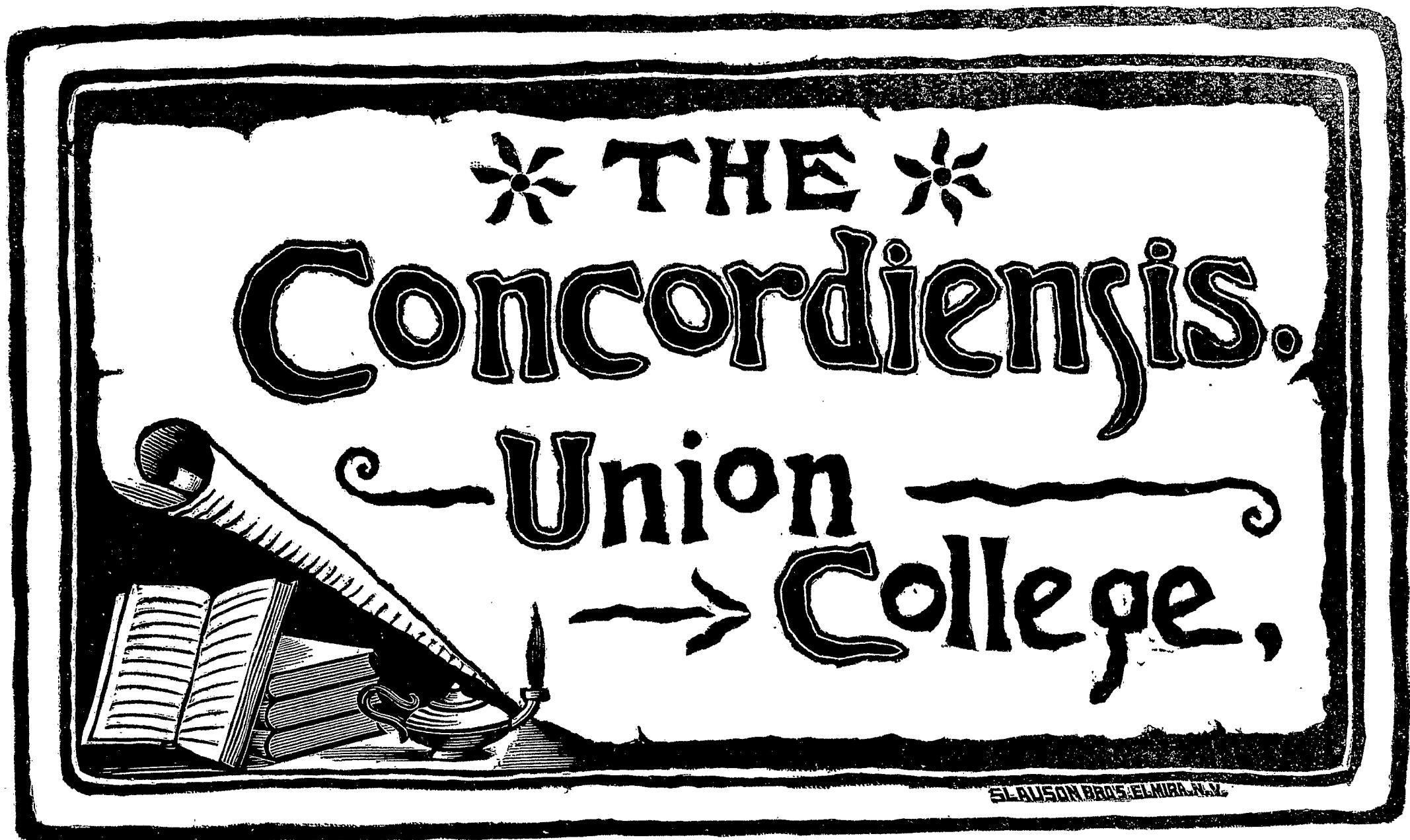


Volume XII.



Number 4

JANUARY, 1889.



SCHENECTADY, N Y.



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THE CONCORDIENSIS.

VOL. XII.

UNION COLLEGE, JANUARY, 1889.

No. 4.

To ———

I love you—not because your lips
Are sweetly curved like Cupid's bow,
But for the words they softly frame,
Tender and loving, sweet and low.

I love you—not because your hand
So soft and dimpled, soft and warm;
But for its pressure, mute caress,
I'd gladly brave life's hardest storm.

I love you—not because your eyes
Are sparkling, bright, of raven blue,
But for your pure, unspotted soul
Which looks those virgin windows through.

GEO. COMSTOCK BAKER.

LITERARY.

Evo'ution.

To treat so large a theme as Evolution in a brief article for THE CONCORDIENSIS is an undertaking for the responsibility of which the contributor is greatly relieved to be able to refer to the editor. But as the reader is also concerned in the transaction, it is due to him to know at once that it is not the design of either the editor or the contributor to present him with a profound study of the ruling doctrine of modern science. It is rather to state in simple words what Evolution is as understood in the scientific world of to-day and to illustrate the kind of evidence upon which the doctrine rests. The fact that vague, confused and incorrect notions, even upon these elementary aspects of the subject, are yet too commonly prevalent, must be the apology for treating what has to many become a hackneyed theme.

Any article of common use—a chair, a clock, and a pocket-knife—belong to a class of things which has had a history of progressive development. Take the pocket-knife, for instance; its history may be imagined to be about as follows: Primitive man, realizing the need of a cutting

implement, at first used sharp-edged stones picked up from the base of cliffs or bed of streams. But gradually he came to understand that by chipping to an edge one flint stone by means of another he could make a better tool than he could find. An improvement was next made by polishing the rough chipped surfaces into smoothness. Then the idea of fitting a handle into his flint axe occurred to him and thus originated the prototype of every form of handle-and-blade cutting instrument. At a later period our remote ancestors learned that other materials than stone could be fashioned into edged implements and especially that by heating and fusing certain substances found here and there outcropping on the hill-sides, a compound could be formed readily capable of being hammered into blades. Thus were formed edge-tools of bronze and from these the passage was not difficult to edge-tools of iron. Then followed a rapid development resulting in a wide variety of instruments—weapons of keen shining blades, single-edged and double-edged, suited to the needs of war and the chase, and milder instruments for household use and for the arts of peace. Finally, coming down to modern and civilized times, the need of a cutting instrument for sundry small and entirely peaceful offices that could be carried upon the person without danger thereto, led to the invention of the pocket-knife—an edged instrument the blade of which is jointed to the handle and can be folded into the latter which then serves as a sheath.

A reflection of this sort shows that as regards common articles of handicraft they did not come to be, as we now find them, hastily or suddenly, but slowly and gradually. They do not by any means belong to our generation, but they represent the cumulative product of the thought, skill, experience, of all generations back to

primitive man. The rude originals were the work of dawning intelligence attempting to satisfy the earliest realized human needs. Succeeding generations with expanding intelligence adopted the inventions of their forerunners to the larger needs of their increasingly complex lives. Thus the process continued down to our time.

Our pocket-knives, timepieces, etc., are therefore said to have come to be what they now are by a process of *Evolution*.

