

important to life, experiments at Prague had shown that seed germination was markedly speeded by the presence of K_{41} . In seeds where perhaps 20 out of a hundred would germinate naturally, the number was increased clearly beyond any experimental error in the presence of radioactive potassium.

Dr. Brewer's report to the chemists indicates that a high proportion of the radioactive kind of potassium appears to be associated in animals with embryonic tissue. Bone marrow, for example, is rich in K_{41} compared with other tissues of the body, and the concentration grows less with the maturity of the animal. Interesting too is the fact that a mature animal which had developed cancer and therefore had more than normal abundance of embryonic tissues in its body showed an increase in the K_{41} content, of its tissues.

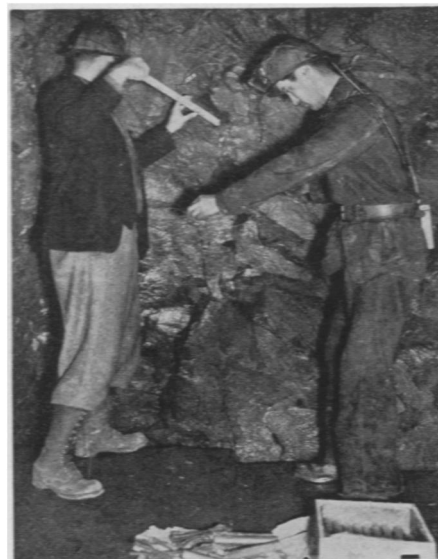
The heart, he reported, is relatively low in its K_{41} content and has relatively more of the non-radioactive K_{39} kind of potassium present.

Dr. Brewer's studies were made with the aid of a large atom "scale" known technically as a mass spectograph which determines the weights of the atoms in an element.

His present studies on animal tissues are the culmination of a similar line of research on potassium which has included the analysis of seawater for the element, down to a depth of two and one half miles; a study of the ratio of the two kinds of potassium in minerals from all over the world and an investigation of the same thing in plants.

The ratio of the two varieties, and hence the average atomic weight, is sensibly constant, Dr. Brewer told the writer, in seawater and in minerals. Constant it is too in plants with the exception of kelp which seems to have the ability to concentrate the radioactive form, and in potato vines where the older vines show more of K_{41} than do the younger ones.

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SETTING THE BLAST

Experimental test adit of the U. S. Bureau of Mines at Mt. Weather, Va. Wing G. Agnew, resident engineer, left, tamps dynamite into drill holes with his wooden pole and the miner prepares to hand him the primer stick with its wires and detonating caps. The box of dynamite can be seen in the foreground.

tunnel into the mountain side?" The questions poured out as Mr. Agnew grinned and settled back with his cigar in his old farmhouse office.

Mine For Tests Only

"Pick yourself one of these 'hard' miner's hats and come on down into the adit," replied Mr. Agnew. Adit, it should be explained for those who are neither miners nor cross-word puzzle fans, is a nearly horizontal entrance to a mine open only at one end, whereas a tunnel has both ends open.

The mine, he explained as we walked down the hillside to the entrance, is truly a test mine where the Bureau of Mines can have command of all controllable conditions in experiments on the efficiency of drill bits, dust production and its relation to the silicosis problem, the efficiency of different kinds of dynamite and blasting agents, mine ventilation and other problems.

But because it is a test mine, it creates the local mystery. To the layman it seems senseless to mine without mining anything, not to care too much where the mine is going, or how fast it goes there.

The Bureau of Mines, pointed out Mr. Agnew, could perform some of its tests in commercial operating mines by arrangement with the owners. But such

ENGINEERING

Mystery Mine in Blue Ridge Revealed as U. S. Test Tunnel

Tunnel of 175 Feet Into Mountain Will Be the Proving Ground for Bureau of Mines Experiments

By ROBERT D. POTTER

See Front Cover

INHABITANTS of the Virginia town of Bluemont, neighboring farmers and hilldwellers on the nearby Blue Ridge mountain range have a new mystery to supplant a local murder of some months back. They have been watching strange out of state automobiles, and trucks with little-seen government license plates, take men and machines into the gravel ridge road that meanders some five miles off the main highway and finally reaches Mt. Weather.

These men and their equipment, they know, are for a mine that has been pushed by drilling and blasting through the hard Blue Ridge rock all winter. The local mystery comes in the supposed purpose of the mine; a purpose which in local rumor circles runs all the way from gold mining to the search for some nameless blue-green mineral highly useful for Navy battleships in a way which no one will venture to explain.

On the trail of this Blue Ridge mine mystery, Science Service photographer Fremont Davis and the writer bounced over the twisting ridge road until the U. S. Weather Bureau's abandoned kite-station at Mt. Weather was reached. Still no mine. The caretaker, however, pointed to a still more torturous road carved through rock and between giant trees on a timbered ridge. Fifty feet down that road we stopped and backed up in haste to a safe place and went ahead on foot. Finally, down the slope perhaps a quarter mile, we came to the local "mystery" mine.

