Hollis Rocks! Part 1 - A Geologic "flea market"

Sometimes you first really appreciate something when you see it in a fresh perspective. Maybe you first understood what it means to be an American after you'd lived abroad long enough to grow fluent in another language, accommodated to the ways of another society, and then returned home. Maybe you first could visualize the moon's movement in orbit and its phases in three dimensions after you watched a total eclipse of the moon, from start to finish.

To appreciate New Hampshire in a new perspective, you may wish to look below its surface, and learn its geology. But be advised: it's complex and incompletely understood. Like incredibly good sausage, if you love New Hampshire, you may not want to know how it was made. But if you do, and you want to start shopping for fixings to make your own Hollis, let's go to Home Depot. We can check out two of the main ingredients without getting out of our car, taking a "circle tour" of the new Home Depot just north of the Hollis line on Route 101A in south Merrimack. Drive up the entry and check out that rock wall of slabs of white, tan and dark brown rusty schist. No landscape architect could have dreamed this up. Continue up, but instead of going to the parking lot, turn right and follow the road that goes behind the store until it ends before a cut wall of dark brown rusty schist with a big sloppy "7" of white rusty schist inlayed in it. Yuck! Who's responsible for this graffiti? Turn left and continue past the parking lot down the exit road and take the left at the Dunkin' Donuts sign. On your left are walls of new cut rock containing a tacky mix of rusty schist of various colors, all jammed together at weird angles. The contractor who did the site preparation responsible for this rocky chaos ought to be reprimanded, don't you agree? Well, we're three hundred million years too late.

Anyone who loves jigsaw puzzles will be fascinated studying the bedrock map of New Hampshire. As you learn the geologic relationships between bedrock and soils, you will appreciate their expression in the terrain, tree and ground cover, agriculture and even local industry. Driving down the highways, bike exploring the back roads and hiking the trails of New Hampshire is not unlike crashing a series of family reunions. After a while, you get a feel for how each clan looks and behaves, so you can guess what's under you by recognizing each rock family "face" by the trees, ground cover and land uses it fosters.

Keep in mind that most of the rock you see lying around town is not bedrock. All of Hollis is a geologic "flea market". There's rock hauled here from hundreds of miles away, generally from northwest of here, left here by glaciers. In turn, tons of homegrown Hollis rock litters the roadsides and beaches of Martha's Vineyard, Nantucket and Cape Cod. All of New England is a geologic tag sale. In general, any rock you find in your back yard which has rounded corners is probably an import. That thousand ton boulder with trees growing on it could be an import - except for the trees.

To look at the average rock wall in Hollis therefore, is to look at a rogues gallery of stone coming here from anywhere between Hollis to Hanover. If you find an exposure of solid rock with layers and grain parallel to the local lay of the land, and it's similar to another exposure of rock nearby, its likely to be bedrock. If whatever road or river runs into it turns and goes around it, it should be bedrock. If it has a view but no developer is building homes on it, its probably bedrock. If it has a five inch diameter brass U. S. Geologic Survey location marker embedded in it, then you've definitely got bedrock.

You're looking at white Muscovite schist, an exotically light colored north African Silurian era rock, when you drive up the entry to the new Home Depot on 101A. Lying on top of it or sandwiching it from below is a darker north African rock called calc-silicate schist, known locally as rusty schist, which underlies most of Hollis. You see this same rock exposed when you turn right on Depot Road at the light at Route 111 in the pull off area below Runnells Bridge, and heading west on Worcester Road on your right, where it skirts around the ridge, a "buckle" in the bedrock, just before it drops down to Beaver Brook. You see a big block of it exposed on the west side of Silver Lake Road where the state park ends and the orchard begins, across from a pull off. This defines the geologic fault and bedrock contact line crossing Hollis diagonally from its southwest to northeast corners, forming the west sides of Silver Lake, Dunklee and Pennichuck Ponds. It divides what I call Moroccan Hollis from Yankee Hollis and represents the east side line of a branch of the Fitchburg pluton, a Permian granite intrusion into the rusty schist bedrock.

