



Where I work Marleen Martinez Sundgaard

Photographed for *Nature* by
Rocco Ceselin.

As a NASA engineer, I have the coolest job: I play with robots in a 'sandbox'. Anything a lander or rover on Mars does, we first test here on Earth in our sandbox filled with crushed garnet. We need a dust-free space, and garnet is so hard that it creates no dust. We use bright lights to mimic the sunlight on Mars, so pictures taken here are comparable to those captured on the red planet.

For the past few years, I've been working on the international InSight mission, which is studying the interior structure of Mars. The planet doesn't seem to have tectonic plates, so the surface that the lander digs into has the same composition that it had one million years ago.

Before the mission launched on 5 May 2018, we spent about one year testing a full-scale model, shown behind me. We needed to ensure that the lander would be able to use all its equipment no matter what angle it landed at relative to the surface. We tested all possible angles. On 26 November 2018, InSight landed at a perfect two-degree tilt.

We needed to troubleshoot how InSight

deploys its equipment, so we set up the sandbox like the landing site using a process called 'marsforming'. We used augmented-reality headsets, loaded with a digital map based on pictures taken by the lander. If you look down with one on, you are standing on 'Mars'. That brought tears to my eyes.

The lander's 'mole', a heat probe that is supposed to hammer five metres into the surface, isn't digging as expected, so we needed to deepen the sandbox to find a fix. We raised the lander model on blocks and added an extra crate of garnet to make a small, deep space in which I could position a backup heat probe, as I'm shown doing, to test solutions to get the mole on Mars underground.

As a five-year-old, I wanted to become the first astronaut to walk on Mars. Since 2008, I've been applying for the astronaut corps. For now, I have the next-best thing.

Marleen Martinez Sundgaard is the lead systems test-bed engineer for the InSight and Psyche missions at the NASA Jet Propulsion Laboratory in Pasadena, California. **Interview by Amber Dance.**

Correction

This article erroneously implied that the InSight mission has multiple landers on Mars. It has just one. It also stated that the lander was malfunctioning. In fact, the lander is working as designed, but is struggling to cope with unexpected terrain.