

# SANCTUARY

REDEFINING NEW FRONTIERS

AN ETERNAL LUNAR VAULT FOR HUMANKIND

Nathalie Besson · Benoit Faiveley · Mario Freese · Martin Krzywinski · Michael Benson  
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**"As I take man's last step from the surface [...] I'd like to just say what I believe history will record. That America's challenge of today has forged man's destiny of tomorrow."**

—Gene Cernan, on Taurus-Littrow, December 13th, 1972.

Gene Cernan photographs geologist Jack Schmitt, during last Extra Vehicular Activity (EVA) on Taurus-Littrow, December 13th, 1972.



# SANCTUARY IS A LUNAR TIME CAPSULE OF INFORMATION ART DESTINED FOR THE MOON

Sanctuary will be one of the payloads on ALINA, a space craft engineered by PTScientists bound for the moon. Carrying two rovers, numerous scientific experiments and Sanctuary, ALINA will land on the Taurus-Littrow lunar valley, the site of the last manned Moon landing.

Sanctuary draws motivation and inspiration from previous efforts to communicate and commemorate our knowledge and individuality, such as the Pioneer plaque, Voyager's Golden Record and the Arecibo message.

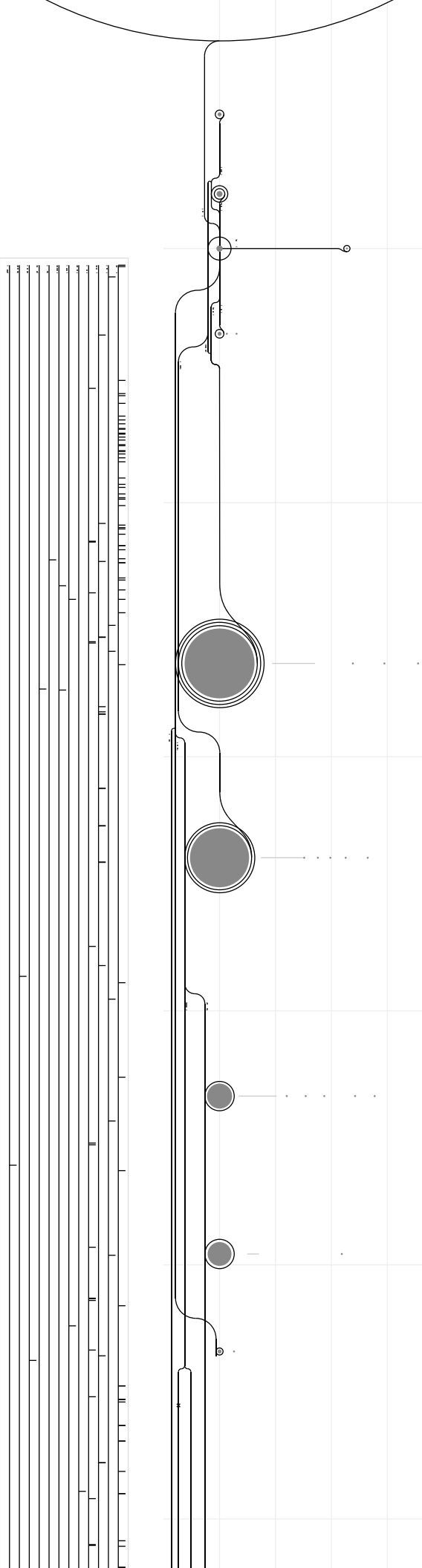
It is a collection of 90mm sapphire discs with stories, illustrations, literature and art—many created specifically for Sanctuary. The discs are encoded using a unique microlithography process that etches the information in the form of tiny pixels—2 billion per disc.

The discs are themed after the traditional Platonic Universal Elements—quintessence, air, earth, water, fire—which are interpreted by modern equivalents—space, matter, water, life. The quintessence disc will appear first and acts as a greeting in the form of thousands of contributed self-portraits.

Sanctuary will also contain fully assembled anonymously contributed genomes of a woman and a man, sequenced and assembled at Canada's Michael Smith Genome Sciences Center.

The Sanctuary team is a collective of researchers and artists from international institutions and diverse fields of study. We are active in public outreach at the interface of science and art.

◀ Our footprints in space depicted in the "Cosmic Journeys" information graphic that will appear on one of the Sanctuary discs. Shown are the paths of every space mission, including gravity assists. By Emmanuel Pietriga.





**"How many ages hence  
Shall this our lofty scene be acted over  
In states unborn and accents yet unknown!"**

**—William Shakespeare, Julius Caesar**

"Snoopy" and a Saturn V S-IVB Tank in heliocentric orbit.

Nuits Saint Georges, in Burgundy, supplied wine bottles to the crew of the Apollo 15 mission. The lunar Saint George crater was named after this city.

This is my city.

On the edges of the crater, the astronauts buried the labels of the wine bottles, making Nuits Saint Georges known 'From the slopes of its vineyards ... to the slopes of the Moon.'

