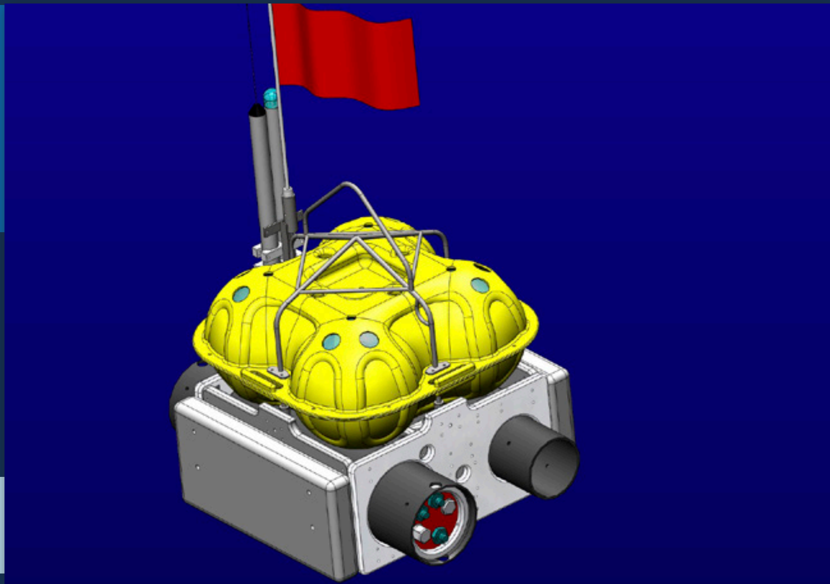
SCRIPPS INSTITUTION GOES DEEP



Researchers Rely on Rapid Prototyping to Build Replacement Parts for Deep-Sea Research Vehicles

"Any university that wants to keep up with the latest manufacturing technology should consider a Dimension 3D Printer."

— Martin Rapa,
Scripps Institution of Oceanography

This ocean bottom seismograph is one of 69 operated by the Scripps Institution of Oceanography's Institute for Geophysics and Planetary Physics (IGPP). The school printed scale models of this instrument using the Dimension 3D Printer.

Martin Rapa, developmental engineer for the Scripps Institution of Oceanography's Institute for Geophysics and Planetary Physics (IGPP), is responsible for designing and implementing deep-sea seismic research equipment. With help from a handful of students in the engineering department participating in a paid internship program, Rapa produces every component for the Institute's ocean bottom seismology instruments.

"Our equipment packages are installed in half-ton, free-fall vehicles, deployed on ships all over the world," Rapa said. "When it gets to the bottom, the vehicle records earthquakes and collects seismic data, giving scientists a better understanding of deep earth processes."

Rapa's students are well versed in using 3D computer-aided design (CAD) software to create prototypes and parts for deep-sea instruments, but waiting for functional machine-made prototypes became costly and inefficient, often delaying deployment for weeks or months at a time while waiting for the next research vessel to depart. Over several years, IGPP spent thousands of dollars developing full-scale prototypes and either machining them by hand on-site or sending the designs to a third party for fabrication.

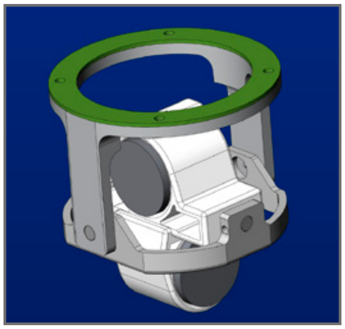
"We were looking for a way to streamline the production of functional parts and prototypes, including instrument molds and scale models, in order to allow more rapid development and deployment of new ideas," said Rapa. "We also wanted to give students a break from hands-on machining in the shop, which is not very cost-effective or appropriate for their skills training."

Since purchasing the Dimension 3D Printer, the IGPP has seen a 50 percent reduction in time and expense incurred for parts manufacturing, allowing the Institute to deploy new instrument packages faster and more cost-effectively than ever before.

IGPP Deep-Sixes Costly Overtime, Production Costs

Manufacturing new instruments and functional prototypes is now easier and more efficient, with the IGPP team better able to respond to immediate, mission-critical needs. During a recent deployment, a polyethylene beacon bracket on one of the instruments broke during routine service. With a ship ready to depart the next day, there was no time to get a replacement part fabricated without paying exorbitant overtime charges.

"Since ABS is relatively porous compared to polyethylene, we weren't sure how the part would perform at 1,000-meter depths," Rapa said. "But the part was already designed, so rather than paying overtime and overnight delivery charges, we went ahead and fabricated it using the Dimension 3D Printer. We saved thousands of dollars and the part performed flawlessly."

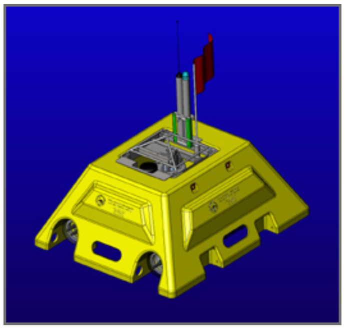


Martin Rapa and his team designed this new, trawl-resistant seismometer platform using the Dimension 3D Printer. The Scripps Institution uses the models for underwater stability testing.

IGPP also has the ability to construct several full-scale prototypes for each instrument it designs. Prior to getting the Dimension 3D Printer, the Institute didn't have the luxury of modifying designs or constructing several iterations of the same prototype. At a cost of $30,000 each for full-scale prototypes using previous methods, the Dimension 3D Printer saved IGPP significant time and money, and allowed the Institute to have more precise control over instrument design.

Rapa can easily amortize the cost savings realized with his 3D printer, and anticipates recouping the full cost of the unit within four to five years. To help further defray the cost of the unit, Rapa also makes the 3D printer available to other groups for a nominal charge, running parts for other design and engineering groups at the Institute when his team isn't using it.

"There's a more than fifty-fold difference between creating functional parts in the shop versus fabricating them with the Dimension 3D Printer," Rapa said.



The above images are an actual Scripps Institution seismometer being deployed off the coast of Oregon. The Dimension 3D Printer plays a critical role in designing and building functional parts for these instruments.

Research Instruments Bring Deeper Understanding of Ocean Floor

IGPP's deep-ocean instruments provide significant research advantages to scientists studying the earth's crust and geological processes associated with underwater volcanoes and earthquakes. Focusing on ocean-floor regions at high risk for seismic activity, researchers use IGPP's instruments to identify high stress points. Seismologists can then get high-resolution pictures of ocean-floor tectonics, or deeper broadband measurements of deep-earth processes, to improve earthquake and tsunami preparedness.

"One of our current projects is a new instrument for the (U.S.) Pacific Northwest, a region many scientists feel is under-prepared for seismic activity," said Rapa. "Having the Dimension 3D Printer means we can design, troubleshoot and perfect this equipment more efficiently, and provide even more value to the scientists who process the data."

Stratasys | www.stratasys.com | info@stratasys.com

7665 Commerce Way
Eden Prairie, MN 55344
+1 888 480 3548 (US Toll Free)
+1 952 937 3000 (Intl)
+1 952 937 0070 (Fax)

2 Holtzman St.,
Science Park, PO Box 2496
Rehovot 76124, Israel
+972 74 745-4000
+972 74 745-5000 (Fax)

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