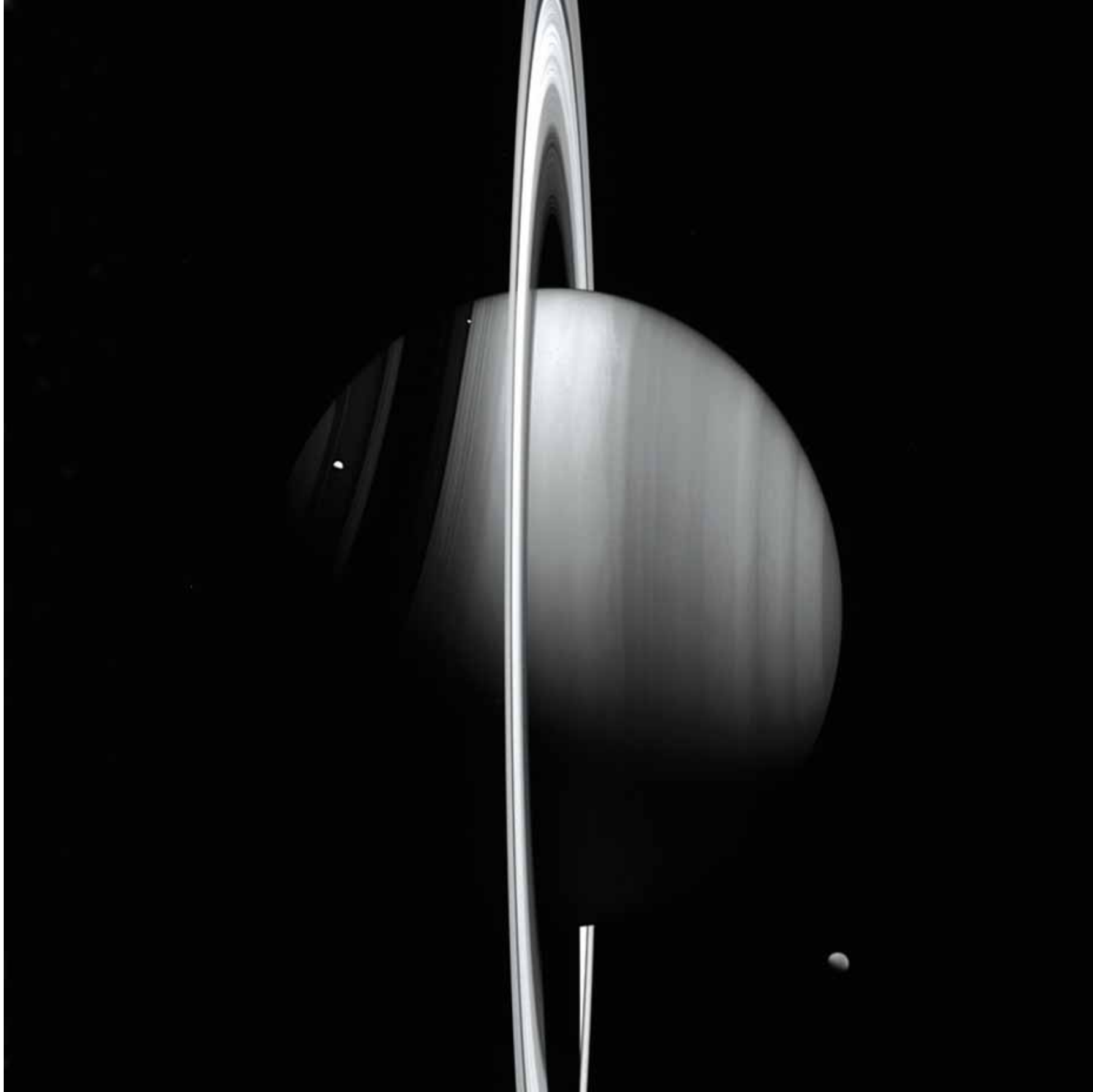


New images of the planet Saturn and its rings inspire awe – and could answer the oldest question in human history: are we alone?

