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PHOTOGRAPHS FROM NASA AND KINETIKON PICTURES

Beyond: Visions of Our Solar System *The exhibition at the National Air and Space Museum in Washington features a photograph of Jupiter's moon Io, with an 86-mile-high volcanic plume exploding above its horizon.*

Marveling at Wonders Out of This World

EDWARD ROTHSTEIN

EXHIBITION REVIEW

WASHINGTON — When I was very young, I cherished a collection of "space cards" — trading cards that accompanied packs of bubble gum — offering exotic visions that supposedly would soon be within reach: space ships gliding through Saturn's rings; explorers enduring a Venus dust storm; loopy Technicolor Martians making their first contact with visiting Earthlings.

Some of those half-century-old imaginings may have been outlandish, but the cards left their mark, assisted by decades of science fiction that confidently assumed we were on the brink of an era of pioneering exploration. In a way, we were, though not quite as those cards suggested. But the appetite they whetted remained.

The images on view at a remarkable exhibition at the National Air and Space Museum here could well serve as inspirational space cards for this century. But they possess far greater power than those old naïve fantasies. They are vividly, compellingly real; they astonish and bewilder, luring the viewer into a state of wonder.

In "Beyond: Visions of Our Solar System" 148 photographs of moons and planets show these brave new worlds as extraordinary landscapes of mists, dunes, fissures and rocks. The exhibition has appeared in other, more modest incarnations (including as a traveling show), but this is its most complete form. The filmmaker, writer and photographer Michael Benson deserves much credit for the refinement of these images, but we need no technical understanding of their origins to be struck by what they portray.

Photographs on display include those of, from left, the Sun, Mars, Uranus, and Neptune and its moon Triton.

The clouds surrounding Venus have disappeared as radar images reveal a terrain of sharp-edged ridges, volcanic craters, petrified lava flows and delicate striations — testimony to a relentlessly active geographical furnace. We see the blue copperish haze of a Martian

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sunset — not the invention of a painter of a child's bubble-gum cards but the actual scene from the planet's surface, a small sun penetrating the atmosphere's powdery dust.

Saturn is photographed as if by a tourist who can't get enough shots of the Eiffel Tower, though now the viewer only wishes there were more. It is as if the material world had been left behind for a realm of eerie golden textures, delicately shaded rings and suspended threads of light. Jupiter, in all its immensity, is almost eclipsed by the impression left by its tiny moon Europa, which has a surface like the skin of an aged man's skull, seeming almost transparent, showing veins beneath thin flesh, its crusts and ridges the relics of ancient forces.

Some images — umbilical coils of roiling fire from the surface of the Sun or Martian dunes with dark spots marking the melting of carbon-dioxide frost — almost appear to be abstractions, bearing little resemblance to anything familiar. As for Earth seen from space, even that sight is presented anew, the planet outlined by a glowing crescent of reflected sunlight hitting clouds above the South Pacific.

These photographs offer an implicit chastisement to the wild pop sci-fi imaginings of the past, but they are also fulfillments of the same urge to know what lies beyond our gravity-bound grasp. They are records of unusual ventures, magnificently achieved: they were taken by unmanned space probes and beamed back to Earth. These contraptions may not carry human life, but they are instruments of the extended human will and imagination.

We have sent these probing eyes catapulting in long orbits, sweeping past planets and their moons (as with the Galileo or Cassini missions), or (as with the Mars rovers) stubbornly exploring the planetary surface, or (as with Voyager 2) ultimately veering outward in silent millennial journeys through deep space. Arthur C. Clarke, after looking at some of these photographs, wrote in a foreword to Mr. Benson's 2003 book ("Beyond: Visions of the Interplanetary Probes," Abrams), "These images serve as a spectacular reaffirmation that we are privileged to live in the greatest age of exploration the world has ever known."

But this is a strange kind of exploration because so little of it reveals any human presence. These images have not only been captured by robotic probes, they also show (unlike those early sci-fi pictures) barren worlds. We are looking at fearsomely beautiful realms that seem to preclude life and disdain the human. Whatever their character — ranging from the swirling random currents of Jupiter's atmosphere to the draftsmanlike elegance of Uranus surrounded by a scarcely visible halo of slight rings — the harsh majesty seems to leave no room for a living presence.