As a child, I would visit the small plaza in front of the town named after the crater, 'la Place du Cratère Saint Georges,' and look up at the Moon. I always thought that a part of my hometown was there...

...waiting to be found.

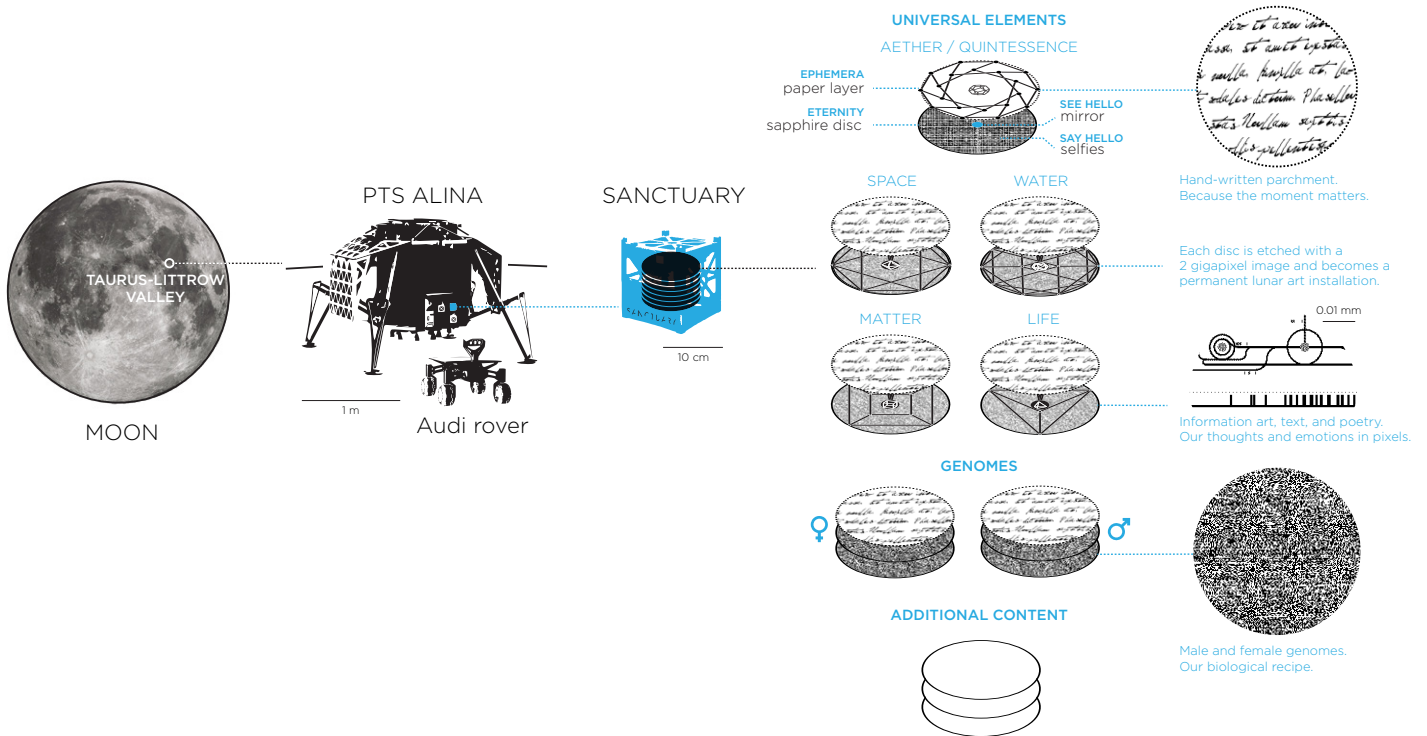
—Benoit Faiveley, Producer of Sanctuary



# SANCTUARY

ETERNITY FOR HUMANITY

## SANCTUARY AT A GLANCE

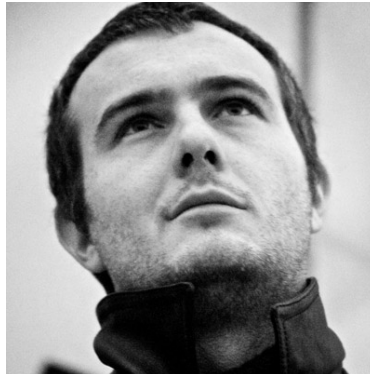


SANCTUARY IS A COLLECTION OF 17 DISCS



Nathalie Besson  
PARTICLE PHYSICIST  
*Department of Particle Physics,  
IRFU/CEA*

Sanctuary is an original artistic outreach project. It is a record of humanity for a visiting alien: a creature from elsewhere or our future-selves (space- or time-alien). It is an object of art and conversation. It is not an encyclopedia and does not attempt to be exhaustive. Located on the guardian of our nights, the Moon, our archive and friend, it belongs to everyone.



Benoit Faively  
DOCUMENTARY FILMMAKER,  
SANCTUARY PRODUCER

Sanctuary is a Moon time capsule created by people who share common values. It draws motivation and inspiration from previous projects that commemorated human knowledge and individuality, such as the Golden Record. Sanctuary's approach is original and its mode of encoding is both modern and analog. It holds many messages and images, some complex and some simple.