# Adventures in wonderland

By *Carolyn Porco*



The ring cycle: an image taken by the Cassini spacecraft in February 2005 of Saturn with its rings and three of moons – Titan, its largest (far left), its second largest, Rhea (top) and bright Enceladus (furthest right)

A glistening, golden spaceship, with seven lonely years and billions of miles behind it, glides into orbit around a ringed, softly hued planet. A flying-saucer-shaped machine descends through a hazy atmosphere and lands on the surface of an alien moon, ten times further from the sun than the earth is.

Fantastic though they seem, these visions are not a dream. The Cassini spacecraft and its Huygens probe have travelled invisible interplanetary highways to the place we call Saturn. Their successful entry into orbit, the landing of Huygens on the cold, dark equatorial plains of Saturn's moon Titan and Cassini's subsequent explorations of the Saturnian environment are already legend – one act in a mythic saga of high adventure and deep spiritual yearning that begins and ends with us.

Our tale begins at the dawn of the space age. We humans have been interplanetary travellers now for over 50 years. In that time, we've explored nearly every corner of the solar system. We've sent robotic spacecraft to the planets, all eight of them. Our exploratory machines have rendezvoused with comets and landed on asteroids, we now have a spacecraft on its way to Pluto and – in what I regard as humanity's finest hour – we have set foot on our own moon.

Like wandering pilgrims, our spacecraft have journeyed far and wide to quench an innate lust to explore, to survey our cosmic surroundings, to ensure the future of our progeny and to seek the answers to questions that have vexed us and every generation of our ancestors before us: how is it that our small planet, and our living on it, came to be? What is the great cosmic theatre within which life on our planet has unfolded? And are terrestrial organisms, evolved as we are from inanimate materials, the only living creatures there or ever were in the 13.7-billion-year history of the universe?

At the heart of every scientific voyage, be it to the planets or to probe the quantum world of fundamental particles, is the same abiding quest: to understand the deep connections joining us to all that surrounds us and to glimpse our part in the greater whole. A half-century of travelling the solar system has rewarded us with insights into the interrelatedness and origins of the earth and its sibling planets and has shown us with unmistakable clarity exactly what our cosmic setting really is.

Cassini, the joint American/European mission launched in 1997 to orbit Saturn seven years later and the latest chapter in our saga, has done this and more. Its voyage has been one of hope and daring, an astonishing feat ▶



**Left:** an artist's rendering shows Cassini passing through jets of vapour and fine icy particles erupting from the south polar terrain of Saturn's small moon Enceladus

**Right:** a Cassini image from February 2011 shows a vast northern storm and Saturn's second-largest moon, Rhea, along with the planet's rings (seen nearly edge on) and their shadows

**Far right, top:** while in the shadow of Saturn, Cassini captured an unprecedented image of a total eclipse of the sun, and a spellbinding view of Planet Earth – a mere dot seen from a billion miles away

**Far right, bottom:** part of a large mosaic of images of Enceladus, Saturn's most fascinating moon, which harbours an organic-rich sea of liquid water beneath its south polar cap – a potential source of life

of technological skill and mastery. Its story has been part scientific travelogue, part metaphor: a long reel of alien scenes and extraterrestrial vignettes that have informed and delighted us with startling discoveries and splendour beyond compare, and a metaphor for that acute, uniquely human hunger to understand ourselves and the underlying meaning of our own lives.

### A galaxy far, far away

Ten times further from the sun than the earth, the Saturnian planetary system is so remote and other-worldly that we might as well have travelled to a faraway place in orbit around a distant star in another quadrant of our galaxy. It is tethered by a giant planet, second in size only to Jupiter, with a muted but complex atmosphere cleaved by ferocious, planet-girdling winds and prone to the episodic eruption of colossal storms. Saturn hosts an enormous, resplendent set of rings, wreathing it in a vast garland of icy rubble, perpetually in motion and slicing knife-like across the sky directly above the planet's equator.

