on the next day's excursion. At ten P. M. the berths are made up and everybody tumbles in. Next morning we breakfast in the car, put our lunches in our knapsacks, are met by our local leader or leaders. After a full day's work on the Iron Ranges we return to the car for dinner. While we are dining our car is on its way to the next locality. There is another lecture in the evening, and so the schedule continues for over 10,000 miles of railroad travel, not including side trips of 1,000 to 2,000 miles. Most of the time that we are sleeping, eating or studying we are traveling, and so we make use of every minute of the day, and accomplish as much, more comfortably and more efficiently, in one third of the time that it would take to do the same work under ordinary traveling conditions. Wherever the car can not take us we either hike, or arrange for horses or automobiles to meet us. If we wish to see some important section between stations, the railroad company (as in the case of the Northern Pacific) stops the train so that we may "go and see." Sometimes we disembark at one station and take a four days' hike across country to where our car is waiting to take care of us once again. Imagine the delight of having your home, classroom and library always with you and never having to tug a heavy suitcase and a bag of rocks around a strange town or mining camp, or wrestle with an exceedingly varied and at times somewhat unpleasant diet. To those who say that this is altogether too luxurious a mode of travel for a geologist, we would reply that by keeping the party in the best physical and mental condition we are able to get more work done.

The mechanical difficulty of transporting small classes over great distances—of taking one's students to the mountain instead of trying to bring the mountain to the students—has been solved. We have succeeded in making the great railroad system of America an integral part of the university machinery, and we believe for the benefit of both.

The excursion this summer will probably be in Canada and the itinerary will be announced not later than April 1. Those interested in joining the expedition are requested to communicate with the director of the school as early as possible.

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## THE COMPOSITION OF GEOLOGICAL PUBLICATION IN THE BIENNIUM 1921–1922

THE published matter relating to geology listed in U. S. Geological Survey Bulletin 758, Bibliography of North American Geology for 1921–1922, by John M. Nickles, was analyzed by the authors in 1924 as to its sources by individuals and institutions and its composition in relation to the principal branches of geology. On completion of the study it was recognized that the two-year period was too short to indicate clearly some of the important trends and plans were laid for extending the analysis over a longer period, partly before 1921 and partly after 1922, when later bibliographic material became available. Since the completion of the extended study is remote it is thought that some of the salient facts brought out for the biennium already studied are of sufficient interest to justify presentation here.

No effort will be made to describe methods in detail; it is recognized that many errors are inherent in attempting a brief objective survey of material so varied in quality and significance as published scientific matter. The facts presented constitute an analysis of printed pages of whatever size or quality as listed in the bibliography above mentioned and for the years in question. The authors recognize clearly that the value and quality of such published matter varies enormously and moreover that no two persons would agree as to the relative value or significance of different papers. Some will feel that too much matter is being published, others that no such limit has been reached. To some of these problems the present paper contributes data without presuming at present to discuss causes, express opinions or render judgments.

The total amount of geologic matter published in the biennium 1921–1922 was almost exactly 60,000 pages, or 30,000 pages a year. Of this amount about 25,000 pages was classed as Economic Geology, about 15,000 pages as Historical Geology (including much areal geology) and the remaining 20,000 pages as Physiography, Paleontology, and Mineralogy-Petrography in the order named. The largest source of this material is the university and college group which is responsible for practically one third of the total. Another third of the total is produced by the state surveys and the U. S. Geological Survey combined, each contributing about half, and the remaining third is due to foreign, consulting, and petroleum geologists, and miscellaneous U. S. and Canadian public bureaus, museums and societies.

Relative to the total the university product is low in Economic and Historical Geology and high in the other subjects and the output of the state and national surveys shows opposite characteristics. Obviously these features are interdependent since the two groups dominate the entire production.