What we are is what we know, how we came to know it and how we talk about it and how we live in our Universe. Sanctuary will be a dialogue and a playful riddle. It will be funny, intriguing and pedagogical. If you were an alien, how would you image humans from the content of the disc? If you were a member of the Sanctuary team, what would you have included? The discs invite us to project ourselves into the future and to decipher, imagine, create, and exchange.

The Moon is a friendly mark in the sky—a piece of the early Earth. Without tectonic shifts or winds or erosion, the Moon is already an archive of our world. For Aristotle it marked the boundary between our imperfect world and the perfect world of spheres. The Moon is both a familiar neighbor and the first step into outer space: a perfect

## Imagine looking up at the sky to say "Hey, I'm up there!"

place for a message for space- or time-alien and for our fellow humans of today.

Sanctuary's potential outreach is unbounded. You might see the discs in a museum, in a class, or even contribute a drawing or selfie to the project. Imagine looking up at the sky to say "Hey, I'm up there!"

One of the challenges of Sanctuary is to make the content not only understandable and relevant but also legible and durable. Engravings on sapphire provide a perfect medium—the images on the discs will be visible with the naked eye, composed of individual elements, like miniature works of art.

Sanctuary fosters curiosity and makes science more accessible to the public. Sanctuary is also about more than science. It includes literature, mathematics, games, art, puzzles and many Easter eggs for the exploring eye.

The Sanctuary team is dynamic, curious, collaborative and experimental. We laugh, think, contemplate and challenge each other to find our best ideas.

## Sanctuary is modern and analog.





Mario Freese  
ENGINEER, DESIGNER

Our Earthly speck of dust in the universe is of great cosmic insignificance — a stark contrast to what humankind has managed to achieve, both individually and collectively, in the fields of science, arts and technology.

Friedrich Schiller said  
"Man only plays when in

the full meaning of the word he is a man, and he is only completely a man when he plays." I am given the wonderful challenge of playing in all these fields, roaming the realms of math, physics, medicine, engineering, music, art, chemistry, computers and, quite literally, rocket science.

My even greater challenge is to veer from the beaten track of time capsule tropes, avoiding the obvious and expected—after all, life is also full of delight. So, in addition to selecting representative achievements of mankind, I wish to make subjective choices and include topics of personal and emotional relevance.

Working on this project reminds me just how much our perception is regularly challenged. The discs in the Sanctuary collection store information microscopically, with pixels too small for our eyes to see. We're sending these pixels into the boundless void of space, another scale we cannot perceive in full.

Beyond the stories, graphics and the riddles that compose our project, lies our obligation to collaborate and inspire our fellow Earth and space travelers in love and peace.



Martin Krzywinski  
GENOME SCIENTIST, ARTIST  
Canada's Michael Smith Genome  
Sciences Center

The Sanctuary project is a love poem to the universe, designed by scientists and artists with passion about the origins and evolution of ideas, knowledge, art and culture.

The images on the discs can be seen and interpreted by the naked eye, with smaller elements requiring a magnifying glass or

microscope. The etching creates an encoding that is visual and recognizable. Importantly, it is self-explanatory—no special equipment is required to access the discs.

Each disc has room for stories—combination of text, images, diagram, mathematics and data encodings—that narrate an important, curious or delightful

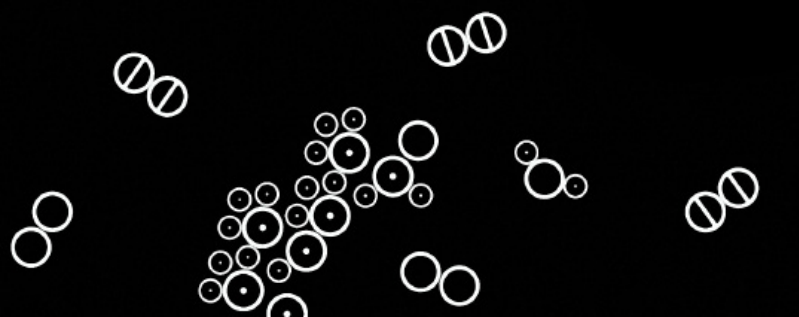
idea. Across the discs, many stories are told, some narrated, some drawn and some left open for interpretation. Scattered across the discs are elements called collections—finding and interpreting them requires exploration, curiosity and imagination. The discs pay respect to the origins of ideas and our ongoing intellectual and emotional exploration of our world, mixing modern notions with ancient ones.

The stories and the collections represent what is important to us in the moment and across time, the things that we want to hold on (and cannot) to and the things that are hard saying goodbye to (though we must).

Sanctuary continues the conversations that is worth having—about beauty, truth, living well and exploring the outer spaces and our inner spaces. It gives space wings to our spirit, our ideas and even our genomes—some of the things that make us human.

**Sanctuary continues  
the conversations that  
are worth having.**

...after all, life is also full of delight.





