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MRNPA NEWS

From the Summit

by John Titland, President MRNPA

I have just re-read a magazine article about Easter Island that continues to give me reasons to ponder. The article is by Dr. Jared Diamond, Professor of Physiology at UCLA. To prompt your memory, Easter Island is the treeless, barren, South Pacific island, more than 1400 miles from the nearest inhabited island, where more than 200 huge stone statues stand in rows looking out to sea. Easter Island is so isolated that the first Europeans to visit found the island's inhabitants unaware that humans existed anywhere else. Until recently the enigma of Easter Island has been why and how the islanders, who numbered only about 2000 at the time of the first European contact, were able to quarry, move, and erect these solid stone statues weighing up to 82 tons, apparently without the aid of any wood, on an island so poor in resources that it was barely able to provide them with shelter, adequate diet, and fuel for cooking. Dr. Diamond's magazine article summarizes some recent archeological and paleontological findings about Easter Island.

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Mount Rainier, The Volcano

While all the world watches *Dante's Peak* on the big screen, Northwesterners can watch Mounts Rainier, Saint Helens, Baker, Adams, Glacier, and Hood on the big horizon. Dante's Peak is fictional. Our peaks are real. Unlike Dante's Peak, in which even the dog gets saved, real volcanic eruptions, mudflows, etc., can leave hundreds or thousands dead. Even as remote as it was, Mount St. Helens left 57 dead. One of the biggest fears scientists have about Mount Rainier is in close proximity to a population of over half a million people. Thousands of those live in the valleys directly in the path the monumental mudflows would travel.

The Big One: Will Rainier really Go?

The first question after "will it ever erupt again?" is "what will it do if it does" Will Tacoma turn into a 20th Century Pompeii? What is the primary danger? Lava? Ash? Pumice? Floods? Being inundated by a massive mudflow?

The most recent geological review of the Electron Mudflow (*Scott and Pringle, in press*) estimates that a flow of similar size and composition would reach Orting in 1 to 2 hours, with a flowing depth of about 30 feet, and leave the town buried about 15 feet deep. Even though the Electron Mudflow apparently occurred without an accompanying eruption, it is used by scientists and emergency-preparedness planners as the design event to be expected from a major eruption of Mount Rainier. (*Tanaka*).

Ash-flow-producing eruptions are another significant volcanic hazard previous unrecognized at Mount Rainier.

- The greatest risks are from mudflows. Studies of past flows yield the most meaningful estimates of what could be expected in size of flows, as well as frequency, dynamics and extent. Such mudflows might well be caused by a steam eruption, which would melt some of the vast snow and ice reserves, causing a disastrous mudflow, rather than a violent explosion similar to Mount St. Helens in 1980.

- One scientist (*Frank - 1985*), believes that a northeastward sector collapse is especially likely at Mount Rainier because the summit cone formed in a depression oriented in that direction, is

From the Summit, continued from page 1

The evidence now shows that prior to the time human activities began there, Easter Island was covered by lush, subtropical forests. Numerous varieties of plants, shrubs, and trees were present, including large numbers of a species of very large palm tree. The island was also the breeding sight for prodigious numbers of sea birds. By any standard, Easter Island was an island paradise.

Humans arrived on Easter Island between AD 400 and 700. By AD 800, human activities already had impacted the island's ecosystems. The number of forest trees had declined as the forests were cut and replaced by crop land. At the same time, the human population was increasing. The population reached maximum in the period AD 1200 to 1500. This population peak corresponded with the period of maximum stone statue building. Then things fell apart.

By AD 1400, the palm trees were extinct. This extinction corresponds well with evidence of a precipitous decrease in the amount of seafood in the islanders' diet--no large trees for boat construction--and an increase in the consumption of chicken and rats, both introduced species. By AD 1600 to 1700 the islanders had turned to cannibalism as a source of meat. The population crashed to less than 25% of the previous maximum, probably due to starvation. Island society broke down into chaos and civil war.

In 1722, Dutch explorer Jacob Roggeveen "discovered" Easter Island. At that time, vegetation had been reduced to (by modern count) only 47 species of native plants, mostly grasses, sedges and ferns. No native land animals or birds larger than insects were present. No nesting sea birds remained. In little more than 1000 years of human habitation, Easter Island changed from island paradise to wasteland. And while this extreme and ultimately disastrous environmental breakdown was taking place, island inhabitants spent untold amounts of human effort and island resources building hundreds of stone edifices which their descendants eventually threw down and desecrated.

In concluding his article, Dr. Diamond points out that unless we heed the environmental lessons Easter Island provides, the future of the Earth may be foreshadowed by the history of Easter Island. Except for size, there is not much difference between an island isolated by uncrossable ocean and a planet isolated in endless space. If either gets trashed, there is no place else for the inhabitants to go. And what today looks like merely a common palm tree may in the future be the boat needed to find food.

But Dr. Diamond makes another observation similar to one that Jane and I have made in discussing Mount Rainier National Park and its surroundings. It is that environmental changes take place slowly relative to human time--too slowly for most people to get concerned. On Easter Island, palm trees went extinct in less than 1,000 years. It is unlikely that any islander saw much of a change in a lifetime. In the Pacific Northwest, an unbroken carpet of trees once stretched from the foot of Mount Rainier to the Pacific Ocean and salmon spawned in every creek deep enough to drink from. Today the entire old growth ecosystem may be extinguished in a timespan of less than

continued from previous column

200 years and salmon may be gone in 150 years. These time periods are much closer to human understanding than 1,000 years but how many of us see these changes? Each of us begins life assuming the world around us, as we "discover" it, is the way the world has always been. As we get older and recall our early discoveries, we recognize that the world has changed. Only then can we understand how much the world was different before we arrived and how much it can change in the future.

