

The Role of Imagery in Popular Geoscience Writing: The Ice Age at North Lake

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Introduction

Scientists, and science itself, have not always communicated well with the general public. This is especially true at the local or grassroots level. Scientific prose is laden with heavy terminology and scientists are not comfortable in shedding this writing mindset when addressing the public. It makes reading our prose burdensome and that, in turn, makes it difficult to establish two-way communications. We should, all of us, eschew the obfuscation that comes from arcane and sesquipedalian jargon, but good popular science writing is a great deal more than just finding short words. It needs to be understood that popular science writing is a form of literature, or at least it needs to try to be. That involves a very different approach.

The purpose of this field trip is to illustrate and explore one literary device used in popular geoscience literature: imagery. Our science has an almost unlimited potential to generate fascinating, even captivating images of the Earth's deep past. Such images, when presented in a literate prose, can capture the attention and imagination of the general reading public. Exploiting this properly, we geologists can be ambassadors of science to a very wide audience.

It must be obvious how much this is needed in a culture where too many have succumbed to the lures of pseudoscience. We need to be proactive in presenting our various sciences in order to counterbalance the efforts of those such as psychics, astrologers, faith healers, and, most of all, creationists. These "schools of thought," are, or should be, the artifacts of an earlier stage in our culture's development. We have been lax in confronting their challenges at the local level. Too often we have ceded the battlefield to them, assuming that we would win the fight for hearts and minds on the basis of our own history of success and logic. We have been in our labs while they have been on our school boards!

Geology is interesting. Every branch of this varied field offers fascinating topics which compel the broadest appeal to the general public. This field trip will explore the ice age history of one of New York State's most scenic realms: North-South Lake State Park (referred to hereafter as "North Lake"). It is an ideal location to introduce the general public to the Ice Age itself. North Lake has a venerable heritage, occupying a site that has attracted visitors since the early 19th Century. For nearly 200 years, generations of people have been drawn to its scenery: its view of the Hudson Valley, its picturesque mountainous landscape, and the two beautiful lakes. North Lake has been a very influential locale; it is the birthplace of the Hudson River school of art, America's first and very serious contribution to the world of landscape painting.

Scenic as it might be today, North Lake has a very complex ice age history, recorded in the landscape and on the bedrock. These evidences of the Ice Age bring to the mind's eye vivid images of a chapter of glacial history that would have fascinated any of the Hudson Valley school landscape artists who worked here. Nobody painted those scenes from the past, but they can be "painted" in words.

Our journey begins at the top of the Catskill Front, the "Wall of Manitou," on the ledge which is the historic site of the famed, but long gone, Catskill Mountain House Hotel. This ledge, in some form, must have been there at the time when the glaciers first came down the Hudson Valley.

Recently I stood at the lip of the ledge and gazed into its past. I saw the Hudson Valley, before me, much as it had been 23,000 years ago. It was heavily forested then, and I found that the forest was not much different than you would expect nowadays; there were oaks, maples and birch. There were a lot of chestnuts back then too. Many of these trees were enormous; there had never been any axes in this forest. Trees had grown to great age and size.

As a geologist I was blessed with being able to watch this forest for centuries, a lot of them. I thought that the summers were getting shorter and grayer. They seemed to stop getting really hot; in fact they were downright cool and cloudy. There seemed to be fewer warm weather birds, and I thought there were fewer summer insects as well; I rarely heard katydids.

The winters were not all that cold though, but they too were overcast. It always seemed to be about 31 degrees out and snowing. I got to be a little weary of the snowfall, but it would not stop. As more centuries elapsed I noticed that the trees atop of nearby South Mountain seemed to sicken. Even in late August they seemed pale, even yellow. They were losing a fight (or perhaps a war) with the climate. With more centuries I saw that patches of them were dead.

Then, down below, I noticed the same affliction in the forest of the Catskill Front. Their leaves, even in August, were small and yellow. Summer, it seemed, was just not warm enough to allow healthy growth of these trees. What was going on? I was the only person in all of North America. There was nobody to go and ask.

Now I noticed that the snowfall was lasting into May and then June. The new snows were retuning in October and even late September. We are used to climatic cycles, but our droughts are always followed by rainy seasons; our heat waves are balanced by cold spells. But I was watching a one-way process. The Catskills were changing into a land without summer. Now the forests up on North Point were all dead and the trees below were dying as well. It was a somber sight.

