engineering study has not been an absolute factor in determining their actual lines of engineering work. It is found that graduates in civil engineering are engaged in mining, in machinery and in electricity, and that graduates in other courses are employed upon work in which they received no especial technical instruction. Thus it appears also that the particular course of engineering study is not so important a matter as students and the public generally suppose. In fact, a young man thoroughly grounded in fundamental principles and well trained how to apply them has almost an equal chance for success in all branches of engineering practice.

Looking now over the field of tendency thus briefly outlined it is seen that there has been ever present a powerful impulse towards specialization, to which, indeed, nearly all others have been subordinated. This has demanded a higher standard of admission, great thoroughness in all fundamental subjects, and a rigid adherence to scientific methods. Engineering education has had an active part and healthy growth; it now enjoys the respect and confidence of the public, and its future is sure to be more influential than its past. It is not specialization that has caused its success, but rather the methods which specialization has demanded. Those methods have resulted in imparting to students zeal and fidelity, a love of hard work, a veneration for the truths of science, and a consciousness of being able to attack and overcome difficulties; these elements of character are, indeed, the foundation of success in life.

Looking now forward into the future it is seen that in our efforts for the promotion of engineering education a wide field for work still lies open. The student should enter the engineering college with a broader training and a more mature judgment. The present methods of instruction are to be rendered more thorough and more scientific. In particular the fundamental subjects of mathematics, physics and mechanics are to be given a wider scope, while the languages and the humanities are to be so taught as to furnish that broad, general culture needed by every educated man. In general let it be kept in mind that education is more important than engineering, for the number of men who can follow the active practice of the profession will always be limited. Hence let it be the object of engineering education to influence the world in those elements of character that the true engineer possesses, so that every graduate may enter upon the duties of life with a spirit of zeal and integrity, with a firm reliance upon scientific laws and methods, and with a courage to do his work so as best to conduce to the highest welfare of his race and his country.

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AN OZARK SOIL.

CENTRALLY located on the Ozark Plateau, in the southwestern portion of the State of Missouri, there is a tract of very hilly country, underlain by Lower Carboniferous limestones and noted for its exceedingly stony soil. It comprises a portion of the counties of Stone and Barry, and is bounded on the north and west by the gently undulating plateau country commonly known as the 'crest of the Ozarks;' on the south and southeast by the escarpment of the Lower Carboniferous strata which bounds the broad basin-like valley of White river, and on the northeast by the outcrop of the Ozark Series. This small geographic district is characterized by ridges which are from 200 to 300 feet in height, yet so narrow that often two ridges and two valleys are required to make a mile. It is to the soil which covers these steep narrow ridges that I wish to call attention.

Our district being without the limits of the glaciated areas possesses a soil which has been in process of formation during many periods. It has never been disturbed by either marine or lacustrine agencies, and consequently, is but the residual material accumulated on the surface of the limestone rock after the decay of higher strata. These strata consisted of the coarsely crystalline, crinoidal Burlington limestone and abounded in layers of white chert.

The surface stratum of the soil which we are now considering is a layer of angular white chert gravel. The pieces vary in size from very small to a cubic foot, but sizes of a cubic inch to ten cubic inches predominate. Where the ridges are narrow the surface is so completely covered with this broken chert that the true soil cannot be seen, and in the spring, when the brown oak leaves and dried prairie grass are burned off, the hills look like hugh piles of broken rock. On the steeper hillsides the chert layer, which is here a true talus, is often several feet in thickness, and no attempt is made to reach the underlying soil for the purpose of cultivation. But on the flat-topped ridges, the plow passes under the superficial chert into a rich black soil, which is six to eight inches in thickness and remarkably fertile. This soil layer is nearly free from large fragments of chert, although very small particles abound and aid in giving the soil a very loose texture. The black color is, of course, derived from the decay of vegetation, and the carbonaceous matter accumulates more rapidly where the overlying chert layer is thickest. In fact, the existence of a black soil in this latitude is probably largely due to the presence of the chert.