During my term as President of MRNPA one of my goals has always been that our grandchildren's grandchildren should find the Mount Rainier National Park the same as we see it today. But that's not good enough. We must heed the environmental lessons of places like Easter Island and be perceptive enough to see where the loss of the palm trees, the Northwest forest, and the salmon is taking us. One of my greatest fears is that our grandchildren's grandchildren will find Mount Rainier National Park very much as we see it, except it will be the ultimate natural museum, surrounded by human impacted, impoverished landscapes and subdivisions. Preserving Mount Rainier National Park is very important to all of us, but it will only really be preserved when we do the same for what remains wild and natural everywhere.

When I wrote my first "From the Summit" column almost four years ago, I began with song lyrics by John McCutcheon. Let me finish this, my last column, by quoting the chorus from the song Old Man From the Mountains by "Walkin'" Jim Stoltz.

"And he's clutching at your arm and he's yelling in your ear.

He shouts his words a pleading, a begging you to hear.

He says "Bigger ain't better and faster ain't farther,

Unless you're running stone blind.

Oh, we're selling out fast All the gold of our past,

Tradin' away one of a kind,

And we're burying them one at a time."

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The opinions expressed in the MRNPA News are those of the authors and do not necessarily represent the official position of the MRNPA.

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Mount Rainier, the Volcano (continued)

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like a "greased bowl." The White River drainage would be affected by such a collapse. The same report suggests the precipitous headwaters of the Carbon River might also be affected by that renewed failure. It also noted that the Cowlitz River has a much lower probability of a sector-collapse lahar.

- A major earthquake could precipitate a major problem. Triggering by earthquakes or steam eruptions could destabilize the volcano's continuously active hydrothermal system, and cause a large and dangerous flow to occur. (Scott and Vallance, 1995). Canada's largest historic landslide is believed to have occurred in response to an earthquake of magnitude 3.2. (Evans - 1989).

- The least likely scenario is a debris flow of lake-breakout origin. The small lakes on or near Mount Rainier are mostly cirque lakes with stable sills. Only a few are old, moraine-dammed lakes that have previously broken out. Lake water displaced by a landslide is a possible, although unlikely source of local flooding or debris flows. (Scott and Vallance, 1995).

Is Anything Being Done?

The thing that worries the scientific community most is the number of people living and working in the hazard area. They also worry about development moving closer to the mountain, and what may happen if and when the mountain moves closer to the people!

Pierce County, the most likely recipient of anything Mount Rainier may deliver, has prudently taken an aggressive stance in hazard-awareness education and emergency preparedness. Much like the messenger who had to be the bearer of bad news, they took a firm stand when the Orting School District wanted to build a school in what would be the path of a repeat of the Electron Mudflow. Not only was the school not built, hazard planners now meet with teachers from Orting to brainstorm ideas for classroom materials for use in educating grades K-9 about volcanic dangers.

Local emergency planners also have evacuation and services plans in place should mudflows inundate areas along the Puyallup, White and Nisqually rivers.

Will The Dams and Reservoirs

Hold Back a Mudflow?

The Nisqually, Cowlitz and White River systems contain reservoirs which could, depending upon flow size, either lighten or aggravate the effects of a mudflow. A flow may be contained by a reservoir, or the impact of the wave may cause dam failure. Such factors as reservoir size, dam type and whether it's full or empty would all be factors. The Mud Mountain Dam on the White River is exclusively a flood-control structure of earth and rockfill construction which is normally empty, and thus would greatly reduce, or at least slow (but probably not eliminate) downstream risk.

Other downstream dams, Mossyrock Dam (Riffe Lake on the Cowlitz River), and Alder Dam on the Nisqually River, would serve a similar function. However their reservoir levels vary from season to season, so the degree of risk mitigation

would depend on their water level at the time of a mudflow. (Scott and Vallance - 1995).

How fast would a Mudflow travel?

Few will forget the speed with which the Toutle River carried the volumes of debris flow material from Mount St. Helens to the Puget Sound lowlands. The Osceola flow is estimated to have been 45 MPH. Distances from Mount Rainier to the lowlands or to the nearest downstream reservoir, range from 24 to 48 miles. Travel times range from 2 to 3.6 hours. (Scott and Vallance - 1995).

What would it be like when Mount Rainier erupts?

What will Puget Sounders face? Ash? Lava? Pyroclastic flows? How far will things flow? How fast will it come? Since anything about how, what, when and where a Mount Rainier "event" will occur is pure speculation, we hereby present a little science fiction of four hypothetical scenarios. Not science fiction as in flying saucers, but fiction based on what science knows about what mountains like Mount Rainier can do when they "come to life."

Four Scenarios

These scenarios are the work of Mrs. Janet Cullen Tanaka, a pioneer in volcanic hazards management studies, who published the first urban and regional planning study of Mount Rainier hazards, using the Puyallup Valley as an example. These were written in 1972 (a mere instant in the life span of a volcano), but note how accurately Mount St. Helens followed pieces of Ms. Tanaka's script. The real event may resemble any one of them, a combination of several, or none of the following. All names are fictitious.

Scenario #1: Steam explosion and mudflow

The hypothetical Wire Service report reads as follows:

(Seattle) October 8: Late season tourists and Park Rangers at Mt. Rainier National Park were shaken up this morning by a major steam explosion and avalanche on the mountain. The explosion, the largest witnessed on a Cascade volcano since the May, 1980 eruptions of Mt. St. Helens, occurred shortly after 9:00 a.m. The only warning, park personnel reported, was a series of "half a dozen" sharp earthshocks during the fifteen minutes immediately preceding the blast.

"They put us on guard," Chief Ranger Andy Adams told reporters. "We had a feeling something was going to happen--and man, it sure did!"

