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The Rovers take the stage!: an immersive live experience of Mars exploration

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The Mars Yard has been created in 2022 at the Cité de l'espace (Toulouse) to host the live animation "The Rovers take the stage" ("Les rovers entrent en scène"). It is built as a ~900 m² arena able to accommodate ~250 persons at a time (Fig. 1). The idea behind that set was to propose an immersive environment faithfully replicating a Martian geological outcrop. To that end, the Mont Mercou outcrop explored by the NASA rover Curiosity in Gale crater has been chosen. Mont Mercou is a ~7m-high stratified dune formed within an ancient river. Studied by Curiosity in 2021, it features one of the most scenic environment of the mission, and was therefore a suitable model for the Mars Yard (Fig. 2a).

When entering the Mars Yard, the visitors enter a scene built as a "mini-crater", to provide an instantaneous sense of immersion with the Martian set as their immediate landscape. They are facing two walls sculpted and colored to replicate the size, shape and structures typical of the Mont Mercou outcrop with a variety of smooth and cross-stratified series (Figs. 2 and 3). Several small details such as exaggerated renditions of LIBS laser shots have been placed to further this feeling (Fig. 3). On top of the rocky setting, a giant outdoor screen has been installed to provide visual support to the exhibition.

As part of the animation, the visitors get to see four full scale replicas of Martian robotic explorers (Fig. 2b). Two of them are animatronics: the NASA's Mars 2020 Perseverance rover, and the CNSA's Tianwen-1 Zhurong. Both rovers are fully functional and perform movements and simulations of their science activities (e.g., wheel motion, LIBS laser shot, sampling). Two additional replicas are also present: the helicopter Ingenuity and the pioneer rover Sojourner. All of these replicas are presented and/or operated within the Martian setting offered by the Mars Yard as if they actually were on Mars.

These rover operations are taking place as part of a ~40 minutes-long live animation presented by a duo of scientific guides. During this presentation, the visitors are given general but visual information about Mars, its geologic robotic exploration, and therefore the mission of the rovers in front of them. They are also presented with activities like feeling the Martian wind, of the effect of SuperCam's laser on rocks, using a low-powered laser and a balloon. Recent news from the missions are also given since the animation is regularly updated with the latest notable material. This includes latest images sent back to Earth by the rovers that are displayed on the giant screen.

This exhibition and animation is a joint effort between Cité de l'espace, French Space Agency CNES and the IRAP laboratory in Toulouse.



Figure 1: General aerial view of the Mars Yard (© Cité de l'espace), with full scale replicas of the *Zhurong*, *Sojourner* and *Perseverance* rovers, before installing a giant outdoor screen above the rocky setting.

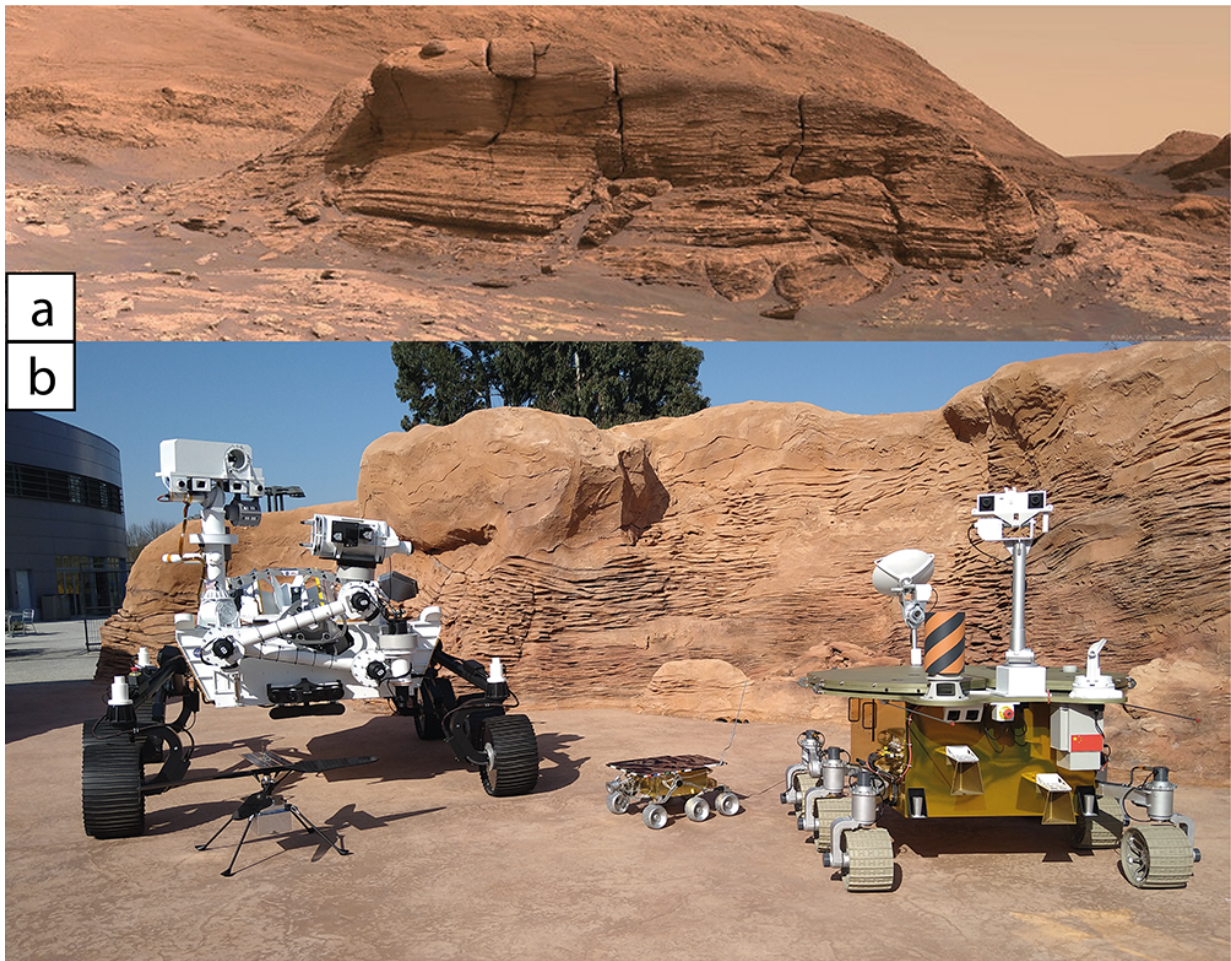


Figure 2: a) General view of the Mont Mercou outcrop on Mars, that was the main inspiration for the setting of the Mars Yard. This ~7m-high scenic outcrop displays a variety of cm- to dm-scale cross-stratification formed in a fluvial setting (NASA/JPL-Caltech/MSSS/Thomas Appéré). b) General view of the Mars Yard setting, with full-scale replicas of *Perseverance*, *Sojourner* and *Zhurong* rovers, and *Ingenuity* helicopter (© Cité de l'espace).



Figure 3: Details of the structures and LIBS laser shots markings reproduced on the Martian setting (© Cité de l'espace).