

UPDATE FROM ANTARCTICA!
News for Students 12-18 yrs.
HUGIN 'THE BRAVE LITTLE SUBMERSIBLE'
EXPLORES UNDER THWAITES GLACIER, ANTARCTICA



**HOW MUCH? HOW FAST? TWO MAJOR QUESTIONS
OUR SMALL HUGIN CAN START TO TACKLE!**

The Hugin, a little orange submarine, travelled to Antarctica in 2019 with a clear set of objectives: work with ample supervision in shallow open water alongside the ship, complete a set of underwater test runs collecting samples and measurements and successfully complete a dive under a floating section of Antarctic ice. The plan was solid. All were tests designed to resolve any problems before a return trip in 2020 to send the expensive instrument off to map under an unexplored section of floating ice at Thwaites Glacier. But the Hugin's science team felt that it was ready for more and in a surprise effort the submarine accomplished the unexpected for the 2019 field season! Here is how...

Hugin the AUV!

The Hugin (pronounced Hoo-gin) is an autonomous underwater vehicle (AUV) operated for the Thwaites collaboration by physical oceanographer Dr. Anna Wåhlin and a team from Sweden's University of Gothenburg. Named '*Ran*' after the *Norse God of the Sea*, the orange torpedo shaped vessel is designed for diving up to 2 miles (3 kms) down in the ocean and motoring along all on its own for 186 miles (300 km). This little explorer is densely packed with 20 assorted instruments, all tucked inside along with a gas-filled bladder to keep it buoyant.



Hugin's control center and the CO bladder used for floatation in this ~15 ft. (4.5 m) submarine.

How Much? How Fast? One key question that scientists are trying to answer is how much ice will melt and how fast could it

happen? To answer this they need to know the variation in ocean water temperature and salinity from the surface to the bottom. Differences in temperature and density form different layers in the ocean water, and knowing where warmer layers rest against the ice is critical in understanding the ice response. *How much and how fast* ice may melt are central questions that drive much of our climate research in the Polar Regions.

Why is this little submarine important?

Unlike our friends the seals who freely swim wherever they choose, *Ran* is a programmable marine explorer that can be set to comprehensively explore and collect data along a specific pathway or area. This will allow the scientists to gather a more complete picture of what it is like under the floating ice of Thwaites Glacier. While our seal friends collect data on temperature, salinity and depth, *Ran* carries a packet of equipment including a small *Multibeam echo sounder* that sends out sound waves to build detailed maps of the seafloor under the ice. The shape of the seafloor is critically important in our understanding of ocean circulation and how different 'parcels' of water interact with the ice under the Glacier. Little *Ran* will far exceed its size in value!

The International Thwaites Glacier Collaboration is a partnership between the U.S. and the U.K. Working together the two countries want to understand the unstable Thwaites Glacier in West Antarctica. Over a five year period scientists will use different instruments and tools to study how the changes in the ocean, ice and atmosphere are affecting this part of Antarctica.



The team sends *Ran* down ~0.5 miles (1 km) under 1000-1500 ft. (300-500 meter) thick floating Thwaites' ice to map the sea bed, collect water samples & measure circulation.



The research ship suspends an instrument in the ocean to communicate with the Hugin while it works underwater so it doesn't try to resurface under shifting sea ice conditions.



After the Hugin safely resurfaces, members of the team are sent out in an inflatable zodiac boat to 'catch' it and pull it back to the ship.



Hugin team members, Dr. Wählén right, Dr. Mazur left, celebrate with a team High-5 after the small submarine is safely back onboard.

Science Technology Engineering and Math (STEM) Connections

The following questions are designed to be open-ended leading to a class discussion.

- 1) AUVs extend our ability to collect important data on water/ice interactions. Science today involves a widening set of remote instruments and equipment. Do you think there will always be a role or a need for people to participate in science research trips to Antarctica?
- 2) *Ran* and the seals (Antarctic Field update #1) are both collecting information from under floating ice of Thwaites Glacier. Consider their individual strengths, what data would each of these 'research tools' be able to collect that the other would not?

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For more on this story check out the blog posts by our field based correspondence:

Tasha Snow: <https://thwaitesglacier.org/blog/snow-on-ice>

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