Yet these are photographs. They present themselves to us as records of the real. They show us landscapes that the human eye might conceivably see. But we know too that they depict something we might never see. And some landscapes (like the surfaces of the Sun) we could never see. This mixture of the real and the imagined, along with these works' humanly inspired inhuman origins, conspire to create a strange photographic universe in which the human is everywhere implicated but nowhere sensed.

Though these pictures were captured without human intervention, almost none would look the way they do without elaborate human tinkering. Though they are photographs, they are not snapshots. Most at this exhibition would not exist without Mr. Benson's aesthetic labors; they are, in part, his creation.

Here is where this record becomes even more knotty. We have all, by now, seen the astonishing photographs from the Hubble Telescope with their vibrant portrayals of colliding galaxies and giant star clusters. You see similar moving images on planetarium domes: full-color displays of exploding crimson or yellow accompanied by sub-wooferish whooshes of sound.

Well, the colors are as phony as the sound. The Hubble pictures are all in black and white; colors are imposed to approximate hues suggested by frequency data. These tints are often exaggerated for dramatic effect or to create contrast. Even the image creators acknowledge they may not resemble what an eye in galactic space might see. Many are colorized far more radically than any 1930s movie.

Mr. Benson is more rigorous because he takes the human eye as a guide; he wants to show us what the eye would see if only it could. He immersed himself in the raw photo Web databases of NASA and the European Space Agency and then got to work, selecting, cropping, matching, shifting. He explains his approach in his book "Beyond" and on his Web site, but this should be demonstrated in the exhibition in far more detail; we really don't know how much was done to each image.

Black-and-white moon pictures from lunar orbiters of 1966 and '67, for example, originated on 70-millimeter film that was developed aboard the craft itself, then scanned and transmitted to Earth. What came back were not stunning vistas but scans of film strips. Fragmentary images had to be matched, gaps filled in, contrast adjusted. Many later pictures are also created out of mosaics: one view of Jupiter and Europa from 1979 was put together out of 60 pieces.

Color was also an issue, as with the Hubble. "Almost all of these photographs," Mr. Benson writes, "required substantial amounts of digital processing. Many had never been rendered into color before, or if they had they'd long since vanished." In general, whether a spacecraft used video technology or digital sensors, three successive shots were taken in black and white, each using a different frequency filter, so color information might later be deduced.

But because the camera might be whipping by a planet at 35,000 miles per hour, these three raw images might not perfectly match. So Mr. Benson and his colleague, a planetary scientist and imagery expert, Paul Geissler, transformed them so they could be superimposed and used to create color pictures. In some cases color information was unavailable and had to be inferred from another mission's shots of the same landscape. The show's panoramic glimpse of a Martian dust storm, Mr. Benson explained in an e-mail message, took him months of work, drawing on about 100 images.

It is amazing that this process is as invisible as it seems here, and the results encourage trust in Mr. Benson's and Mr. Geissler's judgments. "The solar system is already spectacular enough," Mr. Benson writes, "without pumping artificial colors into it."

But of course he is still creating many of these photographs out of data that would be far less impressive in its raw form. So these works are as much a record of Mr. Benson's explorations as the spacecraft's. And the care in which they are made ensures that however inhospitable to human visitation these worlds may seem, the pictures are a reminder of the crucial presence of human passion and perception.

At a time when American plans for human space travel seem to be at a standstill and NASA's mission confused, these haunting images captured by robotic probes paradoxically suggest that this won't truly be a great age of exploration until, despite harshness, costs and challenges, we again see the importance of human experience in space.

ANDREW COUNCILL FOR THE NEW YORK TIMES

A visitor to the exhibition, which features 148 photos, at the National Air and Space Museum.

"Beyond: Visions of Our Solar System" is on view through May 2 at the National Air and Space Museum on the National Mall in Washington; nasm.si.edu.

ONLINE: MORE PHOTOS

Additional images from the exhibition:

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In these photos, what you get may not be what you'd see.