



MISSION PLAN
HYPATIA - CREW 280

Hypatia I's Mission

Hypatia I is an all-female, multidisciplinary, and intergenerational crew, selected to participate in an analog mission to the Mars Desert Research Station (MDRS) in April 2023. Its goals include (i) conducting research related to Mars and to space exploration more broadly, (ii) developing scientific outreach and communication activities, and (iii) promoting STEM careers, particularly among young girls.

The Commander of Hypatia I is Mariona Badenas Agustí, who was part of another MDRS Crew (LATAM III) in 2019. Inspired by that experience, Mariona made it her goal to return to the MDRS with a team of leading Catalan female scientists. Her goal was clear: to perform high-quality space-related research and to encourage young people to pursue scientific careers.

The Hypatia project was launched on February 11, 2021, coinciding with the International Day for Women and Girls in Science. On that day, Mariona Badenas Agustí and crew member Carla Conejo González (Executive Officer) met to discuss the possibility of creating Hypatia I and selecting its crew. After two years and a half of hard work, the Hypatia I team is grateful to the MDRS Executive Team for the opportunity to conduct a Martian mission and work towards achieving our goals.



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Hypatia I Crew

Hypatia I (MDRS Crew 280) is composed of 9 women with the following backgrounds: 1 astrophysicist, 2 biologists, 3 engineers, 2 mathematicians, and 1 journalist.



The Hypatia I crew (in order from left to right and top to bottom): Mariona Badenas-Agustí, Carla Conejo González, Ariadna Farrés Basiana, Laia Ribas, Núria Jar, Neus Sabaté, Cesca Cufí Prat, Anna Bach and Helena Arias.

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MARIONA BADENAS-AGUSTÍ

Crew Commander & Crew Astronomer

She has a degree in Astrophysics from Yale University (USA) and a Master's degree in Astrophysics, Cosmology and High Energy Physics from the Autonomous University of Barcelona and the Institute of Space Studies of Catalonia (Spain). She is currently pursuing a PhD in Planetary Sciences at MIT in Boston.

CARLA CONEJO GONZÁLEZ

Crew Executive Officer & Crew Biologist

Human biologist and science communicator. She has been Head of Science Programs at the Catalunya La Pedrera Foundation, where she has promoted scientific vocations among young people for almost a decade. As a science communicator, she has also been responsible for the content of the Catalan TV programs Quèquicom and Xplorers. She is the co-founder of the scientific tourism initiative Polaris.

ARIADNA FARRÉS BASIANA

Crew Scientist & Health and Safety Officer

Specialist in astrodynamics, celestial mechanics and solar sails at the Goddard Space Flight Center of NASA (USA). She has participated in the launch of the James Webb telescope. She holds a PhD in mathematics from the University of Barcelona (Spain).

LAIA RIBAS

GreenHab Officer

Leader of the Repro-Immune Team research group at the Institute of Marine Sciences of the Spanish National Research Council (CSIC), where she investigates the interactions between the reproduction and immune system of fish. She is part of the Nüwa team, the award-winning project for the design of a city for 1M inhabitants on Mars. She holds a PhD in biology from the Autonomous University of Barcelona.

NÚRIA JAR

Crew Journalist

Science and health journalist with 15 years of experience in some of the most important media outlets in Catalonia and Spain, such as Catalunya Ràdio, TV3, La Vanguardia, Raci, El País, Muy Interesante, and Revista 5W. She is the author of the podcast audio series "Human Condition" and "The Female Scientists of COVID".

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NEUS SABATÉ

Crew Engineer

ICREA researcher at the Barcelona Institute of Microelectronics (IMB-CNM-CSIC). Co-founder of Fuelium, a spin-off company dedicated to the development of sustainable paper batteries for disposable portable devices. Her research has been recognized by institutions such as the European Research Council and the Bill and Melinda Gates Foundation. Currently, she is working on the development of rapid and affordable molecular devices for the global detection of infectious diseases.

CESCA CUFÍ PRAT

Mission Specialist

Aerospace engineer at Airbus Defence & Space and specialist in orbital control systems. Her work focuses on the control of high-precision instruments for Earth observation. Passionate about mountaineering, with a good command of risk management and survival techniques in extreme environments.

ANNA BACH

Back-up Crew Scientist & Artist in Residence

Data analyst, mathematician, and computer scientist, as well as creator and illustrator of comic strips on her profile Annet Planet, where she accumulates 40,000 followers.

HELENA ARIAS

Back-up Crew Engineer

Mechanical engineering, electronic engineering, and physics student at the Polytechnic University of Catalonia and the National University of Distance Education. She is also an engineering intern at the Alba Synchrotron as well as an Olympic shooting elite athlete.

Research Projects

One of the main goals of Hypatia I is to conduct space-related research during its rotation at the MDRS. Different research projects, led by the members of Hypatia I, will be carried out in four major disciplines:

- Astronomy
- Space biology
- Engineering
- Scientific communication

Some of these research projects include:

OBSERVATION OF THE 'MARTIAN' SKY

The MDRS is a unique place to observe the night sky thanks to its low light pollution and the dry climate of the desert. The station has two telescopes with which the properties of star clusters will be studied, asteroids and other minor bodies will be searched for, and astrophotography will be used as an outreach resource for the public.

CIRCADIAN RHYTHMS IN SPACE

One of the most important challenges of a future manned trip to Mars are human limitations. Astronauts have been found to have problems with sleep because they work long hours, face drastic changes in their routines, have different hours of light than on Earth, and face environmental factors that disrupt their circadian rhythms. The members of Hypatia I will use wristband devices to monitor neurophysiological constants related to sleep for 24/7 with the aim of detecting any imbalances that may affect their health and mission performance.

