Ngozumpa 2016

Field Report

SCIENCE IN THE WILD

Ngozumpa Glacier - Intro

Dates: May 20 – June 12, 2016
Location: Ngozumpa Glacier, Nepal
Trip Level: Novice to intermediate
Altitude range: 4593 ft.(1400 m) in Kathmandu to ~18,000 ft. (5486 m) in the mountains
Team members: Dr. Ulyana N. Horodyskyj, Patrick Rowe, Benjamin Pothier, Amrit Thapa , Sonam Sherpa, Gelu Sherpa, Lhakpa Nuru Sherpa

Summary: The Ngozumpa, at 18 kilometers, is one of Nepal's largest and longest glaciers. It is growing a large terminal lake called Spillway, which may someday pose a flooding hazard to the Sherpa villages down-valley. We have been studying this glacier and its growing glacial lakes since 2011, along the way training locals on research and field protocols through The Sherpa-Scientist Initiative. The Science in the Wild Nepal 2016 was our first return to the area following the devastating earthquakes of 2015. The next few pages outline what we were able to accomplish in this 3-week timeframe.

Patrick Rowe

The 2016 Summer Glacier Olympics, held on the shores of Gokyo Lake, Nepal, raised money to support our Sherpa team. Events included a relay race, shotput, javelin, tug-of-war, and our 3rd annual glacier river rubber duck race where fans from abroad could participate by sponsoring a duck.

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Ngozumpa Glacier Terminus

Ngozumpa Glacier terminus:

- The team was able to successfully repair a high-altitude weather station at ~15,000 ft. (4570 m).
  - One micro-station collected weather data (e.g., air temperatures, relative humidity, and precipitation) for 1.5 years continuously (starting Fall 2014). The other, measuring wind speed and direction, was partially destroyed in the 2015 earthquakes.
    - Corrosion to a station's motherboard meant we had to send it to a lab upon return to the US, where they were able to successfully pull data through May 20, 2015, after which the station failed due to monsoonal rain saturation.
    - The total station is currently up and running, collecting data through the monsoon, fall, and winter of 2016/17. We plan to return to it in the Fall 2017 to educate and train a new crew of citizen-scientists.

Benjamin Pothier

The glacier terminus weather station and its rocky platform, as seen post-earthquake. It is located on the surface of a debris-covered glacier (Ngozumpa). Beneath about a meter of rock and dirt, there is glacial ice. The station was rebuilt robustly in order to withstand another season of freeze and thaw processes on the glacier and in case of another earthquake.

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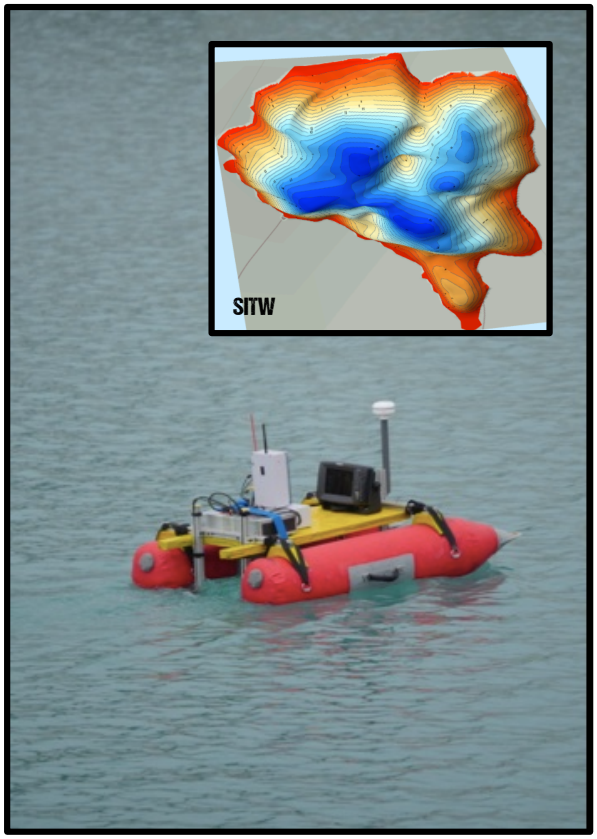
Ngozumpa Glacier Lakes