Geologists from the University of Washington and the Cascades Volcano Observatory say that the massive explosion was caused by a pocket of steam coming into sudden contact with the cold ground water and frozen rock beneath the head of the South Tahoma Glacier on the southwest side of the old volcano. The blast apparently broke the surface just above the 10,000 foot level, involving the entire head of the glacier and portions of the ridge known as "Success Cleaver".

Ice, rock, and steam shot over a thousand feet into the air with a sound one observer described as being: "like all the thunderclaps I ever heard rolled into one." The earthquake

accompanying the blast proper knocked dishes off the shelves at the ranger station.

While astonished tourists watched and wondered if the volcano were erupting, a huge fall of rock and blocks of ice broke from the blast area and caromed off the glacial slopes into Tahoma Creek Canyon. A party of climbers on Pyramid Peak, above the Canyon, said they could see "tremendous" amounts of water coming out of the glacier near a big column of steam.

The wall of water, rock, mud, and debris which geologists call a "lahar" poured through the canyon only minutes after the initial explosion.

"If there was anyone in there," said ranger Bob Bridger, "they sure never had time to get out!"

Early reports say the bulk of the massive mudflow came to a halt at the junction of Tahoma Creek and the Nisqually River, where it is currently creating a partial dam. High water is reported on the Nisqually as far down as Alder Dam, over thirty miles downstream from the blast site. Officials from Tacoma City Light and the Army Corps of Engineers said that there is no apparent danger downstream from the dam, but warned that flooding may occur in lowland areas on the upper Nisqually due to the breaking-up of the dammed mass of mud and debris. The Dept. of Emergency Services has ordered threatened areas evacuated.

Scientists from the U.S. Geological Survey who have been studying Mt. Rainier since the 1960's say that the dormant volcano has not shown any signs of impending eruption. Carl Chandler, head seismologist on the Rainier project, told reporters that there had been no significant seismic buildup of the kind normally expected before a regular ash or lava eruption.

Dr. David Daniels, number one Rainier watcher for the USGS, pointed out that the mountain has been the site of several moderate steam explosions and mudflows in the last 50 years.

"This one," he said, "was just bigger and louder. But there is no doubt that there is a hot area under South Tahoma Glacier. We've had a lot of rockfall activity there in the past few years."

It is not yet known whether there are any casualties.

(The above scenario is a fictional account)

Scenario #2

An article in **EARTH Magazine** (entitled):

Washington State's Signature Mountain Wakes Up
With a minor hydromagmatic and ash eruption beneath summit
crater lake
with lahars and ashfall

by: David A. Daniels, Everett Edwards, and Frances Fox

Mt. Rainier, a dormant andesitic volcano, erupted briefly during the month of June, following approximately more than a century of quiescence. The activity was presaged by six days of intense microearthquake activity beneath the summit area. Beginning 10 days before the eruption, temperature measuring devices located in the walls of the summit crater showed an apparent rise in temperature. This was confirmed at minus 8 days by airborne infrared imaging. At minus 3 days considerable breakup appeared in the ice filling the east summit crater. By minus 24 hours a large crater lake had formed.

On the evening of June 24 several earthshocks occurred. These were felt over a radius of 50 miles from the volcano.

Observations just before dawn on June 25 revealed the lake to be bubbling in places, with a large column of steam and sulphurous gases rising from fissures in the crater wall surrounding the lake.

The eruption proper began at 10:20 am on June 25 with a steam explosion which breached the crater walls, releasing the crater lake onto the southeast quadrant of the mountain. Barographs recorded 47 separate explosions in a 2-1/2 hour period.

The emptying of the crater lake caused major ice breakup and lahar formation from the Emmons, Ingraham, Cowlitz, and Nisqually Glaciers. Lahars averaged heights of 25-100 feet in passage down the river valleys draining the affected glaciers. Measurement of total volume of both lahars and ashfall are still in progress at this writing. The shortest mudflow extended approximately 5 km. from the terminus of the Nisqually Glacier. The longest originated from the Emmons Glacier and was contained in the reservoir behind Mud Mountain Dam, approximately 75 km. downstream.

Ash eruption began 2 hours and 5 minutes after the first steam explosions. Over the period from June 25-29 a moderate volume of ash was expelled, the major portion on the first and third days. Deposits from the first day are composed primarily of fragments of older rock from the summit and conduit walls, ranging in size from a coarse sand to blocks 4 meters in diameter. (Larger blocks were loosed by the subsequent avalanching, but to date these mentioned are the largest apparently due to explosive activity at the crater area.) Subsequent deposits range from a coarse brown sand to greyish colored pumice measuring from a medium sand to 20 cm. chunks. Heaviest deposits occur on the northeast flanks of the volcano and in the immediate vicinity of the crater. A depth of 20 cm. was measured at the Silver Creek Ranger Station approx. 22-1/2 km. from the summit crater. Ash deposits extend to 150 km., with a fall of less than 1 cm. at Wenatchee, approximately 130 km. northeast of the volcano.

The last ash explosions were recorded near 11 pm on June 29. By the afternoon of July 3 the seismic activity had fallen to near seasonal normal. At this writing (Aug 1) all eruptive activity seems to have ceased. It is assumed that the June eruption was similar to Rainier's previous minor eruptions.

Structures and roads on the affected sides of the mountain were heavily damaged or destroyed by the lahars. Seismic and thermal warnings were heeded, and the low-lying valley areas on all sides of the volcano were evacuated by civil and military authorities prior to the beginning of the eruption. There was one fatality. A television news reporter crossed state patrol barriers and was swept away with his vehicle by a lahar.

(The above scenario is a fictional account)

Scenario # 3: Major Eruption

(E-Mail from a young seismologist)

Subj: Mt. Rainier
Date: 001-07-01 18:19:20 PDT
From: irenekirk@geostat.com
To: Gregicard@roget.edu.stat
Dear Greg,

No vacation for me! Dr. Harry laid his cold, clammy hand on my shoulder this morning. Seems Rainier is doing funny things earthquake-wise again. So sun yourself this weekend and think of me slaving over a hot seismograph.

