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CRATERS OF THE MOON NATIONAL MONUMENT.

The writer will always remember quite vividly his first views of this most interesting area some fifteen years ago. Many subsequent trips have brought familiarity and understanding of the wierd rock forms there but the thrill of seeing black, rough cinders and a jagged horizon line of torn and jumbled rock towers belongs to that first trip. It was only what could be seen from the tortuous old road from Arco to Carey but it went around the lava tongues that penetrate far into the southern bays of the White Knob Mountains and here and there the roadbed gave forth hollow sounds indicating caverns beneath. Reluctantly further exploration had to be deferred to a later time. Another day stands out in memory- dedication celebration on a bright June day in 1923. The people of Arco were ~~the~~ hosts to a crowd estimated at 1560 people, who gathered on the wooded eastern slope of the Inferno hill. Booths were erected for serving lunch, speeches were made but the water wagon did not arrive so coffee could be made. At length it hove in sight coming up the crunching its way up the cinder slope and drawn by six weary horses. Lunch disposed of the crowd regained its good humor just as a man came running up with the excited announcement that the craters were erupting. Everyone followed his lead around the shoulder of the hill where sure enough great billows of black smoke could be seen pouring from the Crystal Pit crater. Some enterprising Arcoan had suspended a lot of burn ing auto tires in the throat of that crater and the results were certainly realistic.

In area this is the nation's largest monument, 80 square miles but no visitor ever sees any great part of it. Fortunately some of the best features, however, are within two miles of the entrance so the short time visitor sees these. Its location is on the northern edge of the Snake River Plains at the base of the White knob Mountains. At present but one highway pases through its margin but some time in the future

a radris planned from the south up thru the entire monument to join the present one. This project is feasible and will give access to many wonderful features to far south to be reached at present without excessive walking. The long axis of the area is N.W.-S.E. which makes such an entrance very desirable.

The topography of the region is that of a slightly elevated but broad mound with some thirty sizable cinder and lava cones superposed upon it. Sunken tracts are strung along the axis and in fact these mark the location of the great rift zone which beneath the veneer of lavas is a real break in the earth's crust. The Great Cinder Butte rising 600 feet above its surroundings easily dominates the high points. From its summit on a clear day the entire monument can be studied. There is no drainage system for all precipitation sinks far down in the fissured lavas. In a few places snow in crevices blends into a subterannean sheet which is itself impervious to water and thus holds water in ponds upon its upper, cupped surface. Such water holes hold water almost as cold as ice. Some years back excessive warmpth melted the ice basins and to provide a sure supply water has been brot by pipes from Little Cottonwood creek four miles to the entrance buildings. Snowfall at this elevation (5800 ft.) coes rather early in winter and lingers long in spring. In one spatter cone there is always snow to be seen down in the pit. This is sometimes called the ice cave. Probably there is some snow holdover at the entrance to the Great Owl Cavern also. The writer can recall taking a picture out thru a rift down in the bottom of Yellowjacket Water Hole with icicles framing the sides and students wading down the incline-the time was late June. Porous lavasare fine insulators hence imbedde snow and ice are long retained. Some people hold that ice is formed faster in summer in lava caves but the facts run counter to this. Either snow is caught and held directly or percolating waters from spring melting above trickle down thru tiny openings and are refrozen by meeting with cold air retained within cavernous spaces in the lava.

taken here and also in the ice cave near Shoshone and from 40 to 42 deg.F.is the result in summer.This means slow melting of the ice. Renewal of the supply must therefore occur in winter or early spring.

Something should be said of the kinds of rocks found in the area. Basalt,which is a dark,heavy iron-magnesium lava,is the prevailing rock. Its physical condition may be massive as is usual in the main body of a large flow;it may be full of large gas bubbles when it is scoria; or it may be what is rare here a rock froth-pumice.Fragmental forms are such as bombs,cinders and lapilliOne must ~~XXX~~ examine samples of these to be able to identify them in the field.Another form made up of hot,plastic clots that fall in a circular ridge outside a fire fountain or boiling pit of lava gives a coarse,crumbly mass usually reddish in color and called volcanic tuff.The towers of tuff out on the North Crater flow are notable.Unbroken bombs are now hard to find but many fine ones were removed by collestors before the Monument was set aside.Dr. I.C.Russell in U.S.G.S.Bulletin 199 describes one of these which was 14 feet in length.The usual ones seen are less than a foot in diameter but tiny ones a half inch long may be picked up in the cinder of Inferno hill.A good collection may be seen at the entrance.

