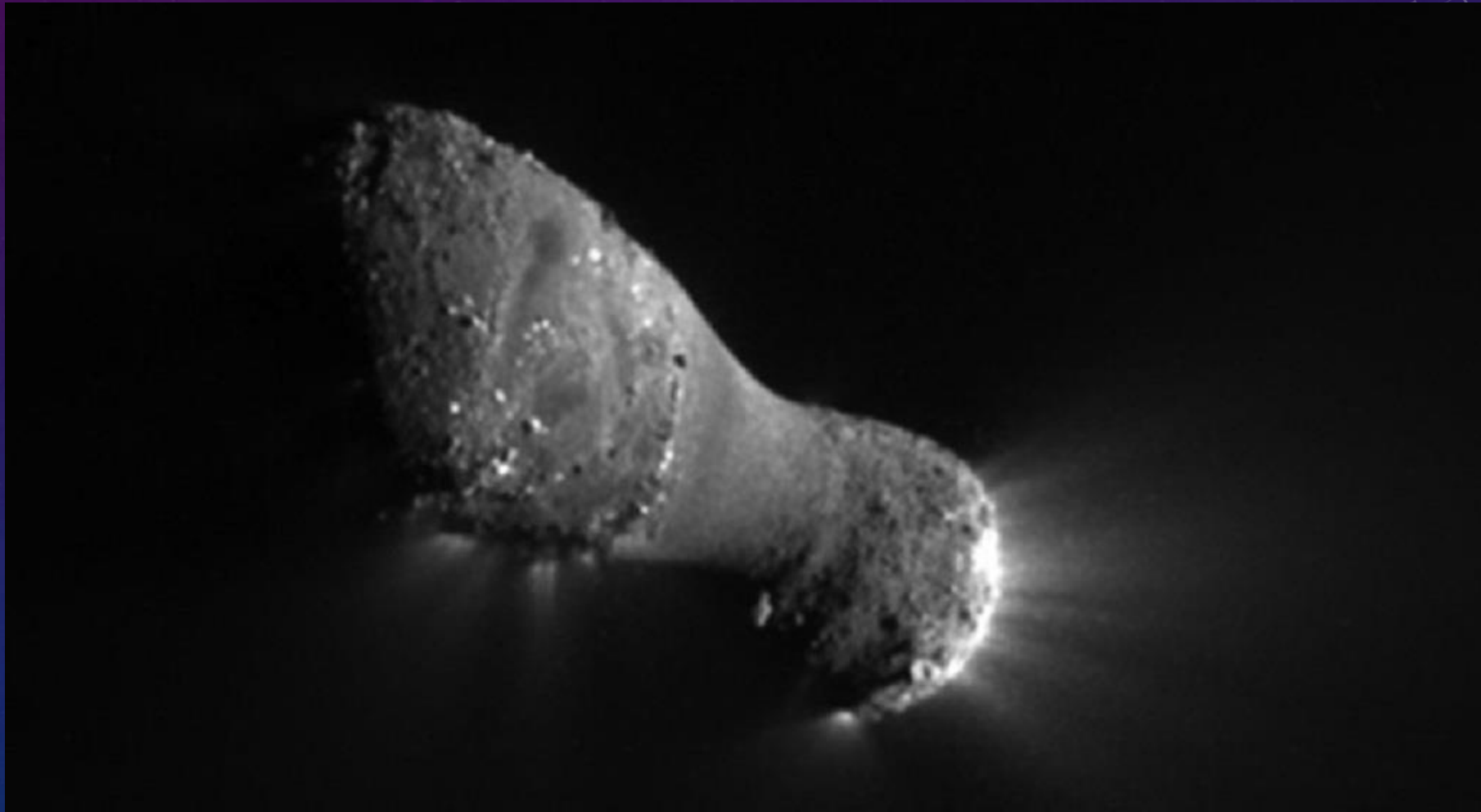
“DEEP IMPACT”. THROW A WASHING MACHINE SIZED LUMP OF COPPER AT COMET TEMPLE I, AND DETERMINE THE NEAR SURFACE PROPERTIES AND CHEMICAL COMPOSITION BY SPECTROSCOPY OF THE EMISSIONS

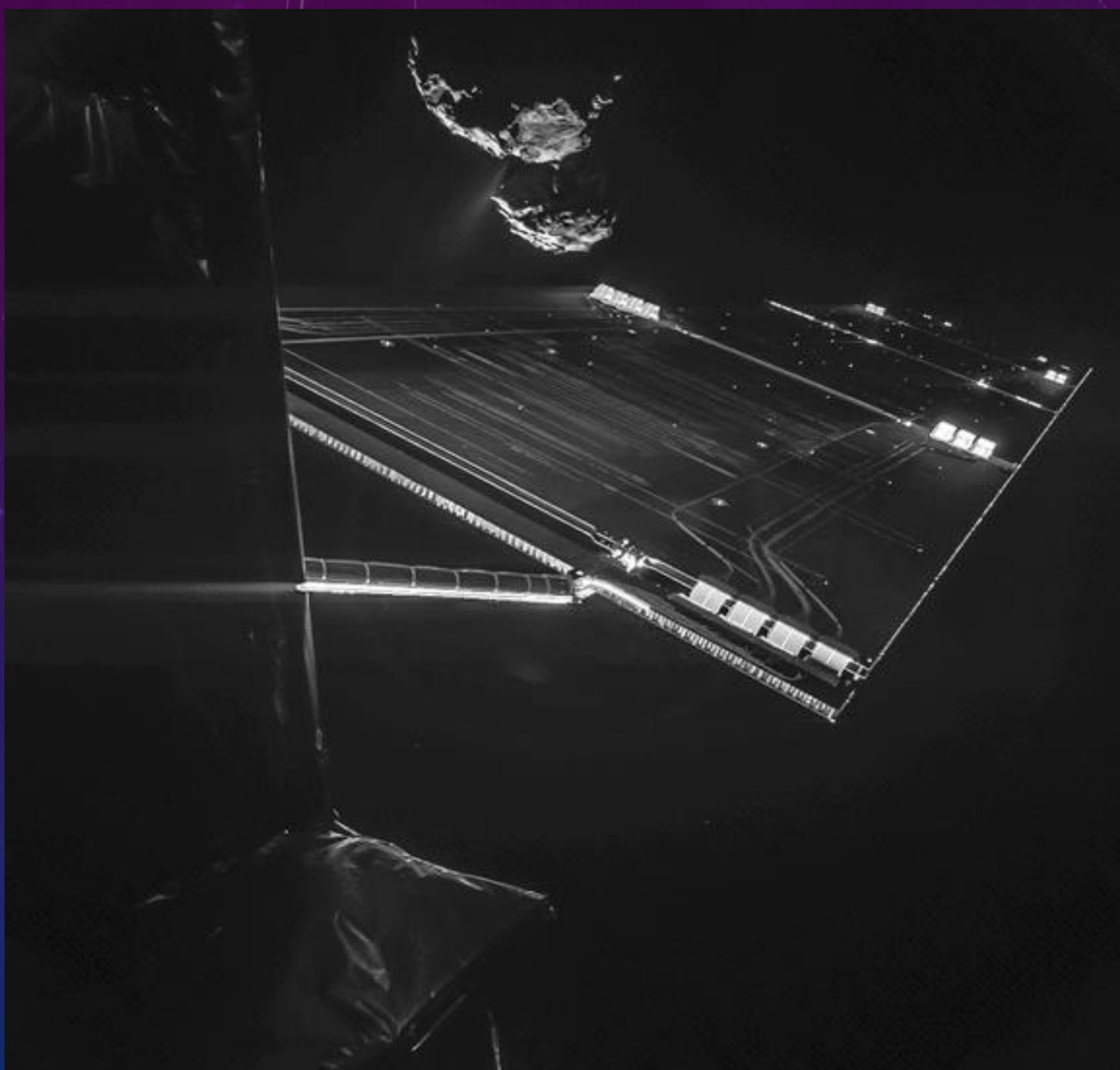


COMETS – A LOT LIKE DEEP FRIED ICE CREAM!