It is evident that in this sense not only common articles of handicraft are products of an evolutionary process but every material object made by human skill. A work of art—a cathedral, for example—is as much an evolution as the minor object we have considered. Only the cathedral grew out of realized needs of a higher type, the aesthetic and religious, instead of the merely practical.

But a little reflection shows that not only material things but laws, customs, manners, institutions, are products of a process of evolution. For they also grew out of realized needs and were handed down from generation to generation, at each step undergoing modifications in adaptation to the conditions of the time. Take the history of the Democratic form of government, for instance. What could be a more luminous example of an evolution?

This, then, is Evolution in human affairs. We must hasten to consider what modern science has to say about the same principle prevailing in the realm of nature. Are natural objects, is the earth, is a plant or an animal, the product of an evolutionary process?

In respect to the earth it is possible to speak with positiveness. Its history is written in plain characters in the rocks. By studying the operations of nature now going on about us—the flow of rivers, the movements of winds and tides, the action of rain and frost, the effects of volcanic and earthquake disturbance and other changes brought about by physical and chemical forces—we are able to clearly understand how the framework of the earth has been built up in past ages. We see that causes similar to those now in action have laid down the beds of rocky strata and determined the aspects of shores, mountains,

lakes, rivers and plains. And the evidence is conclusive that the process of formation was a gradual one, that the earth came to be as it now is, not quickly or suddenly but by a slow progression, extending through a great length of time. In short, its history has been one of Evolution. The primordial earth, acted upon by natural forces, gradually, through the successive geologic ages, became transformed into the earth of to-day, according to a principle similar to that by which the primitive cutting implement, modified by successive generations of men, came to be the instrument of to-day.

If we look from the earth to the cosmos, there are evidences (embodied in the Nebular Hypothesis) that our planetary system has passed through an evolutionary process.

The principle of evolution being therefore well demonstrated in the realm of physical nature it remains to consider whether it applies also in the department of organic nature. Is a planet or an animal, the oak or the horse, the product of a process of evolution? To get light upon this subject naturalists have made studies in several fields of investigation. They have examined the remains of the organic life of past ages, as found in fossils of the rocks, and have learned that the organisms first to exist upon the earth were simple in structure and that there was a succession of, upon the whole, gradually higher and higher plant and animal forms. They have found that in former ages plants and animals existed that are now extinct and that in many instances they possessed a remarkable combination of the characters of now widely distinct groups. For instance, some fossil animals were both bird-like and reptile-like, so that the naturalist is puzzled to know whether to call them reptilian birds or avian-reptiles. The suggestion derived from the study of these animals is that they were the common ancestors of both the birds and the reptiles of to-day. Only in a few instances has it been possible to trace a series of fossil forms from an ancient extinct species to a living species of the present. But this is not to be wondered at, since the remains in the rocks could scarcely be expected to be complete. In the cases of the horse and the camel such series have been worked out quite perfectly.

Much work has been done in the department of comparative anatomy to ascertain the structural affinities between different groups of living animal or plants. A uniformity of structural plan between groups apparently widely different has often been discovered, suggesting that they are divergences of a common ancestral type. When closely related groups (as different species of the same genus) are compared, their anatomical differences are exceedingly slight, so that it is not difficult to conceive that both have descended from a common progenitor.

It has been shown that the geographical distribution of plants and animals strongly indicates the origin of species by derivation from other species.

Lastly, the study of Embryology—the development of the individual animal or plant—has given strong corroboration to the conclusions arrived at by investigations along other lines of inquiry. It is believed that the stages through which an animal passes in its individual development are repetitions of the stages through which the class to which it belongs has passed in its development. To watch the development of a chick through a period of a few weeks (this is practically possible) is therefore to see in recapitulation the development of the class birds through the long periods of geologic time. It is at least entirely true to say that the stages through which the chick passes in its development, form a series which is exactly similar to a series of type-forms of the principle animal groups taken in order from the lowest group to the bird group, and that this series is again similar to that of the remains found in the rocks, proceeding from the oldest to the most recent.

If it be concluded from evidence of this sort that evolution in the organic world is a *fact* it remains to consider what the *causes* of evolution are. The pocket-knife, the cathedral, the political system of a state, are evolved by human agencies; the earth has been evolved by natural agencies; by what agencies have organic forms been evolved?

To this inquiry the work of Darwin was directed. By very extensive observations and experiments and by the study of a vast amount of data derived from various sources, he deduced

the principle of “natural selection” or “survival of the fittest”—phrases of so great expressive value that they have worked their way into general literature. An example or two must serve to indicate what this principle is: Suppose a herd of deer pursued by a pack of wolves. Whether a given deer escapes destruction will depend entirely upon its swiftness in running. For those that lag behind will be overtaken by the wolves, and while they are being devoured the swift-footed ones will escape. Thus there is a survival of the fittest, which in this case means fleetest. Again, suppose a flock of birds, crossing a sea in time of migration, struck by a heavy storm. Whether a given bird will withstand the stress depends entirely upon its bodily strength. The weaker will be overcome, while the stronger will reach shore in safety. Here, again, is a survival of the fittest, in this case fittest meaning strongest. Once more, take the case of a plant producing a hundred seeds and flinging them to the wind by which they are carried various distances and let fall in various situations. Whether a given seed will develop into a new plant or whether it will germinate at all depends entirely upon the favorableness of the situation in which it has lodged. It may have fallen on bare rocks or on streams by which it has been borne to the sea, in which cases it fails to germinate at all. Or it may have fallen on poor soil or on ground already fully occupied by more hardy plants, in which cases its development is only partial,—it becomes a stunted, imperfect plant. Or, finally, it may have fallen on good soil in which case it gives rise to a thrifty, perfect plant. Here, too, is a survival of the fittest, fittest in this case meaning having the most favorable environment.

Thus there is a constant struggle going on among organic beings and by a principle of natural selection the fittest, that is fleetest, strongest, possessing the most favorable environment, etc., etc., survive. Moreover, by the law of heredity, these qualities of superiority are transmitted to succeeding generations and so conserved. Hence there is a cumulation of superior qualities and so an evolution of higher and higher forms, natural selection being the *cause* of the evolutionary process.

That the principle of natural selection is a real one there can be no doubt, but whether it is a sufficient cause of organic evolution is quite a matter of question. But whether sufficient or not this does not affect the fact of evolution, if fact it be. Darwinism might be entirely false yet organic evolution entirely true. Most persons confuse Darwin's hypothesis of the cause of evolution with evolution itself. As we have seen, evolution, as a fact, rests on grounds entirely apart from the evidences of natural selection. It is true that Darwin's attempt to explain the causes of organic evolution did much toward establishing it as a fact but, as pointed out, evidences of an entirely different sort place evolution in this light.

If evolution be a real process not only in human affairs but also in every department of nature it is plainly not a process of creation, in the absolute sense, but rather a process of formation. Evolution does not account for the existence of things but for the forms of things. It does not account for the fact that there are cutting instruments but explains how a cutting instrument came to have the form of the pocket-knife. The original cutting instrument—the sharp stone—came to be one at all, that is, ceased to be a mere stone, because primitive man conceived the idea of so utilizing it. It is this *idea* that explains the existence of the pocket-knife; evolution explains its form.

