# Ice Bot: A Deep Sea Diving Apparatus

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Ice floats on water, and upon freezing, exerts an outward force of over 700 megapascals (Mpa). The deepest spot on the ocean floor yet explored is within the Mariana trench, and only reaches a pressure of 111 Mpa. We have designed and built buoyancy engines that harnesses the expansive property of ice and can theoretically withstand even the most extreme of ocean pressures. Our ice-bot engines have no moving parts, and are entirely comprised of non-compressible materials. Incompressible artificial “whale blubber” acts as a bio-mimicry insulation comprised of non-toxic mineral oil. Peltier joule-thief thermoelectric coolers were employed to do the work of chilling the water as they are solid incompressible ceramic units. Resistance to ultra-high pressures is designed into the ice-bot engines. Another feature inherited by using ice for buoyancy is that the ice-bot has regenerative buoyancy. Most deep diving crafts jettison ballast mass at the bottom of their dive in order to become positively buoyant and return to the surface. Because the ice-bot engines do not require sacrificial ballast they can be used to create a net transfer of mass from the ocean floor to the surface. This “artificial upwelling” can fertilize unproductive areas of the ocean far away from the nearest shore. Fertilized ocean can fix much more atmospheric carbon, and sequestering of carbon is so important that it has been identified by the NEA as one of the grand challenges of engineering.

**Awards Won:**

Second Award of $2,000