Ice and the Glen

40% in Himalayas

Nearly all the world's fresh water is stored in ice. But, from the perspective of geology, ice is a rock. Like any other rock, it contains information, making it part of the geologic record. The ice sheets of Greenland and Antarctica are records of past climate. Over 200,000 layers of ice have been counted in the Greenland ice sheet (a sedimentary rock), allowing geochemists to track isotopic compositions of gases in the atmosphere over 200,000 years, and infer global variations in temperature at decadal scales. In the Glen, spectacular evidence of the existence of past continental ice sheets was produced by melting of the Scioto lobe of the Laurentide ice sheet about 15,600 years ago. The resulting flood in Birch Creek Canyon dwarfed the flood of May 22 this year, depositing a boulder of the Laurel limestone, which outcrops at water level about 200 yards above the Birch Creek stepping stones, 30 ft up the western side of the canyon below the confluence of Birch Creek and Yellow Springs Creek. This implies a floodwater depth some 10 times greater than the rainwater flood, and a volume roughly 100 times greater.

This past winter, the surface ice on the Great Lakes provided a record of exceptional cold in this region. The daily fractional ice coverage record was broken by this year's ice cover every day from March 1st through June 5th, when the ice finally disappeared. The cold weather also produced beautiful ice in Glen Helen. In addition to its beauty, the various ice structures provide a record of past temperatures and precipitation. Instead of telling us what happened thousands of years ago, however, ice in the Glen tells us about what has happened in the previous weeks or days. It is a record of past weather, not climate.

This picture of icicles at the Cascades tells us that a period of wet weather was followed closely by subfreezing weather. The near absence of ice on the Cascades, together with the long thin structure of the icicles implies that the temperature was not far below freezing, in contrast to what we experienced later in the winter.

The ice in the right picture is evidence of a prolonged period (weeks) of subfreezing temperatures. The water that flows over the Cascades has been above the surface a large distance, and is thus fairly easy to freeze. But the large flow volume requires a long time for the Cascades to freeze over, nonetheless. The open water on the right hand side of the creek below the Cascades is warmer because of its origin as groundwater (from the contact of the Springfield, and Cedarville Dolomites below the large cliff on the right). The relatively straight ice-water boundary shows that, after the fall into the plunge pool, the two waters do not mix much. This boundary is similar to that of the Amazon and Rio Negro in Brazil, where it shows up in the distinction in sediments. The lack of icicles under the overhang indicates either that the weather before the freeze was not particularly wet, or that visitors had been plucking the icicles for souvenirs, or that brief warmups to near freezing temperatures contributed to the fall of the icicles.

The ice in the left picture indicates a several day period of exceptionally cold weather. Since the water that comes out of the Yellow Springs is about 57 degrees Fahrenheit (the mean yearly temperature of Yellow Springs, OH), and flows within minutes to the Grotto in a channel with relatively small surface area to volume ratio, it is much more difficult to freeze than the water dripping out of cracks in the overhang at the Cascades, or even the water in the Cascades. In fact, the high temperature in the previous 100 hours or so had been less than 10 degrees Fahrenheit.

Intere-sting corre-lation

Next time you take a winter's hike through the Glen, consider the beauty of the ice in the context of geology, and protect also these objects, as ephemeral as flowers, as part of our stewardship of Glen Helen.