Love, Irene

Subj: Mt. Rainier
Date: 001-07-06 17:18:19 PDT
From: irenekirk@geostat.com
To: Gregpicard@roget.edu.stat

Dear Greg,

You should have come here for the holiday! We had some real excitement on the 4th. There was a magnitude 5.5 earthquake under Paradise. It shook the heck out of the Inn for about 20 seconds and dropped an avalanche off the upper end of Nisqually Glacier. Dr. Johnson from NW history was climbing on Nisqually Glacier, and said it felt as though the mountain was trying to shake him off the way a dog shakes off water. One of their party had his ankle cracked by a falling rock.

Total event count is up over 100 for this week and only about 10% of that is normal tectonic stuff. You suppose Rainier is trying to tell us something??!!

Yours,
Rene

Subj: Mt. Rainier
Date: 001-07-10 20:21:22 PDT
From: irenekirk@geostat.com
To: Gregpicard@roget.edu.stat
Greg--

A quick one...Event count...the CVO people from Menlo Park and Denver are constantly on the phone. Dr. Harry is threatening to sleep in the lab.

Subj: Mt. Rainier
Date: 001-07-12 22:22:22 PDT
From: irenekirk@geostat.com
To: Gregpicard@roget.edu.stat

...Count doubled yesterday. The Emergency Preparedness people, CVO, and our staff had a big meeting this a.m. The consensus seems to be that ye olde mountaine is going to ERUPT--maybe. Love from the Very Junior Asst.

Subj: Mt. Rainier
Date: 001-07-15 17:07:24 PDT
From: irenekirk@geostat.com
To: Gregpicard@roget.edu.stat
Gregoire!!

Drop everything and come to Seattle! Rainier's got a terrible case of the shakes and she's starting to run a temp. There were two M 5.7 shocks today. One dropped a rockfall onto the highway between Longmire and the Nisqually Bridge.

The infrared pictures from day before yesterday show a definite new hot area on the SW side below Point Success. The runoff from Nisqually and S. Tahoma and Kautz is way over last week's. All ground temps are increasing, according to the USGS gang. Dr. Harry screameth and lo I must runneth. See you for the "rock festival." Remember Professor Sisko's battle-cry: "Saint Helens was for practice!"

Rene

Subj: Mt. Rainier
Date: 001-07-20 12:23:159 PDT
From: irenekirk@geostat.com
To: Gregpicard@roget.edu.stat

Dear Greg,

I think it's pretty rotten of your boss not to let you come to watch the eruption! You **would** major in microbiology!

They pulled the plug on Alder Dam yesterday. They figure it will take a couple of days to empty out enough water to contain a mudflow in the reservoir. The southwest glaciers are putting out a lot of mud and water. All the streams on that side are approaching flood stage--in July yet.

We're having 3 or 4 strong earthquakes per day and the monitors look like they have hiccups.

An evacuation order was put out today for the valleys on the SW. Park is closed until further notice.

And the tourists! They're swarming in by the hundreds. Not to mention the scientists. I've never seen so much geophysical brass all assembled in one place. A couple of Japanese professors set up an "eruption pool" yesterday. Everybody kicks in ten bucks and the one who guesses the closest time to the beginning of the eruption wins the pot.

You've got to get away from those bloomin' protozoa! ST. HELENS WAS FOR PRACTICE!!!

Subj: Mt. Rainier
Date: 001-07-23 23:58:50 PDT
From: irenekirk@geostat.com
To: Gregpicard@roget.edu.stat

Dear Greg--

I saw it, but I don't believe it! The balloon went up at 6:45 this morning. What a blast! TV couldn't do it justice!

Thanks to Dr. Harry, I had a ringside seat. I was one of the "front-line" corps at the UW-USGS observation station set up about 8 miles due south of Rainier. He virtually yanked me into the lab and introduced me to the team as: "My junior assistant, Ms. Ives, who is doing her doctoral dissertation on this eruption." (Which is the first I'd heard of it!)

Nobody got much sleep between the excitement and the earthquakes. By dawn's early light things were really shaking. Pieces were coming off some of the glaciers right and left. Our Russian observer was a little apprehensive about being so close.

Anyway at about 6:25 there were some steam explosions at the 13,000 foot level at the right of Point Success. A whole line of steam-spouting fissures opened almost all the way across to Cowlitz Cleaver. There was steam and rock and blocks of ice blowing up like crazy! (I suppose a volcanologist could describe it better, but I'm just a V.J.A.S. who was in the second grade when St. Helens blew out.

We could see big fountains of water and debris splashing across the top of the glaciers.

At about 6:42 there was one really tremendous shock-- it sure played heck with our recording equipment. We no sooner stopped shaking ourselves when the whole fissure opened up with a tremendous banging, whooshing sound. It started at the lower end and seemed to spread toward Point Success. In just a few seconds it blew Point Success and all the glacier around it clean off the mountain! One minute there was this huge outcrop

of rock and the next--blam--this big cloud. Honest. Then there was this kind of doughnut shaped cloud that started rolling out from the bottom of the main cloud. One of the guys from the GS said it was a "base surge".

Then there was just a fountain of pieces of rock--great chunks of it mixed with a cloud of steam. A minute or two later the ash started coming. Wow! Just like the pictures you always see of Vesuvius. Big grey clouds of ash just boiled out of that hole where point Success was.

Fortunately the wind was blowing due east. As it was we got peppered with little pieces of pumice up to an inch across. It wasn't as hot as I thought it would be, but it was plenty warm. The noise was so loud we had to yell at each other. Dr. Kamirov kept saying things about Bezymianny and urging us to retreat to a safer distance. I for one agreed with him and so did the guys who were old enough to remember St. Helens!!