"We later civilizations ... we too know that we are mortal ... empires sunk without a trace, gone down with all their men and all their machines into the unexplorable depths of the centuries."

—Crisis of The Mind, Paul Valéry



Charlie Duke's family photo, Descartes Highlands, Apollo 16



Roland Lehoucq  
ASTROPHYSICIST  
IRFU/CEA

Sanctuary is an attempt to break the barrier of time, a tentative archeology of future. In the Jimmy Carter message found on the Golden record: "We are attempting to survive our time so we may live into yours."

But Sanctuary is not only a message to the future. It is also an opportunity to talk

among ourselves about each other, here and now—an important conversation for which we are willing to make a detour to the Moon, all the while imagining the audience to be our descendants or galactic neighbors. As an archive, the Moon is the perfect place to house it.

Passing on our knowledge to future generations requires that we transcend our lifespan horizon that isolates us from a distant future.

I feel like being a copyist monk of the Middle Age, transmitting knowledge in an beautiful way, helping to share our common humanity.

∞	1	1/2	1/3	1/4	1/5	1/6	1/7	1/8	1/9	A
1	1	1	1	1	1	1	1	1	1	1
1/2	1	1	1	1	1	1	1	1	1	$A \times \frac{21}{1} = 1$
1/3	1	1	1	1	1	1	1	1	1	$1 = \frac{21}{1} \frac{1}{10}$
1/4	1	1	1	1	1	1	1	1	1	$A \times \frac{41^2}{1} = 1$
1/5	1	1	1	1	1	1	1	1	1	$1^2 + 1 = \frac{41^2 + 41}{1}$
1/6	1	1	1	1	1	1	1	1	1	$A \times \frac{81^2 + 121^2}{1} = 21 - 3$
1/7	1	1	1	1	1	1	1	1	1	$11^2 + 2^2 + 21 = \frac{81^2 + 24^2 + 161}{6}$
1/8	1	1	1	1	1	1	1	1	1	$A \times \frac{16^2 + 64^2 + 356^2}{1} = 161 - 15$
1/9	1	1	1	1	1	1	1	1	1	$61^2 + 61^2 + 11^2 + 61 = 3$
1/10	1	1	1	1	1	1	1	1	1	$= 161^2 + 96^2 + 1761^2 + 1,61$
										$\frac{384}{1}$
										Totus



Emmanuel Pietriga  
COMPUTER SCIENTIST  
INRIA

Sanctuary is about celebrating humanity's achievements, our understanding of the world, and our ability to creatively express ourselves through art and engineering. To properly reflect these achievements, Sanctuary has to be a worthy achievement on its own, in both form and content.

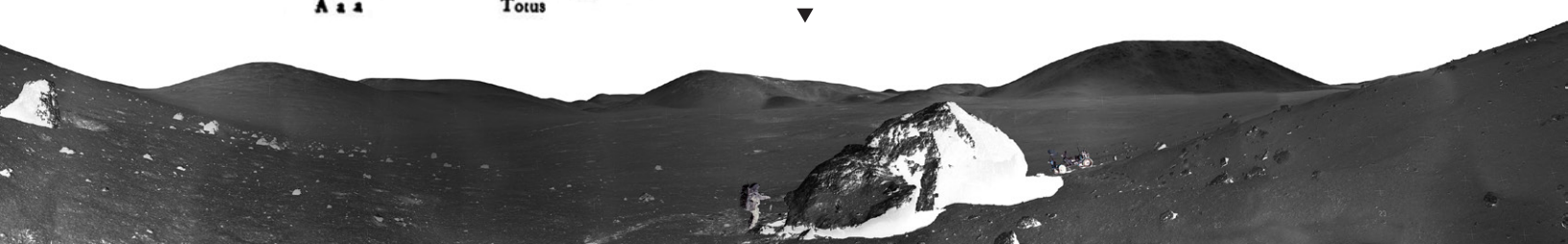
One challenge we face is to select meaningful content. Sanctuary is not an encyclopedia. Nor does it try to be. It is made of fragments. Fragments of our knowledge, seemingly random collections of art pieces and engineering feats. Fragments of things the Sanctuary team feels passionate about. Fragments between which connections may exist, at different levels, but that are only suggested.

The other challenge we face is to assemble those fragments and to convey those connections in a meaningful manner. We need to define visual grammars that will remain decipherable for thousands of years. Grammars that will encode the information contained in, and between, our fragments in a way that makes its decoding and understanding possible (often with some effort). Sanctuary should be full of riddles. This is what will make it poetic, and intriguing. Both to people who see it now, and to people in the future, coming from our world or another.

...to creatively express ourselves through art and engineering.

As navigation charts from many centuries ago, the discs will tell not only about our knowledge of the universe, but also about us, our way of seeing things, of crafting representations of those things, and of our desire to convey them to others.

◀ Arithmetica Infinitorum, John Wallis.  
Bear Mountain, Boulder 2, East Massif, Sculptured Hills, South Massif, Station 2. Apollo 17 mission, December 1972. NASA/Johnson Space Center.





