

The background is a deep blue gradient with a subtle pattern of white stars. Overlaid on the left side are several white line-art diagrams. These include concentric circles with arrows indicating orbital paths, and a large circular scale with degree markings from 140 to 260. The text is positioned on the right side of the image.

THE SOLAR SYSTEM

A GUIDE TO THE PLANETS AND THEIR MOONS

DISTANCE FROM THE SUN IN ORDER FROM CLOSEST TO FARTHEST

- Mercury: 5.79×10^7 km
- Venus: 1.08×10^8 km
- Earth: 1.50×10^8 km
- Mars: 2.28×10^8 km
- Ceres: 4.14×10^8 km
- Jupiter: 7.78×10^8 km
- Saturn: 1.43×10^9 km
- Uranus: 2.87×10^9 km
- Neptune: 4.50×10^9 km
- Pluto: 5.90×10^9 km
- Haumea: 6.45×10^9 km
- Makemake: 6.85×10^9 km
- Eris: 1.02×10^{10} km

THE SUN



THE SUN

- Density (Metric): 1.409 g/cm^3
- Mass (Metric): $1.989 \times 10^{30} \text{ kg}$
- Radius(Metric): $6.9551 \times 10^5 \text{ km}$
- Period of Rotation: Because the Sun is a ball of gas it does not rotate as a rigid body and thus has two periods of rotation.
- Period of Rotation at the poles: 37 Earth days
- Period of Rotation at the equator: 26 Earth days

ATMOSPHERIC COMPOSITION OF THE SUN

Hydrogen	73.4%
Helium	24.85%
Oxygen	0.77%
Carbon	0.29%
Iron	0.16%
Neon	0.12%
Nitrogen	0.09%
Silicon	0.07%
Magnesium	0.05%
Sulfur	0.10%



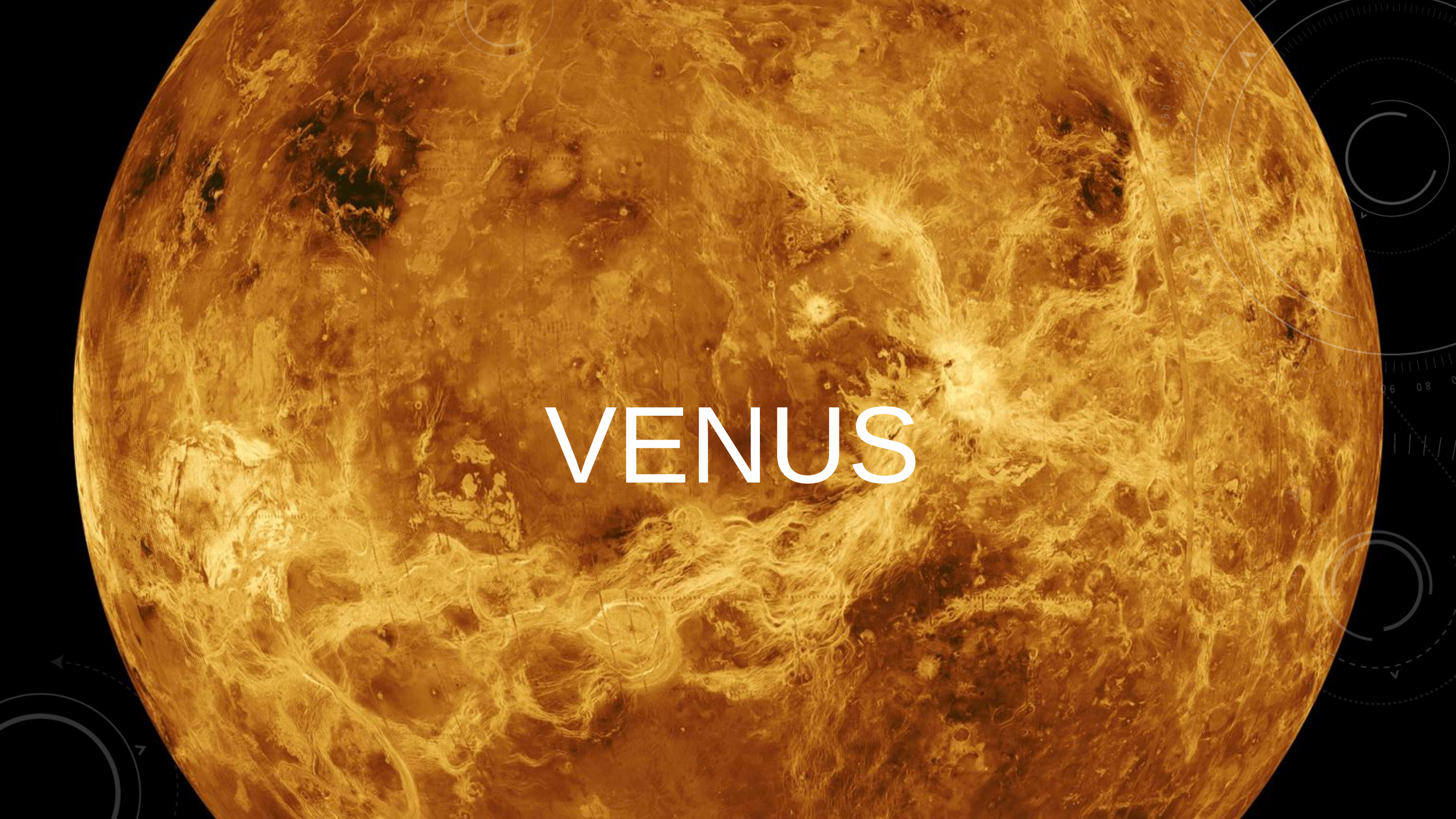
MERCURY

MERCURY

- Density (Metric): 5.427 g/cm^3
- Mass (Metric): $3.3010 \times 10^{23} \text{ kg}$
- Radius(Metric): $2.4397 \times 10^3 \text{ km}$
- Period of Rotation: 58.646 Earth days
- Period of Revolution: 87.965 Earth days
- Mercury has no moons

ATMOSPHERIC COMPOSITION OF MERCURY

Oxygen	42%
Sodium	29%
Hydrogen	22%
Helium	6%
Potassium	0.5%
Argon	Trace Amounts
Carbon Dioxide	Trace Amounts
Water	Trace Amounts
Nitrogen	Trace Amounts
Xenon	Trace Amounts



VENUS

VENUS

- Density (Metric): 5.243 g/cm^3
- Mass (Metric): $4.8673 \times 10^{24} \text{ kg}$
- Radius(Metric): $6.0518 \times 10^3 \text{ km}$
- Period of Rotation: 243.018 Earth days
- However, Venus rotates in the opposite direction of its orbital motion
- Period of Revolution: 224.475 Earth days
- Venus has no moons

ATMOSPHERIC COMPOSITION OF VENUS

Carbon Dioxide	96.5%
Nitrogen	3.5%
Sulfur Dioxide	Trace Amounts
Argon	Trace Amounts
Water	Trace Amounts
Carbon Monoxide	Trace Amounts
Helium	Trace Amounts
Neon	Trace Amounts

A satellite view of Earth showing the Americas, with the word "EARTH" overlaid in the center. The image features a blue ocean, brown and green landmasses, and white cloud patterns. On the right side, there are faint, semi-transparent circular and linear graphical elements, including a scale with numbers 0, 20, 40, 60, 80, and 100, and several concentric circles with arrows, suggesting a technical or scientific theme.

EARTH

EARTH

- Density (Metric): 5.513 g/cm^3
- Mass (Metric): $5.9722 \times 10^{24} \text{ kg}$
- Radius(Metric): $6.3710 \times 10^3 \text{ km}$
- Period of Rotation: 23.934 hours
- Period of Revolution: 1 Earth year
- Atmospheric Composition: Oxygen(O_2), Nitrogen (N_2)
- Earth's natural satellites: The Moon