It boasts Titan, a moon the size of the planet Mercury, with a cold, thick, hazy atmosphere suffused with simple organic molecules and a strangely earth-like, geologically diverse surface, sculpted by wind and rain, girdled by a broad equatorial belt of dunes and dotted in its polar regions with lakes and seas of liquid organic compounds. And it is home to more than 60

other moons, including bright, icy Enceladus. The south polar terrain of this body, no bigger than Britain, is shockingly warm and crossed by deep fissures whose towering jets of fine, icy particles erupt from salty, organic-rich liquid water reservoirs below its surface. This thrilling set of conditions points to a subsurface oasis in which earth-like prebiotic chemistry – and perhaps even life itself – may be roosting.

As an interplanetary vehicle bestowed, through its on-board cameras, with a sense of sight, Cassini has allowed us to peer into these exotic realms with an acuity we once could only dream of. Because we humans are exquisitely engineered to comprehend visual stimuli arrayed into two dimensions, images hold a pre-eminent position in the vocabulary of human communication.

And Cassini's images, coming as they do from across the solar system, have communicated to us a sense of being there, a sense of immersion and engagement in a strange, forbidding environment we could otherwise only imagine. They have achieved the near-miraculous, converting the fleeting and indifferent fluctuations of light's electromagnetic fields into powerful visceral emotion – an awe-inspired exaltation at seeing what has never been seen before.

Look at the images on these pages – only a fraction of Cassini's offerings – and immerse yourself in their grandeur, and you will come to know the joy and soul-filling sustenance that

of terrestrial life, and you'll immediately comprehend the significance of our findings here.

And oh, the wonder you will feel at setting eyes for the first time on the geysering turmoil at the south pole of Enceladus, knowing that therein may possibly lie the most promising, most accessible locale in orbit around our sun for unveiling Genesis II: a second origin of living matter beyond the earth. This possibility alone has made the toil of more than two decades on Cassini worth every strain. For, should we ever discover that life has independently arisen twice in our solar system, then at that point we could safely infer that life is not a bug but a feature of the universe in which we live and has occurred a staggering number of times throughout the cosmos during its 13.7 billion years. And that would be a final answer to probably the oldest question in human history.

These discoveries and more make clear to us processes that operate well beyond Saturn, from the origin of solar systems to the drivers of meteorology on our own planet, all the way to the origin and cosmic distribution of life itself. In this regard, the scope of Cassini's mission has been truly universal and its findings are revolutionary.

### Moving image

As I write, Cassini continues to return one phenomenal discovery after another from within a far-flung planetary system that we have been privileged to come so intimately to know. And

when it is all done, it will undoubtedly go down in history as one of the most scientifically productive missions that has ever flown.

But in the end, the story of Cassini, like that of all our interplanetary explorations over the past five decades, has been a story about longing – a longing to know ourselves, to finally understand our place in the magnificent scheme of cosmic evolution. There is one image we have taken of Saturn that says this so much better than words ever could – an image that, despite all the dazzling vistas we have been witness to

## The story of Cassini has been about a longing to know ourselves

over the past seven years, remains Cassini's most beloved one. Taken in late 2006, it was a sight humankind had never seen before – a total eclipse of the sun seen from beyond Saturn. Among the striking glories visible in this image – the unfamiliar appearance of backlit rings, the refracted visage of the sun seen diamond-like along the limb of Saturn and the beautiful blue ring created from the spray exhaled by Enceladus – you can spot, across a billion miles of interplanetary space, our own planet, earth, as if nestled in the arms of Saturn's rings.