Jean-Philippe Uzan  
COSMOLOGIST  
CNRS

Sanctuary is a parenthesis in my life studying our universe and an opportunity to share not only some knowledges I have grasped over the years but also why they matter to me and maybe to you.

It is an adventure with new friendships, a challenge to design a common object that would matter to all of us (and to you), while remaining personal. It is also a risk—to make mistakes, but also to say 'I'.

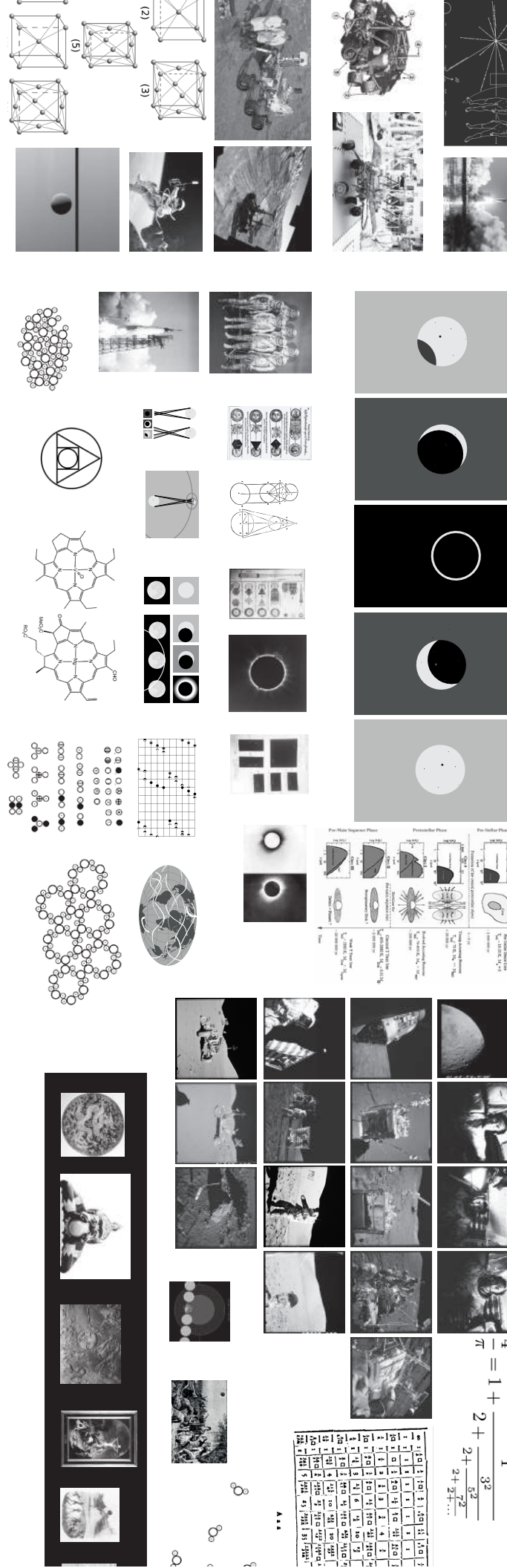
Sanctuary for me is a step forward (or back) in space and in time to contemplate our planet today, what humanity has achieved, what we all have in common and our diversity taking the suit of an alien or an archaeologist from the future. This soft-fictional scenario gives me the freedom to talk about science in different ways, maybe to give a body to concepts that shall become common knowledge beyond any technicalities, while letting space for interpretation. In the end I hope the poetry and mystery that I contemplate in the cosmos will emerge from this collection of disks, with their originality and their weaknesses, that with time will become strength and personality.

Sanctuary will wait on the Moon, maybe the most important celestial body of all. The Moon is a mirror of humanity present in all the mythologies, our closest friend, allowing us to measure time and construct the first calendars, our gate to the universe, but still the farthest place in space reached by the foot of mankind, but also the memory of the Solar system and the protector of the Earth.

...with originality  
and weaknesses,  
that with time will  
become strength  
and personality.

Anyone born in 1969 dreamt to walk on the Moon. Sanctuary is my first step in that direction.

Excerpts of content for the Sanctuary discs.



n	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
2	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
3	1	3	3	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
4	1	4	6	4	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
5	1	5	10	10	5	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
6	1	6	15	20	15	6	1	1	1	1	1	1	1	1	1	1	1	1	1	1
7	1	7	21	35	35	21	7	1	1	1	1	1	1	1	1	1	1	1	1	1
8	1	8	28	56	70	56	28	8	1	1	1	1	1	1	1	1	1	1	1	1
9	1	9	36	84	126	126	84	36	9	1	1	1	1	1	1	1	1	1	1	1
10	1	10	45	120	210	252	210	120	45	10	1	1	1	1	1	1	1	1	1	1

$$\pi = 1 + \frac{1}{2^2} + \frac{1}{3^2} + \frac{1}{4^2} + \frac{1}{5^2} + \dots$$



Michael Benson  
AUTHOR & ARTIST

In his epic 1793 work *The Marriage of Heaven and Hell*, written in imitation of biblical prophecy, English poet and artist William Blake conceived a powerfully original aphorism: "Eternity is in love with the productions of time." As a pioneering international collaboration between science and art, *Sanctuary* is an excellent candidate