The only way in Hollis to find a north African granite called Exeter Diorite is to play golf at The Overlook. On the eighth hole you tee off over a cliff of this dark gray quartz-poor granite. The worse you play, the more intimate you become with this rock. On seven, you can hook your drive into an outcrop of it off the tee or over club your approach iron into it behind the green. On three, slice and carry the green and your shot bounces off a wall of it, maybe into the river. On six, you can top your drive into a ledge of it sticking out of the middle of the fairway. Found in this one spot locally, this rock emerges in much more impressive fashion to our northeast as the coastal granite hills extending from Kingston and Exeter to Durham and Portsmouth, NH. You see glacially polished exposures of it along Route 101, when driving to the coast.

Another type of bedrock found under only the southeast corner of Hollis is a smooth gray non-rusty schist called Berwick Formation, also a North African plate remnant. There's an outcrop of it at the northwest corner of the Overlook Golf Course parking lot, but the nicest way to find it is to put your canoe in the Nashua River below Runnells Bridge at Alpine Grove and head south toward Pepperell, paddling upstream. You'll pass outcrops of this rock in the river banks and see wild flowers, wetland plants and water birds found nowhere else in Hollis. A ledge of this rock juts into the river just south of the state line by the air strip, forming a swimming hole.

The bedrock underlying the northwest corner of Hollis is Massabesic gneiss, a gray, black and white laminated rock found from Maine to the Catskills as well as the northern British Isles, left five hundred million years ago when Laurentia, the original north American plate, collided with Avalon and Baltica, the northern British and Scandinavian plates. This tectonic pile-up pushed up the Adirondack, Taconic and Green Mountains in the Ordovician period. Two hundred million years later the continents pulled apart, but a strip of Avalon stayed to form the east coast, as the predecessor of the north Atlantic Ocean opened up. A hundred million years later the continental plates shifted again and this time Gondwana, the North African plate, bulldozed into the North American plate, sandwiching the residual strip of Avalon. between it and Laurentia. This huge collision buckled up the Appalachian, Wapack and White Mountain ranges. Toward the end of this tectonic demolition derby, emerging like the winning last survivor between the smoking wrecks of Africa and Avalon, erupted lava now represented in the Woodmont Orchard ridge as a dike of light gray metamorphic Permian two-mica granite. It was once magma which welled up between the two colliding continental rock strata three hundred million years ago when there were volcanoes in southern New Hampshire. It formed a mountain range and "hot glued" southeast Hollis to northwest Hollis, among other things. As the plates pulled apart again, this "glue" held, so the rift which began and widened to became the Atlantic Ocean opened to the east of us as the Gondwana plate retreated, leaving a band of north Africa behind. It underlies most of Hollis and its soils support its agricultural bounty.

There were two rounds of volcanic activity related to the older tectonic plate collision and breakup which built the mountains in the western parts of the state and the bases of the White Mountains, and another two rounds of volcanism related to the second convergence and subsequent rifting which produced surface lava, basing the local granite industry and producing the volcanic moats and plutons of the White Mountains. Add a million and a half years of weathering followed by a hundred thousand years and a dozen cycles of glacial advances and retreats and you get what you see on the maps of the bedrock geology, topography and soils distribution of the state of New Hampshire. Small but complex, I think you'll agree that making New Hampshire wasn't easy!

A stonecutter will tell you that each granite is unique and has a story to tell. Like a French sauce, granite results from a particular mixture of ingredients plus heat, plus time. To make Permian two mica granite *A la Woodmont*, infuse two parts native red hot magma into one part imported Massabesic gneiss, crumbled, plus one part imported Silurian schist, shredded, stirring in white Moroccan schist, grated, to taste. Cover and simmer under pressure for two hundred million years. Let slowly cool. Deep glaciate for one hundred thousand years. Uncover and let warm slowly to room temperature. Garnish with peach trees and preserve. Enjoy!

Jim Canfield, June 2003