ONR OF THE NORTHWEST'S ONLY TWO GENUINE UNDERGROUND NEWSPAPERS

THE CASCADE CAVER
Vol VII No. 7
July, 19 68
Official publication of the
Cascade Grotto of the National
Speleological Society
Seattle, Washington 98102

CARBONATITES by Don Tubbs

Caves have been found in three of the four major types of rocks. These are: sedimentary (limestone), metamorphic (marble), and igneous extrusi (lava). A worthy objective of interested cavers is the discovery of a major cave in igneous intrusive rocks (like granite, Bob).

Well, not quite like granite. There exists a special kind of igneo rock known as a carbonatite. This species may be composed of up to 97 $CaCO_3$, making it a prime subject for subsquent solution by carbonic ac These rocks are found much like granites, and are formed deep within th Earth. They may be formed by one of three processes. The first is by solidification of a calciun and carbon dioxide rich magma. The second process is one of hydrothermal transfer, where hot, high pressure fluids would deposit calcium brought up from below. The third process is one of gas transfer, whereby calcium carbonate is deposited upon the release of CO_2, as in the formation of speleothems.

Recent experimental evidence supports the first process. (See accompanying reprint).

These rock bodies are not common, but there are four in the United States. One is in Arkansas, and is about one tenth square mile in exposed area. Another, of two square miles area (with vertical releif of a thousand feet), is in Colorado. A third body, describe simply as a "large mass is found near Baker, (southern) California. The fourth deposit is in the Bearpaw Mountains of Montana, but so far only veins have been found.

No reports of cave development in these localities have been published, nor have I found any pictures or descriptions of topography. Should adequate jointing and peripheral drainage exist, however, there is no reason why significant caves could not develop.

SYNTHETIC CARBONATITE MAGMA (from NATURE, March 14, 1959)

Judging from the literature during the past decade, there is a growing interest in problems related to the genisis of carbonatites and associated alkaline igneous rocks. The interest has undoubtedly been fostered b the discovery of large reserves of rare earths in these rocks. Many fie geologists believe that carbonatites were emplaces as liquid magmas; but hitherto there has been no conclusive experimental evidence to support existence of carbonatite liquids. In fact, from the available experimen evidence it seemed unlikely that such liquids could exist at the low te eratures indicated by field studies. We have recently obtained experi al evidence that simplified carbonatite magmas can exist at moderate te eratures through a wide range of pressures.

Resusts fromaa study of the join calcite-water in the ternary system $CaO-CO_2-H_2O$ show that calcite begins to melt at a temperature of 740 deg. C at 1,000 bars pressure of water vapour. Only a trace of liquid was de eloped at this temperature, but the amount increased with increasing wa content and with increasing temperature. This evidence implied, but did not prove, the existence of carbonatite magmas.

Subsequent studues on the system $CaO-CO_2-H_2O$ have shown that the minimum liquidus temperature at 1,000 bars pressure is 675 C. ± 5 C. At this temperature and pressure, a liquid with the composition calcium oxide 64, carbon dioxide 18, water 18 (weight per cent) is in equilibrium with calcium portlandite and vapour (almost pure water). At 680 C. and the same pressure, a liquid develops on the calcium side of the $Ca(OH)_2-CaCO_3$

(cont. on p.)

EDITOR'S PAGE

The CASCADE CAVER is published monthly at 1117 36th Ave. E., Seattle, Wn. 98102. Editorial material should be submitted to Rob Stitt, 600 Lk. Wn. Blvd. E., Seattle, Wn. 98102. Deadlines are: submitted material, the first Tuesday of the month; publication, hopefully, will be by the 2nd Tuesday. This month didn't quite make it, however.

The CASCADE GROTTO OF THE NSS meets on the 3rd Monday of the Month, at 1117 36th Ave. E. in Seattle, EXCEPT for August, 1968, when it will meet at 2316 N. 113th Pl., Seattle. There will be a map in the Aug. edition to tell you how to get there. Like the time is usually 8:00 PM, and the meetings will be over by 10 (it sez here).

MEMBERSHIP LIST-- On page 33 we have finally published the Grotto address list of all paid up members; subscribing (S), Regular (R), or Family (F). IF this list is in error in any way, please notify Rick Rigg or Rob Stitt immediately. A corrected list will be published if warranted.

FIELD TRIPS--The Cascade Grotto has over 35 members, of which 22 are R or F types in the Seattle area. The field trip chairman has gone to some effort to set up a series of trips for this year, but so far the turnout has not been what should be expected considering our membership. We have some very good trips planned for the next few months, why not attend one or two? You might even get some caving done!!

DYNAMITED CAVE--September 28-29 has been selected for a Dynamited Cave work party weekend. In order to satisfy the requirements of our special use permit, we shall: 1. Completely remap the cave, obtaining both vertical and horizontal profiles; 2. Clean up the cave, removing all trash, debris, carbide, and wall markings; and 3. Place a gate on the entrance.

This will be a joint trip with the Oregon Grotto. A visit from the NW underground jug band is anticipated. Saturday night there will be some sort of a social function, perhaps a barbacue, to help raise money for the Grottos. More information will be forthcoming in the September CAVER.

NSS MEMBERSHIP-- Since the Cascade Grotto is a chapter of the NSS, it would seem in order that its members should also be NSS members. The advantages to be gained from this are several: 1. Receipt of all NSS publications; 2. A voice in society affairs, setting national and regional policy; 3. A vote in the Grotto elections, with the possibility of becoming an officer (O dubious honor!); 4. An NSS number, which you can dream of writing on cave walls in your Maidenform bra (However, it is not reccommended that you actually engage in this pastime, if you wish to retain the respect of your fellow cavers); 5. You will be able to make a positive contribution to the cause of caving in the U.S. and the world, and aid the NSS in carrying out its objectives.