While *Sanctuary's* trajectory is into space—it will cross the 238,900-mile gulf between Earth and Moon, and proceed to ride along there as our Solar System continues on its 230 million year orbits of the Milky Way's core—it is also, equally importantly, into deepest cosmic time. So it seems appropriate to end this summary of our profoundly visual project with another quote, by the great 20th Century Italian author Italo Calvino, from his 1965 collection of stories, *Cosmicomics*: "So our efforts led us to become those perfect objects of a sense whose nature nobody quite knew yet, and which later became perfect precisely through the perfection of its object, which was, in fact, us. I'm talking about sight, the eyes; only I had failed to foresee one thing: the eyes that finally opened to see us didn't belong to us but to others."

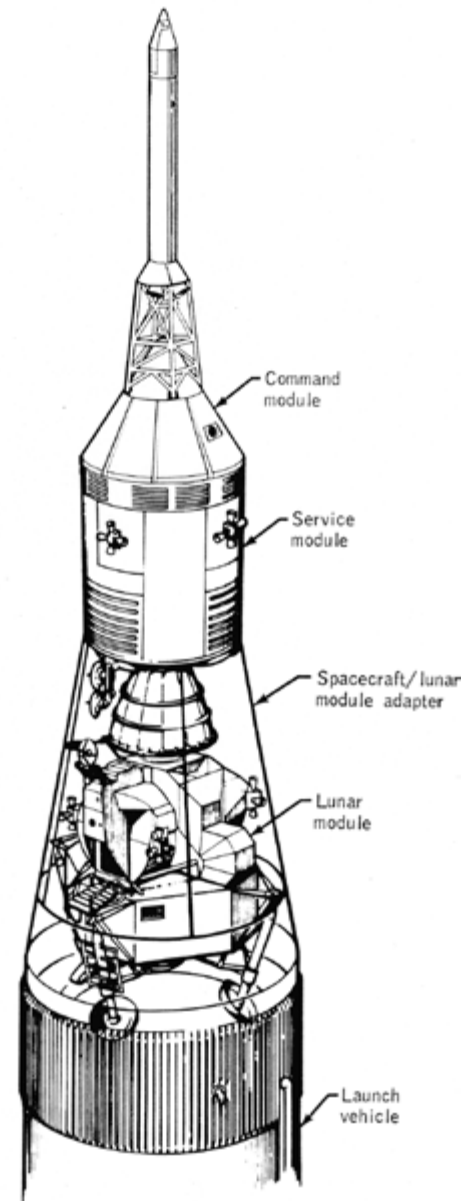
for eternity's devotion. A time capsule bearing examples of human genius, to be placed on the lunar surface during the third decade of the third millennium CE, *Sanctuary's* mission is to preserve something of our creativity and spirit for the ages.

Hoping for eternity's approbation, *Sanctuary* has anticipated — and prepared for — exactly this eventuality.

## Eternity is in love with the Productions of Time. William Blake

Comprised of 24 synthetic sapphire discs, with each disc 90-millimeters (3.54 inches) wide, *Sanctuary's* 700-gram (1.54 lb.) cargo of knowledge is etched using a unique analog microlithography process. Being analog, it doesn't require any specific technology to decode (other than a magnifying glass or microscope for some of its content). Each disc encased within *Sanctuary's* aluminum case contains 3.1 billion miniature pixels inscribed into a material known for its hardness and durability—sapphire being the third hardest mineral, after diamond and silicon carbide. The project's vast canvas of approximately 75 billion pixels contains and compresses a bold set of curatorial decisions, many involving the creation of thematic strands of content designed to unfold across and between the individual discs. *Sanctuary* is designed to last for hundreds of thousands, millions, even billions of years—a production of time destined to prevail through the eons.