The doctrine of evolution has been of incalculable value to our age in enlarging the horizon of thought and in indicating methods of research in almost every department of knowledge.

JAMES H. STOLLER.

An Educational Necessity.

In 1887 one thousand four hundred and ninety-nine students graduated from the colleges and universities of this state. Two hundred and seventy-four of these or about 16 per cent. received the degree of Bachelor of Arts which terminates a regular college course. The other 84 per cent. divided among themselves every imaginable degree that ingenuity can invent from Veterinary Surgeon to Doctor of Philosophy.

It is then a fact that 84 per cent. of the students of the state graduated from a university, and not a college course.

The primary object of a college course is mental development. The object of a university course is instruction in one or more special branches. The distinction is clearly drawn and the colleges of New York state seem to be carried away with the university idea. The trustees of Columbia recently considered seriously the proposition to abandon entirely the collegiate department. Cornell university, the largest and richest in the state, prides itself on being a place, where any man can learn anything, has eleven or more distinct courses leading to a degree, and in 1887 out of a total of 829 students graduated eight in the regular collegiate course.

The great majority of the youth of the Empire state who desire a collegiate course, go outside of the state to obtain it. It would seem as if they had no choice. Yale draws students from New York state beyond any local college. Harvard and Princeton depend very largely upon her, while the younger colleges of New England are never without New York names on their catalogues and the number is constantly increasing.

In this state of facts, in the opinion of the writer, there must be something radically wrong with New York institutions. It is the duty and it must be the business of some college to adhere strictly to college principles, to insist upon mental development as the true end of a college education. This college must let the students in the lower institutions of the state know, that a higher education means higher mental growth and must give them an opportunity to get that growth if they desire it. The people of the state have a right to demand such an institution and will have one when the reaction from universities begins. There is a growing desire that these great corporations dealing in undergraduates, call in their runners, neglect to cry for freshmen and turn their attention to the education and training of those who come, without attempting to provide a separate course and degree for every student. Some New York college must meet this demand and this is the opportunity of Union College.

It is not only an opportunity but a duty, as Union is the first and most distinct non-sectarian college of the state, was the first organized under the Regents of the state and the one nearest its capitol city. All other colleges in the state are sectarian and under church control.

And while Cornell is doing excellent work as a great non-sectarian university, Union must take her place now, as she was before the university craze, as the non-sectarian college of New York state, devoted to the one idea of the development of the mind and character of its young men. It is the duty of Union College to make its tuition absolutely free to at least one from every county in the state who shall apply for a higher education, to take a decided stand so that all shall know it, for the pure collegiate course; and sooner or later the people will appreciate the advantages that she offers their sons.

H. C. MANDEVILLE.

A Butterfly Kiss.

A butterfly kiss from
Fair lips a-pouting,
That its pleasant, I wis
To take such a kiss
From an innocent miss
There can be no doubting,
A butterfly kiss, from
Fair lips a-pouting.

GEO. COMSTOCK BAKER.

Is the North Pole the Cradle of the Human Race?

We may say that for centuries there has been a discussion as to the origin or birth place of man. The Egyptians, the Persians, the Assyrians, the Greeks, the Romans and North American Indians, have all had their theories or beliefs concerning the place where originated that wonderfully complex, ingeniously constructed, and highly developed organism called man. Whether we turn to Eastern or Western, to Ancient or Modern thought we are involved in a maze of theories, in a labyrinth of hypotheses; from which we are to choose that siiken cord which, if followed, will eventually lead us into the brightness of that fountain head of all light, the Truth.

But what theory shall we accept? Or, shall we say with Nadaillac, that, "All hypotheses are permissible?" Before we can come to any conclusion, we must examine the different theories, obtain all the facts bearing upon the case, and show the relations and bearings of these facts to the theories. But first we must become acquainted with the theories.

Plato held that man first appeared upon the island Atlantis, and Donnelly places this island in the middle of the Atlantic ocean.

Quatrefages, the French anthropologist, and other eminent scientists, claim that the cradle of the human race was in central Asia.

Haeckel, Paschel, Lyell and others place the origin of man upon a part of a prehistoric continent now submerged under the waters of the Indian ocean. Delitzsch believed that the Euphrates river was one of the four streams which are said to be characteristic of the garden of Eden.

Darwin, as is well known was the founder of the theory of evolution.

Warren upholds the "North Pole" theory, while Morton, Gliddon, Nott and Agassiz argue that man did not descend from a single pair, but that in the different continents he is indigenious to the soil and sprang from it.

Having given some of the most prominent doctrines that are held concerning this subject, we will try to show what are some of the facts, and the bearing upon the case of these facts taken from four different sources, namely, from geology, mythology, language and the historic geographical distribution of the human race. First let us criticize from the geological standpoint as to the antiquity of man. If man existed before the glacial period, there is good reason for believing that he originated, if not at the North Pole, at least in high northern latitudes. But if it can be proven that the earth was not inhabited by man before the glacial period, then any theory which places the "Garden of Eden" in the North must, as a matter of course, become immediately invalid. But in this as in other places of our discussion, the arguments are so evenly balanced that we must in the main form our own conclusions, which perhaps, and indeed probably, would be changed by some one

additional strong argument or evident fact. And so upon the very threshold of investigation concerning the ice age and the relation man bore to it, we tread upon uncertain ground. Over this, as over many other questions of geology, there is much doubt and uncertainty. Prof. Prestwich is believed by some to have proved beyond a doubt that palaeolithic man was post glacial. Croll and Geikie contend that there were two glacial periods and that man flourished between them. Then there are others who hold that man was a preglacial being. Each of these three different views have their supporters who bring up reasons why their theory is the true one. If we take the premises of Belt and allow that the flints found along with mammalian remains in widely separated portions of the world, were instruments made by man, then we must admit the evident truth of his conclusion that man was preglacial. Yet by many eminent authorities it is held to be improbable that these flints, found in beds in vast numbers, were the outcome of man's ingenuity; but rather that Belt and others by picking out from among thousands of flints those particular specimens which had some peculiar and definite form, have held them up for examination and claimed that they were shaped and fashioned by the hand of man. Then again it is argued that where remains of pottery have been found in what was the preglacial deposit, that these remains were, within comparatively modern times, washed into their present position along with the preglacial deposit. But yet, although we take into consideration the extreme rarity of marine remains of man in any age, we are not willing to accept the proposition that man existed before the glacial epoch.