To describe lava surfaces other terms are employed.If the surface is rather smooth,aside from a graining due to flow movement,and is in gentle billows it is called pahoehoe (pah-hoe'ay-hoe'ay) a Hawaiian term for it.Sometimes ~~it~~ This type takes aropy form due to sinuous movements of the still plastic lava. Another variation is due to a cobalt-blue surface film of oxidized iron and manganese and this makes the so-called "Blue DragonFlow". A lava surface quite different because so rough, jagged and spiny is the aa lava(pronounced ah'ah).It can be traversed only with the greatest difficulty.Sib-surace movement has torn and broken the cooled crust and in places heaped it into ridges.Pahoehoe and aa types often alternate on the same general flow and one may walk

It seems that the smooth form may change to aa further out from the vent.

on lanes of the formerfor considerable distances.

Kinds of Cones and Craters.

Because cinders can be piled up in steeper cones this kind is the most conspicuous.To be sure there are lava splashes,bombs and clots mixed with the cinders,as examination of the crated walls shows,but the latter predominates.Big Cinder Butte and North Crater Butte are good examples of the cinder cone type.A second type is the spatter cone or tuff cone built up by spatters or clots which pile up in ring form around an orifice in which a fire fountain was bubbling.There was neither sufficient gas or energy to blow this material far upward as cinder or ash.It fell near by and while still hot so that clots cohered.A chain of these cones iss a very conspicuous feature at the end of the present auto road.They are not over 50 to 60 feet high and each has a deep but narrow throat.The rims have crumbled considerably and should be protected by a railing. No one has as yet fallen into these pits but the danger exists.One of these craters was once called "bottomless" but exploration revealed a bottom and some interesting gypsum crystals on the walls.It is now called the Crystal Pit. Spatter cones wherever found are not large and often occur right on the top of lava flows of considerable depth.This is because there is sufficient heat and steam(gases) to produce this minor affect.The writer while on a trip to the Cow Creek Craters in S.E. Oregon some years ago found one quite unique cone of this type.The s spatters had almost completely closed the top of the cone thereby producing an oven or igloo form with an interior space about twenty feet high.Drippings of chocolate color lined the walls of that one.It may be mentioned here that in the Moon spatter cones there can be seen smooth remnants of an inside coating or lining.which was at one time more ex-- tensive. ---- A third and last type of cone is so inconspicuous as to almost escape notice.They are built of compact lava are broad and dome-like and are seldom as much as 50 feet high.Their great width obscures their height.The mound at Great Owl Cavern is an example.No violent

eruptions occur from these craters the molten rock quite free of gases wells up and flows slowly away from the orifice or drains away thru channels beneath the congealed surface finally leaving tunnels as the supply fails. It is the subsequent caving in of such tunnels that reveals the long tubular caverns. Over the Snake River Plains are scores of such cones known as lava or shield cones. Ferry Butte west of Blackfoot ~~and~~, Split Butte south of Shoshone are of this class.

Besides the tunnel caverns there are other depressions such as the pit craters illustrated by the Big Sink Water Hole. These are due to extensive collapse of a cooled roof when lava subsided below. On the top of almost every shield cone there is such a sunken place. When large they have been utilized in some instances, as corrals for stock. The deepest and largest crater in the monument is the Big Crater. Inspection will show it to be but one in a row of seven. With craters as with all features seen here it is only the last ones that we are looking at. The scene would change in a few weeks should the subterranean forces again become active.

A question that often comes up is the age of the youngest or latest lava flows. Harold T. Stearns cites the study of a limber pine which was growing in a ~~crevice~~ crevice so close to a black, rock flow that it must certainly have grown up since the flow cooled. This tree showed 461 annular rings. It now will allow some time for the "craters" to start 500-600 years might be a safe estimate