From deep under our feet we could hear a pneumatic drill battering the hard rock. The exhaust of the motor-driven air compressor was the only other sound in the quiet mountains. The mine, we knew, was the test adit of the U. S. Bureau of Mines, so we searched out the genial resident engineer, Wing G. Agnew.

"Why was the mine? Where was it going? What for? How deep was the

work would have to be done at odd times to avoid conflict with the operations and in many cases it would not be possible to juggle conditions through a wide range needed for a particular experiment. As every scientist knows, without control of all possible factors an experiment only gives a qualitative hint rather than a positive quantitative answer. Moreover if an experiment is done in a private mine the information becomes the property of that mine and may not be released to the mining industry as a whole.

175 Feet Into Mountain

The Bureau's Mt. Weather mine, in effect, is a proving ground where any sort of mining test that needs to be made can be carried out. As resident engineer, Mr. Agnew's task is to get the mine into the toughest rock he can find that will, at the same time, be of consistent uniformity. He will then cooperate with the various divisions of the Bureau of Mines in any tests they may wish to make. The geologically ancient basalt rocks of the Blue Ridge seem almost ideal for this purpose.

With the shaft now 175 feet into the mountain Mr. Agnew chuckles at the slow progress, for he knows that his searched-for "tough" rock is at hand. Thus a problem that would cause gray

hairs in the head of an engineer of a commercial mine, brings delight on Mt. Weather. As an ex-small boy who liked to dig caves in a convenient bank of clay down by the creek, the writer could not help envying Mr. Agnew his job of digging.

Blinded at first by the darkness and deafened by the roar of the drill biting at the rock face at the far end of the tunnel, we stumbled along the little handcar track into the mine. Shortly the dim lamps of the miners' caps glowed through the misty, fog-like haze of the pneumatic drill's exhaust. The roar of the drill forbade all attempts to speak.

Pneumatic Hammer Used

The beam of a flashlight showed the blue-green rock in the face of the adit. One could see the cannon-like pneumatic hammer aimed at a hole near the floor. Into the hole stuck the vibrating drill rod that 2,000 times each minute battered the rock and at the same time slightly twisted the drill bit. From the hole poured a small stream of muddy water whose source was the end of the drill where a jet of water issued to lay the rock dust.

We were fortunate, for the last of 18 holes in the face was nearly finished and the next step of filling the holes with dynamite and clay was about to

begin. Then would come the hollow-sounding blast that would strip another five feet out of the hard rock face and make a day's work of cleaning up by mucking.

In the tremendous roar of drilling, action pictures were obtained and then we gladly retreated to the mouth of the mine to learn what it was all about.

While Mr. Agnew nonchalantly sat on a rock and slit the sides of wrappers of dynamite sticks, we asked more questions. We found that the slits were to allow the dynamite to spread throughout the drillholes when the explosive was tamped into place. Those sticks with the wires running from one end were the primers containing special gelatine dynamite and detonating caps that would set off the blast. The little tags 0, 1 and 2 on the primers indicated delayed action blasts. The "zero" sticks explode first, followed by those numbered 1 and 2 a fraction of a second later.

Blast At Center

The trick of mine blasting, explained Mr. Agnew, is to set a heavy charge of "zero" sticks in the center of the face which explodes as soon as the electrical igniting circuit is closed. Almost immediately, however, the "1" sticks explode and with the center of the face partially freed have most of their driving force also toward the center. Finally the weaker charges at the edges of the face, plus an extra heavy charge along the bottom, explode and add their force to the blast. This last blast picks the rock up and deposits it on pieces of sheet steel that temporarily form the floor of the shaft and make the clean-up removal of the rock much easier.

Because he has only local labor, Mr. Agnew himself fills and tamps in all the drill holes and sets off the electrical circuit for the blast. After watching him take a long wooden pole and tamp the dynamite in place we were glad to withdraw again to the mouth of the mine. To a layman watching a mining engineer "tamp" the dynamite, the verb "pound" seems more applicable.

From the face of the mine the distant entrance is only a small spot of light in a world of darkness. It seems inconceivable that any rock can be hurled horizontally for that distance and by bouncing off the walls finally gain the entrance. But that is exactly what happened in the blast.

Rock Hurled Out

First came the hollow sound of the explosion and your eardrums and even



DIGGING THE MUCK

The debris of rock after an experimental blast which, in this instance, hurled rock to the entrance of the adit some 175 feet away.

your body felt the impact of the rushing air. Almost at the same time came the cloud of gases and the swirl of leaves swept up by the rushing man-made wind. And then a piece of rock some 15 inches long bounced out ten feet beyond the mouth of the mine.