ATMOSPHERIC COMPOSITION OF EARTH

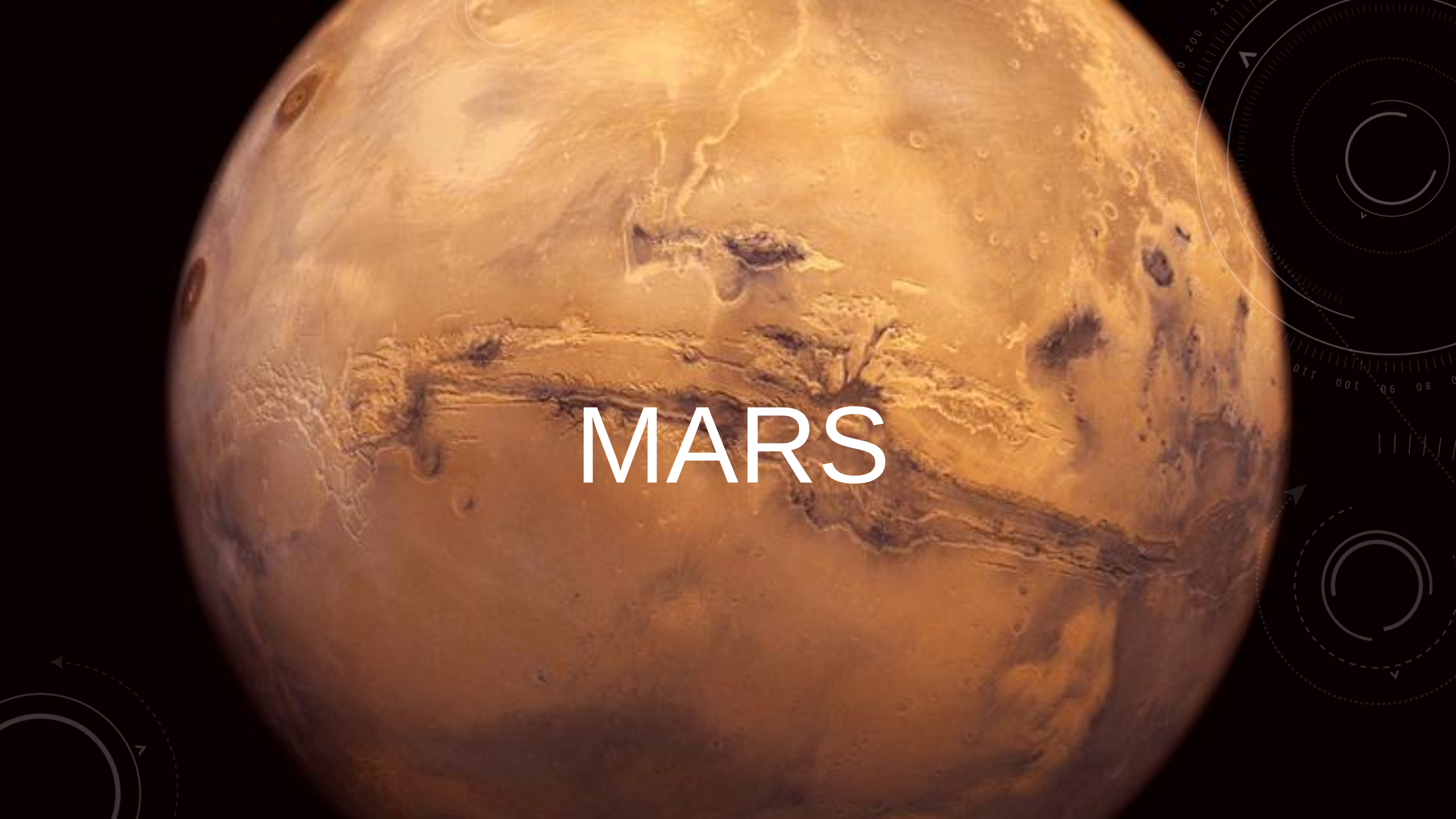
Nitrogen	78.08%
Oxygen	20.95%
Water	~1%
Argon	Trace Amounts
Carbon Dioxide	Trace Amounts
Neon	Trace Amounts
Helium	Trace Amounts
Methane	Trace Amounts
Krypton	Trace Amounts
Hydrogen	Trace Amounts



THE MOON

THE MOON

- Density (Metric): 3.344 g/cm^3
- Mass (Metric): $7.342 \times 10^{22} \text{ kg}$
- Radius(Metric): $1.738 \times 10^3 \text{ km}$
- Period of Rotation: 655.728 Earth hours
- Period of Revolution: 27.322 Earth days
- Distance from the Earth: $\sim 3.844 \times 10^5 \text{ km}$



MARS

MARS

- Density (Metric): 3.934 g/cm^3
- Mass (Metric): $6.4169 \times 10^{23} \text{ kg}$
- Radius(Metric): $3.3895 \times 10^3 \text{ km}$
- Period of Rotation: 24.623 hours
- Period of Revolution: 686.20 Earth days
- Atmospheric Composition: Carbon Dioxide (CO_2), Nitrogen (N_2), Argon (Ar)
- Mars natural satellites: Phobos and Deimos

ATMOSPHERIC COMPOSITION OF MARS

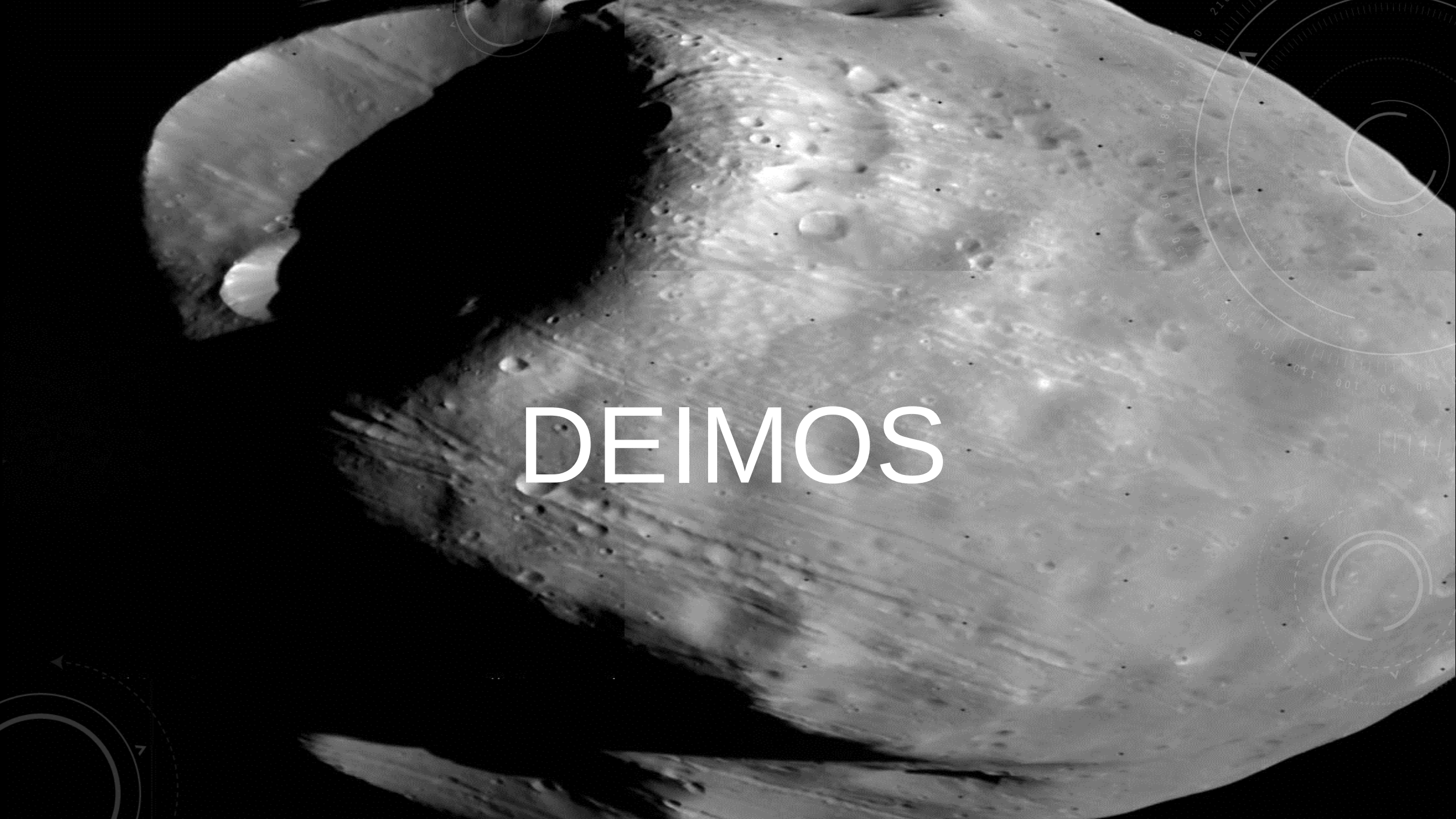
Carbon Dioxide	95.32%
Nitrogen	2.7%
Argon	1.6%
Oxygen	0.13%
Carbon Monoxide	0.08%
Water	Trace Amounts
Nitrogen Oxide	Trace Amounts
Neon	Trace Amounts
Hydrogen-Deuterium-Oxygen	Trace Amounts
Krypton	Trace Amounts



PHOBOS

PHOBOS

- Density (Metric): 1.872 g/cm³
- Mass (Metric): 1.0659×10^{16} kg
- Radius(Metric): 11.1 km (potato shape)
- Period of Rotation: 0.31891 Earth days
- Period of Revolution: 0.31891 Earth days
- Distance from the Mars: ~9,376 km



DEIMOS

DEIMOS

- Density (Metric): 1.471 g/cm³
- Mass (Metric): 1.4762×10^{15} kg
- Radius(Metric): 6.2 km (tri-axial shape)
- Period of Rotation: 1.26244 Earth days
- Period of Revolution: 1.26244 Earth days
- Distance from the Mars: ~23,458 km



CERES

CERES

- Density (Metric): 2.09 g/cm^3
- Mass (Metric): $9.47 \times 10^{20} \text{ kg}$
- Radius(Metric): $4.7620 \times 10^2 \text{ km}$
- Period of Rotation: 9.07417 Earth hours
- Period of Revolution: 4.60 Earth years or 1680.996 Earth days