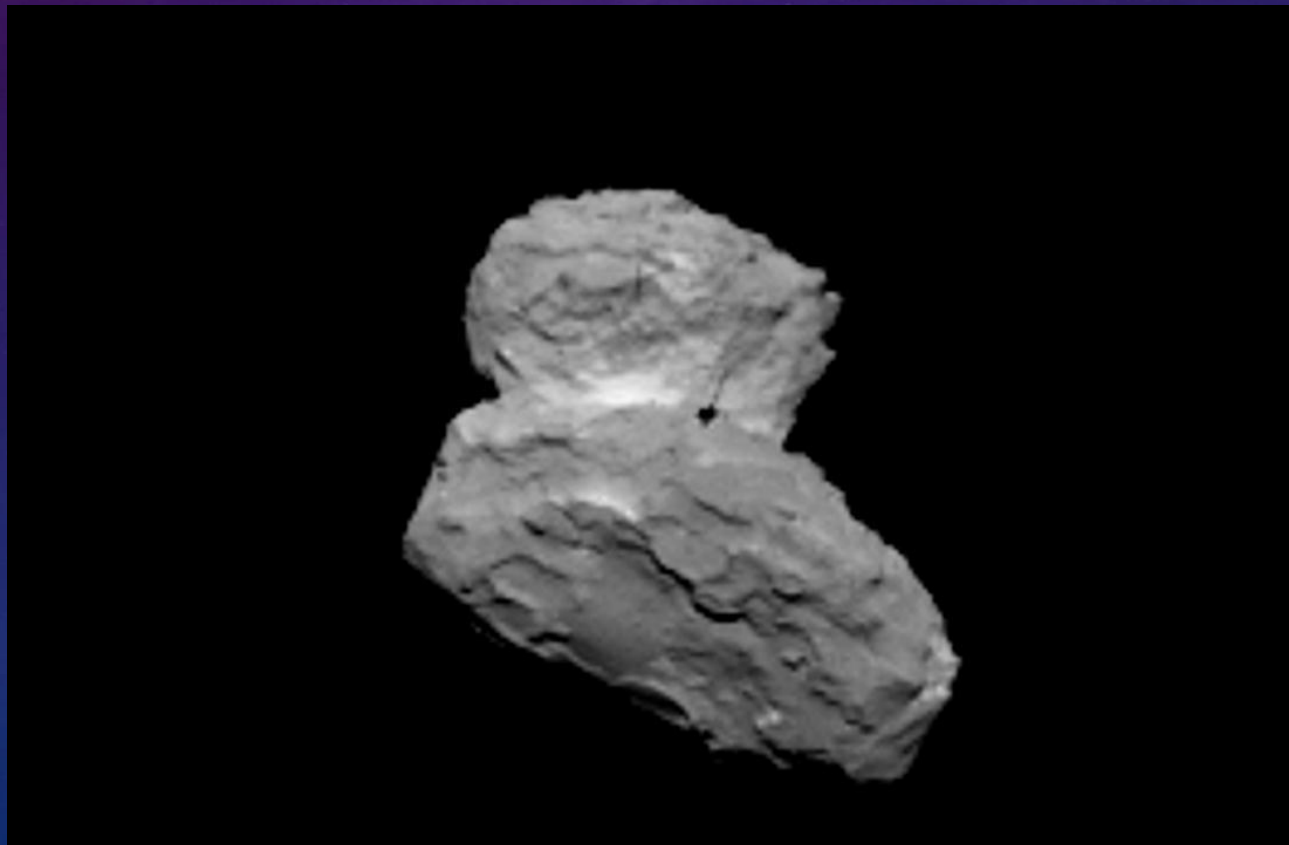


COMET HARTLEY 2: LOOKS LIKE A ROOK ON A CHESS BOARD,
WITH HAIR. SUNLIGHT HEATS AND VAPORIZES VOLATILES
LIKE WATER, CO₂, MAKING THESE JETS





67P/CHURYUMOV–GERASIMENKO – THE RUBBER DUCKY
COMET. TWO ORBITING OBJECTS BUMPED AND FROZE
TOGETHER? OR ONE OBJECT MELTED MOSTLY AROUND ITS
WAIST?



SOME COOL VIDEOS ON THIS STUNNING COMET IN HIGH RESOLUTION, FROM THE ROSETTA / PHILAE MISSION TO ORBIT AND LAND ON THIS COMET

- [YouTube \(13min\) on Comet 67P](#) and spacecraft Philae's discoveries
- Rosetta's final image sequence ([YouTube 3min](#))
- Rosetta's long adventure, visiting Leticia and Stein on its way to Comet 67P ([YouTube 12min](#))

AND NOW – WE HAVE COMET NEOWISE IN OUR SKIES HERE IN THE SUMMER OF 2020

- Comets are named after their discoverer, and given also a letter and number to better catalog them.
- Alas, nowadays, most viewing of the sky with the patience necessary to find a dim fuzzy object never seen before, are done by automated telescopes doing survey work, or satellite missions
- So, we have a lot of Comet PANSTARRs and now NEOWISE ([Near-Earth Objects - Widefield Infrared Survey Explorer](#)), an infrared telescope designed to study asteroids and their temperatures, but was lucky enough to discover this fine comet in our skies today.