Later in the day we did move to about 12 miles out, much to Dr. K's relief (and mine). I must tell you about the mudflows, they were really spectacular! All this water and ice and rock was just pouring off the glaciers where the fissures had opened. The Kautz Glacier was taking the worst beating. (That was the one you took all the pictures of last March.) The Nisqually was having a pretty bad time of it too. The little glaciers down below were getting peppered with hot pumice, and the So. Tahoma was just covered with chunks of rock that must have been as big as houses.

We weren't where we could see much of the canyons, but Daniel from the USGS said the muddy mess was running up to over a hundred feet deep in places. He and some guys from glaciology were up in a Forest Service helicopter. The bridge at the foot of Nisqually Glacier went out. They said you couldn't even see where the creekbed of the Kautz was: it's all filled with mud. Longmire meadow is all covered with mud and rocks and a lot of debris has come down at Paradise, too.

All the roads in the SW side of the park have been washed out or swallowed up in mud. The Nisqually River is over flood stage as far down as Alder. The last I heard, Alder Dam is still holding.

Right now it's almost dark and we can see the glow in the sky above the new crater. So far no lava, just pumice and ash. It's sure hard to believe this is Rainier. S.H.W.F.P.

Love, Rene

P.S. Oh yes, I split the eruption pool with Pat from the Geology office and a Dr. Ramirez from N.O.A.A.

Subj: Mt. Rainier
Date: 001-07-25 12:03:04 PDT
From: irenekirk@geostat.com
To: Gregpicard@roget.edu.stat

Dear Greg

Glad to hear you got your color TV working in time to watch the show. But, nothing, NOTHING, compares to being here and seeing, hearing, feeling, and (yecchh) smelling it in person. Dr. Harry is right--I'm going to do my dissertation on some of the seismic aspects of the eruption.

The eruption continues with no let up in sight. Still all ash and pumice. A white line of cinder cones (pumice cones?) has built up at the fracture where the initial breakthrough occurred. Kautz Glacier is done for, and so are the smaller ones. Nisqually is still breaking up, but old So. Tahoma is bearing up bravely under a

pile that looks like half the mountain's guts. The only way you can really tell there's still ice is by the flood of water gushing out.

Alder Dam is holding but discharging water as fast as it comes in. The winds continue to blow due east, and the Yakima farmers are pretty upset about the ash.

And you simply wouldn't believe the tourists!! The state police and military have had to erect barriers to keep them back. They are coming right into the park on the north and west sides. The highways are lined with cars. People are setting up their tents and parking campers all over. The farmers and suburbanites have got smart. They're renting their land and yards and charging whatever the traffic will bear.

So far no one has been killed, but I don't know why. A lot of good land has sure gone under.

Subj: Mt. Rainier
Date: 001-08-15 19:20:21 PDT
From: irenekirk@geostat.com
To: Gregpicard@roget.edu.stat

Dear Greg,

Well, Rainier seems to have set her mind on being a semipermanent attraction. There are three new craters below the first, and yesterday the lowest, at the 8000 foot level where the Kautz Glacier used to be, started putting out some thick lava flows. Dr. Lowell says it is dacite. Dr. McCormack says it's a dacitic andesite. (I'm glad I'm a seismologist.) Anyway, it doesn't really flow. It oozes along at about 8 or 9 feet a day. (That's what McCormack tells me, anyway, and I'm too chicken to go up with them and measure it myself.)

The first casualties happened yesterday. A planeload of Army Engineers got caught in an updraft from the eruption cloud last night and crashed into the mountain. There weren't any survivors.

Alder reservoir is becoming the world's biggest mudbath. Tacoma City Light said it would be cheaper to abandon the dam than to try to dig out the reservoir. It's solid. The water goes over the dam in places, but it's still holding.

The winds have let down and the fruit crops may not have suffered too badly. The ag boys are telling the farmers that the ash will be good fertilizer in a few years, but it doesn't make them any happier right now.

By the way, would you be just as willing to marry a volcano-seismologist as a plain garden variety earthquake chaser? I think the pumice has got in my blood!

Love, R.

Subj: Mt. Rainier
Date: 001-09-01 16:08:04 PDT
From: irenekirk@geostat.com
To: Gregpicard@roget.edu.stat

Dear Greg,

Well, it seems to be all over but the digging out. Rainier is still steaming, but her heartbeat says she is napping again. There have been no new lava extrusions for five days and the pumice turned off on the 25th. Alder dam still stands, and people are returning to their property---if they can find it. The tourists are going home, but I suppose there will be new batches along after Labor Day.

Maybe Rainier has had her fling. Probably she's just taking a breather for a few weeks or months. Anyway, Dr. Harry says I'm number one in charge of the old girl's cardiology from now on, so I should be the first to know.

What that means, dear heart, is that I've been made Senior Assistant Seismologist. So any thoughts of my coming to join you at M.I.T. are O.U.T. But if you're still so inclined, there is a position just opened for a good research micro-biologist at the University of Washington Hospital.....

Love,
Irene

(The above scenario is a fictional account)

Scenario #4:

A Book Review about Catastrophe

If, indeed, the great eruption of Santorin was the cause of the plagues and phenomena of the Red Sea described in the book of Exodus, we can deduce that the whole affair may have spanned no more than a few weeks. If Santorin brought about the fall of Crete, archaeological records reveal that the major part of the catastrophe took no longer than that.

The climax of the great eruption and collapse of Krakatoa took less than a week. Katmai's demise came about in only two and one-half days. Indian legends indicate that the fall of Mazama took place in a matter of days.