There was something else. I saw weeks of weather when the skies were blue, clear, and cloudless, while cold, very dry winds blew steadily out of the northeast. I looked that way and wondered if there was something cold and dry in that direction. I could not even guess an answer. It was a relentless wind, and it got on my nerves after a while, but it would not stop.

Now the snows lay on the ground longer into the "summer" season. I saw dirty old snowdrifts in mid-July. One summer the ground never thawed out and that was the year all the trees finally died.

Trees don't make noise, but once they are dead all the noise makers soon disappear. I watched as all the singing birds, all the noise-making insects, and all the vocal animals vanished. The dead forest became unnervingly silent.

But real silence was rare; those howling dry winds continued and now they desiccated the dead trees. Soon dry and brittle twigs were blown down, then the branches fell, and finally even the great limbs crashed to the ground. This made the forest a very noisy place . . . until only the tree trunks were left.

I, the lone witness to all this, again gazed to the northeast. There I spied something I had not seen before. A large massive entity now filled that distant stretch of the Hudson Valley. In the early morning it was a dark blue which graded to a green and then a yellow as the mornings progressed. The object was a brilliant white at noon. In the afternoon the pattern of colors was reversed. But what was I looking at? As weeks and months progressed, it crept farther south, down the valley. With enough time its image sharpened and its identity was revealed; it was a great glacier, filling more and more of the valley and advancing to the south. Now, at last, I comprehended the very nature of all the mysteries that I had been watching. The Hudson Valley and the Catskills had been sinking into an Ice Age.

Events accelerated. Soon, the great stream of ice passed by below me. Ominously, it began to ascend the slopes of the Catskill Front. It rose closer to where I stood. Then I heard a distant snapping, falling and crashing sound, and then another. These sounds became routine and I wondered what it was. This mystery, too, would be solved. I was looking in just the right direction when I saw and heard the advancing glacier pushing over one of those old and dead tree trunks, and then another.

The full impact of all this was frightening; it was overwhelming. Now streams of ice were flowing across the top of the Catskill Front. More ice was flowing up Kaaterskill Clove. The ice was reaching towards the top of South Mountain. Then it even overtopped that mountain's crest (Figure 1).

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I had been transfixed by the flows of the glaciers, now all around me, and was not paying much heed elsewhere. But then I did turn to the north and gazed up at North Point. There, in a spine chilling flash, I saw the image of a great ice sheet coming across that mountain. It signaled the main act of this drama. This was not some small valley glacier; this was the real thing. An enormous and thick ice sheet had been advancing out of the north and now it was about to override all of North Lake and all of the Catskills and much of North America! (Adapted from Titus, 2005 and 2007)

The preceding passage is hardly something to be called “scientific.” It is an *image* of the Ice Age, bordering on fantasy. Most of it lacks evidence so it is not science; it is art in the service of science. And that is the point of this field trip and this guide.

Most conventional scientific prose might well be compared to realistic art. The motives, both in science and such art, are generally the same. The scientist and the artist seek to portray the world as it is. But the artist is always given “license.” He is free to play with colors and shades of darkness to bring an “artistic” interpretation to his portrayal. He is always free to alter nature in order to capture Nature.

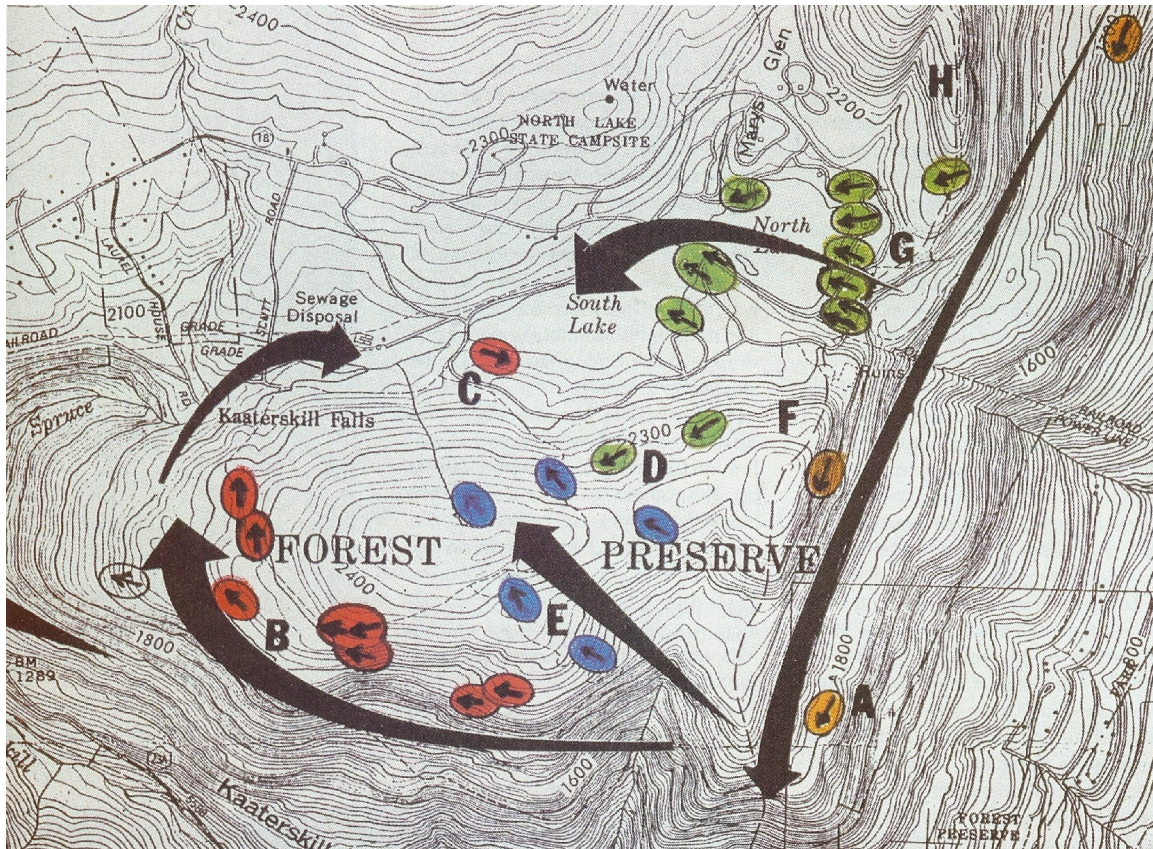


Figure 1.

Mind you, I am not arguing for abstract art, but impressionistic. It has been the case, since the later 19th Century that artists have employed impressionistic forms of painting. Here the effort is to seek to portray reality, but in a more “artistic” fashion. The purpose is to capture the eye as well as to portray, and to reveal more than to represent. The description of the advance of the glaciers, as presented above, is intended as an impression. Impressionistic literature is not new; it is a recognized genre of literature (Wikipedia, 2009).

What is the purpose of this? Should scientists even do such things? The answer is that the purpose and justification are one in the same. The purpose is to communicate, in this case, the *nature* of the Ice Age to a broad and general public.

There is, of course, a strict reality of the Ice Age and its history, and that is the largely the domain of the professional scientist. That reality is portrayed in dry, often technical prose. It can also be difficult to follow even for the experienced scientist but, in the normal context of professional science, that is acceptable. But that is *not* acceptable in popular writing. If it tends to be difficult, or even impossible to follow for the average reader, then nothing is being accomplished.

And there is so much more than the strictly realistic. There is a spirit of the Ice Age, even a romance of the Ice Age. Artists, such as Frederic Church, have attempted to capture all that in canvases such as “The Icebergs” (1861). Writers such as John Muir have sought to capture the adventure of glacial landscape (See his “Travels in Alaska,” 1915). We scientists have rarely followed such paths, and that is unfortunate.

We continue our field trip: Head south and up the Blue Trail, ascending from the Mountain House site. Continue on the Blue Trail where it forks to the left, until reaching Boulder Rock. Boulder Rock is a fine glacial erratic, brought here when the ice had covered all of South Mountain. Look also for numerous striations and a few rat tails in its close proximity. A chapter in time is found here:

There was a time when the very concept of the Hudson Valley did not mean very much and it was not all that long ago, at least not in the way that geologists think about time. Let's take a plane ride back 20,000 years ago. We are the mind's eye, the human imagination, and we can do such things. We are flying from what will someday be the village of Catskill to what will be the city of Kingston. It is a clear day and we can see all the way to the horizon in any direction that we care to look. There is, however, virtually nothing to see.

Looking straight down we see a flat expanse of white. We drop down and fly close to the “ground” (the mind's eye can do such things) and we benefit with just a little more detail. Now the whiteness is broken by a few dark fractures. We are close enough to tell that it is ice that we are looking at, and now we can also see some drifts of snow. But, for all practical purposes, this is a featureless and white Arctic landscape.

We rise up high into the sky, higher than before. Off to the east, the white extends to the horizon with absolutely no blemish. That horizon shows the Earth's curvature, but it is a white curve against a very pale blue sky. We look north and see exactly the same visage. Then we look west and there, at last, is the one blemish to the perfectly white landscape. The peak of Slide Mountain pokes above the ice; it is an island in a sea of ice.

The sight of Slide's peak is a welcome one, but this view quickly generates a rush of awe. Slide rises to more than 4,000 feet in elevation, but only a bit of its summit is showing. The conclusion is inescapable: there are thousands of feet of glacier beneath us. I used the word Arctic but I might better have called it Antarctic. There is nothing in the modern world to match what we are seeing except the vast whiteness of Antarctica. It is this notion that inspires such awe.

Millennia from this time, scientists will recognize this as one of the great glaciations of all history, and they will name this glacier the Laurentide Ice Sheet. More than half of the North American continent, on this day, is covered with ice. We are the mind's eye; we rise thousands of miles above the surface and gaze to the north. Even this high, there is nothing but white curved globe as far as we can see in that direction. Once again, a rush of awe overwhelms us.

To the south we do better. We are now high up enough to easily see the southernmost extent of the glaciation. The ice has reached into northern New Jersey and northeastern Pennsylvania. More ice has reached as far south as Long Island. Beyond the whiteness is a barren and desolate landscape. Someday scientists will called this bleak region a tundra or a “periglacial” zone.

Now we understand why, at this time, the very notion of the Hudson Valley is meaningless. All of this valley, along with the Catskill Front, is buried in the thickness of the ice we see. It gets worse: off to the east both the Taconic and the Berkshire ranges are similarly submerged in the ice.

We continue our ice age flight and drift back to the north. With our mind's eye we operate a form of radar that penetrates the ice below. We can see the Hudson Valley beneath the ice and we can see the Catskill Front and the Catskill Mountains. We are the mind's eye; we can do such things as this. (Adapted from Titus, 2008)

The “mind’s eye” is another literary device. It is freely used here along with the first person “I” and “we.” All are supernatural entities serving to transport the reader back into time. Scientists don’t use such things in professional literature, but, of course, that is the point of this effort.

There is a secondary function of the supernatural first person. Importantly, the mind’s eye serves also to emphasize that this is not professional literature. The reader understands that, and understands that this is largely fantasy, exempt from all the rules of professional literature. The reader should not be confusing any of this with professional science and that is critical.

We follow the Blue Trail west from Boulder Rock. Soon we reach the junction with the Red Trail and, just east of that junction, we find an inconspicuous notch that the Red Trail passes across. This is the very top of a substantial meltwater spillway (Figure 2). Once large volumes of water, impounded by a glacier to the north, passed this way and tumbled down an increasingly large canyon below. We can look at this feature as a modern bit of the landscape, or we can travel into the past.

This notch was once actively draining water out of an ice-bounded lake, extending off to the north. If you visit this site, look and, in your mind's eye, see that lake. All along the two shores, left and right, you are likely to see platforms of ice extending out into the lake. The middle is ice free, dark and deep. A slow current will be flowing toward you. As it approaches the notch, it is squeezed into the narrows between the rock cliffs here and it picks up speed. A silent but very powerful flow of water rushes through the notch. There is something akin to the hum of electricity here, but otherwise it is remarkably silent. (Adapted from Titus, 2009)

Off to the south, the flow quickly becomes a loud chaos. A raging, foaming cascade plummets downhill into Kaaterskill Clove. It disappears under the ice which still fills most of that deep clove. There is an enormous amount of power to all this; it comprises the very image of the end of the Ice Age. Glaciers are melting rapidly and vast amounts of water have to drain off somewhere and they too must do it quickly. (Adapted from Titus, 2001)

Turn west and continue on the Blue Trail and follow it toward the Hotel Kaaterskill site. Turn right and travel down the old unmarked hotel trail. Near the bottom of this trail we will again turn right and follow eastward on another unmarked path, keeping a sizable ledge immediately to our left. Back east, almost to the Catskill Front, are enormous boulders called the “Druid Rocks.” These were probably dislodged as the ice flowed northward, across them, and plucked them free.

We are beneath the ice. Above us, a sizable glacier is flowing northwards. This glacier has peeled off of the Hudson Valley ice and turned into Kaaterskill Clove and then curled around South Mountain (Figure 1). After rising up to that mountain's crest, it has overtopped it. The moving ice is plucking the rocks just beyond that crest and that is what we are experiencing now. We hear the low groaning sounds of advancing ice, punctuated by sporadic sharp cracking and popping sounds. The years pass by and we, the mind's eye, are able to stay here and experience all that is happening. With time, these sharp sounds abate, and eventually they cease. There has been, however, the steadily increasing gurgling and rushing sound of flowing water. The glaciers have passed their zenith, the climate has begun to warm, and the ice age will soon begin its end.

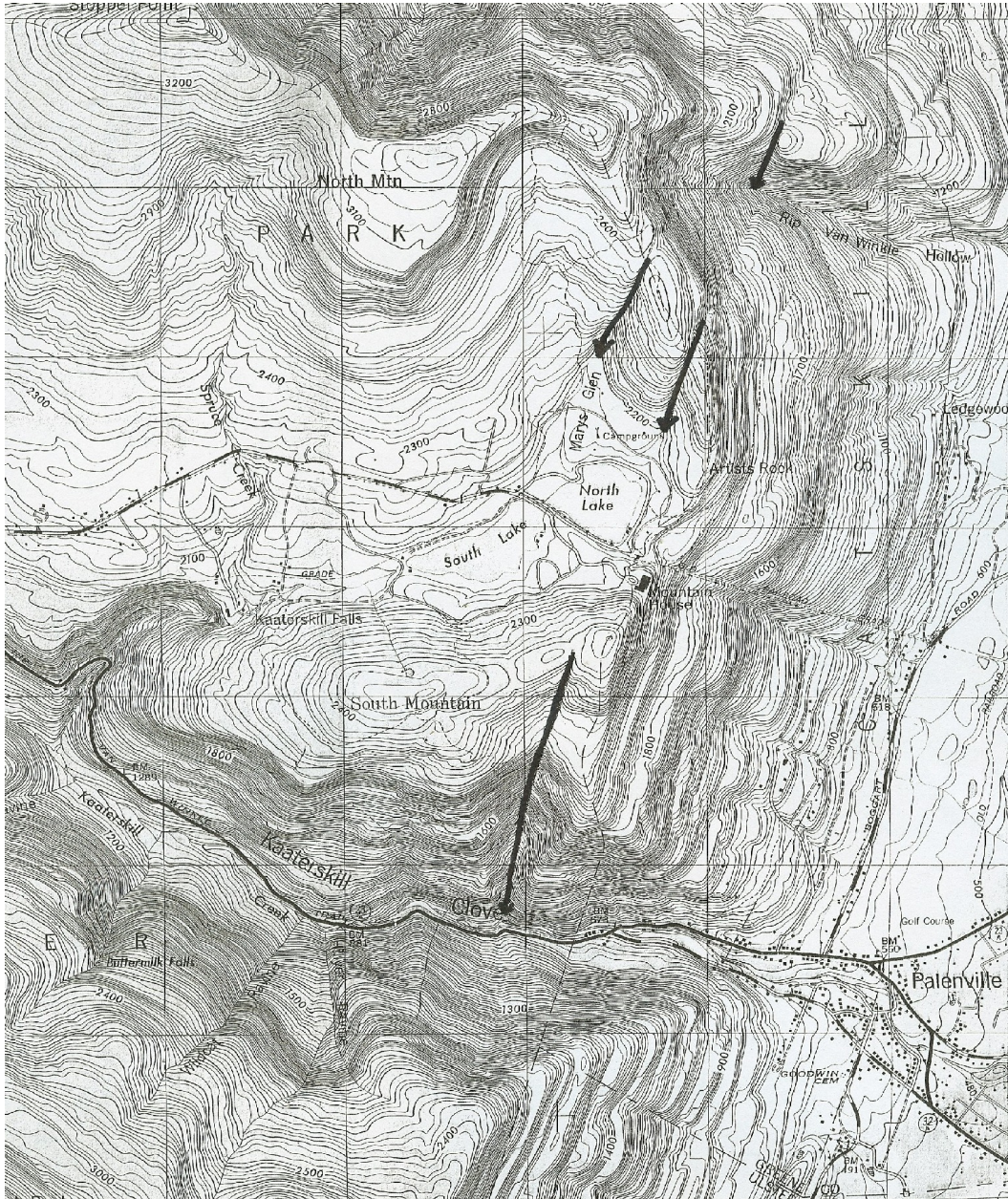


Figure 2.

Continue east until returning to the Blue Trail. Hike down to the North Lake parking lot. Towering above the lake is North Point. A great hollow up there appears to be a late ice age cirque. John Lyon Rich (1934) and George Halcott Chadwick (1944) quarreled over how many cirques were to be found in the Catskills. Rich recognized many of them; Chadwick was skeptical, believing that all or nearly all were simply the products of dendritic (he used the word arborescent) drainage. At the top of Ashby Falls in Mary's Glen two patterns of striations can be seen. One, from the east, represents ice overtopping the Catskill Front, but the other, is oriented and a manner consistent with an Alpine glaciers descending the southern slope of North Mountain, down from the cirque. We, the mind's eye, can see this Alpine glacier.

Mar. 13, 12,748 BC - *We gaze above North Lake to the North Point cirque. It has been an unusually rainy and warm early spring season, but today is the worst. A powerful nor'easter has been moving up the east coast and now intense rain pummels the North Lake vicinity. On this day there is still a glacier within the now old cirque, but its days are numbered. The climate has been warming and it has been quite some time since the ice has managed to advance down the valley of Mary's Glen. The rain has melted all snow off of the ice and what remains is a shiny beryl blue colored glacier. It is a beautiful sight, but we do not get to see it for very long. The warm rain, falling on the cold ice, is generating a ground fog. Our view disappears into that fog.*

