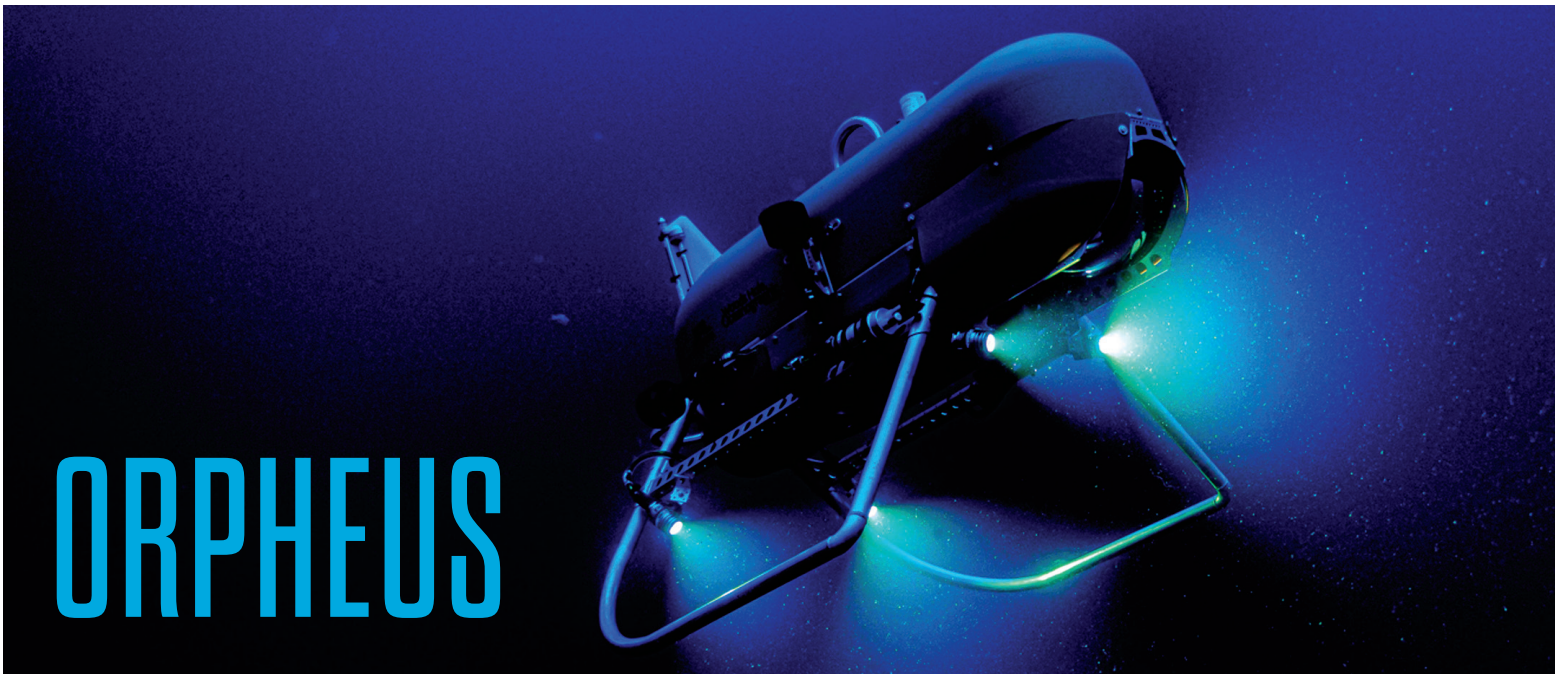

ORPHEUS

WHAT IS ORPHEUS?

Orpheus is the first in a new class of autonomous underwater vehicles (AUVs) designed to withstand the pressure of the ocean's greatest depths—particularly in the hadal zone—while working independently or as a networked fleet to survey and sample almost anywhere in the global ocean.

The hadal zone is the deepest region of the ocean (6,000-11,000 meters) and was named for Hades, king of the underworld in Greek mythology. Orpheus is named after the hero who made it to the underworld and back.

True to its namesake, Orpheus is designed to be a nimble and capable AUV, able to maneuver around obstacles and to land on the seafloor to collect samples and lift off again to continue its mission. The lightweight design of Orpheus is modular and based on proven technology to minimize construction and shipping costs and to permit it to be launched from small research vessels as well as ships of opportunity. Control and mapping software developed by NASA to explore Mars give it a superior performance compared to a conventional AUV.

WHY EXPLORE THE HADAL ZONE?

The hadal zone cannot be considered as simply a continuation of the deep-sea environment because the seafloor at such extreme depths, particularly in ocean trenches, form isolated and disparate ecosystems that may have evolved separately from one another. These trenches are among the least explored environments on Earth. Scientists know very little about what species live in these habitats, what the biological diversity looks like, how life there has evolved to withstand and thrive under extreme conditions, and how processes in the hadal zone link to the rest of the ocean–and to us on the surface.

WHAT RESEARCH IS WHOI CONDUCTING WITH ORPHEUS?

WHOI scientists have a vision to systematically study the hadal environment with *Orpheus* and a fleet of similar AUVs to answer basic questions about what lives in the very deep sea and how the hadal zone connects to the rest of the planet.

The adaptations that enable species to exist under hadal conditions could lead to promising medical treatments, and offer clues about the rise and evolution of life itself.

A deeper understanding of the hadal zone also sets the stage for exploration of oceans beyond Earth, on planetary bodies such as Jupiter's moon Europa and Saturn's moon Enceladus, which are known to harbor liquid water oceans beneath a thick crust of ice. Systematic exploration of Earth's hadal regions will broaden our understanding of the range of conditions capable of supporting life here and, by extension, beyond Earth.

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