JUPITER

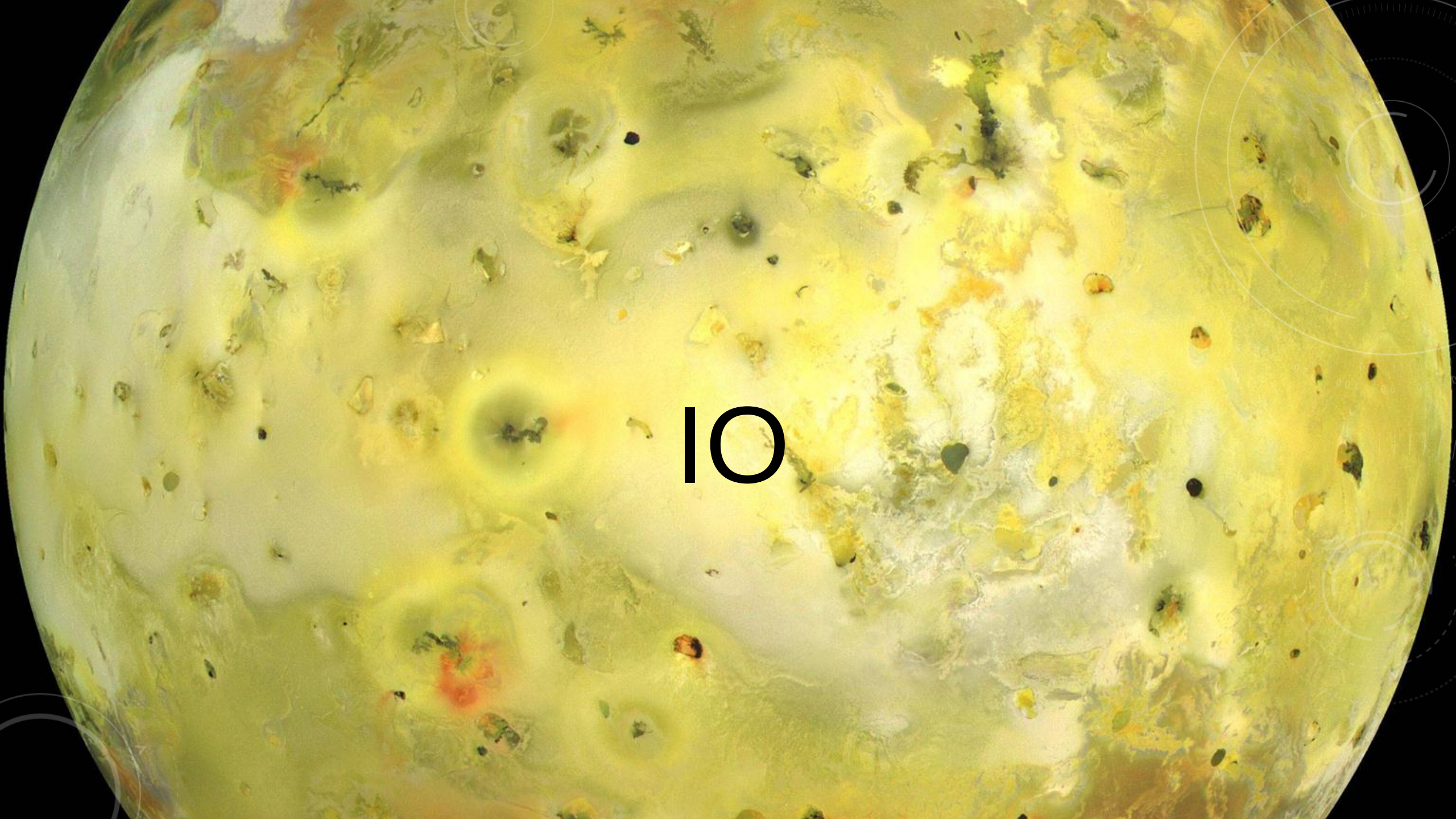


JUPITER

- Density (Metric): 1.326 g/cm^3
- Mass (Metric): $1.8981 \times 10^{27} \text{ kg}$
- Radius(Metric): $6.9911 \times 10^4 \text{ km}$
- Period of Rotation: 9.92496 hours
- Period of Revolution: 11.9 Earth years or 4343.5 Earth days
- Atmospheric Composition: Hydrogen(H_2), Helium (He)
- Jupiter has 50 natural satellites which includes:
Io, Europa, Ganymede, and Callisto

ATMOSPHERIC COMPOSITION OF JUPITER

Molecular hydrogen	89.8%
Helium	10.2%
Methane	Trace Amounts
Ammonia	Trace Amounts
Hydrogen Deuteride	Trace Amounts
Ethane	Trace Amounts
Water	Trace Amounts
Ammonia ice	Trace Amounts
Water ice	Trace Amounts
Ammonia Hydrosulfide	Trace Amounts



10

IO

- Density (Metric): 3.528 g/cm^3
- Mass (Metric): $8.9319 \times 10^{22} \text{ kg}$
- Radius(Metric): 1821.6 km (tri-axial shape)
- Period of Rotation: 1.769138 Earth days
- Period of Revolution: 1.769138 Earth days
- Distance from the Jupiter: $\sim 421,800 \text{ km}$
- Atmosphere: Mainly sulfur dioxide



EUROPA

EUROPA

- Density (Metric): 3.013 g/cm^3
- Mass (Metric): $4.7998 \times 10^{22} \text{ kg}$
- Radius(Metric): $1,560.8 \text{ km}$
- Period of Rotation: 3.551181 Earth days
- Period of Revolution: 3.551181 Earth days
- Distance from the Jupiter: $\sim 671,100 \text{ km}$
- Atmosphere: Tenuous amounts of oxygen



GANYMEDE

GANYMEDE

- Density (Metric): 1.942 g/cm³
- Mass (Metric): 1.4819×10^{23} kg
- Radius(Metric): 2,631.2 km
- Period of Rotation: 7.154553 Earth days
- Period of Revolution: 7.154553 Earth days
- Distance from the Jupiter: ~1,070,400 km
- Atmosphere: Tenuous amounts of oxygen

The image features a large, detailed view of the planet Callisto, showing its heavily cratered surface in shades of brown, tan, and white. The planet is positioned on the left side of the frame. On the right side, there are several technical overlays: a circular scale with degree markings from 0 to 210, concentric circles with arrows indicating rotation or orbit, and a dashed line with an arrow pointing towards the planet. The word 'CALLISTO' is centered over the planet in a large, white, sans-serif font.

CALLISTO

CALLISTO

- Density (Metric): 1.834 g/cm³
- Mass (Metric): 1.0759×10^{23} kg
- Radius(Metric): 2,410.3 km
- Period of Rotation: 16.689018 Earth days
- Period of Revolution: 16.689018 Earth days
- Distance from the Jupiter: ~1,882,700 km
- Atmosphere: Mainly carbon dioxide

A close-up, slightly angled view of the planet Saturn, showing its characteristic rings. The planet's surface is a pale yellowish-tan color with subtle banding. The rings are a mix of light and dark grey, showing some texture. Overlaid on the right side of the image are several futuristic, semi-transparent circular UI elements. These include concentric circles, dashed lines, and arrows, some of which are labeled with numbers like 100, 110, 120, 130, 140, 150, 160, 170, 180, 190, 200, and 210. The overall aesthetic is high-tech and space-themed.

SATURN

SATURN

- Density (Metric): 0.687 g/cm^3
- Mass (Metric): $5.6832 \times 10^{26} \text{ kg}$
- Radius(Metric): $5.8232 \times 10^4 \text{ km}$
- Period of Rotation: 10.656 hours
- Period of Revolution: 29.5 Earth years or 10767.5 Earth days
- Atmospheric Composition: Hydrogen(H_2), Helium (He)
- Saturn has 53 natural satellites which includes: Mimas, Enceladus, Tethys, Dione, Rhea, Titan, Hyperion, and Iapetus