Several years ago a ' cyclone,' in passing across the hill tops in the vicinity of Rancho Springs, in Stone county, prostrated the timber in narrow belts. The fallen oaks have upturned the soil, producing fine sections through it. Under the dark soil layer we find a light yellow clay, at first nearly free from chert, but which, at the depth of two feet, contains such a large percentage of large chert fragments that it requires the use of the pick in excavating it. This yellow sub-soil is a stiff clay and, when puddled with water and plastered into the ' chinking ' between the logs of the simple country houses, makes an excellent substitute for mortar. When plowed into, rained upon and dried, it hardens on the surface as though frozen, so that to walk over a plowed field when it is in this condition makes no impression on it. Yet it contains the elements of fertility and in time will weather into a good soil.

The yellow subsoil clay grades imperceptibly downward into a bed of closely packed but invariably fragmental chert. At three feet from the surface of the soil, less than 10% of the material is clay, occupying the narrow crevices among the chert. At this depth also the yellow clay changes rather abruptly to a similar fine-grained stiff clay of a bright brick-red color. From here to the surface of the limestone rock, which may be 10 or 20 feet from the surface of the soil, the mass is composed almost exclusively of the fragmental chert. What clay there may be among it is always of the bright red variety.

Now it is to the characteristic feature of the subsoil clay, viz., its color, that I wish to call special attention. This, as we have just seen, differentiates naturally into an upper yellow variety and a lower red variety. The line of demarcation between them is not sharp, and bears no definite relation to the main body of the chert. For when the ridges are broad, and the subsoil clay over the chert bed thickens, the surface of the clay rises into the subsoil stratum, leaving quite a thick bed of not very stony red clay over the main body of the chert. In short, as the line of demarcation persists in

following a given depth under the surface, which is about three feet, it is evident that the difference in color is due to a modification of the red clay by some action either atmospheric or aqueous. Now, red clay is the natural residual product of the decaying limestone. Red is, also, the color most generally represented in the mud of the caves. Indeed, there is no macroscopic difference between the red cave earth and the clay on the limestone rocks outside. They are due to the same general cause and constitute the same formation. But the upper three feet of the residual clay on the ridges has been converted into a yellow clay. The same effect has been observed and recorded, by numerous writers, in other unglaciated districts, but in this it is perhaps more prominent than in others. The cause appears to have been not the action of the atmosphere, which is incapable of destroying and removing the red oxide of iron, but the solution and removal of a large part of the iron salt, by percolating water containing acids generated by the decay of the vegetable matter contained in and on the soil.

The writer, believing that certain colors are, to some extent, characteristic of the products of certain periods and certain climates, wishes to propound the following questions:

1. If a residual clay were to form, in the absence of vegetation, at the present time in the Ozarks, would it be yellow immediately or would it first pass through a stage of red color?

2. Did the pre-glacial residual material, in certain districts of the upper Mississippi basin, as, for instance, over the Galena and Niagara limestones of northwestern Illinois, have a yellow stratum over the ordinary red, as in the present subsoil of Stone county, Missouri? (The remains of the pre-glacial residua yet seen by the writer in northwestern Illinois indicate only a red subsoil.)

3. Is it not possible, indeed probable, that the red clay in southwest Missouri represents some ancient period, while the modification of its upper three feet into a yellow clay is peculiarly the result of a more recent period?

The writer does not intend to answer these questions, but in conclusion will state one fact, which bears strongly on the last and may be found to be a key to its solution. In some long-past period the streams in Stone county laid down a flood-plain of of gravelly clay and silt of a prevailingly bright red color. Obviously, the material came from the soil and subsoil clay of the surrounding ridges. During a later period the same streams laid down a flood-plain of a light brown and yellow color. Obviously, the material came from practically the same position as during the earlier period. For an explanation of the strong contrast between the two fluvial formations we must look to the surface portion of the residua on the ridges. If we read the evidence aright it indicates that, subsequent to the formation of the first river deposit, a change of climate converted the previously red surface portion of the residual clay into a yellow clay, before the advent of the period during which the later formation was deposited.

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CURRENT NOTES ON ANTHROPOLOGY.

SOCIAL ORGANIZATION OF THE INCAN GOVERNMENT.

UNDER the title, 'Die sociale Verfassung des Inkareichs' (Dietz, Stuttgart), Dr. Heinrich Cunow, already known by an able treatise on the Australian aborigines, presents an analysis of the government and sociology of the Peruvians before the advent of the Spaniards. It is written from a careful comparison of the best early authorities and in the spirit of modern sociological science. The subject, therefore, is presented in a widely different light from that offered in Prescott's History. The