Let us now pass on to the relation of the historic geographical distribution of the human family to these theories. We must first decide whether man is indigenous to the different continents, an opinion to which so great an authority as Humboldt was inclined to be favorable, or whether man sprang from a single pair. That this latter view is the correct one is now generally held by scientists. Indeed Bopp's investigations have removed it from the sphere of conjecture and placed it upon a scientific founda-

tion. He was induced to take this view through a careful examination of the different languages spoken. However seemingly unlike; however widely separated by intervening oceans, there are, nevertheless, found words or roots in all languages which are practically the same. These are especially words or roots relating to the family and to primitive methods of agriculture. This proves that all men, whatever their nationality, had a common origin. Being then agreed concerning the prehistoric unity of the human race, the question naturally arises as to where this unity existed. Warren says at the North Pole, and brings good arguments to prove it. He reasons that as the earth cooled the poles would be the first place inhabitable by man, and that man at the glacial period following the known cause of the flora and fauna pushed southward in all directions, and then as the ice and snow retreated into their northern fastnesses man followed and thus spread over all the inhabitable portions of the globe. This theory, if true, is by far the easiest way to account for the spread of man from some particular place, for man would have but followed his natural course in order to people the continents. Whereas under any other hypothesis, force or accident must have driven man into many regions which have been peopled ever since history has been recorded or tradition handed down. Now if we refuse to accept this hypothesis and hold that man has come into being since the glacial epoch; then we must look elsewhere for what is often called "Paradise."

If central or southern Asia be taken as the starting point of primeval man, then America must have been peopled by way of Behring Straits or else by accident or design the Pacific must have been crossed. Either of these theories is permissible. Although barriers blocked the way to the further immigration of man, yet, as the Huguenots were forced to abandon their native land and seek religious freedom in a new world, so ancient tribes driven by a more powerful enemy may have been impelled to embark upon comparatively unknown seas and find refuge in a barren and inhospitable land such as the northern part of America must have been. That this was the way in which

America was for the most part peopled is now held by the majority of scientists. Accident may have and probably did drive some to our shores. And indeed in modern times we have instances where Asiatic coasting vessels or junks have been driven by storms across the Pacific and wrecked upon our western shores. It is probable that in this way arose our South American civilization, built up by a people far superior to the natives in intelligence.

Thus we are brought to the conclusion that the western continent was peopled with a homogeneous race into which other struggling individuals or handfuls of men came and left their mark. As an example of this, it is believed that the Joltecs settled in Mexico in the seventh century and indisputably built the great cities of which the remains now exist. Thus we see that with Asia as the starting point, there is but little difficulty in the way of migration, either westward into America, eastward into Europe, or southward into Australia, Africa and the islands of the Pacific ocean.

From a mythological standpoint this is also probable. As, in spite of adverse interpretation, the ancients almost universally looked toward the land of the rising sun as the abode of the gods and the birthplace of man.

Let us now examine the different theories in the light of the facts which we have stated.

Whether man originated in the Island of Atlantis, as Plato held, we have no means of knowing except through the unscientific means of mythology, which may be of value as adding a proposition already probably true, but of little worth if forced to stand alone.

As to the theory that the cradle of the human race was in Asia, the most prominent difficulty is that of migration, which, as we have seen, may be overcome. While two of the strongest points in its favor is the centralness of the location, and the likeness of some of the languages there spoken to the prevailing idea of what the original speech was. This Asiatic idea would include the theories of Quatrefages, Haeckel, Paschel, Lyell and Delitzsch.

As to the evolutionist doctrine of Darwin, the limits of this paper will not allow us to do more than say that we believe that the differences

between man and brute are so fundamental and striking that it is improbable that man should have sprung from brutes and become endowed with reason, in its true and broad sense, with the power of speech, and above all with a spiritual nature.

Then concerning the "North Pole" theory. If it could be proved that man existed before the glacial period, there would be strong reasons for believing that what is now the region of snow and ice was once the birthplace of man. But scientists have as yet failed to prove this beyond reasonable doubt. In Warren's book upon this subject we find that he has strained every nerve, culled out every fact, or idea, and interpreted every mythological belief, either in the defense, or to the advancement of his pet theory. And by this very evident fact of his taking only what will help in the proof of his doctrine, goes far to cause the reader to disagree with him in his opinions.

Lastly, we have the theory of an American school of anthropologists, whose doctrine, that man is indigenous to the different continents, has been undoubtedly proved to be false, and as false it has been repudiated by most scientists of the present day.

From this mass of doubt and contradiction, we have tried to form an impartial judgment and obtain some theory in which we could say that we believed until a better one should be brought forward or an old one substantiated by corroborating testimony.

A. R. CONOVER.

Clippings.

—Columbia and the University of Pennsylvania have lengthened their law course from two to three years.

—The trustees of Amherst have recommended that the number of students be limited to three hundred.—*Voice*.

—Because of his belief in the theory of evolution, one of the professors of Columbia Theological Seminary has been expelled.

—Columbia's Librarian, Mr. Dewey, has been appointed librarian of the state. He also succeeds Dr. Murray as secretary of the Regents.

→ THE CONCORDIENSIS. ←

PUBLISHED MONTHLY BY
STUDENTS OF UNION COLLEGE.

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EDITORIAL.

APROPOS of the fact that the bulletin announces the near approach of chapel orations, it is, perchance, not out of place to resurrect the hackneyed subject of college decorum. It is especially to the underclassmen we wish to speak. We feel assured that we are but voicing the wish of every upperclassman when we request that you listen quietly and respectfully to what each speaker has to say, and wait until he has finished before you give vent to your approval. Imagine yourselves in the position of the speaker and think how little it would take to embarrass you. Above all things don't laugh and stamp if you hear a trisyllabic word, or if the speaker wishes to beautify his production by the use of a happy quotation from the poets. It undoubtedly is hard for the majority of students to sit through a siege of college orations, but let it be remembered that it is much harder for those most intimately concerned. A little consideration on your part would add much to your dig-

nity, and at the same time save the speakers much confusion.

* * *

IN THE last issue of THE CONCORDIENSIS there appeared an address by the Hon. Warner Miller at the Alumni banquet in New York city. With all the deference due to a gentleman occupying so high position in the councils of the State as Mr. Miller, we must confess that in our opinion he took a position regarding the scope of a collegiate education quite foreign to his enviable reputation for sagacity, and a position, too, which would, if it were adopted by his Alma Mater, surely prove her death blow. The whole tone of the gentleman's address was one of lament, so to speak, at the progress of the age—the progress which has even knocked for admittance at the doors of conservative and venerable institutions demanding as its right a place beside the hoary learning of Greece and Rome. Science has advanced with mighty strides within the past twenty-five years, and in consequence there is demanded of him who would be esteemed educated and enlightened a far wider knowledge of the laws which govern alike in natural and spiritual realms. It is because of this demand, that every institution which can honestly lay claim to being a college has within the last decade been endeavoring to broaden its curriculum, a fact which Mr. Miller most of all regrets. It should be the aim of a college not to so narrow its course that it may "turn out" A B's at an age when they ought to be attending a high school, but rather to graduate men with such a fund of information, with so well trained minds and with their judgments so acute that they may be able in after years to grapple understandingly with the great questions of their day. No, Mr. Miller, the undergraduates of "Union" would rather see both her requirements for admission and her curriculum broadened, and if a man must needs be twenty-five years of age before he can graduate, so much the better for his future success.

The highest perfection of human wisdom is to know that there is an infinity of Truth beyond its bounds.—*Paschal*.

COLLEGE NEWS.

Matters of General Interest.