ATMOSPHERIC COMPOSITION OF SATURN

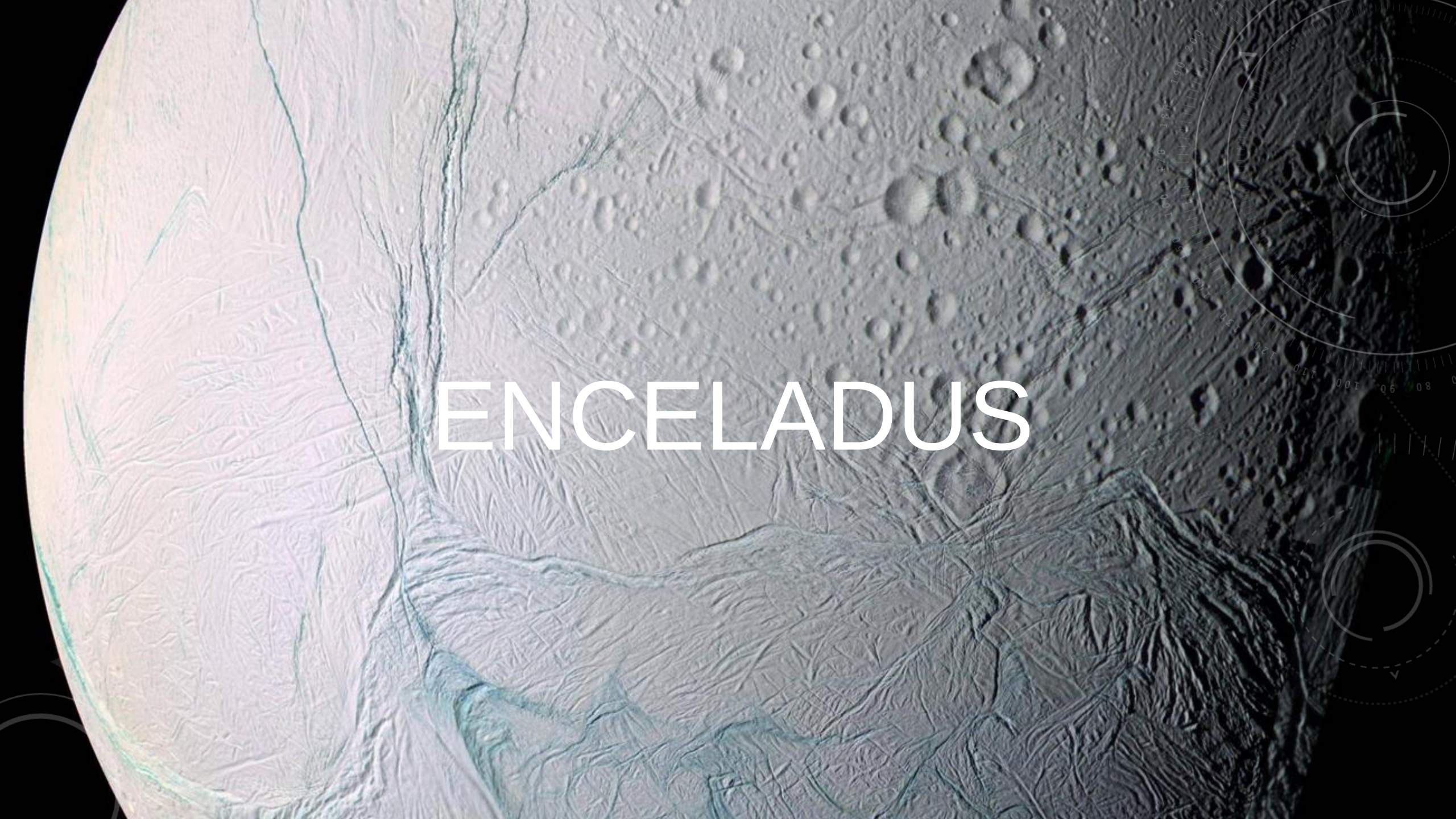
Molecular Hydrogen	96.3%
Helium	3.25%
Methane	Trace Amounts
Ammonia	Trace Amounts
Hydrogen Deuteride	Trace Amounts
Ethane	Trace Amounts
Ammonia ice	Trace Amounts
Water ice	Trace Amounts
Ammonia Hydrosulfide	Trace Amounts



MIMAS

MIMAS

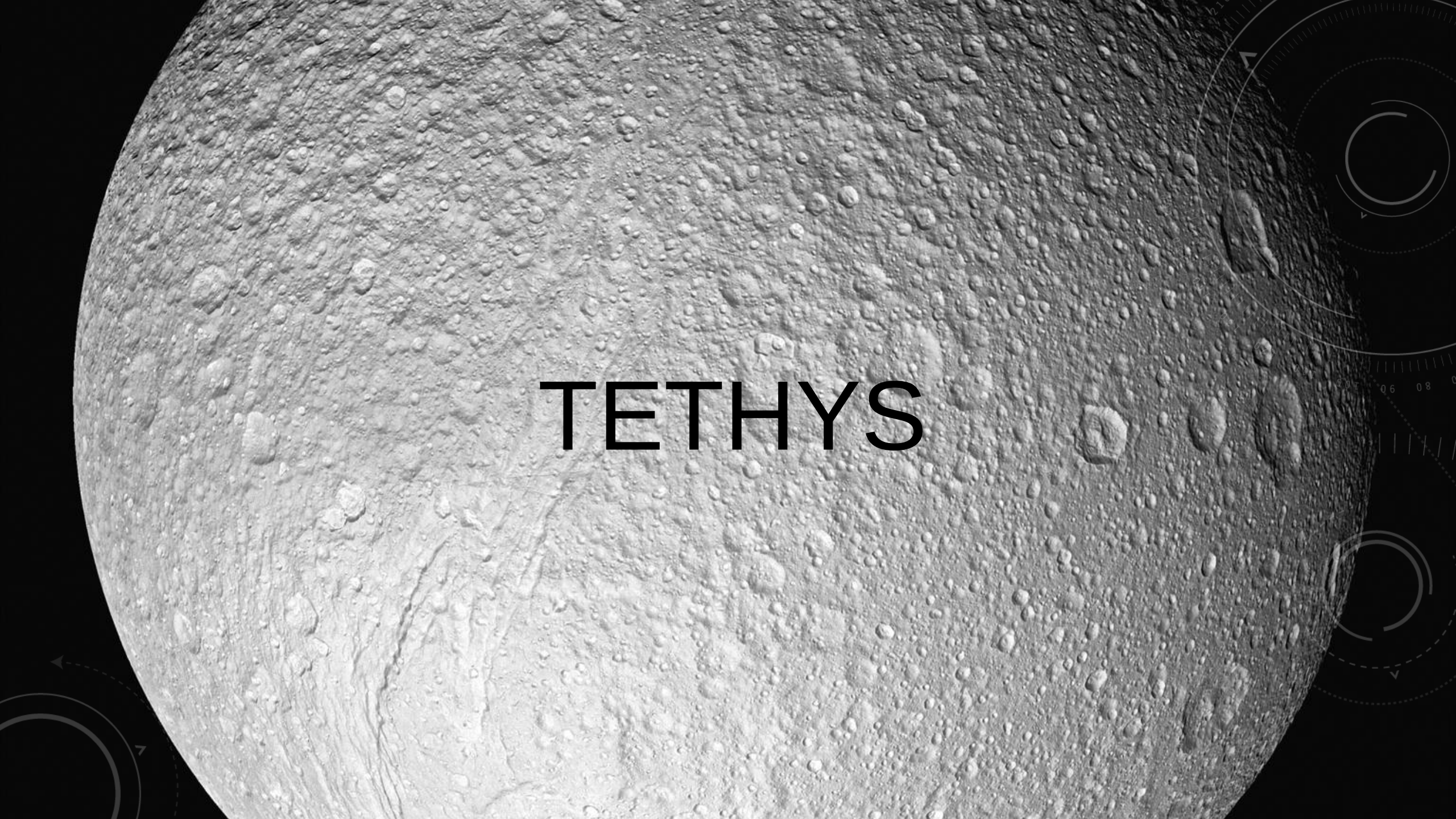
- Density (Metric): 1.15 g/cm^3
- Mass (Metric): $3.7506 \times 10^{19} \text{ kg}$
- Radius(Metric): $1.982 \times 10^2 \text{ km}$
- Period of Rotation: 0.9424218 Earth days
- Period of Revolution: 0.9424218 Earth days
- Distance from the Saturn: $\sim 185,539 \text{ km}$

A composite image of the moon Enceladus. The left side shows a smooth, icy surface with a subtle color gradient from yellow to blue. The right side shows a darker, heavily cratered surface. A technical overlay on the right includes concentric circles, a scale from 0 to 100, and a dashed line with an arrow. The word 'ENCELADUS' is centered in white capital letters.

ENCELADUS

ENCELADUS

- Density (Metric): 1.608 g/cm^3
- Mass (Metric): $1.0794 \times 10^{20} \text{ kg}$
- Radius(Metric): 252.1 km
- Period of Rotation: 1.370218 Earth days
- Period of Revolution: 1.370218 Earth days
- Distance from the Saturn: ~238,037 km
- Atmosphere: Mostly water with trace amounts of nitrogen, carbon dioxide, and methane



TETHYS

TETHYS

- Density (Metric): 0.973 g/cm³
- Mass (Metric): 6.1755×10^{20} kg
- Radius(Metric): 533.0 km
- Period of Rotation: 1.887802 Earth days
- Period of Revolution: 1.887802 Earth days
- Distance from the Saturn: ~294,672 km