NEOWISE: PRE-DAWN JULY 10, FROM THE POGONIP



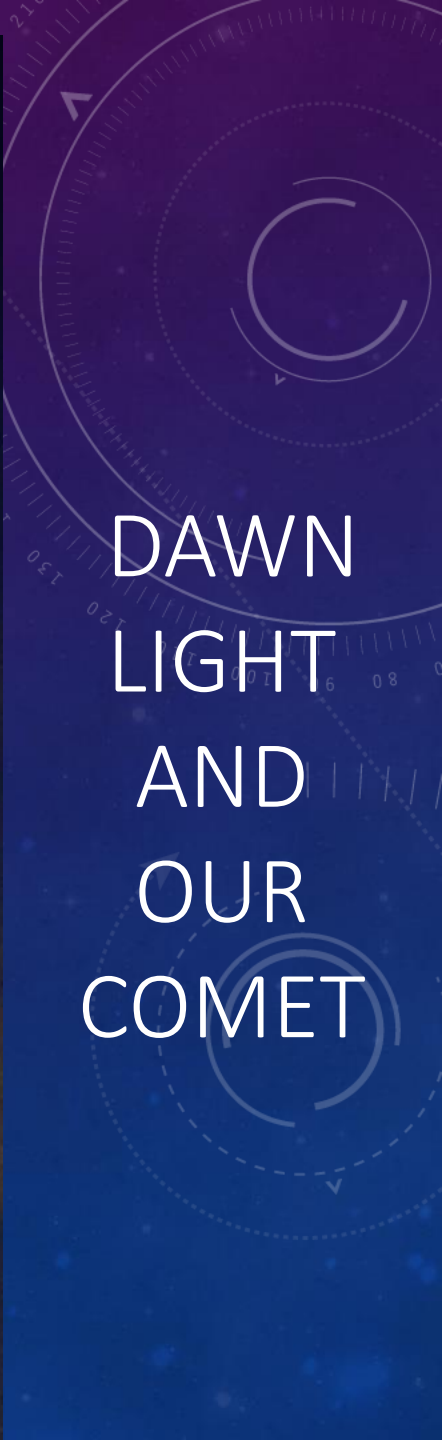


MINUTES LATER; HIGHER IN SKY. NIKON D7000 WITH
35-220MM LENS, STACK OF 10 X 4S IMAGES





DAWN
LIGHT
AND
OUR
COMET



FROM THE TRAIL AT THE TOP OF SPRING ST. BELOW UCSC, NOW WITH WIDE ANGLE LENS SETTING



SAME MORNING: VENUS AND ALDEBAREN IN THE HYADES STAR CLUSTER – BEAUTIFUL CONJUNCTION!



VENUS, ALDEBAREN, AND COMET NEOWISE AT WIDE ANGLE





VENUS IN
A THIN
CLOUD,
INSIDE
THE SIDE-
WAYS "V"
OF THE
HYADES
STAR
CLUSTER

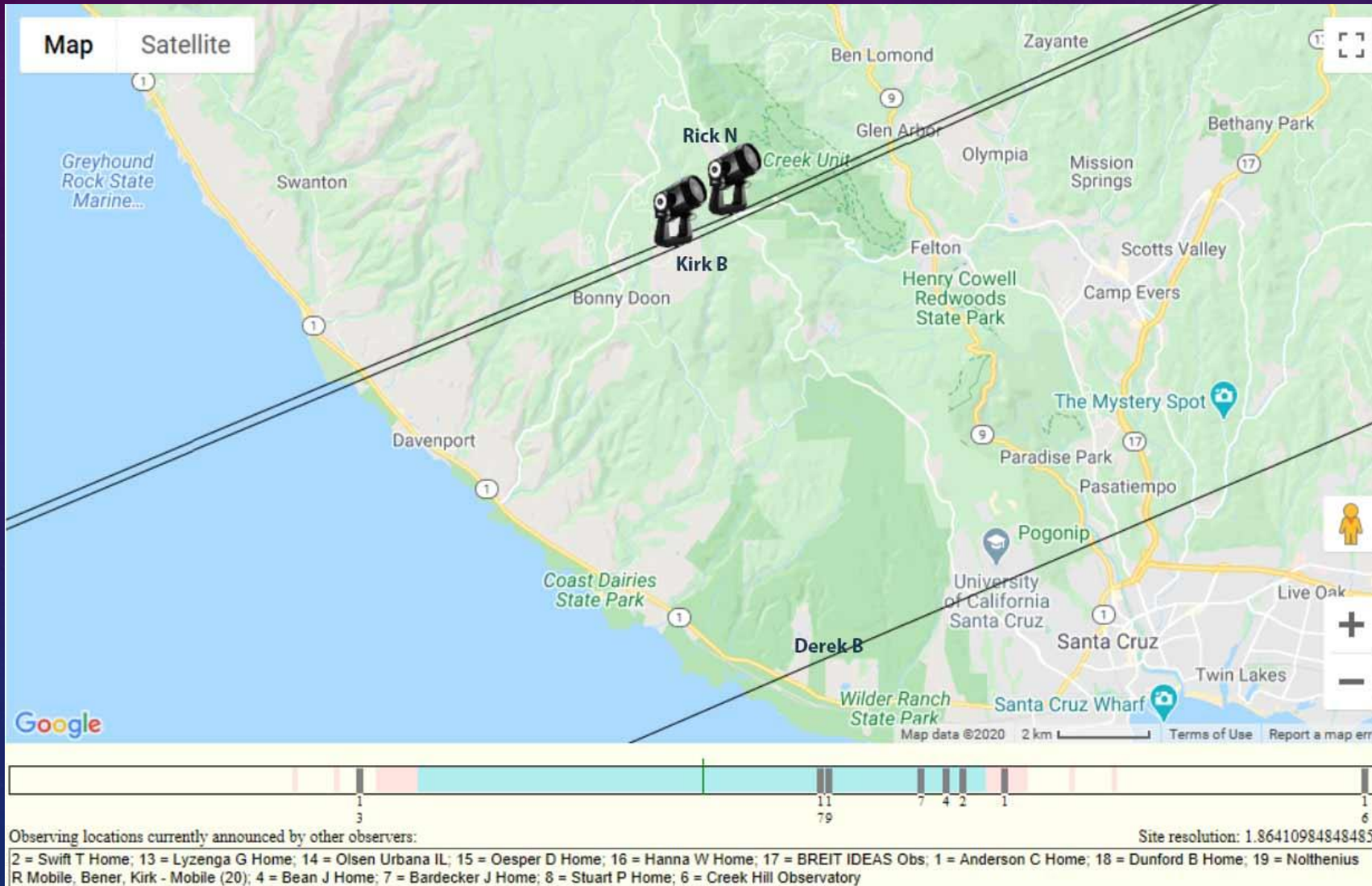
LAST SHOT OF JULY 10; DAWN AND VENUS/ALDEBAREN



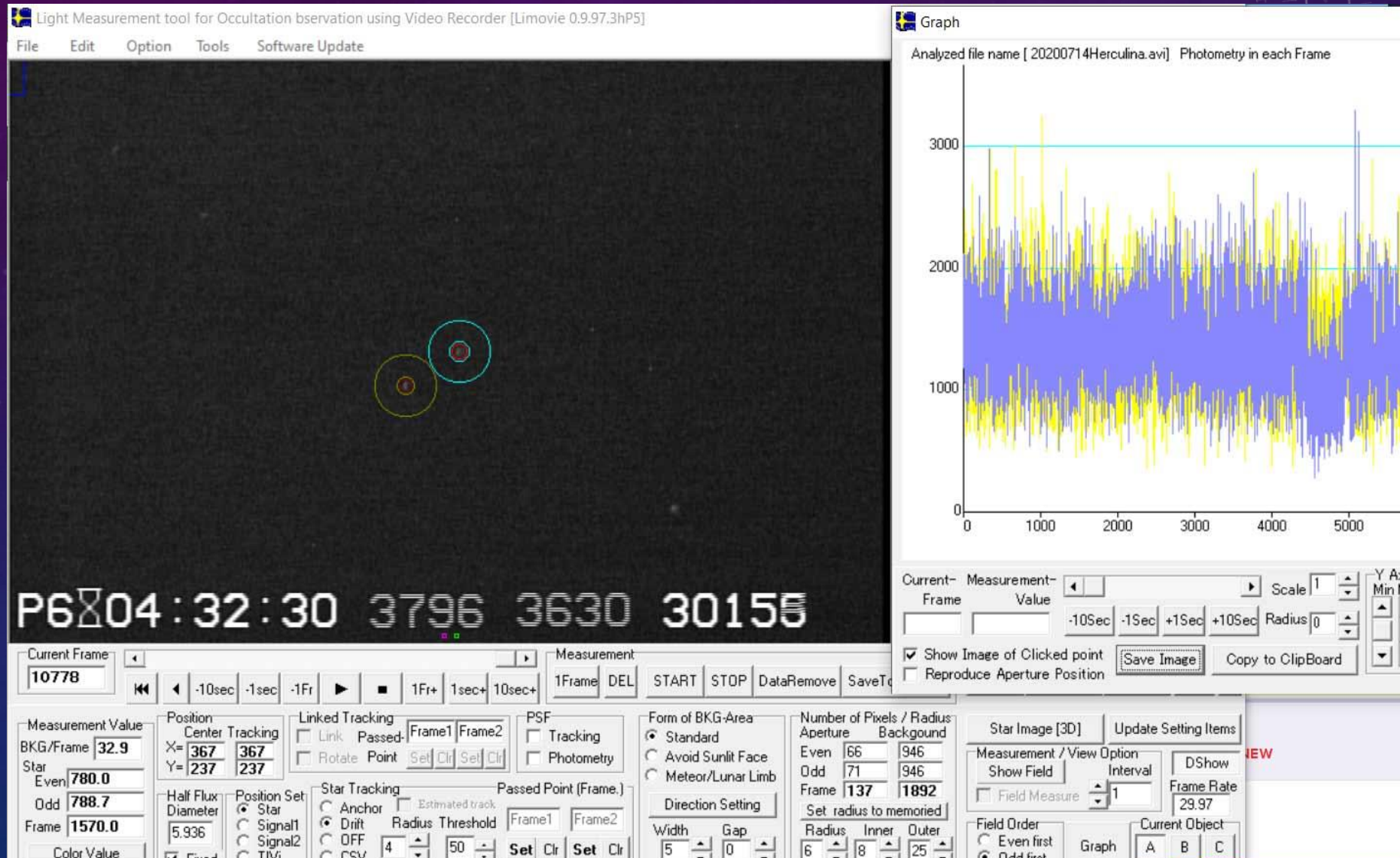
2 DAYS LATER: I'M VIDEO RECORDING THE OCCULTATION OF A STAR BY HERCULINA – DID IT HAVE A LITTLE LONG LOST MOON?