The following is a letter to THE CONCORDIENSIS from Prof. Wells, dated from Cleveland, Ohio:

The fair Forest City has quite a number of prominent citizens on the list of alumni. Among these are Dr. Kirke Cushing, '48, still well remembered by the older citizens of Schenectady, and now one of the most popular physicians of that city, Willis B. Hale, '70, a successful banker, and Henry N. Raymond, '58, superintendent of the Board of Charities. The latter gentleman was a classmate of Fitzhugh Ludlow, author of the famous 'Song to Old Union,' now dear to every alumnus, and sung on all festive occasions from commencement to banquet. He tells the following reminiscence of the origin of the song: One evening about ten o'clock the boys were playing whist in their room, when a rap was heard at the door, and Moses stepped in saying: 'Mr. Ludlow, the Prex desires to see you immediately.' What's up now! said the boys, and Ludlow followed his leader. On entering Dr. Nott's study the latter looked up and said: 'Mr. Ludlow, I want you to write a song for our Commencement programme, and I must have it to-morrow for the printer.' 'All right,' said Mr. Ludlow, and meandered back to his room meditating on his theme. He sat down, and in ten minutes rose from his table with the song of songs written without an alteration or blemish. It was sung with great applause, and will be sung wherever Union men are to be found as long as Union sends forth loving sons. My guest and colleague, Dr. Cady Staley, is doing his Alma Mater great honor in his position as President of the Case School of Applied Science. The new building has risen from the ashes like Phoenix, and is a beautiful structure of towering proportions, commanding a grand outlook down the famous Euclid avenue. The interior is a model for a practical school, and the lower stories are already in use. The attendance has greatly increased since the advent of a President, and the institution is evidently the pet of the city. It has a large endowment and doubtless

a great future before it, as other wealthy men, besides its founder, are now remembering it in their wills. President Staley proves to be just the man for the place, and he has the enthusiastic support of the corporation. He is very happy, and enjoys the acquaintance and confidence of the best and most influential men of the town in the various professions, and is pronounced a social and professional success. He is before the public quite frequently as a lecturer on architecture, and is the leading man in the support and council of his own church. On the whole, therefore, Union has no cause to be ashamed of her sons in this great and growing city.

The following report of a lecture delivered by President Webster at Elmira, N. Y., on the 18th inst, is from the *Tidings* of that city:

"The largest audience that has greeted any of the lectures in the union Y. M. C. A. course, gathered to listen to President Webster of Union college, at the First Baptist church last evening. President Webster fully equalled the expectations of those who knew of his competence to treat the subject, "Science and Religion," which he had chosen. The speaker drew clear and distinct lines between the provinces of science and religion, and kindly criticised those who sought to bring the two in conflict. He pointed out the vast changes that had taken place in religious thought, and predicted even greater changes in the coming decade, but demonstrated that the christian religion would always be the true doctrine for mankind, and that it was folly to suppose that any experiments of the laboratory or any developed ideal could supplant the teachings and influence of Christ. The lecture was one adapted to the times and gave many fields for thought and reflection. President Webster made an impression on his audience as a man of pure character, great ability and as one with a great faculty for understanding the workings of men's minds. The lecture was attended by many prominent men of the city, who expressed themselves as impressed with its justness and ability.

After the lecture the Union college alumni living in this city met President Webster at the residence of Col. D. C. Robinson, and listened

to the gratifying account of the workings and prosperity of the college. Among those present were the following: Dr. Cowles, Prof. Monks, Rev. C. B. Gillette, Rev. Stanley Jewell, H. C. Mandeville, City Engineer Bovier, Prof. Beardsley."

THE ALUMNI BANQUET HELD AT THE DELAVAN HOUSE, ALBANY, JANUARY 22.

The corridors of the Delavan house presented an animated scene upon this occasion, swarming as they did with the alumni of Union college. Evening dress was the rule, and glossy broadcloth brought out the snowy whiteness of many glistening shirt fronts. The beardless youth of '88 jostled graduates up in the forties, and many were the reminiscences revived and twice told tales again repeated. There were those that had won renown in all the walks of life, the world of letters, the pulpit, the rostrum and the bar. The garnet of "Old Union" peeped from many a buttonhole and many of the same buttonholes were worn threadbare by the thumbs of the merry raconteurs. At 6:30 the throng passed into the ladies' waiting room, where Mr. Joseph M. Lawson called the assemblage to order and briefly stated the objects of the meeting. A temporary organization was effected by calling Judge Jackson of Schenectady, to the chair and J. M. Mosher, of Albany, to the desk of the secretary. On motion, the following gentlemen were appointed a committee on by-laws and for the nomination of officers. After a brief recess, the committee returned and made their reports:

THE BY-LAWS

provide that the name of the association shall be "The Union College Alumni Association of Albany and North Eastern New York." Its object "shall be the promotion of social intercourse and good feeling among its members and the advancement of the best interests of Union College." The requirements for membership are "any person who is, or has at any time been a president, member of the board of trustees, or member of the faculty of Union college; any person who has received or has been entitled to receive the diploma of Union college; any person who shall have been a student at Union

college, in any course, for the period of at least one collegiate year, and shall have left in good standing; any resident in the territory above named shall be eligible to become a resident member; any person similarly qualified, residing without the territory, shall be eligible to become a non-resident member." The officers shall consist of a president, vice-president, secretary and treasurer, and executive committee, consisting of three members resident in Albany and eight from the remaining territory. The boundaries of the territories are as follows: Southern line of Columbia county on the south, of Montgomery county on the west, and the eastern and northern boundaries of the state on the north and east. The annual meeting and banquet shall be held upon the fourth Tuesday of January of each year, unless otherwise designated by the executive committee. The dues are placed at one dollar per year. The by-laws, as printed by the committee, were unanimously adopted without debate.

THE OFFICERS ELECT.

The following ticket was presented by the committee and was elected unanimously: President, James H. McClure, Albany, '51; vice-president, S. W. Jackson, Schenectady, '42; secretary and treasurer, J. Montgomery Mosher, Albany, '87; executive committee, J. E. Sherwood, '62; J. E. Craig, '80; Amasa J. Parker, Jr., '63; Samuel S. Edwards, Hudson, '62; C. H. Holmes, Schoharie; Albert Smith, Troy; C. C. Lester, Saratoga Springs; F. W. McClellan, Schenectady; W. J. Kline, Amsterdam, Lee W. Beattie, Cambridge; John M. Carroll, Johnstown. The following names of members, additional to those previously published, were announced:

President Harrison E. Webster, LL. D., '68, of Schenectady; Judge Judson S. Landon, of the Supreme Court; Rev. Dr. George Alexander, '56 of New York; John Carmichael '47, of Amsterdam; Hon. S. W. Jackson, '52, of Schenectady; F. E. Abbott, '81, of Schenectady; Seymour Van Santvoord, '78, of Troy; David Muhlfelder, '80, of Albany; Rev. P. H. McDermott, '74 of Johnstown; Frank W. Moore, '81, of Potsdam; Prof Wendell Lamoreau, of Schenectady; Colonel Wm. F. Lansing,

'88, of Little Falls; Dr. J. D. Reagles, W. S. Scott Hunter, '66; Hon. John Paige, '64; Hon. A. P. Strong, '64; Robert J. Sanders, '80; Dr. H. W. Veeder, '86; Prof. C. C. Brown, Prof. S. G. Ashmore, Lieut. H. H. Benham, Prof. M. E. Perkins, Edward C. Angle, '86; G. W. Featherstonhaugh, '74; W. C. Vrooman, J. W. McClellan, '83; L. W. Case, all of Schenectady; Prof. H. W. Phyfe, '87 of Castleton.