DIONE

DIONE

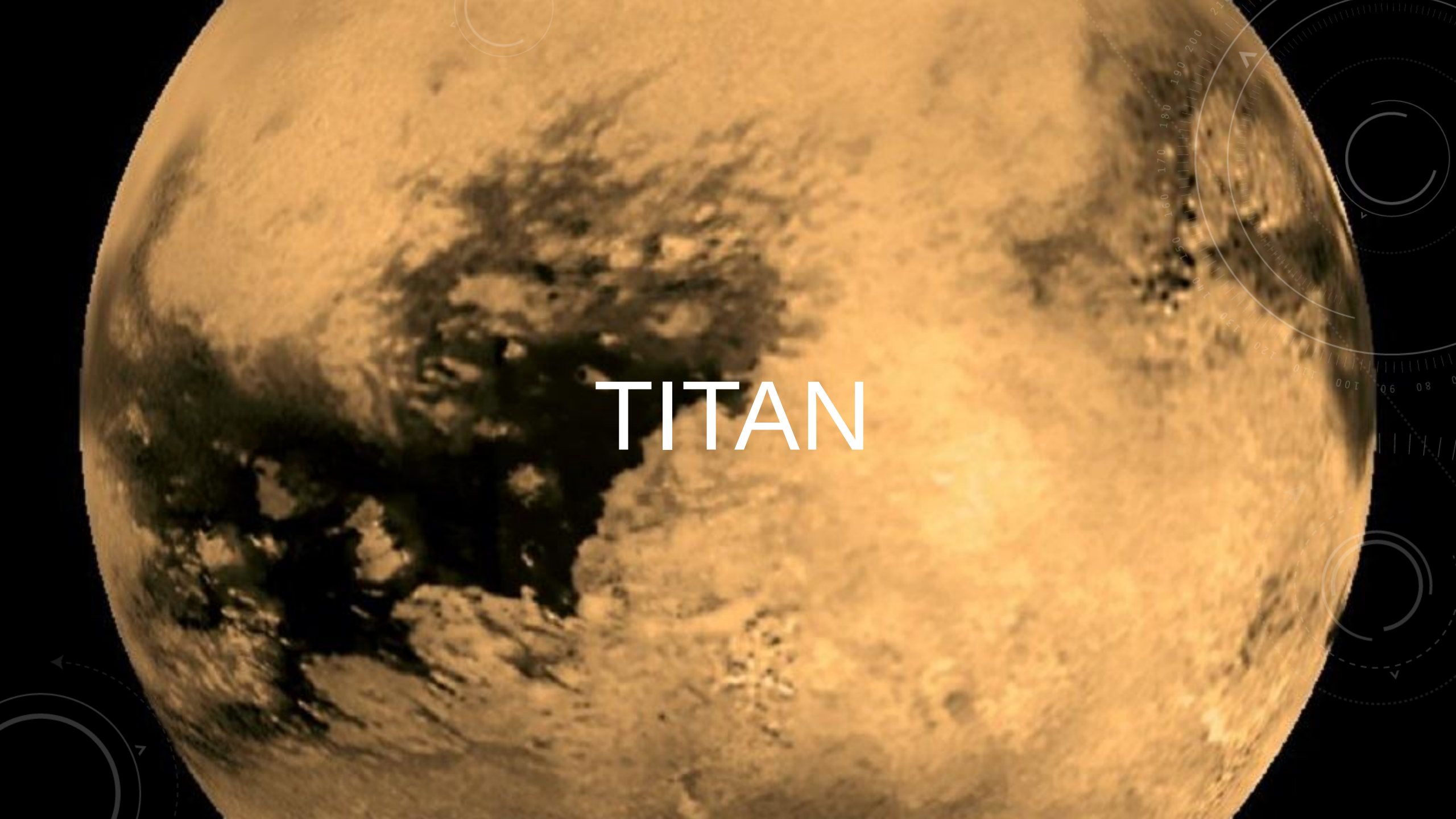
- Density (Metric): 1.476 g/cm³
- Mass (Metric): 1.0957×10^{21} kg
- Radius(Metric): 561.7 km
- Period of Rotation: 2.736915 Earth days
- Period of Revolution: 2.736915 Earth days
- Distance from the Saturn: ~377,415 km

A large, cratered sphere representing the planet Rhea, with faint technical diagrams in the background.

RHEA

RHEA

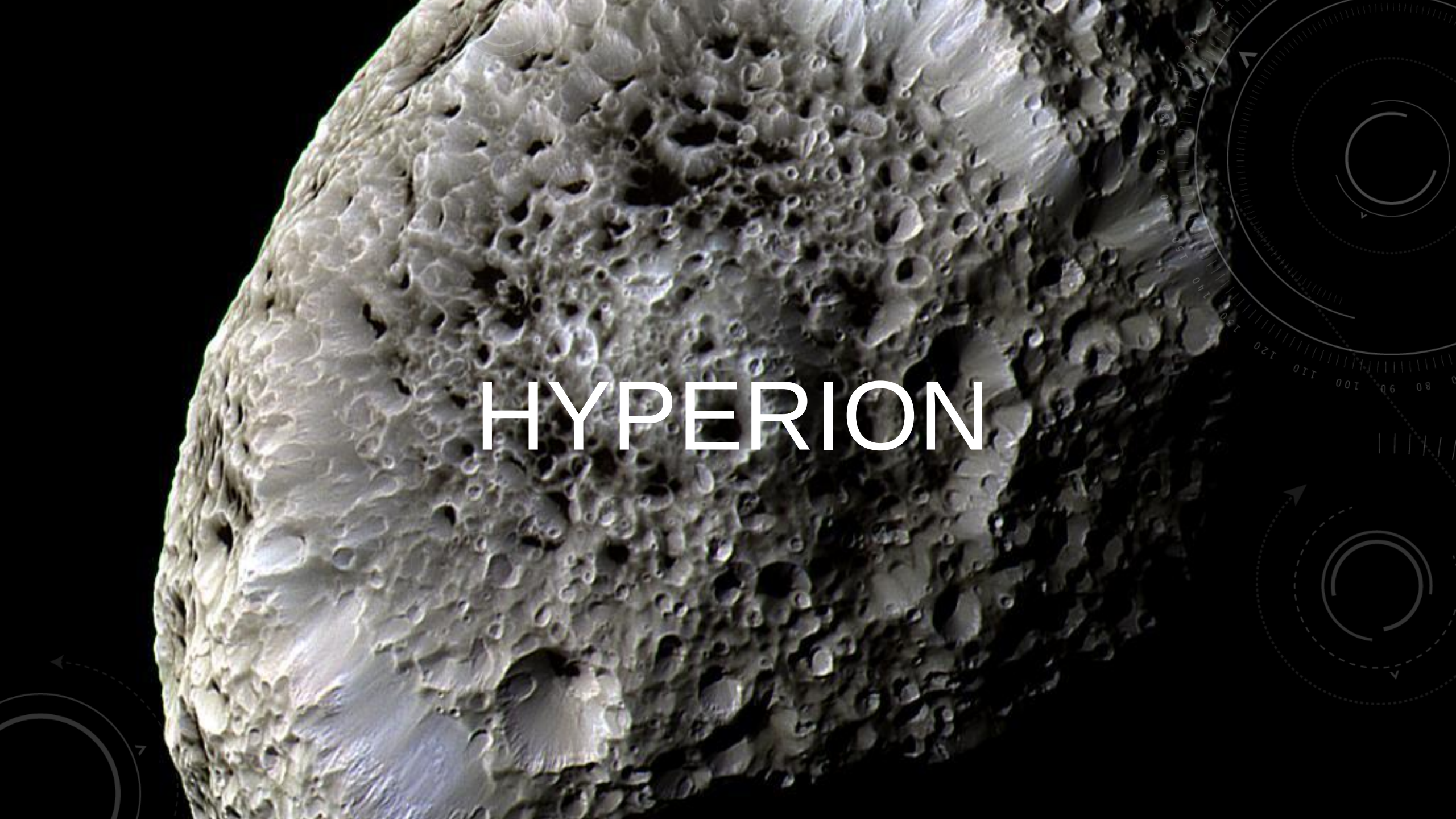
- Density (Metric): 1.233 g/cm³
- Mass (Metric): 2.3071×10^{21} kg
- Radius(Metric): 764.3 km
- Period of Rotation: 4.517500 Earth days
- Period of Revolution: 4.517500 Earth days
- Distance from the Saturn: ~527,068 km