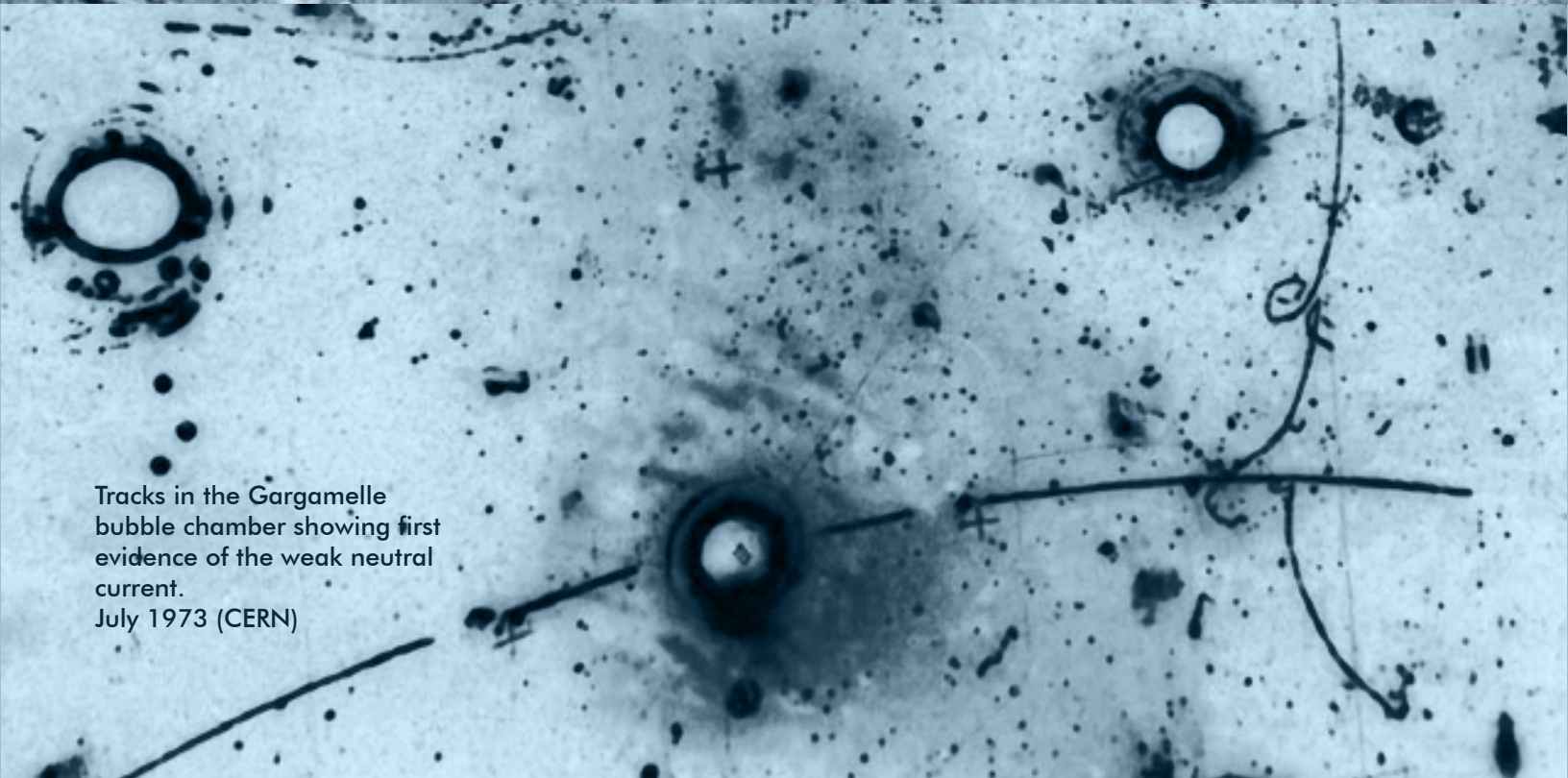
Who or what its eventual audience will be is unclear. Will it be humanity's descendants? An alien reconnaissance mission from another planetary system? Perhaps our cybernetic successors, in the form of an artificial intelligence brought into being through human ingenuity, and long superseding it? We simply don't know. But we would submit that the chance that *Sanctuary* will be discovered, known, and appreciated by sentient beings in the distant future is high. This is in part simply due to its direct proximity to our world, currently the only known home of life in the universe.



APOLLO LAUNCH CONFIGURATION FOR  
LUNAR LANDING MISSION



Fallen Astronaut, Hadley Rille, Apollo 15






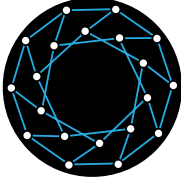
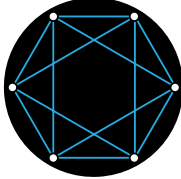
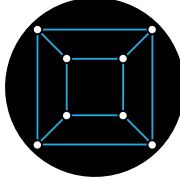
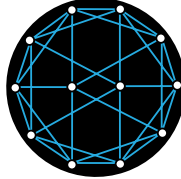
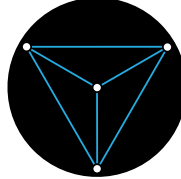


Tracks in the Gargamelle bubble chamber showing first evidence of the weak neutral current.  
July 1973 (CERN)