THE BANQUET.

The myriad lights of the large dining hall shed a rich radiance over the festive board. Covers were laid for nearly 200 guests upon tables laid in the form of a gigantic letter "U." After grace being said by Rev. A. V. V. Raymond, D. D., Toastmaster Hon. Edward Wemple bade all be seated, and the discussion of the tempting viands began accompanied by the inspiring music of Gartland's orchestra. Then came the "flow of soul," introduced by Toastmaster Wemple in a brief but eloquent speech, ending with the sentiment, "A union of hearts, a union of hands and our thoughts for Old Union forever."

"THE TRUSTEES"

was the first regular toast, and to the air, "Hail to the Chief," Judge Landon, of Schenectady, was announced as the speaker. He paid a high compliment to President Webster, and in doing so echoed the sentiments of the entire board. They had each and every one of them pledged themselves to stand by and support the new president. He had no sympathy with those who shed tears over Union college, and had the greatest amount of confidence in the college and also in Union university.

"FREE EDUCATION."

"My Country 'tis of Thee" was the melody that introduced Prof. O. D. Robinson, the speaker assigned to this toast. He began by greeting the company as "happy sons of a cherishing mother." He traced the advance of free education in this country and alluded to the Puritans as "leveling society up instead of leveling it down." He paid a handsome compliment to the Albany academy and expressed the opinion that the High school and the academy were coming nearer day by day and that the future of one was the future of the other.

THE MEDICAL DEPARTMENT.

Dr. S. B. Ward arose to respond to this toast amid shouts of laughter, caused by the playing by the orchestra of the familiar tune, "Saw my leg off." He spoke of many changes in the faculty and management of the medical college, and enlivened his remarks with many pleasant stories told in his own inimitable way.

"PREPARATORY EDUCATION."

The rollicking college tune "Merrily We Roll Along" was played by the orchestra after which Prof. Henry P. Warren was introduced. He alluded to the great number of Albany academy boys that had gone to Union, and then, although an alumnus of Yale, made a plea for the smaller colleges on the ground that many of them have their classes divided so that students can advance and not be obliged to go over old grounds again. He spoke highly of Rugby and advocated a more intimate intercourse between master and pupil. His speech was eminently interesting and practical and was received with great interest.

"LAURIGER HORATIUS."

The singing of this glorious old college song was the occasion of unstinted enthusiasm. The singing was led by Prof. John E. Sherwood and Joseph M. Lawson, and the grand chorus swelled from two hundred throats in rich melody. Many eyes grew misty and strong hands trembled in fraternal grasp. In an instant the "old days" came again and all were boys once more. The "campus," the college green and a thousand and one incidents of years ago flashed into life, and then the song ended and gave place to the stern realities of life.

"BOARD OF REGENTS."

Secretary Melvil Dewey responded to this toast after the playing of "The Lord High Executioner." He termed Union college as the "Oldest daughter of the regents. She has always lived in the same yard with her mother." No state has a greater system of higher education than that of the regents. The era is coming when such higher education shall not be confined to the colleges, but will be available to those who cannot enter colleges. Libraries and museums are the means, and they will be useful when they are used. Those that think Union

college is asleep, let them look into this room and see the evidence that it is awake.

"OLD UNION."

Upon the announcement of this toast the entire assemblage arose and sang "Old Union," after which the new president, Prof. Harrison E. Webster, was introduced, amidst tremendous cheering and cries of U-N-I-O-N, hika, hika, hika." One enthusiastic alumnus shouted at the top of his voice, "What's the matter with Prex?" and the deafening answer came, "He's all right." President Webster then briefly addressed them. He had found the most sincere and earnest co-operation of the trustees, not only as a board, but individually, and promised that the college, while he remained in charge, would do everything it agreed to do. He wanted no one to apologize for the college. The faculty does not think it needs any apology, and then, with a smile, he said: "To get down to plain statements, I want some money, and I am going to talk to each one of you." Many changes in the college curriculum were in contemplation. The relation of science to religion would be taught as he understood it, with the effort to reconcile them. He concluded by thanking all present for his kind reception.

"UNION'S ALUMNI."

The speaker to this toast was the eloquent divine, Rev. George Alexander, D. D., of New York. He said briefly in substance, as follows; I represent a magnificent body of men. It is a practical body of men and represents all stations, from president to pathmaster. It has given to the world men eminent in science, divines and instructors, men who are on the skirmish line of Christian civilization and are doing the grandest work. We hold her diploma as a certificate of citizenship in the world of letters. He concluded by expressing the hope that all would "take a long pull, a strong pull and a pull all together" in support of Union College. This was the last regular toast, and Secretary Mosher read the following:

LETTERS OF REGRET.

Rev. John W. Harsha, '34, South Argylè; Rev. Archibald Wieting, '41, Fort Plain; Gen. Daniel Butterfield, '49, New York; Gen. Silas W. Burt, '49, New York; Henry G. Ludlow,

'53, Troy; George B. Warren, '47, Troy; Lewis E. Greely, '51, Troy; Robert Hood, '52, Livingston; J. V. D. Ayers, '55, Catskill; J. F. Hazleton, '67, Canijoharie; George S. Stevens, '63, Catskill; Prof. H. L. Harter, '58, New York; W. P. McLaurens, '63, Catskill; John M. Person, '66, Hudson; Daniel Seymour, '66, New York; David Spraker, '68, Canajoharie; James C. Miller, '66, Amsterdam; James Sherman, '70, New Baltimore; J. McClellan, '74, New York; William F. Rost, '73, Troy; Rev. I. C. Russum, '77, Granville; J. R. Vanness, '83, Northville; Rev. Josiah Still, '81, Albia; Howard D. Cole, '86, Mauch Church, Pa.; Dr. M. D. Stimson, '38, Mariaville; W. H. McElroy, '60, New York; Judge Hooper C. Van Voast, New York, and the following of Albany: James C. Cook, '53; Rev. J. H. Enders, '58; W. H. Hale, '60; Rev. O. Hemstreet, '62; Wm. Loucks, '66; Dr. W. H. T. Reynolds, '66; Hon. Neil Gilmore, '60; E. J. Devlin, '81.

The affair was a pronounced success in every particular and even exceeded the fondest hopes of the following committee, who had it in charge: James H. McClure, John E. Sherwood, William P. Rudd, Joseph D. Craig, Joseph M. Lawson, Charles D. Meneely, Albany; John A. DeRemer, Schenectady; W. J. Kline, Amsterdam; S. P. McClellan, Troy; James W. Lester, Saratoga; Samuel Edwards, Hudson; John B. Hubbs, Johnstown; Egbert P. Lansing, Cohoes.