TITAN

TITAN

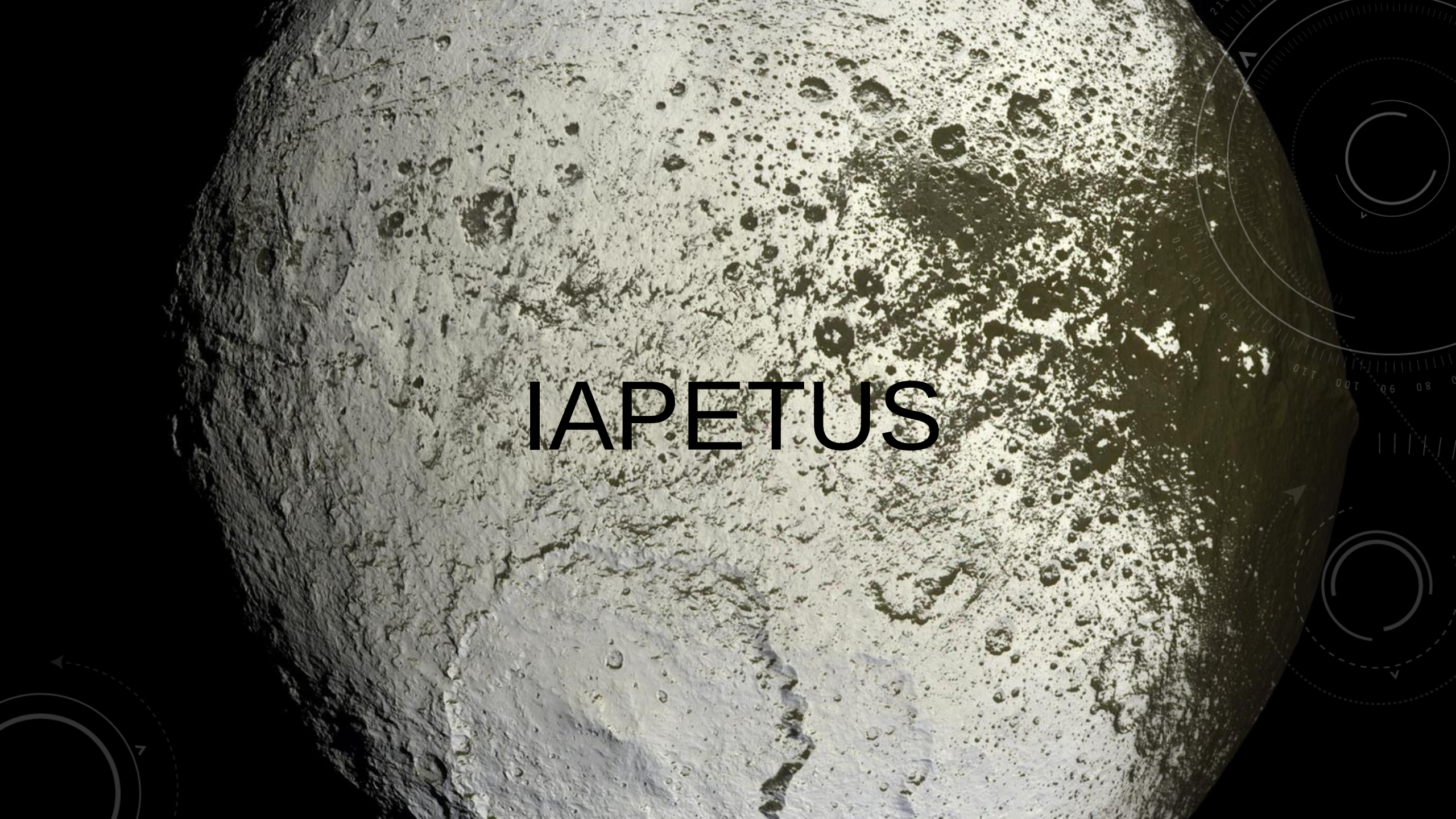
- Density (Metric): 1.882 g/cm³
- Mass (Metric): 1.3455×10^{23} kg
- Radius(Metric): 2,574.7 km
- Period of Rotation: 15.945421 Earth days
- Period of Revolution: 15.945421 Earth days
- Distance from the Saturn: ~1,221,865 km
- Atmosphere: Mostly nitrogen and methane

The image features a large, detailed asteroid with a heavily cratered surface, rendered in shades of grey and brown. The asteroid is set against a solid black background. Overlaid on the right side of the image are several technical, futuristic graphics in a light grey color. These include a large circular scale with numerical markings from 0 to 210, concentric circles with arrows indicating rotation, and other geometric patterns. The word "HYPERION" is centered in a large, white, sans-serif font.

HYPERION

HYPERION

- Density (Metric): 0.544 g/cm³
- Mass (Metric): 5.5855×10^{18} kg
- Radius(Metric): 135.0 km
- Period of Rotation: 21.276609 Earth days in the direction opposite of revolution
- Period of Revolution: 21.276609 Earth days
- Distance from the Saturn: ~1,500,934 km



IAPETUS

IAPETUS

- Density (Metric): 1.083 g/cm³
- Mass (Metric): 1.8060×10^{21} kg
- Radius(Metric): 735.6 km
- Period of Rotation: 79.330183 Earth days
- Period of Revolution: 79.330183 Earth days
- Distance from the Saturn: ~3,560,851 km



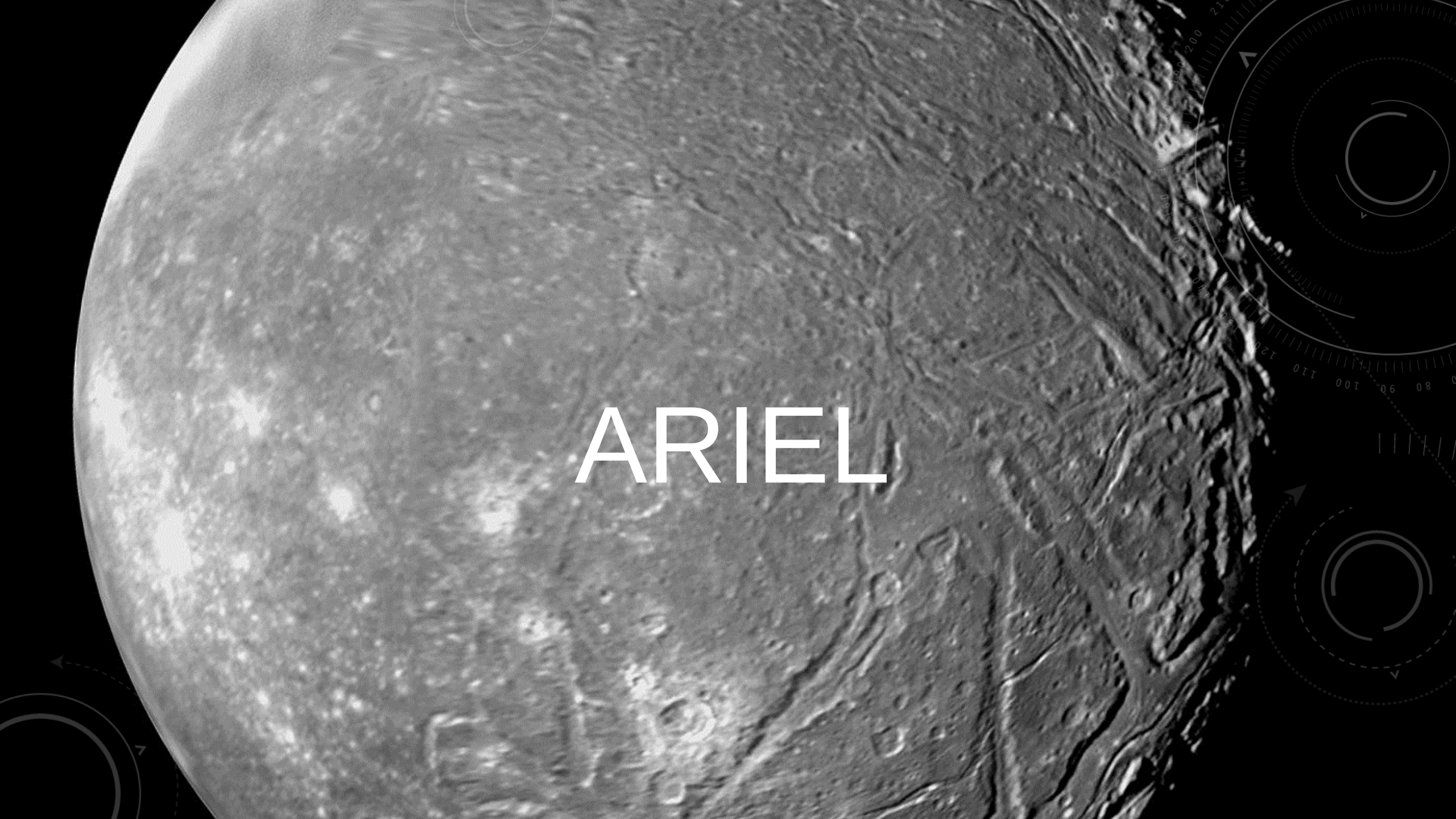
URANUS

URANUS

- Density (Metric): 1.270 g/cm^3
- Mass (Metric): $8.6810 \times 10^{25} \text{ kg}$
- Radius(Metric): $2.5362 \times 10^4 \text{ km}$
- Period of Rotation: 17.23992 Earth hours
- However, Uranus rotates in the opposite direction of its orbital motion
- Period of Revolution: 84 Earth years or 30660 Earth days
- Atmospheric Composition: Hydrogen(H_2), Helium (He), Methane (CH_4)
- Uranus has 27 natural satellites which includes: Ariel, Umbriel, Titania, Oberon, Miranda