The total of 60,000 pages was contained in about twenty-two hundred papers written by 877 men. More than half of these men produced but one paper in the two-year period. Seven eighths of them pro-

duced four papers or less. The remaining eighth produced over 42 per cent. of the total number of papers. Of the 2,200 papers, one fifth was produced by the one-paper men, 46 per cent. by those writing three papers or less, and one fifth by those producing nine or more papers. Certain special classes, including paleontologists, mineral resource analysts, mineralogists and administrative geologists, include most of the longer individual bibliographies. Of 73 men producing over five papers, 44 belong in these classes; of 17 writing over 10 papers, 14 are so classified.

The average paper written by the one-paper men contained 34 pages; that written by the nine, ten and eleven-paper men grouped contained 17 pages. The average geologist of the entire group produced in the two-year period 2.5 papers averaging 27 pages in length, thus aggregating 34 pages per year. Twenty men in several Canadian Bureaus and Societies (excluding the Geological Survey of Canada) average 68 pages per year, 92 men in state surveys averaged 60 pages per year, 224 men in universities and colleges averaged 45 pages per year and 119 men in the U. S. Geological Survey averaged 38 pages per year.

Seventy-eight institutions appear in the university and college group. Fifty per cent. of the university total and one sixth of the entire amount was produced by men in nine leading universities. The first twenty universities were the source of over eighty per cent. of the university total. One university, Yale, during this period produced considerably over a tenth of the university total, and more than twice as much as the next university.

Among the 32 state surveys which produced a total of about 11,000 pages, the two most productive were the source of one fourth of the total and the first eight produced over 60 per cent. of the whole. It is not to be supposed that analysis of publications of another two-year period would result in identical rank of the various institutions since variations from year to year in any but the larger institutions are considerable. Nevertheless, there have been stated above only those general facts which the writers believe would be fairly characteristic of the composition of any biennium when conditions were not notably different from those during the 1921–1922 period.

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## CONCERNING THE ENCYSTMENT OF BUCEPHALUS CERCARIAE

IN the October, 1926, issue of the Transactions of the American Microscopical Society, Dr. George R. La Rue makes the statement (p. 274) that the entrance of the Bucephalus larva into the second intermediate host, so far as he was aware, had not been observed. He inferred that they enter the host by penetrating through the surface of the body just as the schistosome and strigeid cercariae are known to do.

I have performed an experiment to observe the method of penetration. A small (two-inch) rock bass was placed in a finger bowl containing a freshwater mussel (*Elliptio dilatata*) which was rapidly shedding active cercariae. As the fish fluttered about cercariae became entangled on the margin of the fins, especially the dorsal and caudal. Active movements of the fish resulted in many of the cercariae being cast off. After a few minutes the fish was transferred to a watch glass and the movements of the cercariae observed under the binocular. At first the tails of the Bucephalus aided the larva to maintain its anterior sucker in contact with the fin. Many attempts were made to find a place of entry. Gradually the tails became only a confused coiled mass, as the body portion began to penetrate. Within five minutes the body had become separated from the tails and had entered the space between the fin rays. The course of the cercariae is well defined by the bright pink color of the blood corpuscles which gather in its wake. Working by means of a worm-like movement, the cercariae, within thirty minutes of its entanglement on the fin, completes its excursion within the host and begins to encyst.

Encystment usually takes place at the base of the fin rays under the last few rows of pigmented scales. Five hours afterwards active movement was still visible within the cysts. Within twenty-four hours the characteristic clear cysts of Bucephalus are complete. These unpigmented cysts are not very visible to the unaided eye but are easily seen with a microscope. In a ten- to sixteen-inch small-mouthed bass hundreds of cysts may be found, in all the fins, but more especially on the pectorals and the caudal.

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## A PROTEST

THE author has noticed an ever-increasing tendency on the part of writers of college text-books and of research papers not to conform to consistent conventions and to correct English. Accordingly, he hopes that the following concrete examples may help to ameliorate this inexcusable state of affairs.

(1) The symbol for an electric cell consists of two segments of parallel straight lines, one of which is