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## THE UNIVERSAL ELEMENTS AND PLATONIC GEOMETRY

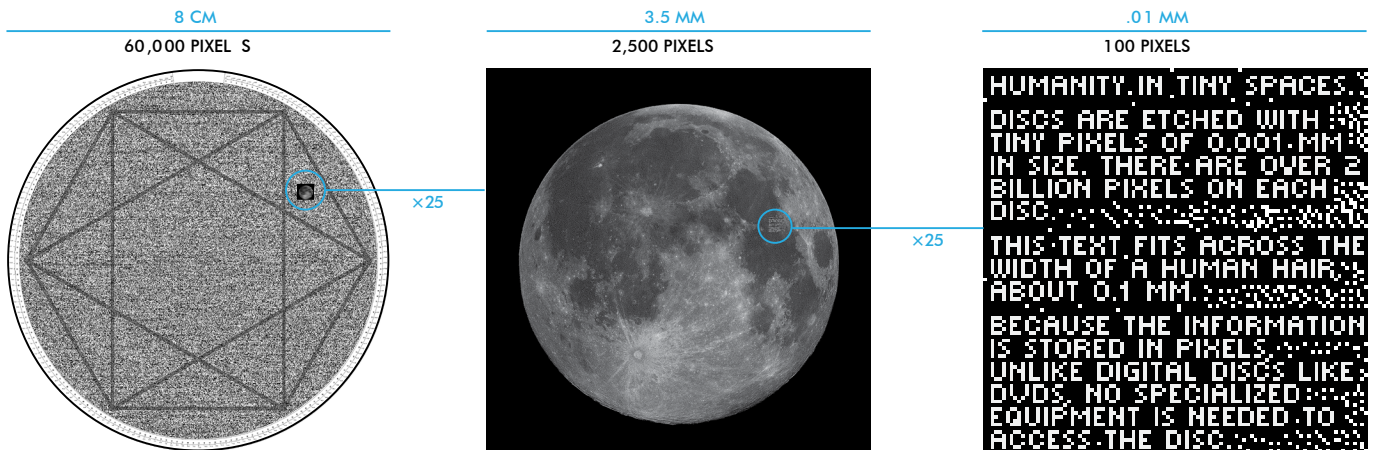
GEOMETRY	dodecahedron	octahedron	cube	icosahedron	tetrahedron
PLATONIC SOLID					
PLATONIC ESSENCE	AETHER	AIR	EARTH	ATER	FIRE
SANCTUARY DISC					
THEME	SELFIES	SPACE	MATTER	WATER	LIFE
UNIT		length	mass	time	complexity
QUANTITY		$\pi$	e	$\sqrt{2/3}$	$\phi$
BACKGROUND		starfield		snow flakes	game of life

The content and design of Sanctuary reinterprets the Universal Elements.

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ETERNITY FOR HUMANITY

## BIG IDEAS IN TINY SPACES

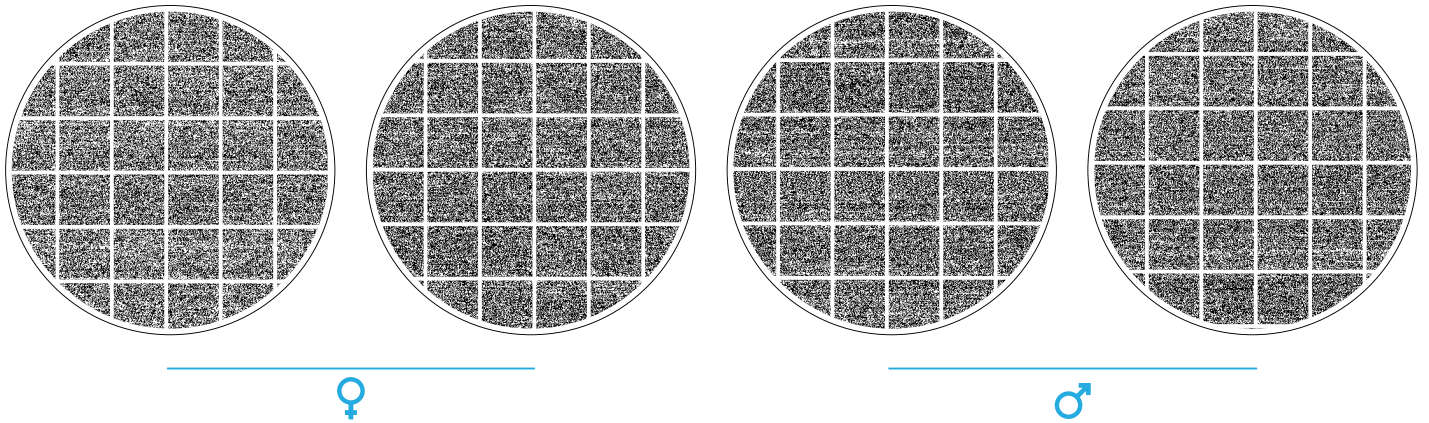


Images, information art and text  
are seamlessly composed on a  
giant canvas of pixels.

# SANCTUARY

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## THE WORLD'S FIRST GENOMENAUTS



Sanctuary will contain our biological recipe:  
a pair of sequenced and assembled  
female and male genomes.



listen: there's a hell  
of a good universe next door; let's go  
—e.e. cummings

KAART  
der Reyse van  
ABEL TASMAN  
volgens syn eygen opstel.  
J. van BRAAM et C. onder de LINDEN  
Excud. Cum Privilegio.

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Benoit Faiveley  
PRODUCER



Nathalie Besson  
PARTICLE PHYSICIST



Mario Freese  
ENGINEER & DESIGNER



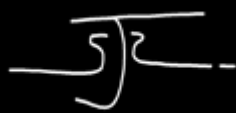
Martin Krzywinski  
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J.-Sébastien Steyer  
PALEONTOLOGIST



Jean Philippe Uzan  
COSMOLOGIST



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