ATMOSPHERIC COMPOSITION OF URANUS

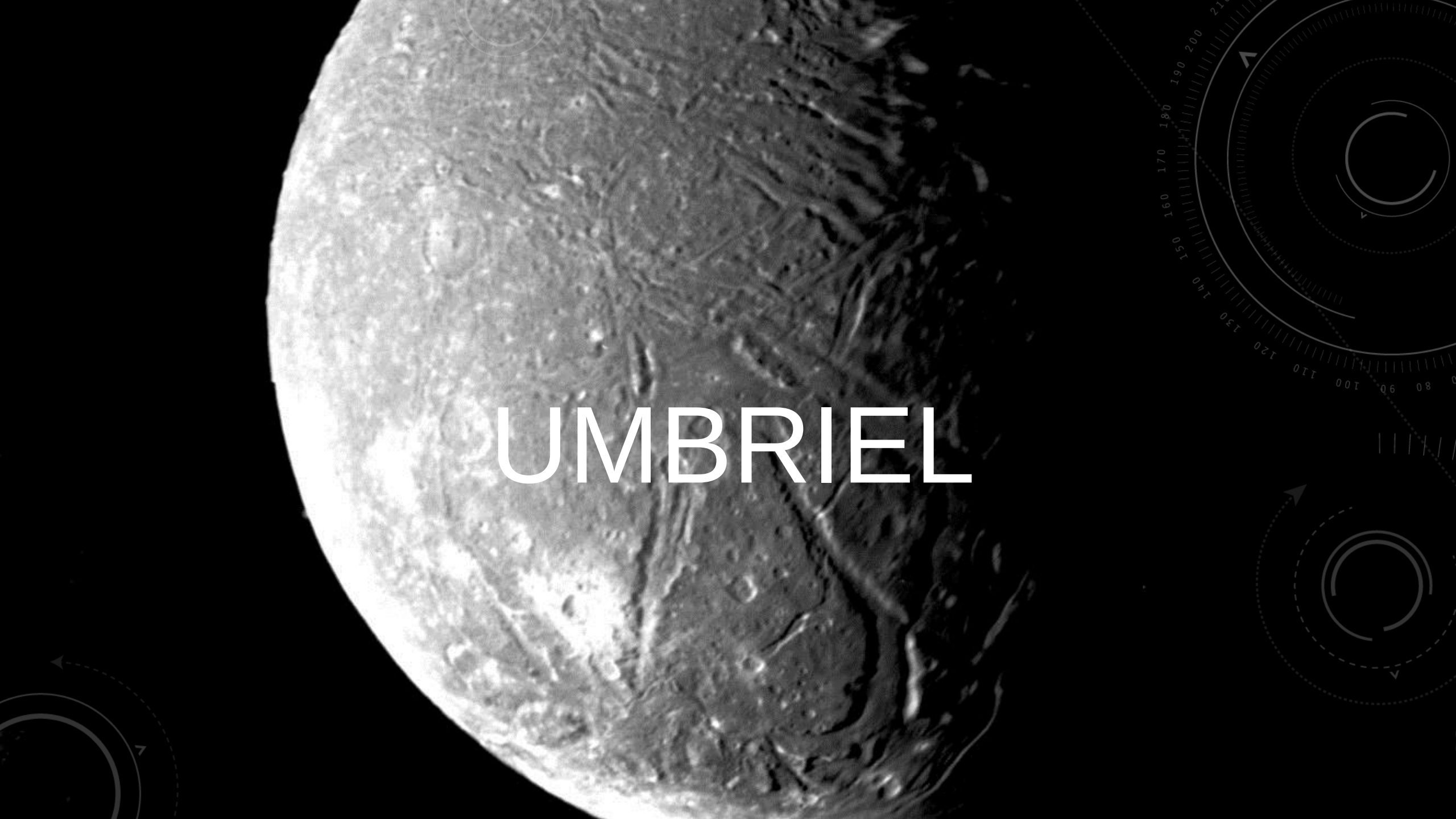
Molecular Hydrogen	82.5%
Helium	15.2%
Methane	2.3%
Hydrogen Deuteride	Trace Amounts
Ammonia ice	Trace Amounts
water ice	Trace Amounts
ammonia hydrosulfide	Trace Amounts
methane ice	Trace Amounts

A detailed grayscale image of the planet Ariel, showing its heavily cratered and ridged surface. The planet is partially visible on the left side of the frame. Overlaid on the right side are several technical diagrams: a large circular scale with degree markings (0, 20, 40, 60, 80, 100, 120, 140, 160, 180, 200, 220) and arrows indicating orbital or rotational paths; and two smaller circular diagrams below it, one with concentric circles and arrows, and another with dashed lines and arrows, likely representing different orbital models or data. The word "ARIEL" is centered in the middle of the image in a large, white, sans-serif font.

ARIEL

ARIEL

- Density (Metric): 1.592 g/cm^3
- Mass (Metric): $1.2948 \times 10^{21} \text{ kg}$
- Radius(Metric): 578.9 km
- Period of Rotation: 2.520379 Earth days
- Period of Revolution: 2.520379 Earth days
- Distance from the Uranus: $\sim 190,900 \text{ km}$



UMBRIEL

UMBRIEL

- Density (Metric): 1.459 g/cm³
- Mass (Metric): 1.2214×10^{21} kg
- Radius(Metric): 584.7 km
- Period of Rotation: 4.144177 Earth days
- Period of Revolution: 4.144177 Earth days
- Distance from the Uranus: ~266,000 km



TITANIA

TITANIA

- Density (Metric): 1.662 g/cm³
- Mass (Metric): 3.4200×10^{21} kg
- Radius(Metric): 788.9 km
- Period of Rotation: 8.705872 Earth days
- Period of Revolution: 8.705872 Earth days
- Distance from the Uranus: ~436,300 km



OBERON

OBERON

- Density (Metric): 1.559 g/cm³
- Mass (Metric): 2.8834×10^{21} kg
- Radius(Metric): 761.4 km
- Period of Rotation: 13.463239 Earth days
- Period of Revolution: 13.463239 Earth days
- Distance from the Uranus: ~583,500 km

A grayscale image of the planet Miranda, showing its heavily cratered and textured surface. The planet is tilted, and the word "MIRANDA" is centered in a bold, black, sans-serif font. On the right side, there are several concentric circles and a scale with numbers 0.6 and 0.8. On the bottom left, there are more concentric circles and a dashed line with an arrow pointing upwards.

MIRANDA

MIRANDA

- Density (Metric): 1.214 g/cm^3
- Mass (Metric): $6.5941 \times 10^{19} \text{ kg}$
- Radius(Metric): $2.358 \times 10^2 \text{ km}$
- Period of Rotation: 1.413479 Earth days
- Period of Revolution: 1.413479 Earth days
- Distance from the Uranus: $\sim 129,900 \text{ km}$

The image features a large, deep blue sphere representing the planet Neptune, showing faint cloud patterns. Overlaid on the right side are several white, semi-transparent circular diagrams. These include concentric circles with arrows indicating clockwise and counter-clockwise directions, and a larger circular scale with numerical markings from 80 to 210. The word 'NEPTUNE' is centered in white, bold, sans-serif capital letters.

NEPTUNE

NEPTUNE

- Density (Metric): 1.638 g/cm^3
- Mass (Metric): $1.0241 \times 10^{26} \text{ kg}$
- Radius(Metric): $2.4622 \times 10^4 \text{ km}$
- Period of Rotation: 16.11000 Earth hours
- Period of Revolution: 165 Earth years or 60225 Earth days
- Atmospheric Composition: Hydrogen(H_2), Helium (He), Methane (CH_4)
- Neptune has 13 natural satellites which includes : Triton

ATMOSPHERIC COMPOSITION OF NEPTUNE

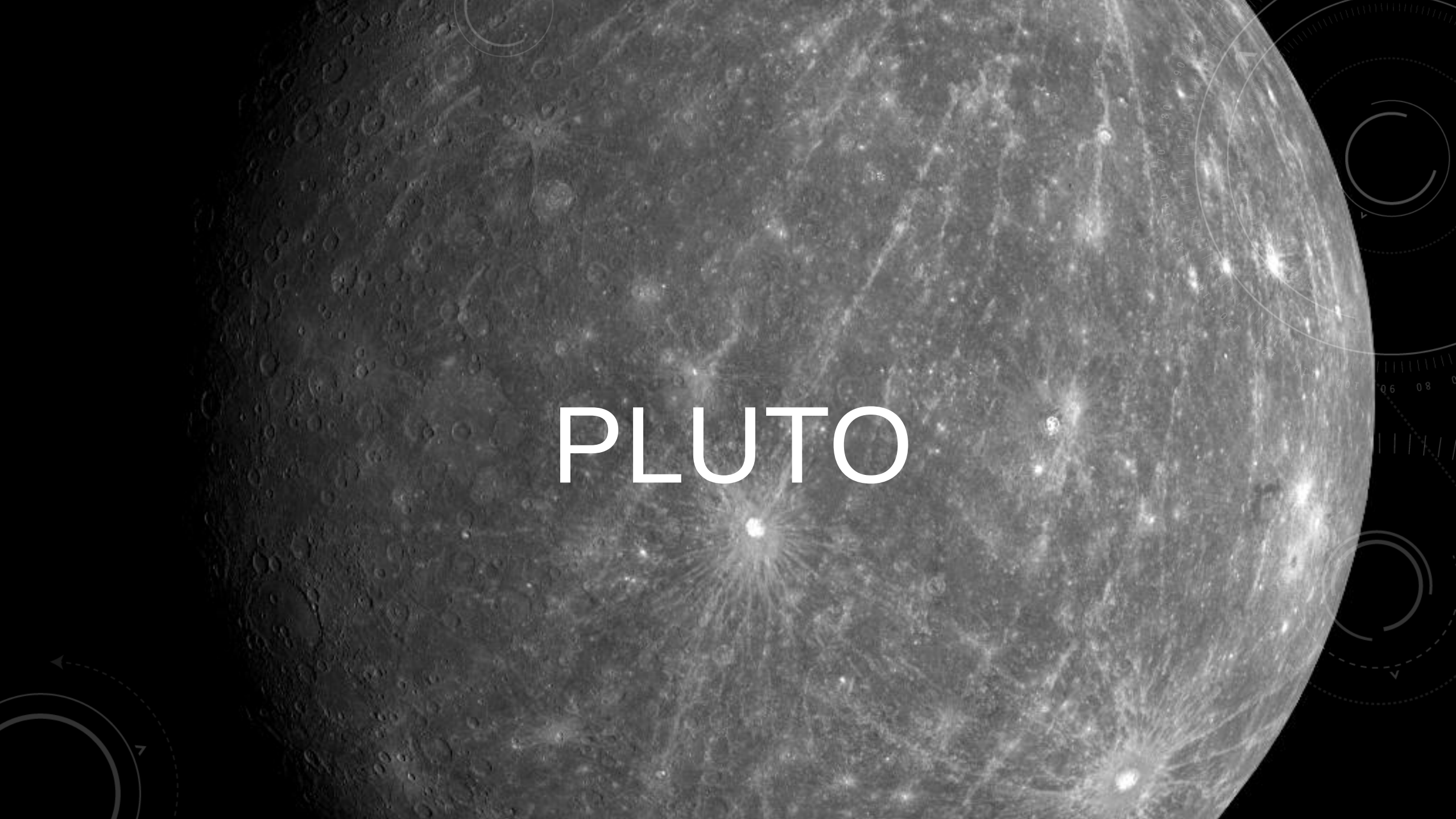
Molecular Hydrogen	80.0%
Helium	19.0%
Methane	1.5%
Hydrogen Deuteride	Trace Amounts
Ethane	Trace Amounts
Ammonia ice	Trace Amounts
water ice	Trace Amounts
ammonia hydrosulfide	Trace Amounts
methane ice	Trace Amounts

The image features a large, detailed view of the planet Triton, showing its complex surface with numerous craters, ridges, and a prominent equatorial band. The colors range from dark brown and grey to a lighter, bluish-grey. Overlaid on the right side of the image are several technical graphics: a large circular scale with numerical markings from 0 to 210, concentric dashed circles, and curved arrows indicating a counter-clockwise direction. In the bottom left corner, there are additional concentric circles and a small arrow pointing upwards.

TRITON

TRITON

- Density (Metric): 2.059 g/cm^3
- Mass (Metric): $2.1395 \times 10^{22} \text{ kg}$
- Radius(Metric): 1353.4 km
- Period of Rotation: 5.876854 Earth days
- Period of Revolution: 5.876854 Earth days
- Distance from the Neptune: $\sim 354,759 \text{ km}$
- Atmosphere: Mostly nitrogen with trace amounts of methane and carbon monoxide.



PLUTO

PLUTO

- Density (Metric): 2.050 g/cm^3
- Mass (Metric): $1.3090 \times 10^{22} \text{ kg}$
- Radius(Metric): $1.151 \times 10^3 \text{ km}$
- Period of Rotation: 153.29280 Earth hours or 6.387 Earth days
- Period of Revolution: 248 Earth years or 90520 Earth days
- Atmospheric Composition: Methane and Nitrogen
- Pluto has 5 natural satellites which includes: Charon, Nix, and Hydra



CHARON

CHARON

- Density (Metric): 1.678 g/cm³
- Mass (Metric): 1.5466×10^{21} kg
- Radius(Metric): 603.6 km
- Period of Rotation: 79.330183 Earth days
- Period of Revolution: 79.330183 Earth days
- Distance from the Pluto: ~17,536 km



HAUMEA

HAUMEA

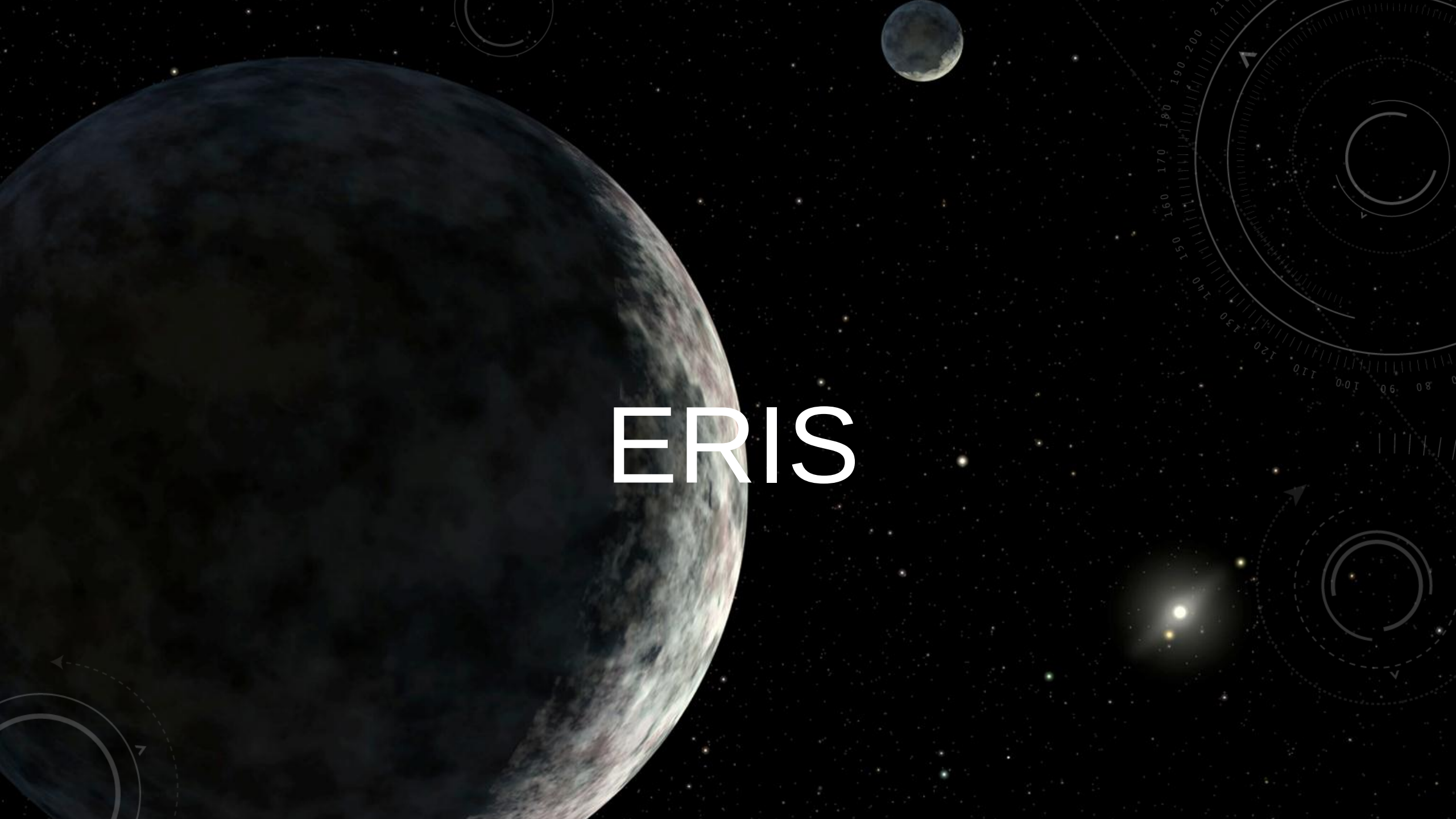
- Density (Metric): 2.6 g/cm^3
- Mass (Metric): $4.0 \times 10^{21} \text{ kg}$
- Radius(Metric): $\sim 650 \text{ km}$
- Period of Rotation: ~ 3.91 Earth hours
- Period of Revolution: 283.04 Earth years or 103379.051 Earth days
- Haumea has 2 natural satellites which: Namaka and Hi'iaka



MAKEMAKE

MAKEMAKE

- Density (Metric): 2.050 g/cm^3
- Mass (Metric): $\sim 3 \times 10^{21} \text{ kg}$
- Radius(Metric): $\sim 739 \text{ km}$
- Period of Rotation: ~ 7.7710 Earth hours
- Period of Revolution: 308.08 Earth years or 112524.948 Earth days



ERIS

ERIS

- Density (Metric): $\sim 2.52 \text{ g/cm}^3$
- Mass (Metric): $\sim 1.67 \times 10^{22} \text{ kg}$
- Radius(Metric): $\sim 1163 \text{ km}$
- Period of Rotation: 25.9 Earth hours
- Period of Revolution: 559.53 Earth years or 204368.147 Earth days
- Eris has one natural satellite: Dysnomia



DAYTONA STATE COLLEGE

Questions



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<http://www.daytonastate.edu/asc/ascscehandouts.html>