The address of the secretary and treasurer, J. M. Mosher, is at 386 Hamilton street, Albany, N. Y.

NOTES.

Three presidents of Hobart College, including the present incumbent have been graduates of Union.

The following statistics, gathered from the alumni catalogue of '84, give an idea of Union's "honor roll." Of course, in the past four years, the list has been largely augmented. On her alumni roll, Union has 36 college presidents, and 107 college professors. Of United States senators, she has graduated 15; of state senators

35. In congress 25 alumni have done her honor; in state assemblies she has been represented by 62 men. Union men to the number of 56 have occupied seats in the supreme courts of their respective states while the number in lower courts is far greater. Besides these she has had three chief justices of the supreme court, three speakers of the United States House of representatives, three speakers of state assemblies, seven governors, six cabinet officers and one president of the United States. In both the Federal and Confederate armies, Union men filled a large share of the responsible positions. General Halleck, at one time in sole command of the United States troops, was, for a time, a student of Union.

Locals.

—Three cheers for Alumni!

—Turnbull '89 has left college.

—Senior and Junior chapel orations are due February 1st.

—The Seniors will continue in Psychology the greater part of the term and will not take up Ethics, as is usual, until spring.

—January 30th is day of prayer for colleges. The sermon will be delivered in chapel by the Rev. Dr. A. V. V. Raymond of Albany.

—The class in astronomy with Professor T. W. Wright, expects to make two or three visits to the Dudley Observatory during the term.

—The Freshmen are making arrangements for a class supper and a committee has been appointed composed of Banker, Smith and Hunter.

—The Senior class has filled the following offices left vacant by resignation. Hanson, Orator; Cameron, Addresser; Vorhees, Base Ball Director.

—Lochner from the University of Rochester has entered the Junior class; and Howels from the Worcester School of Technology, has registered with '92.

—The Gillespie club has elected the following officers for the term: President, Whalen '89; Recording Secretary, Preston, '91; Treasurer, Baker, '90; Corresponding Secretary, Professor Brown, C. E.; Curator, Coons, '92.

—Arrangements have been completed for the Sophomore soiree which will take place in the Arcade Hall, February 1st. It is only right that the other classes, as far as possible, should contribute to its success and be present. The committee is, Preston, Conant, Drury, Walker and Robertson.

Personals.

✓41. Dr. A. W. Cowles, for nearly thirty years president of the Elmira Female College, has resigned his position on account of age. Dr. Cowles will, however, hold the position of Professor Emeritus in the College.

'72. A. C. Boynton, famous as being the fastest mail clerk in the service, recently received injuries about the head in a railroad accident. These injuries have proved more serious than was at first supposed, and Mr. Boynton has been compelled to take treatment from specialists in a New York hospital.

✓77. Olin H. Landreth, for years assistant director of the Dudley Observatory at Albany, occupies the position of Dean of the Engineering department of Vanderbilt University.

'80. Robert C. Alexander has been elected chairman of committee on prizes, by the New York State Bar Association. This Association had its annual meeting in Albany the 15th and 16th of this month.

'84. Irving P. Estcourt was recently severely injured by a gun explosion, at Omaha, Nebraska. The accident resulted in the amputation of his left hand.

✓85. Jesse T. Morey is Superintendent of Schools at Kearney, Neb.

✓88. Van Voast is Assistant Principal of the Catskill Free Academy, at Catskill, N. Y.

✓87. Estcourt is news editor of the Troy Press.

Necrology.

✓George W. Reed, formerly a well-known resident of Brooklyn, died Jan. 16, at New Brunswick, N. J. He was born in Franklin, Penn., in 1817, and was graduated early in life from Union College, and studied medicine. He

was in business with his father in Philadelphia as a manufacturing silversmith for several years, and in 1867 went to Brooklyn, where for nearly twenty years he managed the advertising interests of "The Brooklyn Eagle." He wrote a series of interesting letters from Europe at one period for that paper. He was long an active member of the Marcy Avenue Baptist Church. He leaves a widow and four children.

CLIPPINGS.

Sympathy.

A Sophomore bold and careless and gay,
 One afternoon of a winter's day,
 Fixed himself up and went to the play.
 It was Richard III and a matinee.
 The Sophomore sat in the front parquet.
 All was serene as a day in May,
 Until King Richard began to pray
 "A horse! A horse!" in a pitiful way,
 When the Sophomore sprang from his seat they say,
 And cried, the poor King's fears to delay,
 "I'll get you a horse without delay,
 I know how it is, I have felt that way!"

—*Brunonian.*

—Columbia now offers instructions in Sanscrit, Zend, Pehlevi, Hebrew, Biblical Aramaic, Syriac, Arabic, Assyrian and Ethiopic.—*Ex.*

—It is said that Minister Phelps has been called to the Presidency of Columbia, and that he will accept it upon his return from England.

—A Syracuse man has invented a chair that can be adjusted to eight hundred different positions. It is designed for use in chapel and at church.

—It is now claimed that the first time the exclamation "Eureka" was used was when Archimedes sat on a tack for which he had been looking.

—Of the 559 who have graduated from the fourteen leading women's colleges and seminaries in this country, only 117 are married.—*Carletonia.*

—It is reported that there is an article in preparation for the *North American Review*, on the "Slow set at Harvard," by a member of the crew.—*Life.*

—The German universities enrolled 28,500 students last year, half of whom were studying medicine while half were equally divided between theology and law.

—Wellesley, with 520 students, is pronounced the leading female college in America. Smith stands next with 367; then Vassar, 283; Wilson, 164, and Bryn Mawr with 70.

—The Yale library is the largest college library in the country, containing 200,000 bound volumes. Harvard is second, with 165,000; and Cornell third, with 150,000.

—It is the custom of Cornell to give her Professors every seventh year off, on full salary, time which they are expected to devote to further investigation and study on their specialties.

—Three of the Presidents of Hobart College, the Rev. Dr. Maunsell Van Rensselaer, the Rev. Dr. James Rankine, and the Rev. Dr. E. N. Potter, the present president, are graduates of Union.

—None of the college journals seem to have noticed the fact that Vassar and Wellesley have adopted the cap and gown. We are credibly informed that all the classes there wear them—at night.—*Mail and Express.*

—*The Concordiensis*, Union College, is in the train of journals embodying the full life of a college. Its pages follow a regular sequence, opened by a weighty essay and comprising stories, discussion of physical phenomena, college news and poetry. "A Summer's Trip," in the November number, reads interestingly.—*Collegian.*

ENGINEERING DEPARTMENT.

A Magnetic Survey of Barton Hill.