It takes an hour to clear the mine of vapors and dust and then again we venture back. The going is now even harder than before, for rocks and fragments are splattered down the whole adit.

Ultimately, with skinned shins and scarred shoes, you reach the former face. And there is a pile of rock half as high as a man and beyond it a hollowed-out place. The steel flooring, at least on this particular blast, will be of little use, for instead of being under that pile of rock it has been blown back some 20 feet down the shaft. More pictures are taken, and then the miners come in to start the tedious task of cleaning up for the next drilling and blast.

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METEOROLOGY

South Polar Weather Data To Be Published

WEATHER figures and facts amassed during Admiral Byrd's South Polar expedition are now being digested and arranged for publication at the U. S. Weather Bureau, by Meteorologist George Grimminger, who was with Admiral Byrd in Antarctica.

Mr. Grimminger is being aided by six Works Progress Administration employes. The project will require eight months for its completion, and will involve an expenditure of \$4,500. A formidable amount of reducing, correcting, evaluating, and editing is involved before the work will be ready for the printer. Scientific publication is expected early in 1938.

The report, when finally published, will be unique. It will be not only the first meteorological report ever published by the U. S. Government on the South Polar regions but also the first ever published by any country to include observations made in the upper air over Antarctica by means of balloons, kites and airplanes. No previous Antarctic expedition was equipped to take these observations of air movements and other data concerning the South Polar air currents which breed much of the world's weather.

The data were obtained in temperatures ranging from freezing to 72 degrees below zero.

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CHEMISTRY

Major Forward Step Made Toward Chlorophyll Synthesis

Chemistry Meeting Hears Also of New Solvent, New Male Sex Hormone, and Powerful Local Anesthetic

A MAJOR forward step toward the chemical synthesis of chlorophyll, the green coloring matter of plant leaves upon which depends nearly all life on earth, was disclosed to the Chapel Hill meeting of the American Chemical Society.

About 70 compounds closely related to chlorophyll have been prepared and some of them have strange and powerful physiological properties. One compound, for example, was injected into rats in small amounts of 10 milligrams and virtually bound the animals to a life in darkness in order to live. As long as they remained in the dark they showed no effect. When removed to daylight they died in a few hours.

Dr. Paul Rothemund of Antioch College, in describing his researches on these chemical relatives of chlorophyll, also told of a German chemist who tried some of the substance on himself with the result that he too, was bound to a life "after dark." For ten months he could not go out into the light without having his face swell up, suffering intense pain, and having patches of his hair fall out.

While none of Prof. Rothemund's products are identical with those found in nature he believes that he or someone else will produce eventually a substance indistinguishable from the natural product.

Funds from the National Research Council, the Chemical Foundation and drug manufacturing companies have supported the Antioch researches.

Powerful Solvent

A new world of chemical research was thrown open before the meeting with a description of a chemical solvent that makes possible a whole new series of chemical reactions. In the new solvent water, usually considered a neutral compound, forms a base and reacts with acids to form new chemicals.

Reporting five years of study of the solvent, known as selenium oxychloride, Prof. Gilbert B. L. Smith of Brooklyn Polytechnic Institute said, "Such strange

things happen to substances dissolved in this solvent that chemists must revise their theories of ionization as applied to acids, bases and salts."

Selenium oxychloride is a heavy straw-colored liquid that freezes at about 65 degrees Fahrenheit. It has a corrosive action on many common materials.

Describing its oxidizing properties, Prof. Smith said: "Once some of it froze over night, broke its containers and dripped on the wooden floor of one of the laboratories at the Institute. It ate right through the floor and dripped down into the physics laboratory below. The selenium oxychloride destroyed several instruments in the physics laboratory and even attacked bakelite fixtures."

To picture to his audience the strange properties of selenium oxychloride, Prof. Smith envisioned the world as it might be if the solvent were as prevalent as water and stood in the latter's place as the widest known solvent.

Mountains, said Prof. Smith, would consist only of glass or feldspar, two of the few substances which the solvent will not dissolve. All bridges and boats would have to be constructed of platinum or tungsten.

From the time the temperature went below 65 degrees in the fall the whole world would be a great frozen mass. Snow would fall every time it became colder than mild springtime and when it rained man would have to carry umbrellas made of glass, tungsten or platinum.

New Male Sex Hormone

A new male sex hormone known as epiallopregnanolone has now been isolated and made synthetically, it was announced by Dr. R. E. Marker of Pennsylvania State College on behalf of his colleagues, R. V. McGrew, E. L. Wittle and D. M. Jones.

In most minute amounts this hormone aids the development of male sex characteristics in birds and other animals, including humans. Its source was the urine of expectant mothers.