There is no reason to assume that Rainier would take any longer to undergo an all-out caldera-forming eruption. A summarized review of the event might sound something like these excerpts from the popular book: *The Great Eruption of Mt. Rainier*, by Dr. Norman Nobeaver and Ms. Oshi Ozumi, published by the University of Washington Press in 2006.

"Looking back on the Rainier event, scientists are now in agreement that the great eruption was the outcome of a number of happenings which began as early as 1969. In that year a number of events took place which alerted scientists that all was not well--or perhaps was all too well--with the mountain." p.12

"...in all fairness to the ladies and gentlemen of the scientific community, it should be pointed out that the years of 1971-79 were the 'calm before the storm'. In the autumn preceding the cataclysm it became apparent that Rainier was about to take up where she had left off.

"Seismic activity began to intensify in October, at the time when it would normally have been quieting down. With the exception of a brief drop in the event count during December, both felt tremors and micro-earthquakes underwent a staggering rise from 15 per week in September to 950 in the week immediately before the eruption. Application of the Varayev-Ishihara seismic strain release formulae clearly showed that an eruption of a very large magnitude was due to occur within a short time." p.15

"The second indicators of potential trouble were the biaxial tiltmeters placed on the mountain in the 1970's. Shortly after the first of the year they began indicating definite changes of level on the east side of the mountain." p. 20

"It is of value to note that the really significant changes in ground temperature did not appear until 10 days before the start of the eruption. Rainier, like all dormant volcanoes, already contained enough inner heat to cause periodic steam explosions and glacier outburst floods. Large scale thermal anomalies began

to appear on infrared imagery only in the four weeks previous to the start of the eruption proper.

"Glacier runoff, which would have been apparent during the summer, was no doubt cut down considerably by the normal sub-freezing temperatures of the High Cascade winter." p. 30

"It was the eyes of human observers, rather than instrumentation, which first detected the large scale melting taking place in the ice caves of the east summit crater. A climbing party reported in late March that the large cavern in the crater was filling with meltwater.

"By the middle of April there was a well-established crater lake in the east summit crater. Its temperature was barely above freezing and large chunks of ice were observed floating on the surface....Several fumaroles at the edge of the lake were discharging steam and sulphurous fumes with an audible hissing. Clouds of steam could be seen rising from the summit on clear days.

"Strong earthquakes began to be felt in the park area." pp. 39-40

"Preparations for a full-scale eruption were begun on May 1st and 2nd. Alder and Mud Mountain reservoirs were ordered emptied. A high rate of glacial runoff and several small-scale mudflows were already being experienced.

"Valley floors on the east and northeast side of the mountain were ordered evacuated, as was the upper Nisqually Valley. Cross-mountain highways through the park were closed to all but emergency traffic. Tourists and scientists alike began to converge on the state. It now began to look as though the grand old mountain would *have* to erupt to keep Washington from 'losing face'." p. 49

"Sharp earthquakes were felt for over a fifty mile radius beginning on May 5th." p. 50

"The Seattle-Tacoma area was literally brimming over with earth scientists of every description--as excited as a bunch of children waiting for the circus to begin." p. 53

"If this were happening in pioneer days the only warnings would have been some clouds of steam--which could be mistaken for ordinary clouds, rising rivers--which might have been attributed to normal spring runoff, and some earthquakes---which might have been attributed to the perversity of nature. No wonder people talk about volcanoes erupting without warning!' Dr. Juan Ramirz, NOAA, on KIRO-TV, May 5th." p. 55

"The eruption began at slightly half-past eight on the evening of May 18th...the anniversary of the fateful explosion of Mt. St. Helens. No series of earthshocks led up to the opening curtain. At 8:30 the steam cloud rose placidly above the mountain. At 8:31:53 a tremendous steam explosion blew a hole in Emmons Glacier at the 12,000 foot level. The fracture must have extended completely across the width of the ice face. Explosion followed explosion, finally undermining the east crater area of the summit, spilling the contents of the crater lake onto the rising molten material and gases.

"A stupendous hydroexplosion lifted the east side of the mountain from the summit cone down to the 11,000 foot level. The base surge was well-defined and photographed from several angles." p.64

"At precisely 9:00 pm a deep orange glow in the sky over the eastern side of the ravaged cone signaled the arrival of the magma." p.65

"By dawn on the 19th the eruption was going full tilt. Huge cauliflower clouds of ash and pumice rose tens of thousands of feet above the mountain. Lightning bolts flashed in the clouds and the booming of the thunder mingled with the roar of the volcano. Rainier had truly lived up to all expectations. Let the Hawaiians have their stew-pots: here was a *real* volcano!" p. 67

"The Geological Survey's predictions of huge mudflows were fulfilled. Lahars to rival the great mudflows of the past filled the valleys of the White and Ohanapeosh. Lesser flows, though still sufficient to cause widespread damage came down the Paradise, Cowlitz, and Nisqually valleys." p. 72

"The lahars, particularly the catastrophic White River flow, fell into a rough pattern as follows: (1) increased glacial runoff due to melting of the ice prior to the eruption proper, (2) large, debris-laden flows resulting from the explosive ousting of the crater lakes and the explosions beneath the Emmons Glacier, (3) lesser flooding during the first part of the eruption, (4) increased floods as glowing avalanches swept the flanks of the volcano on the southeast side, (5) a decrease leading to a gradual cessation of flooding on the east side, and finally (6) catastrophic flows of ash and debris accompanying the collapse of the summit. Heavy rains during the Autumn months contributed to later mud and wet ash flows from the side of the still-steaming hulk." pp 73-74

"Although loss of life was certainly on a minor scale during the 'opening gun' of the Rainier event, the White River Mudflow more than made up for it.

"The seeds of the tragedy were laid in the inability of geologists and public officials to convince residents of the lower valleys that they were really in danger. The terrible lessons of 1980 had been forgotten; political, economic, and personal pressures prevailed. Thus, when the east wall of the summit collapsed at 3:50 on the morning of May 20th, there was no longer sufficient time to awaken the ill-fated residents of Enumclaw, Buckley, and East Auburn in time for orderly evacuation.

"Fortunately many of the residents of the lowest-lying area had been forced from their homes by the earlier flooding. Unfortunately, a number of them had simply taken up temporary residence within a few miles of their flooded homes and still in the lowlands." p. 76

"It was, I guess, about 7:30 in the evening on May 20th that we were grabbing a sandwich, when the other guys from the Survey and Dr. Suji came in. They were looking pretty grim. They'd run some rough figures through the computer, based on the amounts of material put out and the change in the chemical composition of the ash. What they came up with was that it looked like the magma chamber was being emptied, and it looked like we might be going to have an honest-to-God caldera forming eruption...

"And when it finally did come, we thought it was pretty dirty of Rainier to do it in the middle of the night. Well, hell, we didn't get any decent photographs at all!" Quoting Dr. Terry Taylor, Center for Volcanology, Eugene, Oregon. p. 77.

"The collapse of the summit sent vast amounts of material avalanching down slopes already mantled with fresh ash and saturated from the torrential rains which broke out from time to time during the eruption...Measurements made in early July led to the conclusion that as much as half the eastern side of the

summit may have fallen outward, while the remainder plunged into the eviscerated mountain." p. 81

"At any rate, we sent out emergency warnings telling the people to get out of those lower valleys. I don't care how many times we told them about the old Osceola Mudflow, they just wouldn't believe that they were in danger of being buried in mud in the United States of America in the first decade of the twenty-first century!" Dr. Terry Taylor. p. 82

"The final estimated death toll from the White River disaster stands at 25,000, with over 2000 others still missing and unaccounted for. Like most of the tragedies associated with volcanic eruptions it was one that never needed to have happened.

"The eruption itself was successfully predicted several days in advance. Even the fact that it was to lead to the collapse of the east side of the summit and the formation of a caldera was predicted several hours in advance by scientists. Every potential danger was known. As much as 8 hours in advance of the catastrophe, warning was given of the potential for a major mudflow too large to be contained by any dam or reservoir. It was a warning that went unheeded by nearly 30,000 people." p. 85

"Although the loss of life in the lower White and Green River Valleys was staggering and the accompanying property damage in the hundreds of millions; the greatest economic blow dealt to Washington by Mt. Rainier was the near-total destruction of a major portion of the hi-tech and aerospace facilities located in the valleys, as well as the temporary loss of the major portion of its fruit-raising industry.

"During the 3 days of the eruption strong west-south-west winds deposited 10-12 inches of ash on the orchards of the Yakima and Wenatchee valleys. Acid rains accompanying the fall literally stripped the foliage from the trees.

"The fact that the ash would, in time, create a richer soil was scant compensation to people whose livelihood was (at least temporarily) wiped out, and for which...at the time of this writing (May, 2005), the Boeing Airbus Company is still fighting its insurance companies in court. p. 90

Summary

The great eruption of Mt. Rainier lasted for approximately 75 hours. It was presaged by several years of sporadic pre-eruptive preparations. Before the eruption proper there were 7 months of heightened seismic activity (with 3 days of felt shocks), 4 months of measurable deformation, and 6 weeks of detectable thermal activity.

"The eruption began at approximately 8:32 pm on May 18 with a massive steam explosion at the 12,000 foot level beneath Emmons Glacier. It built to a climax on May 20 with the continuous expulsion of the contents of the magma chamber, both from the new crater and from fissures on the east side of the mountain. In the late evening hours of May 20, there was a lull in activity, followed by more explosions and the collapse of the eastern portion of the summit at 3:50 am on May 21. Weak explosions continued from collapse until just before midnight.

"At the beginning of the eruption Mt. Rainier raised a magnificent snow-capped peak to 14,410 feet. It was clothed with glaciers and surrounded by forests, rippling streams, and abundant wildlife. It was ringed with highways and facilities for human recreation.

"At its end, Rainier is a battered hulk. On the western side, a chaotic pile of rubble reaches to 12,300 feet. On the east side there is a vast bowl, whose easternmost rim stands at barely 9700 feet. The remains of her western glaciers are buried in ash and debris. On the northeast side there is a desert of ash and pumice reaching 15 miles from the base of the mountain. The former canyons are filled with steaming ash flows.

"The White River Valley below Mud Mountain is filled to depths of 25-150 feet with mud and debris. The towns of Buckley and Enumclaw are unrecognizable beneath 25-30 feet of lahar cover. The lower section of the city of Auburn sustained flows up to 10 feet in depth, with lobes of mud up to five feet thick extending into the city limits of Kent.

"Other mudflows extended 15 miles down the Ohanapecosh, 12 miles down the Cowlitz, and filled the Alder reservoir in the Nisqually Valley. Depths up to 10 feet have been measured in the Nisqually Valley just above the Reservoir.

"Rainier spread a layer of ash to 12" at Wenatchee, 7" at Coulee Dam, 3" at the Canadian border, and 1" at Helena, Montana. Up to 2" blanketed areas of Idaho, and as much as 1-1/2" fell on Northeast Oregon. Some fine ash drifted into sections of Quebec.

"The known death toll, principally from the White River Mudflow, stands at 25,310, with another 2500 unaccounted for in the lower White River area. Twenty-eight persons died in the crash of an Army jet which flew into the ash cloud. One scientist from the Geological Survey died of a heart attack.

"On the positive side of the ledger, profits from tourists visiting the site of the catastrophe topped ten million dollars in the first year. There is no doubt that visitors will continue to tour the area for many years, as they have for the St. Helens monument.