TO CHECK, FORMER STUDENT KIRK BENDER AND I TEAMED UP, WITH IDENTICAL EQUIPMENT TO SEE IF THE STAR WINKED OUT A SECOND TIME, FROM THE HOPED-FOR MOONLET.

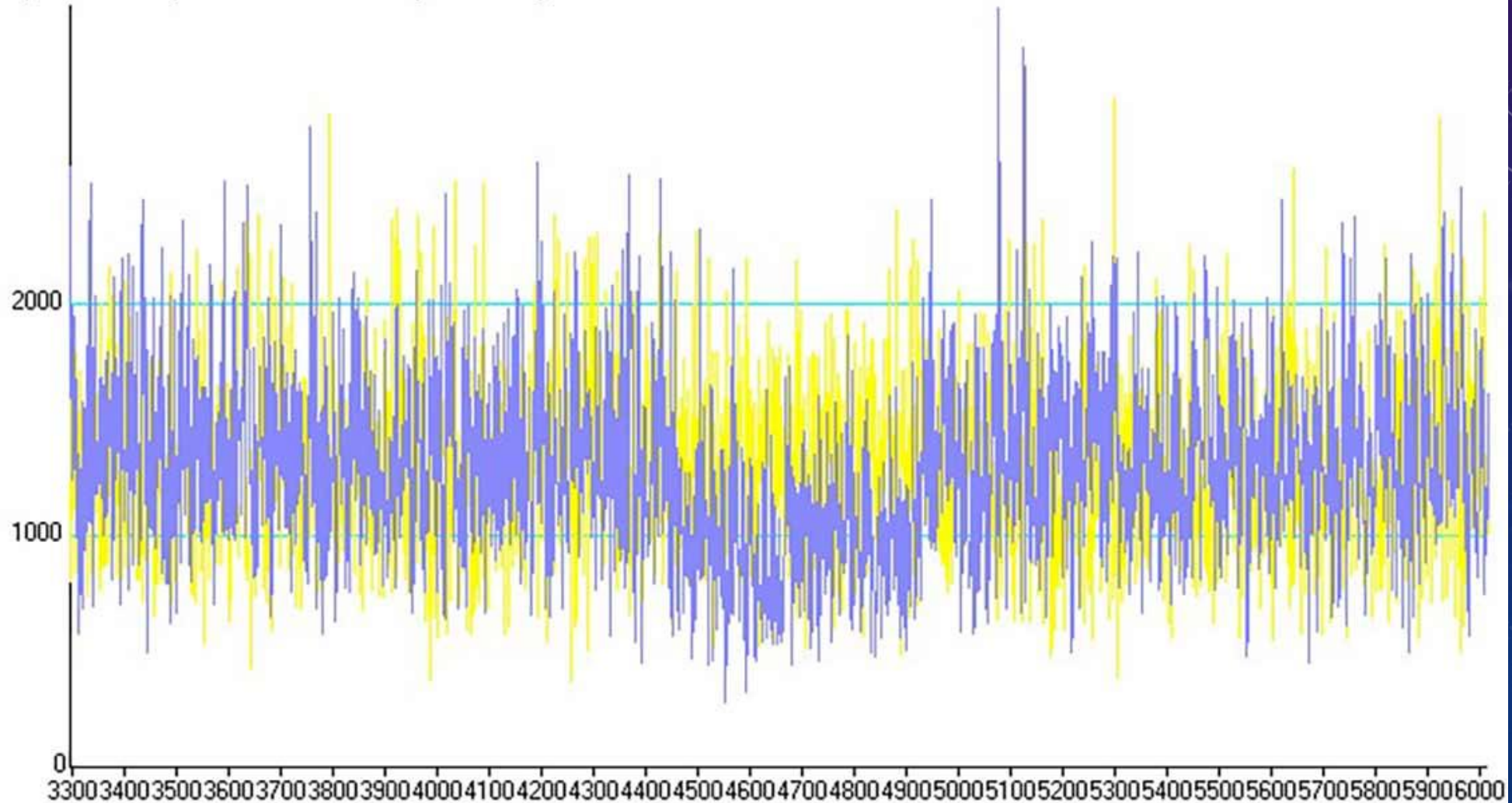


SOFTWARE CALLED "LIMOVIE" CAN BE USED TO EXTRACT THE BRIGHTNESS OF EACH FRAME OF YOUR VIDEO FOR THE TARGET STAR/ASTEROID, AND A NEIGHBORING CONSTANT BRIGHTNESS COMPARISON STAR



SUCCESS! BUT, NO MOON SEEN FROM THE FIRST WEEK'S ANALYSIS OF THE DATA HERE AND OTHER OBSERVERS.

