as a method of malaria control. One of the chief reasons for doubting the effectiveness of such a method has been the belief that *Anopheles* mosquitoes have definite blood-meal preferences. The anophelines which are effective carriers of malaria have usually seemed to have a distinct preference for human blood. Poor carriers have appeared to prefer animal blood. Precipitin tests have lent weight to this belief.

During the first four months of 1933, the staff engaged in malaria investigations[1] in the Philippine Islands made collections of adult *Anopheles* mosquitoes of the *funestus-minimus* subgroup in the municipality of Aritao in Nueva Vizcaya. The population of the area in which the collections were made was about 800. In the Philippines, as has previously been reported,[2] these mosquitoes can rarely be found inside or under houses. They are, as a rule, seen only out-of-doors, in natural resting places, such as undercut stream banks, where daytime catches can easily be made. Recently, collections of these mosquitoes were made at night, while the insects were feeding on carabaos.

The last catch dissected up to the present time numbered 705 mosquitoes. Of these, 133 were caught along stream banks by day, and 572 on carabáos at night. There were five infected mosquitoes among them. In one (*A. filipinae*) the gut only was positive; in one (*A. minimus v. flavirostris*) the glands only were postive; in one (*A. minimus v. flavirostris*) the glands were positive, but the stomach was not successfully dissected; in two (*A. minimus v. flavirostris*) both gut and glands were infected. One mosquito in which gut and glands were infected was caught along a stream bank. The other four infected insects were caught at night while feeding on carabaos.

Here, then, is strongly presumptive information to the effect that mosquitoes which had first taken blood from an infected human were attracted to carabaos for a subsequent feeding at a time when they were potentially dangerous to man. We have not been able to rule out absolutely the possibility of simian malaria or of carabao infections. Both are highly doubtful. Monkeys are very uncommon in Aritao, and the literature has no records of malaria infection in carabaos. This matter is being checked.

The possible usefulness of an animal barrier would seem to be indicated by these findings. But such barriers uncontrolled are of little use, because in the town of Aritao the blood smear index for malaria is about 30 per cent. A detailed report on this subject will be published eventually.

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[1] The malaria investigations are jointly supported by the International Health Division of The Rockefeller Foundation and the Bureau of Science of the Insular Government of the Philippines.

[2] P. F. Russell, *Philippine Journal of Science*, 46: 639–649, 1931; and P. F. Russell, *Proceedings* of the Entomological Society of Washington, 34: 129–138, 1932.

"MAGMATISM"

THERE seems to be no adequate term for expressing the phenomena attending the primary placement of igneous material both within the earth's crust and upon its surface. In most text-books, the word "vulcanism" (or "volcanism") is made to answer for igneous processes, whether they are deep-seated or at the surface. This term seems inappropriate, since the idea implied applies particularly to volcanoes. The correlative words "volcanic" and "plutonic" are sometimes used to express the place or mode of occurrence of igneous rocks, according to whether they be extrusive or intrusive. Is it any more appropriate to use the word vulcanism than plutonism, for general igneous activities? The one might well be used for subsurface igneous processes; the other, for supersurface processes.

The writer has felt the need of a single term which might do for all igneous processes—to be used in much the same way as vulcanism is now used. For this purpose, he suggests the word "magmatism." The idea of this word is to represent the collective phenomena of volcanoes and their dispositional processes; dikes, laccoliths, batholiths, etc., in respect to the way they were formed—any and all movement of magma and its subsequent primary disposal as solidified crustal material. The old terms "vulcanism" and "plutonism" then could be used if desired, to distinguish the two types of magmatism.

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THE REVERSAL OF THE SODIUM LINE, "D," IN FIREWORKS

SOME years ago the writer noticed, at a glass factory in West Virginia, the reversal of the sodium line, "D," and published a note thereon in SCIENCE. Now we are able to supplement this occurrence in the rather unusual setting of fireworks. It happened at the recent "Fourth," at the beautiful grounds of the Kirtland Country Club, near Mentor, Ohio. The exhibits, while not so extensive or elaborate as those at the Washington inaugurals or at Coney Island, were unique and beautiful. Some of them were of a type new to me; and several gave spectra largely for the sodium compounds. I was using my pocket direct-vision, made by Franz Schmidt & Haensen, of Berlin, Germany. On three occasions, the bright sodium line changed suddenly from the bright form to the dark reversal. I was confirmed in my observation by a friend who sat near me, who saw it all clearly, both the bright and the dark line. The occurrence is un-

usual in my experience in that the very small and short volume of vapors in the fireworks could do what it did. The fireworks in question were of the large spinning-wheel type, and also of the fountain and rosette types, where the flames were massed in a space of some foot or more in diameter.

