

Scientists set out to explore microbial life in glacier streams

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The expedition officially starts on 1 August 2018. Credit: iStock

EPFL scientists will spend at least the next four years studying some of the world's biggest glacier-fed streams. By collecting microorganisms from the streams and extracting their DNA, they hope to better understand how these creatures have adapted to their extreme environments. The project, slated to start on 1 August 2018, will be the inaugural research program for the Alpine and Polar Environment Research Center (Alpole) at the EPFL Valais Wallis campus in Sion.

What else besides water do we lose as [glaciers](#) vanish? That's the question a team of scientists led by EPFL will set out to answer on an unprecedented expedition set to last at least four years. They will travel to the world's largest mountain glacier systems, collecting microorganisms from hundreds of glacier-fed streams and analyzing their genomes. Through a combination of environmental sciences, life sciences and geology, they hope to learn how these microbiomes have adapted over the millennia to the extreme conditions they are exposed to.

Through this project, which officially starts on 1

August 2018, the international team of scientists will explore the "third pole" through glacial streams in Alaska, the Himalayas, the Andes, Greenland, Scandinavia, Pamir, Kamchatka, Caucasus, New Zealand and the European Alps. It's the inaugural research program for the Alpine and Polar Environment Research Center (Alpole) in Sion and is being made possible thanks to funding from the NOMIS Foundation, which exclusively supports insight-driven scientific endeavors.

The scientists will collect samples from biofilms, which are thin, viscous films of microbes that form on sediment surfaces in glacier-fed streams. They will then use deep sequencing on the microbial DNA to unravel the structure and biological processes of the biofilms' microbiomes. The sequencing data will be used for two purposes. First, to look back in time, since it may contain ancient biosignatures that could help the scientists to unravel the microbes' strategies for adapting to their surroundings over time. And second, to get a glimpse into the future, since it will help the scientists to better understand how biofilms are being affected by the melting of glaciers and, consequently, the role that biofilms play in ecosystem functioning and the biogeochemistry of Alpine glacier-fed streams.

"Glaciers and their streams have often been abundant on Earth. But today they are vanishing as a result of climate change. Glaciologists predict that 50% of the small glaciers in Switzerland will disappear within the next 25 years. The same holds true for their glacier-fed streams – and the ecosystems those streams support. We owe it to future generations to better understand the microbial life in these vanishing ecosystems," says Tom Battin, the project's research director and head of EPFL's Stream Biofilm and Ecosystem Research Laboratory. "We can achieve that only with the support of foundations like NOMIS, and only by taking a cross-disciplinary approach bringing together experts from ecology,

biogeochemistry, molecular biology and glaciology."

"I am pleased that EPFL is at the center of an initiative to document the microbial life found inside glaciers through this study on glacial runoff," says EPFL President Martin Vetterli. "This research has global importance and is a natural fit for the new Center for Changing Alpine and Polar Environments at EPFL Valais Wallis." This enthusiasm is shared by Markus Reinhard, Managing Director at NOMIS: "We are delighted to support this exciting research project, which reflects NOMIS' vision of encouraging interdisciplinary, novel research that has the potential to provide transformational insights about our world."

The first expedition will begin in February 2019. It will be led by Mike Styllas, a geologist and Himalayas specialist, with the help of two mountain experts from Canada and Italy. The genome research will be carried out in association with Professor Paul Wilmes and his team at the University of Luxembourg. Michael Zemp, a research associate at the University of Zurich, will provide his expertise in glaciology. The scientists will start training this summer in the Swiss Alps.

Even before the first expedition gets underway, Battin is already looking ahead to his next challenge. He would like to archive DNA from glacier-fed-stream microbes in a repository that would be housed at the EPFL Valais Wallis campus. This archive would give tomorrow's researchers a "map" of the microbiomes as they stand today. It won't be long before advancements in molecular biology, and especially genetic sequencing, lead to new discoveries in microbiome processes and bring new perspectives on the use of bioprospecting in the field of biotechnology. Battin's DNA archive would also include samples from any research institution wishing to contribute, thereby creating a unique global repository of genetic information on the life in vanishing ecosystems and extreme environments.

Provided by Ecole Polytechnique Federale de Lausanne

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