If you are interested in A. finding out more about the NSS, or B. Joining the NSS, contact Rick Rigg, who can provide you with a brochure and application blank, and who will even sign your blank because he thinks you are a good fellow.

TAKE FOOTPRINTS

NOTHING BUT

BUT NOTHING

PICTURES LEAVE

Northwest Cave Rescue Association

The N.C.R.A. formed in February of this year to serve the Pacific Northwest, has produced its first unit. The Cascade Unit was officially organized on June 24, 1968. The Cascade Unit is independent of the Cascade Grotto of the N.S.S. Persons interested in joining and supporting the Cascade Unit are invited to apply for membership.

N.C.R.A. membership is composed of three groups:
1. Active Members to lead and participate in rescues.
2. Support Members to support the rescue teams
3. Sustaining Members for financial support.

Qualifications for support membership are easy and for active membership are strict. We welcome interested persons to join and train with us.

The Cascade Unit has elected its Board of Directors. They are:

Bob Brown-	Communications
Charles Anderson-	Equipment
Don Tubbs-	Finance
Dick Mitchell-	Training
Arch Olson-	Member at Large
Rick Rigg-	Member at Large
David Mischke-	Chairman

The next meeting og the Cascade Unit of the N.C.R.A. will be July 22, at 8:00PM at Dr. Hallidays. Please Attend.

******** ******** ******** ******** ******** *****

The Big Push at Papoose

The exploration of the lower levels of Papoose turned out to be only a "Little Push". Three teams made the trip below the majestic 70 foot drop, but only the first party spent appreciable time at the bottom.

The first party contained Al Nolane, Cameron Buttles, Steve Knutson, and Don Nelson. They viewed the terminal siphons and looked briefly for other leads. Not finding any leads, they surfaced.

The second party, with Verne Frese, Archie Olson, and Dave Mischke, followed the first group down and preceeded them out. They spent zero time at the bottom, and only slightly longer at the Millrace room. Frahm's altimiters, the locations of which were kept secret, were not found.

The last party containing Rick Rigg, Frand Harrison, and Don Tubbs toured down to the 50 foot pit and derigged on their way back. They received assistance from Bert Segara and Bob Weggland from the 70 on out.

The main reason the "Big Push" turned little was the group's unfamiliarity with the lower levels of Papoose. Before the Memorial Day weekend, none of the afore mentioned had been to see the sights. Now there are ten more who have

The Big Push at Papoose...con't...
been below [illegible]. Maybe next time we'll find the other 1200 feet [illegible]
(vertical of course) of cave.

D. Mischke

GEOLOGY OF THE RIGGINS, IDAHO AREA by Don Tubbs

A brief look into the geology of the area around Papoose Cave is all that is easily obtainable. A more comprehensive study would require access to unpublished material and general geologic knowledge ot the area that I lack.

An extremely somplified understanding of the local geology may be gained by grouping events into three phases.

First, during Triassic time (approx. 150-200 million years ago) came the deposition of volcanic ash and lavas, along with some non-volcanic sediments. Soon afterwards, in the same phase, assorted sedimentary rocks were laid down, mainly in warm, shallow seas. The limestone of Papoose cave was formed during this period.

Second, the area was intruded by the Idaho Batholith, a large magmatic mass of quartz monzonite (like granite, Bob.) The batholith literally "ate" its way into the preceeding rocks by engulfing huge blocks in its magma, and dissolving or melting them.

This intrusion was accompanied by considerable deformation and uplift, and by the metamorposis which has changed some to the limestone to marble.

Third, the area was eroded and was inundated by the Columbia Basalts--the thick lava flows which cover much of Washington, Oregon, and Idaho. These are the dark, nearly verticla cliffs which are seen high in the valley walls, and which lie in nearly horizontal layers.

Also in this last phase is the accumulation of the stream deposits ((mainly sand and gravel) in the valleys. Some of these deposits were successfully placer-mined for gold during the early part of the century.

(Possibly, somewhere, perhaps on p. , is the map which Don sent along with this....ED.) ---I-----(Cont. from p.)

---

join; this is in equilibrium with calcite, portlandite, and calcium oxide and has a composition cal. ox. 68, CO_2 19, water 13 (wt. %). At 685 C. th e two liquid fields coalesce and at still higher temperatures the range of composition of the liquid field increases. The minimum liquidus temp. in the system has been determined for a range of pressures. At 500 bars the temp. is 680 C and at 4000 bars it is lowered to 640 C. At pressures lower than 50 bars, the minimum liquidus temp. decreases, and at 27 bars pressure the appropriate composition is completly liquid at 665 C. The high melting temperature of calcite is therefore lowered markedly by the addition of calcium oxide and water under pressure. The low-temp. liquid may be regarded as a simplified carbonatite magma. Although calcite is generally t the dominant mineral in carbonatites, dolomite as frequently and important constituent, while apatite and mica are constant accessories. Experiments are under way to find the effect of additional components (such as MgO, P_2O_5 SiO_2 and alkalis on the minimum liquidus temp. in the ternary system. Solubility determinations are also being made to see how the solubility of calcite varies with increasing content of carbon dioxide in the aqueous vapor phase. Many geologists believe that a high temperature vapour, consisting of water and carbondioxide, is able to dissolve large amounts of calcium oxide , magnesium oxide, ferrous oxide, etc.

P. J. Wylie, O.F. Tuttle, Dept. of Geophysics and GeoChemistry, Penn. State. U.