The writer would call the attention of those interested to this unusual occurrence and would invite correspondence thereon.

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SPECIAL CORRESPONDENCE

GEOLOGIC RESEARCH WORK NEAR RED LODGE, MONTANA

THE program of cooperative research work in geology, described by the writers in the issues of SCIENCE for August 1 and December 21, 1930, has already led to highly interesting scientific results and promises disclosures of an even more fundamental character. Indeed, so much is this the case that a brief note as to the status of the project and a historical sketch of its development are believed to be warranted at the present time.

In the field of paleontology, one of the most important discoveries which has been made is that of the Lower Devonian ostracoderm and arthrodiran fauna which was discovered at Beartooth Butte, Wyoming, in 1931 by a party consisting of Professors R. T. Chamberlin, W. H. Bucher, Erling Dorf and E. L. Perry, and Richard F. Miller—the first of the fossils being found by Dr. Perry. The collections obtained in 1931 were described in a paper by William L. Bryant, director of the Park Museum, Providence, published in the proceedings of the American Philosophical Society. Additional collections obtained in 1932 by a Princeton Scott Fund Expedition, led by Professor Dorf, are also being studied by Director Bryant and were described in part in a paper read before the last annual meeting of the American Philosophical Society. This fish fauna is remarkable both for the number, variety and perfection of the primitive fish remains comprising it, and because it contains forms closely comparable to many of those which have been obtained from the famous localities of northwest Europe and Spitzbergen. A highly unusual feature of the Beartooth Butte locality is the occurrence of beautifully preserved Lower Devonian fossil land plants in direct association with the fossil fishes—these plants having been studied and described by Professor Dorf in a paper presented before the Paleontological Society in December, 1932. Further collecting at this locality during the coming summer and in 1934 is contemplated by Professor Dorf. Other important paleontological results include the demonstration, according to Dr. C. E. Resser, of the fact that the Cambrian fossil collections from the Red Lodge area prove an interdigitation of northern and southern Rocky Mountain Cambrian faunas, which should aid materially in correctly determining the correlation of the Cambrian formations of the West. The presence of upper Ozarkian and lower Canadian formations in the area is also suggested by tentative fossil determinations made by Dr. E. O. Ulrich, of the National Museum, and Dr. Rudolf Ruedemann, of the New York State Museum. Collections of foraminiferal fossils obtained from the Jurassic Sundance formation of the Big Horn Basin have been studied and described by Professor J. R. Sandidge in a recent issue of the *American Naturalist* and it has been suggested by workers on the Pacific Coast that this work may aid in demonstrating the Jurassic age of Pacific Coast formations hitherto regarded as of Lower Cretaceous age. A study of the fossiliferous Miocene deposits south of Livingston will be made by Professor Sinclair and Dr. Jepsen this summer, with the assistance of V. C. Miller and Dr. E. C. Marshall, of Livingston.

Studies in petrology and economic geology have been carried on under the direction of Professors Edward Sampson and A. F. Buddington. An outstanding development of the three years' work has been the accumulation of evidence that the Stillwater igneous complex in the northwestern part of the Beartooth uplift is a strongly differentiated noritic sheet of Precambrian age with a stratiform arrangement of facies extraordinarily similar to those in the Bushveld complex of Africa, a fact first recognized by Professor Sampson. The differentiation of the sheet as a whole has been studied by J. W. Peoples, the chromite-bearing horizons by Professor Sampson and copper-nickel sulfide mineralization and the contact metamorphism at the base of the sheet by Arthur L. Howland. One or more bands with a little disseminated sulfide carrying slight amounts of platinum have been defined within the complex. A strongly metamorphosed zone of banded iron formation has been found in the country rock at the base of the complex and also about thirty-five miles to the southeast on Rock Creek, where it, together with masses of ultrabasic rocks and associated chromite deposits, are being studied by Kenneth P. Wilson. The composition and mechanics of intrusion of the Tertiary