Ngozumpa Glacial Lakes:

- The team was able to collect new sonar data (down-imaging and side-scan) to be able to compare results with earlier sonar surveys (e.g., 2012, 2014) and to create new 3D models of glacial lake structure.
  - A USV (unmanned surface sonar vessel), version 2.0, built by Midwest ROV LLC was successfully launched and powered around the lakes autonomously in order to collect data.
  - An OpenROV home-built underwater robot was successfully splashed at 15,700 ft. (4785 meters), setting an altitude record.
    - This was a collaborative effort between Midwest ROV LLC (Patrick Rowe) and Vanguard Diving & Exploration (Gareth Carr) to successfully complete the build, amounting to nearly 100 hours of work.



Benjamin Pothier

Benjamin Pothier

The USV (left) with a 3D lake model inset, and an underwater OpenROV (above) used to explore and map glacial lakes in the eastern Himalaya, Nepal. Next year's goals include longer-duration underwater "missions" as well as recording live video. Science in the Wild is working on making data available online for citizen-scientists to be able to work with and learn how to process it firsthand.

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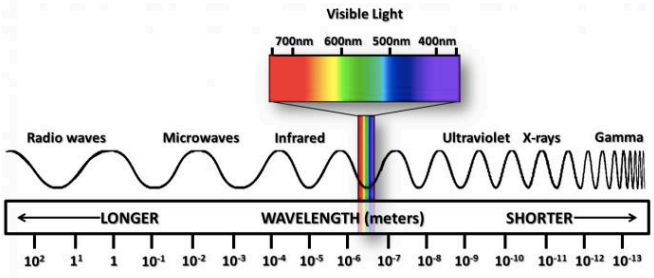
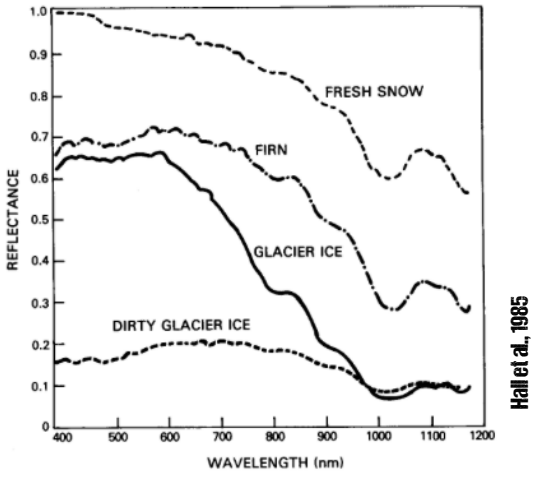
Reflectivity Measurements

Snow Pollution and Albedo Study:

- The team climbed to the summit (~18,000 ft./5486 meters) of an unexplored glacier near Cho Oyu, the 6th highest peak in the world. Half a dozen surface snow samples were collected from the area, as well as spectroscopic (reflectivity) measurements of the snow and ice.
  - Once back at the village, samples were melted, filtered, dried, and stored until analysis in the US.
    - By determining concentrations of black carbon and dust, we can quantify their impacts to snowmelt. Dark particles absorb more solar radiation and can lead to enhanced (accelerated) melting.
- The team also installed a high-altitude station (~17,500 ft./5350 m) to monitor solar radiation inputs (melting potential), to track pre-, during, and post-monsoon albedo (reflectivity) changes to the glacier. The less reflective, the more solar radiation can be absorbed and the more melting that can occur.