Analyzed file name [20200714Herculina.avi] Photometry in each Frame



3 NIGHTS LATER, NEOWISE NOW WAS IN THE EVENING SKY. I
HIKED TO THE TOP OF EAGLE ROCK FOR A NIGHT OF
IMAGING. NIKON D7000 ON TRIPOD, 35-220MM ZOOM LENS,
AND HELP FROM REGISTAX AND PHOTOSHOP!



DISTANT FIRE SMOKE MADE FOR A COLORFUL TWILIGHT.



FORMER STUDENT KIRK B AND MYSELF, AT EAGLE ROCK-
BONNY DOON – FEELING GOOD AFTER SOME VERY NICE
IMAGING AND PANORAMIC VIEWS IN ALL DIRECTIONS.





A SMALL BRUSHFIRE JUST
SOUTH OF SAN FRANCISCO, ON
THE HORIZON.

A STACK OF 5 X 4S IMAGES AT
100MM FOCAL LENGTH



COMET NEOWISE, EAGLE ROCK, REDDENED BY SMOKE





FROM THE
IPHONE 11,
AMAZING
CAMERA ON
THIS PHONE!

JULY 18 – FROM JUST BELOW LOMA PRIETA PEAK, AT 3,000 FT TO GET ABOVE THE FOG. MET WITH ANOTHER FORMER STUDENT AND HIS SON. I SHOT THIS THROUGH OUR 8" CELESTRON 8SE TELESCOPE, WITH THE NIKON. STACK OF 4 X 4SEC IMAGES AT ISO 2000. GREEN IS FROM C2 EMISSION





IPHONE 11
SHOT OF
ME, COMET,
AND THE
8SE
TELESCOPE.
SILICON
VALLEY
SODIUM
VAPOR
LIGHTS
GLOW TO
THE RIGHT



MARCO AND SOFIA FROM ASTRO 25 JOINED US (MIDDLE).
FORMER STUDENT JEFF JOLIN AND SON ON LEFT, ME ON RIGHT



JULY 19, FROM BONNY DOON AIRSTRIP. NOW USING THE LOSMANDY GM8 MOUNT TO GET LONGER UNTRAILED SHOTS. STACK OF 3 X 30S IMAGES. NOTE HOW MUCH DEEPER THE IMAGE IS!



SAME: 6 X 30S AFTER DARK. YELLOW TAIL IS DUST REFLECTING SUNLIGHT, AND REDDENED BY SMOKY AIR. THE BLUE ION TAIL IS ALMOST LOST FROM SMOKE EXTINCTION





AIRSTRIP LIGHTS. 3 X 5SEC
STACK



The image features a dark blue night sky filled with numerous small, white stars. On the left side, a faint, light-colored comet tail is visible, extending from a small bright spot towards the center. On the right side, there is a semi-transparent technical overlay consisting of concentric circles, dashed lines, and numerical markings (e.g., 200, 120, 80, 100, 90, 80).

JUL 20 AT
BONNY
DOON
AIRSTRIP
AGAIN.
CLEAN
SKIES. A BIT
OF
TWILIGHT
BLUE
REMAINING



LATER AFTER
DARK. MY
DEEPEST
SHOT YET: 15
X 30S STACK
OF TRACKED
SHOTS AT
120MM LENS
SETTING.
CLEAN SKIES
LET THE BLUE
ION TAIL
SHOW
THROUGH.