Continue on to campsite 151. There, you will find a very fine scoured and polished ice age surface. Striations and very large crescent marks can be seen here. They display three compass orientations. The first is most poorly preserved and is oriented north to south. It appears to possibly represent the peak advance of the ice down the Hudson Valley. The second and third orientations are at west 25, degrees north, and west, 25 degrees south. These seem to represent two successive younger advances of the ice over the lip of the Catskill Front at North Lake. These can be hypothesized as being events *such as* the Wagon Wheel and the Grand Gorge re-advances, but no evidence in support of such notions can be mustered.

March 14, 12,748 BC – *The rain continues with no slackening, in fact it seems to have gotten worse. In the foreground water is running across the bare bedrock, sweeping it clear of sediment and gravel. The striations of the recent ice age epochs are clearly seen. The ground here will not “recover” from this storm; it will stay bare for many millennia and those striations will remain exposed for all of that time.*

The use of dates in these last two pieces is, of course, an utter fiction. But the intent is to add an out-of-time note of “drama” to the image. Descriptions of weather conditions, likewise, serve to add atmosphere to the imagery. The purpose is not to advance science but to advance art in its service to science. It an effort at literature.

Return to the Blue Trail and continue north toward Sunset Rock. Just short of the turnoff onto the Yellow Trail is a canyon. This is a deep jagged gorge, but today it contains virtually no water within it. It appears to be a late ice age paleoform. The floor of this gorge displays what appears to be bedrock with glacial striations oriented parallel to its direction. This would indicate that a tongue of ice split from the main Hudson Valley glacier and penetrated this canyon. The canyon itself seems to date back to just before the latest phases of the ice age. This steep vee-shaped canyon would appear to be a temporary spillway, dating back, likely, to the last melting of the Hudson Valley glacier (Figure 2). There is another similar meltwater canyon about a quarter mile to the north and, another at Rip Van Winkle ledge. More remarkably, there is a double canyon at Dutcher Pass, almost four miles farther to the north, along the Blue Trail.