"The science of volcanology made tremendous strides in the understanding of the Cascade volcanoes and the mechanisms of caldera-forming eruptions. A permanent laboratory under the auspices of the Cascades Volcano Observatory, has been erected by the USGS and The International Association of Volcanology and Chemistry of the Earth's Interior (IAVCEI) for the continued study of the volcano." p.103.

(The above scenario is a fictional account.)

This section has been excerpted from
The Big Fact Book About Mount Rainier

Letters To The Editor

Dear Fellow Associates,

This is a belated "thank you" from the Ohanapecosh trail crew for the outstanding work done on the trails in the Tipsoo Lake area during last September's trail work party. Crew representative Herb Vogel was amazed at the ability of the participants and the volume of work accomplished which was: 5 yards of fill material spread over 450' at trail surface and over 100' cedar erosion and drainage bars installed in the trail. All of this work would not have been accomplished without the Mt. Rainier National Park Associates! With the increase in entrance fees these areas of the Park that are "free" will certainly receive more use in the years ahead and will require special attention. Please see fit to publish all or part of this in the next newsletter for all of the "work party" people to see. I and my crew hope to see everyone on the "East Side" trails this summer!

Thanks again,

Steve "Scotty" Scott
Ohanapecosh Trail Crew Leader

Park Press Releases

On February 14, 1997 the National Park Service issued a press release that said in part:

"Washington, DC--Marking the third year in their partnership, the National Park Service (NPS), the National Park Foundation (NPF), and Canon U.S.A. announced today that Canon has once again donated \$1 Million to support inventorying, monitoring, and conservation projects in 14 National Parks through the 'Expedition into the Parks' program. The 'Expedition' program brings Park Service staff, researchers, and volunteers together to collect critical data--through activities such as wildlife monitoring, habitat mapping, flora and fauna sampling, photographic surveys--and to perform hands-on conservation and restoration work to protect park natural resources. It is the first and most comprehensive program of its kind to benefit the National Parks.

Watch Your Mail

The Tahoma Audubon Society, Rural Citizens Against Urban Sprawl (Paradise Chapter) and various business owners in the upper Nisqually valley have joined together in a coalition in order to contest the Final Environmental Impact Statement (FEIS) for the Mt. Rainier Resort at Park Junction when the FEIS is issued. Attorneys for the Audubon Society believe the coalition will have a winnable case if an appeal is made to the Hearings Examiner because the proposed design of the Mt. Rainier Resort at Park Junction does not meet the requirements of the state Growth Management Act or Pierce County planning and zoning requirements. However to proceed with any legal action, the coalition needs to raise funds to cover legal fees.

The Board of Trustees of MRNPA agrees with the coalition that the proposed design of the Mt. Rainier Resort at Park Junction is unacceptable and we are further concerned that the proposed size of the resort has the potential to worsen the already severe problems of visitor crowding at Longmire and Paradise. MRNPA has submitted these comments to the Hearing Examiner. In addition, the Board has given the coalition permission to make a direct mail appeal to MRNPA members to ask for contributions to cover legal fees. The Board recommends that any MRNPA members concerned about the proposed resort at Park Junction seriously consider making a contribution. Expect to receive the appeal soon.

John Titland

Park Press Release, Continued...

"The National Park Service applauds Canon for once again committing to the 'Expedition' program, and said NPS director Roger Kennedy. 'This program produces tangible results for priority natural resource projects and the emphasis on volunteer participation helps forge lasting partnerships with park communities.'

"To determine which parks would benefit from the Canon grant, a panel of senior Park Service resource managers from across the country reviewed 55 proposals and selected projects on the basis of technical merit, scientific validity, potential to achieve real results, and strength of volunteer involvement."

Mount Rainier National Park's project to restore the site of Sunrise Campground was one of the 14 projects selected to receive grants through the 1997 'Expedition' program.

Superintendent Briggles has indicated to me his pleasure at having the project at Sunrise selected for funding. He has designated this project as the first "Signature Project" in celebration of Mount Rainier National Park's Centennial Celebration in 1999. The intent of the project will be to return the Sunrise Campground site to "as natural a condition as possible".

This year's work on the project will include modifying the road cuts and the road overburden to reestablish approximately the original land contours and initiating a long term revegetation project. This revegetation project will make use of both plants salvaged during the recontouring work and plants grown from cuttings and seeds collected in the area. The Wonderland Trail campsite will remain at the site, as will some sanitary facilities. Ultimately a trail from Sunrise parking lot to the campground area will be constructed along portions of the old road.

Volunteer involvement was one of the selection criteria used by the 'Expedition into the Parks' program in determining which projects to fund. I expect the NPS will need a large amount of

VIDEO REVIEW:

PERILOUS BEAUTY

The Hidden Dangers of Mount Rainier

U.S. Geological Survey, 1996

Length 29 minutes

\$19.95

Order from Northwest Interpretive Association

909 First Ave, Suite 630; Seattle WA 98104

(206) 220-4140

We veteran Rainier lovers have waited a long time for this; an exceptionally well-done overview of Mt. Rainier's hazards. There's no touristy "you-gotta-see" hype or doomsday predictions; just the geological facts about our signature mountain and what she does, has done in the past, and will most certainly do in the future. The strongest points made are these.

1. This is an andesitic volcano, not the Hawaiian type, and is far more dangerous than the latter because of the way andesite volcanoes behave, and

2. it does not need to erupt to cause a disastrous loss of life and property in the path of debris avalanches and mudflows.

The video has been shown on Seattle's Channel 9, and is available for purchase at a reasonable price.

Reviewed by Janet Tanaka

Editor & Publisher

Volcano Quarterly

volunteer involvement to get this project rolling by 1999. If you haven't yet had the pleasure of volunteering at Mount Rainier, consider becoming a volunteer for this project--a "Signature Project" in preparation for a centennial year. I have to admit, I am very pleased this project was selected too!

Mount Rainier National Park Associates

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