LATER, LOWER, MORE ATMOSPHERIC EXTINCTION. SEE HOW THE BLUE ION TAIL HAS FADED AND LOST ITS COLOR? AEROSOLS WILL DO THAT, REDDENING WHATEVER IS BEHIND

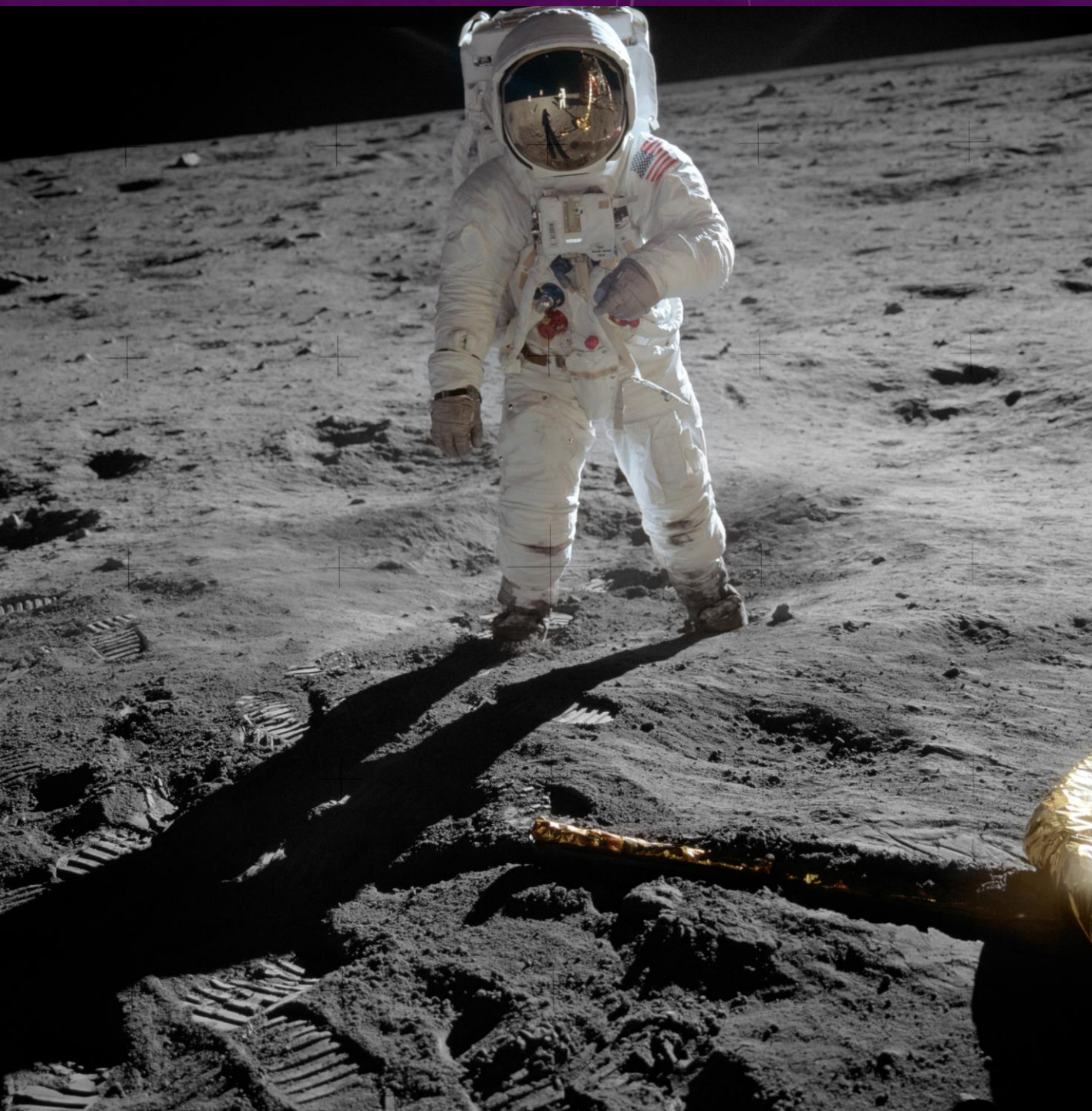




FISHEYE FUN! 10MM FISHEYE LENS GIVES MAJOR DISTORTION AS IT VIEWS MOST OF THE SKY. YES, THAT'S THE OTHER HORIZON ON THE TOP LEFT CORNER. THIS IS THE SUMMER MILKY WAY AT ITS NICEST, ON THIS DARK NIGHT WITH FOG SHROUDING MONTEREY BAY AND SOME OF SF BAY TOO. SHOT AGAIN JULY 20 FROM BONNY DOON AIRSTRIP.

JULY 20 – THIS IS THE 57TH ANNIVERSARY OF THE BIRTH OF MY PASSION FOR ASTRONOMY! A PARTIAL SOLAR ECLIPSE ON JULY 20, 1963 HAPPENED JUST AS PREDICTED, AND I WAS DELIGHTED AND FASCINATED THAT NATURE OBEYED MATHEMATICAL LAWS THAT COULD BE RATIONAL (AS I LIVED IN A LESS RATIONAL CHILDHOOD, ALAS).





JULY 20 WAS ALSO THE 51ST
ANNIVERSARY OF THE
FIRST LANDING ON THE
MOON.

BACK WHEN WE WERE A
GREAT COUNTRY. NOW...
WELL... NOT SO MUCH.