NASA



Hall et al., 1985

Benjamin Pothier

A handheld spectroradiomater (ASD, Inc.) was used to obtain reflectivity measurements of snow and ice in the visible and near-infrared spectrums. Spectrally, fresh snow appears the most reflective, followed by firn (as snow compresses to glacial ice), followed by glacial ice, and finally, dirty ice. Spectral slopes and shapes (absorptions) also hold clues to whether a material is snow, ice, or dirty snow/ice – an important distinction sometimes difficult to make by orbiting satellites with large on-the-ground footprints.

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Postcards from the Field

photos: U.N. Horodyskyj

A look at the terrain and the team from the Science in the Wild Nepal 2016 expedition. Clockwise starting from upper left: supraglacial lakes, varying in color due to particle sizes in the water, dot the surface of Ngozumpa glacier. Walking over this loose rocky terrain can be quite challenging at 15,000 ft./4572 m; part of the team inflates the kayak and prepares other components of the USV system; Nima Sherpa keeps a watchful eye (at a distance) on the USV, making measurements near the unstable ice wall; Gelu Sherpa contemplates the view as we ascend to 5400 meters, while completing our snow sampling on an unexplored glacier.

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Collaborative Efforts

Flyover Country:

- The team's progress on the ground was documented using a Delorme InReach text messenger and tracker in order to produce content for Flyover Country, a National Science Foundation funded offline mobile app for geoscience outreach and data discovery.
- For more information, see: https://medium.com/@crowdandcloud/mapping-nepal-with-the-crowd-the-cloud-and-flyover-country-5877f60d70d5#.493weuggr

The Crowd & The Cloud:

- The team was filmed for a short feature in "The Crowd & The Cloud," a PBS series about citizen science and crowd-sourcing of projects, airing in 2017. The focus for our piece was The Sherpa-Scientist Initiative – educating and empowering the local people in a changing climate. http://crowdandcloud.org

"It's very hard not to fall in love with Nepal and the Himalayas. The opportunity to collaborate with the Science in the Wild team and Sherpa scientists was also a wonderful way to learn more about the Sherpa culture. I enjoyed to join as a citizen scientist in order to help the team fulfill their research when I could, as I am totally convinced of the necessity to conduct climate related research, and it was also a great opportunity for me as a photographer and film director."

- Benjamin Pothier

U.N. Horodyskyj

Benjamin Pothier, an accomplished artist, photographer, and filmmaker from Paris, France documents the team's efforts during the Nepal 2016 expedition.

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Local Support

Our expedition was successful given solid logistical support on the ground in Kathmandu, as well as the support of the people we work with in the communities.

"The Himalayan mountain range in Nepal is not only a beautiful tourist destination but also provides opportunities to research a diverse range of environmental issues. By doing research and using outcome data, Science in the Wild aims to raise awareness among the vulnerable population living in high altitudes on the effects of environmental changes on their livelihoods. Based on research findings, SITW trains local people on the importance of taking care of and maintaining their communities and the adverse effects on the environment if they don't.

For the expedition in May/June 2016, Science in the Wild collaborated with the Department of National Parks and Wildlife Conservation of the Government of Nepal. The expedition took place in Gokyo Valley in the Everest Region at approximately 5300 m. Science in the Wild trained six local Sherpas using high-tech robotic ROV devices. They replaced a weather station that was damaged by the earthquake and collected data from existing sources. During the expedition the team met with a heavy snowstorm which made the work even more challenging. SITW organized Olympic Glacier Games among expedition members, the Sherpas and the local people to raise funds for The Sherpa-Scientist Initiative (a foundation that works to increase environmental awareness amongst Sherpas).

I am proud to be a part of this initiative that will bring environmental knowledge to the people of Nepal and will help to maintain a healthy environment at high altitudes."

- Amrit Thapa, Logistics (Himalaya)

U.N. Horodyskyj

Ulyana and Amrit run errands on motorbike through the streets of Kathmandu in the days leading up to the expedition.

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Get Involved!

U.N. Horodyskyj

Contact info@scienceinthewild.com

or check out www.scienceinthewild.com to learn more about upcoming expeditions and how you can get involved.

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