AQUACULTURE ON MARS

Mars is a hostile planet to live on and grow food because the environmental factors are different from those on Earth. However, future human settlements will need resources to feed themselves. The members of Hypatia I will study how gravity alteration affects the DNA of cells, using a model fish that is used in many laboratories around the world: the zebrafish.

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SINGLE-CELL INTELLIGENCE

The Blob (*Physarum polycephalum*) will become one more member of the Hypatia I mission. It is a macroscopic single-celled organism that can move several centimeters per hour. Despite not having a nervous system or brain, the Blob is capable of learning and solving complex nutritional problems, such as finding the shortest path to feed itself. In hostile environments, the Blob can survive for decades in a state of hibernation. Inside a safety cabin designed for the mission, the Blob will be subjected to various conditions that will allow us to study its learning and decision-making abilities.

MARTIAN GPS

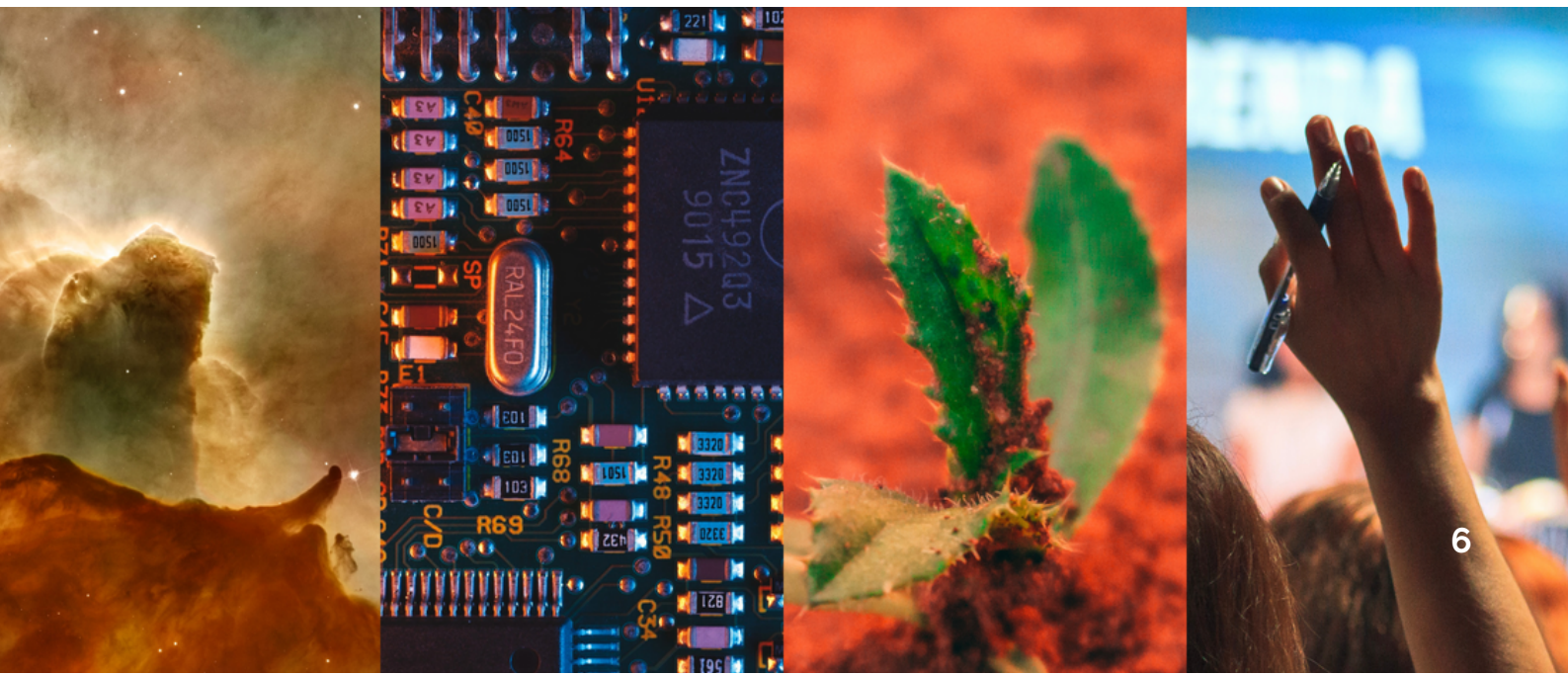
The different rovers that have arrived on Mars navigate the surface of the red planet using various satellites orbiting around it. These connections are not constant and can fail. At the MDRS, we will explore two ways of navigating through the Utah desert. The more classic way is to use the stars as a reference in the night sky. The more innovative way is to use the constellation of CubeSats nano-satellites orbiting above to navigate the surface.

IRON BATTERIES POWERED BY URINE

Batteries are a key element in a manned space mission, but one of the greatest burdens of future trips to Mars is that rockets can not carry too much weight if they want to save on fuel. Therefore, this research project aims to test batteries based on iron chemistry, an abundant material on the red planet, that will use the urine of the crew to function.

DAILY REPORTS TO PLANET EARTH

The crew of Hypatia I will have to write a daily report that explains day by day the activities of the crew at MDRS. The document will also include a description of the progress of the different research projects. At the same time, it will also include photos of the highlights of the day to stay in touch with Earth.



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Collaborating entities

The Hypatia I mission is possible thanks to the collaboration of the following entities:

