In both these localities the fossiliferous beds consist of gray sandstones holding a fauna of European facies, several of the species being common to these and the Russian deposits. Overlying the Ordovician strata at Conception Bay are the sandstones of Great Bell Island, which, as they contain Brachiopods of the Trimerellid family, are probably Silurian (Upper). The fossiliferous Ordovician deposits in New Brunswick and Maine are either fine, dark shales and slates or siliceous mud-rocks, and indicate the probable existence of one or more deep-water sounds in Ordovician times partly shut off from the ocean over the area of the Acadian provinces.

Mr. G. U. Hay contributed an interesting paper, which received hearty endorsement and well-merited comments, on the "History and Present State of Botany in New Brunswick." The subjects dealt with in this paper are: 1. The History of Botany in New Brunswick, referring briefly to the explorations made by botanists in this and the neighboring provinces in the first half of the present century, noting the discoveries of plants made and the partial or fragmentary lists, chiefly of forest trees. Of these lists, probably one of the earliest and fullest is that by Sir James E. Alexander, preserved in his second volume on "L'Acadie," and comprising over one hundred species of plants, shrubs, and trees collected between Petitcodiac and Boiestown. 2. The Present State of Botany in New Brunswick, showing that a fairly complete survey of the Phenogamous flora of the province has been made, with the result that lists aggregate between nine hundred and a thousand species of flowering plants. A beginning has also been made in the cryptogamous flora by the preparation of short lists of mosses, lichens, and algæ. The economic importance of a wider and more general study of this subject is urged, especially with regard to agriculture and forestry; the collection of information on the time of flowering of plants and the ripening of fruits each year at many stations throughout the Province; more attention paid to the medicinal plants found in the Province, and more general and systematic attempts made for the extermination of weeds.

Three more geological papers were on the programme, but, on account of the gentlemen who were to read them being absent or engaged in the work of other sections, they were "read by title." These are as follows: "Note on the Gold-Bearing Ore of the Crawford Mine, in Peterborough County, Ont.," by Professor E. J. Chapman, LL.D. "Notes sur le forage d'un puits artésien dans le quartier du Palais, Québec," par l'Abbé J. C. K. Laflamme. Ce puits a été creusé dans un terrain dont l'horizon géologique ne semble pas encore absolument établi. L'examen des échantillons qui en ont été tirés pourrait être de nature à jeter un peu de lumière sur ce problème de stratigraphie. "Note sur la valeur de l'ouvrage de J. Cornuti sur les plantes du Canada," par l'Abbé J. C. K. Laflamme. L'auteur, dans sa monographie sur M. Sarrazin, avait déjà donné des détails capables de servir à l'histoire des sciences au Canada. En examinant l'ouvrage de Cornuti, publié longtemps avant les travaux de Sarrazin, il espère ajouter une page à peu près inconnue au plus grand nombre de nos botanistes. L'ouvrage de Cornuti a été imprimé à Paris en 1634. Par conséquent, dès le commencement de la colonie, on y a toujours prêté le plus vif intérêt au développement des sciences, et les travaux qui ont été faits sur ce point ont une valeur réelle.

Altogether the meetings were a great success. Dr. George M. Dawson, C.M.G., etc., was elected president of the Royal Society, and Dr. Bourinot honorary secretary. HENRY M. AMI.

THE PLACE OF THE LABORATORY IN TEACHING PHYSICS.

BY A. D. COLE, DENISON UNIVERSITY, GRANVILLE, OHIO.

THE use of laboratory methods in teaching physics has become almost universal in American colleges. But it may well be questioned whether the usual plan followed is the best one. Most colleges require elementary physics as a condition for admission, but this preparation is usually obtained in schools where no opportunity for systematic laboratory work is given, and the student enters college completely ignorant of laboratory manipulation, sometimes indeed without having even seen his teacher perform experiments. In his sophomore or junior year he takes a lecture course in general physics, and at the same time or the year following, a laboratory course. This latter course, however, is often elective, so that many students graduate from college without any laboratory knowledge of physics whatever.

But suppose one does take the laboratory course, is it well adapted to his needs? It often has very little connection with the lecture course, and is conducted by a different instructor. The student begins his work with no training in the accurate use of either hand or eye. Yet his first problem is often a difficult one, involving the skilful handling of complicated apparatus. He does not understand his instrument, turns to reference manuals, but finds their explanations are too general to help, or refer to a form of apparatus differing from his. The instructor cannot help him at once, as he is busy with some other bewildered student. He waits awhile, appeals to a neighbor in vain for help, finally makes a desperate start and at once succeeds in getting his instrument completely out of adjustment. When the instructor does finally get to him, it perhaps takes all the time that can be spared him to get the apparatus adjusted for a fresh start. Two hours have passed, and almost nothing accomplished. This is no fancy sketch. The writer has seen just such cases repeatedly, in several of the best-known laboratories in the country. Is it any wonder that students so misused find physics "hard" and uninteresting? The trouble is not with their work, but they have not been prepared to do it. Yet they can be prepared and with no greater expenditure of time.

Instead of giving the student ninety to a hundred and eighty experimental lectures as a preliminary to such work, give him about half that number, and in place of the other half let him demonstrate for himself the principal facts of physics in a series of about seventy-five measurements, requiring only moderate precision, in order that he may have time for a sufficient number of experiments to fairly illustrate his lecture course. Let him do this while the lectures are in progress, not after they are finished. Let the lectures be given say twice a week, on the other three days of the week give one hour to laboratory practice, and a half hour to recitation on the work of the day and the lecture of the preceding day. Keep laboratory work and lectures in close connection. The ideal method is to have all the class work simultaneously on the same subject — one connected with the lecture of the preceding day — and to conclude with the half hour of recitation.

Of course it is impracticable to duplicate apparatus to such an extent as to carry this system out perfectly, but if the class is divided into pairs for work, and each pair be provided with their own set of the instruments of frequent use, such as metric rule, hand-balances, dividers, test-tubes, etc., a considerable number of the earlier simple measurements can be carried on by all simultaneously. Thus a few glass tubes with the articles named above, will enable a whole class to study the laws of capillarity together, with an approximate verification of the law of diameters.

Where but few duplications of apparatus are possible, five or six different experiments may be going on together. To prevent confusion and loss of time, the apparatus necessary for each is placed by itself, and with it a paper describing briefly the method to be followed and giving references to books kept in the laboratory for the purpose. Each paper may be designated by a number, and each working pair is assigned one of these numbers. A class (or division) of twenty can thus get to work in one minute. For example, suppose the class is just beginning the consideration of specific gravity. Various methods of determining it have been described in the lecture of the day before. The ten working pairs are sent to the desks, where there are sets of apparatus illustrating five different methods, each duplicated once. One is arranged for finding the specific gravity of glass by the hydrostatic balance, another for that of lead by Nicholson's hydrometer, a third for that of quartz by the specific gravity flask, a fourth for alcohol by Jolly's balance, a fifth for mercury by Hare's communicating tubes. On the next laboratory day, each division takes a second one of the five methods, and so on till each has had them all. Lecture and laboratory exercise have helped each other. Each one understands the subject and is prepared to enjoy and profit by the more careful measurement of specific gravity with delicate balance and corrections for variation of temperature and pressure from standard conditions, that awaits him in his term or two of advanced practical work. Such a course prepares him fully for the higher grade of work, so that neither inherent difficulties or imperfect explanation can now be a bar to progress.

It must be admitted that the method presented involves some additional effort on the part of the instructor, but there is abundant compensation in the superior results obtained. If space permitted, I would add something concerning methods of securing at small expense the duplication of apparatus necessary to keep the laboratory studies in close connection with lecture and classroom work, but that would better be reserved for another occasion.

DISCOVERY OF ANCIENT ARGILLITE QUARRIES ON THE DELAWARE.

BY HENRY C. MERCER, DOYLESTOWN, PA.

THE discussion of the Trenton gravel specimens has forced several important questions upon our attention. Where did the argillite come from with which the chipped objects were made? Granted that much of it was found in the river-bed in the shape of boulders and erratic blocks, whence had this material been transported by the river?

To learn that modern Indians on the Delaware quarried jasper and in the process of blade-making strewed the quarry site with "wasters," resembling in form the Trenton specimens, was to ask whether they also quarried argillite.

We had found argillite "turtle-backs" on the surface at the camp-sites of Gilmer's Island, Gallows Run, Ridges Island, and Lower Black's Eddy on the Delaware, but they lacked the final and convincing association with the quarry to prove their pedigree, and we still sought the whereabouts of the ancient pits, the refuse heaps, and the "rejects" or blocked-out implements which were to repeat in the now famous blue stone, the story of the inchoate blades of jasper.

The way towards an answer to one of the vital questions that concerns the antiquity of man in the Delaware valley was opened on May 22, by the discovery by me of a series of seven or eight depressions surrounded by masses of argillite chips (a quarry in fact with all the surface characteristics of Macungie, Vera Cruz, and Durham, in America, or Grimes Graves, or Spiennes, in Europe) on the steep north slope of the hillside at Point Pleasant, Bucks County, Pennsylvania, on the right bank of Gaddis' Run, about one-quarter mile above its mouth and half a mile from the well-known Indian camp-site at Lower Black's Eddy. The work of carefully clearing out one of the depressions and trenching its refuse heap was begun yesterday afternoon and will occupy an indefinite time.

Notched in the slope whose angle is about 35 degrees, the depression, one of eight or nine others, fronts a solid ledge of argillite (an outcrop of the large vein here traversed and exposed by Gaddis' Run, and twice tapped near by, by modern quarries as the purest source of the material).

Its largest diameter is about thirty feet, its depth five, and breadth eight. The trench begun across its narrowest width, penetrating for three feet through loose yellow mould, has shown as yet nothing of importance beyond two bits of charcoal and broken (quartzite pebble) hammer-stones at a depth of one and one-half feet. Another excavation about three feet in diameter has entered the mass of refuse for four feet without reaching its bottom, and discovered at various points thirty-three "turtle-backs," twenty-five broken bases or points, and four hammer-stones. On the surface about the other pits I gathered in a few hours twenty "turtlebacks," six ends or points, and fourteen hammer-stones.

With the work of penetrating to the bottom of the refuse, and studying the ancient quarrying process scarcely begun, I have hardly had time to more than think of the important questions suggested: Who made and worked the quarry? Will it show a successive series of occupations? Can it be connected with the village site at Lower Black's Eddy? What shall we say of these rudely chipped forms? Are they "wasters" and do they of all "wasters" yet heard of, resemble the Trenton specimens?

We are twenty-five miles above Trenton and at the largest and purest outcrop of argillite on the right river bank above that place.[1] The bed of Gaddis' Run and the river-shore below its mouth are thickly strewn with argillite blocks and water-worn boulders — a pathway, in fact, littered with blade material, extending, from the ledge above referred to, to the Indian camp half a mile distant. While the significance of this has been obscured by chipped fragments from the modern quarries fallen into the stream, and the stone dressing that has accompanied the building of a dam, two bridges, and a canal aqueduct, there can be little doubt that the inhabitants of the village often went no farther than a few hundred yards along these beaches for their material.

But too much hangs upon the further examination of this site and the neighboring camp, now at last unfolded to the student in its fuller significance, to warrant a premature word.

LETTERS TO THE EDITOR.

**** Correspondents are requested to be as brief as possible. The writer's name is in all cases required as proof of good faith.*

On request in advance, one hundred copies of the number containing his communication will be furnished free to any correspondent.

The editor will be glad to publish any queries consonant with the character of the journal.

Science Work at the Avalon Summer Assembly.

I HAVE just received a little blue pamphlet containing the announcement of the new summer school at Avalon, New Jersey, and an extremely interesting and suggestive address on "Science Teaching in the Schools," by Dr. Charles Dolley, its president. Copies of this, I have been told, may be had by writing to Mr. Charles Adamson, secretary, 119 S. 4th Street, Philadelphia, Pa. The objects and methods of this new school are so new and attractive that it certainly marks the beginning of a new era in the teaching of science and art in our common schools.

The keynote of Dr. Dolley's address is struck by the following sentences in speaking of the proper method of educating the coming generation: "They begin by moulding little birds' nests of clay, or constructing cones and cylinders, cubes, and octagons out of paper, without ever having examined a bird's nest, other than that of the sparrow under the eaves, and knowing absolutely nothing of the interest to be found in a prism of quartz, a snowflake, or an icicle. They have been taught of the distribution of whales and camels and all sorts of exotic varieties, but are absolutely ignorant and blind to the wonders of nature to be found at their very doors; wonders requiring no text-books, no costly instruments, but which may be investigated by means as simple and inexpensive as the key and kite string of Franklin."

How few the teachers, let me add, who have the slightest inkling as to the wonderful history written in the chalk or slate they daily use!

Missions and philanthropic societies do good work in this world, but much is wasted. "What is needed," says Dr. Dolley, "is a sanitary missionary in every home, and this we can secure by training the children, by awakening in their minds a desire for something better, for more sunshine, more flowers, a wider horizon and more wholesome surroundings." How few the housekeepers who know the slightest whit about the yeast they use, the mother and flowers of vinegar, the moulds on jellies, the cause of rancid butter, or the nature of contagion! "The tritest things of our mortal experience are the most mysterious." There is enough of interest in a mucilage bottle to keep a man studying a lifetime.

[1] On Dark Hollow Run (below New Hope) I found a small vein of it nearly two miles from the river. The blue slate in Pidcock's Creek, on the south slope of Bowman's Hill and at the Harvey and Van Hart quarries below Taylor'sville, lacks the conchoidal fracture.