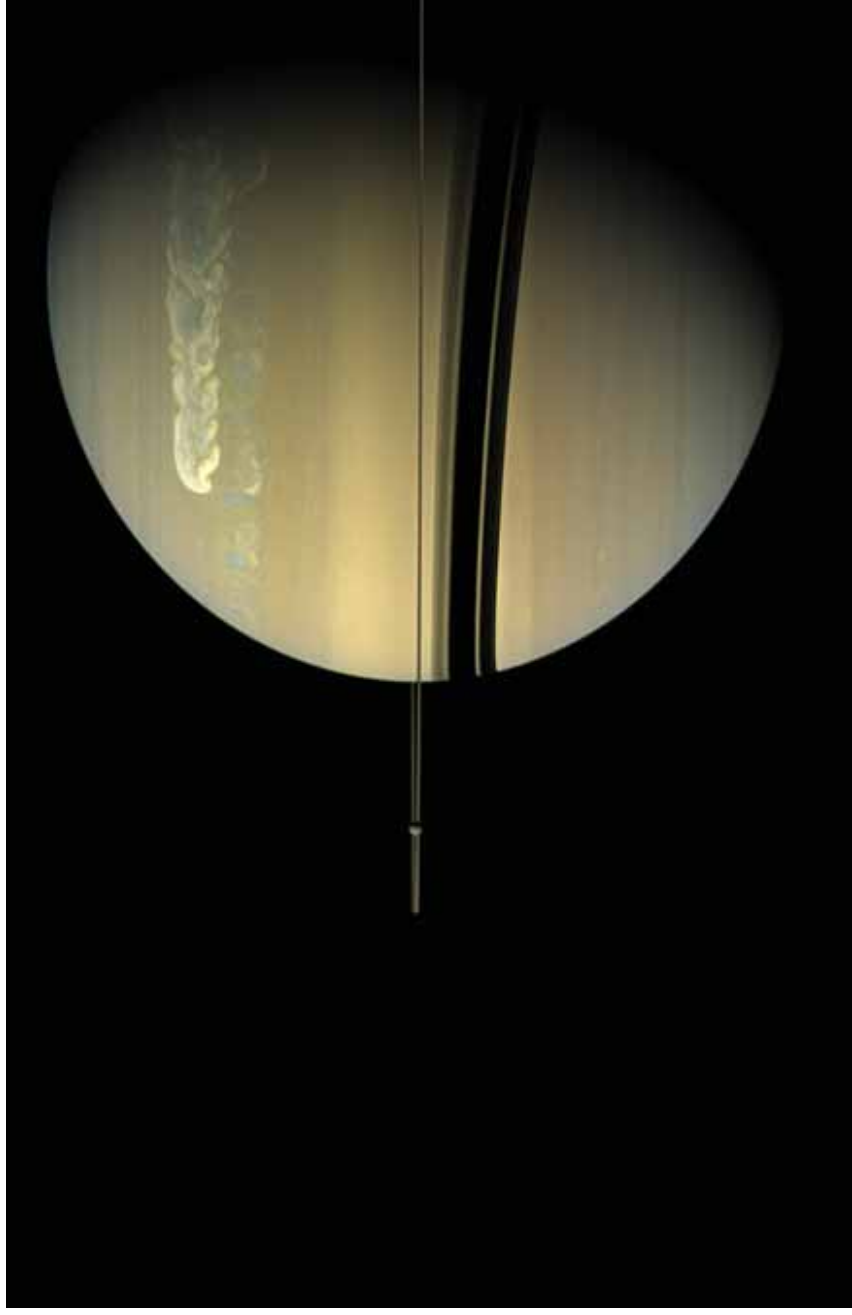
There is a powerful emotion that stirs within us when we catch sight of our small, fragile,

blue-ocean planet as it would be seen by others in the skies of other worlds. It is that startling recognition of ourselves, as we've never seen ourselves before, that never fails to move us. And it moves me to think of evolution. For me, this is where the astronomer Galileo and the biologist Charles Darwin come face to face, because it is an image that was made ultimately possible by Galileo's first experiments 400 years ago, an image that shouts evolution.

I look at this image and see our distant ancestors, stepping down from the trees and walking upright for the first time on to the African savannahs, pausing to look back at the forest from which they came. And I look at this image and I see a species that is unyielding in its pursuit of knowledge and brave and ardent in its longing to grasp the meaning and the significance of its own existence.

Finally, I can't help but look at this image and see the very best that humanity has to offer. We are no doubt the troubled and warlike inhabitants of one insignificant little planet. But we are also the dreamers, thinkers and explorers who took this picture – one world clear across interplanetary space to another. To be so small and reach so far is what makes us, in the end, the extraordinary citizens of Planet Earth. ●

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