July 16, 14,154 BC - *We stand in the center of the canyon in the face of an enormously powerful flow of icy meltwater. A cascade is washing by us, but we are the mind's eye and we can hold our ground. We rise up a hundred feet or so and look to the east. There, before us, the whole Hudson Valley is filled with a glacier. It extends off as far as we can see. This mass of ice is huge and it slopes upwards to the east for miles; we cannot see beyond its top. But, large as it might be, this glacier is condemned to melt away. The climate has warmed and this glacier is, right before us, turning into meltwater. That is the origin of the flow that we have just experienced.*

Return back down the Blue Trail. Follow it to the Artist Rock Ledge, overlooking the valley. From here, there must have once been quite a view at the very end of the Ice Age. Out in the distance was Glacial Lake Albany, nearer was Glacial Lake Kiskatom, and just below to the south was the Palenville alluvial fan, where Kaaterskill Creek emptied out onto the floor of the newly deglaciated Hudson Valley.

Dawn, April 3, 13,445 BC – *We stand on the edge of the Catskill Front and before us, as is so often the case, the valley is filled with fog, which reaches half way up the front to where we are. In the distance, off to our south, is the steady roar of a great flow of fog enshrouded water. What mystery is this? A few hours pass and the fog has been thinning. Now a breeze picks up, blowing along the Catskill Front. It starts to drive the mist away and we can look toward the noise and see the source of that roar.*

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A great flow of whitewater is thundering out of Kaaterskill Clove and flowing through what will someday be Palenville. Fed by enormous amounts of meltwater, this is a very much larger Kaaterskill Creek than what is seen in modern times. The flow has already deposited a substantial alluvial fan. This ancestor of today's Kaaterskill Creek splits up as it passes onto the fan. There are four large distributary streams and a dozen or so small ones. Each is flowing down the gentle slope of the fan.

At the bottom of the fan, the various distributaries reassemble themselves, once again, into a single stream. This is a most remarkable manifestation of Kaaterskill Creek. On this day it is a raging flow of pounding, churning whitewater. It would be called a Class 6 stream in modern times, except that it is bigger than any seen today. We are watching at the exact day and hour that Kaaterskill Creek has more water in it than it ever had before or will ever have again. Up in the mountains the glaciers are melting rapidly. That is where the powerful flow comes from.

The breeze picks up and the fog continues to dispel. Now it can be seen that Kaaterskill Creek flows into a sizable lake, which in modern times, though now dry, is called Lake Kiskatom. Across, at the eastern side of the lake, Kiskatom's waters pass into a narrow bedrock gorge. Beyond, and out of sight, is a sizable waterfall, today called High Falls. Now the fog is gone entirely and that unveils, far out in the distance, a very large lake which fills much of the Hudson Valley. This is Glacial Lake Albany.

With the fog gone, the sun shines brightly. We now see rainbows, two of them. One rising above the upstream end of the Palenville fan, and the other, far away, rises above the location of High Falls. Powerful flows at both sites are producing large, fine sprays of mist. It is a beautiful panorama that we see on this day. In the future people will have to settle for imagining this sight, but we are geologists, and we are privileged to see it for ourselves.

Professional scientists may likely rebel against the use of exact dates for this and earlier passages, but it is, of course, another literary device. The dates reinforce the concept that there really was a past here, moments in time when events of this sort actually did happen. In most other respects this passage is probably close to being acceptable to professional science; the features described have been deduced from abundant clear evidence. The style of writing separates this passage from professional writing, again the whole point of this exercise.

We return to North Lake parking lot. Our trip is over. Our exercise today has been about popular writing much more than science. What is argued here is a doctrine of the separation of popular and professional writing. The pursuit of one should have no influence upon the other. The author disclaims that any of this composition is professional science. The author is a paleontologist, not a glacial geologist. The author stakes no "claim" to any of these subjects and encourages professionals to study at North Lake. But this composition is an appeal for other geologists to take up the writing of their sciences, in local periodicals, for the benefit of their own communities, and for the benefit of themselves. And for the benefit of science.

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