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Eye on the Environment: Nature's Revolt

by Liza Ward for Swan Ecosystem Center

Last Friday night it began to snow again. Between the troposphere and the stratosphere, some thirty thousand feet above the valley floor, millions of billions of ice crystals froze around countless particles of pollen, bacteria, fungi, protozoa, and atmospheric dust.

These particles might have been from anywhere. Sneezed from an orchid in Madagascar, or coughed out of a smoke stack in Beijing. In the upper reaches, they began as flat hexagons, but with each change in wind and temperature, they acquired dendrites, or lost them to form new flakes which fell at a foot per second, evolving into plates, columns, needles, stellars.

The flakes that blanketed Holland Peak had fewer intricacies than the stellars drifting to the ground where I stood. These seemed shed from the stars themselves, which sparkled through a break in the clouds, like the mothers of some miraculous dust.

What my mind saw as white or a electric blue in the darkness, was really a blanket of countless crystal prisms, refracting so much color the only thing my eye could do was to bleach it or go blind. How innocuous snow seemed in that moment.

All around me, the valley slept. Cooney Mountain looked soft, hiding the deep blue fissures I noticed three weeks ago, on a December walk. At midnight, the Kraft Creek snotel cast its measurements into the sky. At Hell Roaring—avalanche country—the Moss Peak snotel recorded rising temperatures, increased water content in the snow, making it heavier, thicker—a recipe for precisely the kind of tragedy that occurred at Big Mountain the Sunday afternoon, when an out of bounds skier sent a slab slide tearing over a groomed snowmobile trail in Canyon Creek.

Saturday morning felt strange. Ghost trees loomed out of the mist. The horses at the barn in Bigfork where my friend works were nearly uncatchable. The gray Arabian bucked beneath me as heavy slabs plummeted from the area roof.

Down in the Swan, it was slightly colder. I made my way across Cooney Creek before the snow began to stick to my skis. My dog, who had huge balls of ice clinging to her haunch hair, struggled like a half-swatted fly on her spindly legs. I moved onward with the grace of a wooden puppet. This is a testament to how fast one type of snow can change to another.

Had we been in avalanche country, this situation would most certainly have been dire. Conditions that seem stable one moment can swiftly change. The simple path of my skis or my dog's warm paw, had transformed the properties of the snow we crossed.

The science of avalanche assessment is as complex and as multi-layered as the earth upon which snow rests. Often, the secret to a snow pack's instability lies deep beneath the surface: a December warming spell. Or a cold powdery snow followed by a heavy, wet snow that quickly froze again; air pockets in an under layer left by rapid evaporation. Different storm layers can fail to bond to each other, like an onion with many skins that flake away as your finger slides across it.

Unstable temperatures like the ones that have persisted all season, and will continue to do so as the climate changes, are ideal conditions for both loose snow slides—or sluffs—and slab slides.

McCay Jenkins in his book *White Death* states that slab slides are far less predictable, and are responsible for some 95 percent of avalanche fatalities. Sunday's avalanche on Fiberglass Hill occurred when heavy wet snow piles swiftly on an unstable layer. The snow stretched, moving down-slope like dough, until it grew so heavy all it took was a single skier to set a giant block loose.

To put it simply—if such a thing is possible—avalanches happen because of excessive loading of snow, or physical processes leading to crystal change. This can happen deep within the snow pack as well as on the surface when temperatures rapidly fluctuate, creating surface hoar or sugar snow—it's dangerous property lying in the shape of its crystals, which fail to bond.

A layer of surface or depth hoar created by a temperature fluctuation could be buried deep in a snow pack, invisible to the eye, but given the right weight and pressure, it can send a heavy slab sliding downward like a million pound tsunami on a rip tide breaking trees, smashing houses—with a force of one thousand pounds per square foot.

Water from runoff or a wet snow can also trickle through the pack, hollowing out the underside of a snow layer or creating a liquid stream, cutting the slab loose in its current. Enormous slides in the Andes have been known to bury entire towns.

Wind loading can also cause avalanches. For this reason, leeward slopes are most dangerous, especially after storms—when crystals have not yet had time to bond. The snow on south facing slopes tends to bond more quickly than that on slopes receiving less direct sunlight.

But for every rule in avalanche country, there's the exception. Southern exposures are prone to wet slides-like the one last Sunday on Fiberglass Hill. And while basins look dangerous—and often are, convex rollovers are more so. Snow is under greatest tension at the point where the slope shifts suddenly downward. But every mountain has its secret invisible to the eye. One must dig through the layers to read a winter's history like rings in the trunk of a tree.

Human history has its own tales: a seventeenth century priest delivering sacraments to three hundred people buried in an avalanche, was himself buried by a slide, and then unburied by another. In 1910, a Northern Pacific train stranded by a storm beneath a clear cut for days in the Cascades, was hurled into a canyon when a giant slab snapped loose in a rainstorm. The survivors described the helplessness, the darkness, the

tap of shovels, their muffled cries falling deaf on the car's walls.

In 1969, five young Montana men were caught in an avalanche trying to summit Mount Cleveland, mowed down and strung out like beads clinging to a stand beneath twelve feet of snow, not to be recovered until summer.

Perhaps most frightening is the World War I footage I've seen of man turning nature on man; the Austro Hungarians and the Alipini were stranded in a battle of attrition on the steep slope of the Tyrolian Alps. Living in snow caves for months, a single misstep meant death. Men went crazy. They threw rocks or shot howitzers to spark avalanches, burying the enemy by the thousand. One veteran is quoted in *White Death* as saying, "It is no glorious death at the hands of the enemy; I have seen the corpses. It is a pitiful way to die, a comfortless suffocation in an evil element."

And yet something in us continues to tempt fate—to ignore snow's complexities. Here in the Swan, a Ferndale man died in an avalanche in the Mission Mountains on the Reservation Divide. In 1998, a twenty-one-year-old snowmobiler at Inspiration Point became a victim of a slide caused by a weakly bonded basal facet layer and surface hoar, and his party's own ignorance. They had transceivers, but had never practiced a search, which goes to show: All equipment in the world does little good if you don't know how to use it.

When I lived in Missoula, I had friends that took me to a place draped in snow they had named with a kind of reverence: the Crystal Theater. I was intrigued by their ability to live in the moment—this was something I had never found myself able to do. And in the end I couldn't.

I would stick to the wide valleys, the slopes under thirty degrees until I know how to dig pits like they did—and truly read the snow pack. And even then, I wasn't sure. There was a young man I knew, who went up north to a place with another magical name—Gold Finger, where he and his family would ski the back country.

By February, his father was dead, killed in an avalanche sparked by a cornice broken by the young man's brother's ski. They had dug their pits; they had probes and beacons. They were skiing the slope one by one. They knew what they were doing, but it didn't matter. Nature knew more, as in the end it always does.

There are also the slides no one sees, carving a history in our mountains. These are beautiful. Deep chutes run like veins down the steep faces of the Swans between Buck Creek and Holland Lake, marked by gullies and sheared trees on the Foothills Trail. Anne Dahl has seen evidence of slides at Lindy Peak, broken trees and protruding rock as if by the angry fist of some giant god.

At Swan Ecosystem Center, you can search through Cal Tassanari's avalanche awareness box; hold his slides to the light and find evidence of strange statues called snow ghosts, snow plumes. A careful record of avalanches—what seems like a hundred charts on a science whose intricacies seem barely comprehensible.

But I'm intrigued as I always have been, and I intend to learn more at the avalanche workshop offered at SEC on January 26th. I'm the one standing in my pajamas in a snowstorm. There's a secret language to its silence.