A magnetic survey of a piece of land is made to determine whether or not there is any mineral (that is, a mineral of the kind which will attract the magnetic needle) on that piece of land. In the summer of '88 while I was at home, Mr. Tefft, superintendent of the Witherbee, Sherman & Company's mines, came to me and asked me if I would make a magnetic survey of Barton

Hill for him. He said that Mr. Reed, their engineer, was too busy to do this work and the company wanted the work done that summer. I told him that I would if he furnished me with the requisite instruments. Procuring the instruments for me I went to work. The first thing that is necessary to make a magnetic survey is to find the true north and south line. The true meridian can be found in a great many ways. Two of the principal ways to find the true meridian are, "By equal shadows of the line," and "By the north star when in the meridian." To find the true meridian by either of these methods would take me considerable time so I went to Mr. Reed and asked him if he had ever found it. He said he had and telling me the exact points I "set up" over the center point and by turning off right angle and running perpendiculars, I arrived at the top of Barton Hill where the survey was to be made. In turning off these right angles I had to be very careful in order to get a line parallel to the original true meridian. At the top of the hill I happened to be fortunate enough to find two very large bowlders and a central large flat rock exactly "in line." In these three rocks I had small drill holes bored in order to fix the true north and south line. From the point on top of the hill I ran a line due north for a distance of 2,650 feet, driving stakes every 50 feet. Each stake on this line I centered. Then "letting up" over each one of these stakes I turned off a right angle and ran due east and west for a distance of 1,800 feet placing a stake at each 50 foot mark and thereby dividing the land into squares of 50 feet. My two chainmen were laborers in the mines and were recommended to me by Mr. Reed so I supposed that they would do their work all right. In running the first line due north an incident occurred in the forenoon of my first day which I will relate and which compelled me to "bounce" my head chainman and get another one in his place. In looking through the telescope of the transit I noticed that the head chainman after centering the stake would drive it to one side and thus knock it out of line. I asked him if the stake was set right. He said yes. I then told him to hold his rod on it and he held it near the bottom of the stake which brought it

near the correct line. I told him to hold it on the top of the stake and he said it was on the top of the stake. I told him that he lied and to go home, that I did not want him. We had some words and I came very near "thumping" him. I went to Mr. Tefft to get another man and started again at the beginning of the line on top of the hill. I did not know what reason he had for driving the stakes out of line neither did I know whether he did the same thing when I was turning off the right angles and running perpendicular to get to the top of the hill. After I had divided the land in squares of 50 feet, which took me considerable time as the lines were run over steep places and through heavy timber and thick brush, Mr. Reed came up to help finish the work as it took two men who understood how to run the compasses. One, taking a small compass and Jacob's staff, the other carrying a tripod with the dip needle, the one with the compass going ahead and "setting up" over each stake, sighting to the preceding stake, then counting the vibrations of the needle per minute, then reading the number of degrees and minutes to which the needle pointed. The compass is then turned until the needle points to 0° . The rodman is then placed in line by the compass man and the latter moves on to the next stake while the man with the dip needle "sets up" over the stake which the compassman put left and rights to the rod. He counts the vibrations of the needle per minute and reads the number of degrees to which the needle points. After all the stakes have been "let up over," a map is then drawn of the land on a scale of 50 feet to one inch. The paper is divided in one inch squares. The lines in one direction representing north and south, those in the other east and west. Then small arrows are drawn at an angle to the north and south line equal to the declination of the needle of the compass. The number of degrees from the compass is placed on one side of the arrow in a certain color of ink and the number of degrees from the dip needle is placed on the other side in a different color of ink. When this is done your map is finished and the magnetic survey completed. Witherbee, Sherman & Co. had examined the map and where they thought the

most ore was to be found they wanted to sink a shaft. This point on the map was to be marked out on Barton Hill and the diamond drill "pointed" to find out how far below the surface the ore was and how large was the vein.

A. TURNBULL.

Hints on Railway Transit Work.

I.—PRELIMINARY.

In this article I shall confine my remarks to the instrumental part of the work of a transitman, without entering upon the topic of selecting the ground, within certain limits, upon which to run the line—although this latter duty frequently involves upon him, owing to the absence from one cause or another of the chief of party.

The first survey of a route is generally made by the chief engineer in person and is termed a reconnoissance. By means of the hand level, barometer, and estimated distances, and above all by the exercise of judgment a decision is reached as to whether a certain route is promising enough to warrant a preliminary survey. In case it is, a party of from ten to fifteen men is put into the field to determine its exact length, curvature, profile and topography.

That part with which the transitman has especially to deal is the curvature, which he measures by taking the deflection to the right or left whenever the line changes in direction.

A prime characteristic of a preliminary is rapidity, and there are many ways which tend to accomplish this end. For instance, in lining the stakes it is not necessary to bisect the rod every time. Six or eight inches to one side or the other does not affect the value of the survey in any way. It should be remembered, however, that I am now speaking of preliminary surveys and *not* of location. A good head chainman can generally put his rod so nearly on line that it is unnecessary for the transitman to signal him to move it. Always instruct your head chainman to line himself in by sighting back along the stakes already set. Unless he does this, he will wander about in the wildest manner possible, and much time will be lost in

consequence. In fact it rests with the head chainman either greatly to expedite matters or greatly to retard them; and a slow, heedless man should never be tolerated.

In passing through timber, a rod should be constantly kept on line well up in front, so that the axmen may lose no time in unnecessary cutting. Should a large tree be struck it is generally better to change the deflection 15 minutes or 30 minutes and thus avoid cutting it down or offsetting around it.

The man whose duty it is to place the hubs should select a point whence both a good backsight and a good foresight can be obtained. There is nothing more provoking to a transitman than to find, when he moves up, that the new point is down in a hole shutting out all view of a backsight, or just short of the brow of a hill which limits his view ahead to fifty or a hundred feet. Such lack of judgment in placing a hub necessitates the immediate setting of another with the consequent loss of time and patience.

Have the hubs made of good timber with a diameter of about three inches and a length of from four to five inches. The hubs should be driven to stay; so long as they are in place, the line is preserved, no matter what becomes of the stakes.

While keeping in view that rapidity is an essential to a preliminary survey, the real accuracy should not be sacrificed, for with proper care and correct methods a good instrumental line can be run as rapidly as a poor one. The adjustments of the transit should often be looked after especially where the instrument has to be carried in a jolting wagon or when it is often set upon rocks. My experience has been that the crosshairs get out much more easily than any other part. In some old transits it seems impossible to prevent their doing so all the time. With aggravated cases of this nature it is well to change the end ahead in successive set ups. Thus if one course is run with the north end of the compass dial ahead, the next course would be run with the south end ahead and so on alternately. The angular error from deranged crosshairs will thus be thrown a certain amount to one side, then back again; thus obviating the

accumulative error which would otherwise attend the use of faulty crosshairs.

A second backsight should always be taken just before moving the instrument, for something may have occurred to derange the first backsight materially.

The compass needle should be kept in good working order, and read every time an angle is turned. Comparing this reading with the deduced course (obtained from the deflections) serves two ends: (1) it does away with large errors in reading the vernier; and (2) it prevents deflections being recorded to the left when they should be to the right and *vice versa*. But the transitman must not expect his deduced and magnetic bearings to agree perfectly at all times; frequently local attraction will draw the needle $\frac{1}{4}$ to $\frac{1}{2}$ a degree or even more. At one point on the Little Tennessee River in North Carolina, I encountered a local attraction of 4° confined to one hub; after being moved ahead the needle returned to its normal reading. Generally however a difference of $\frac{3}{4}^\circ$ will warrant an investigation.

For convenience in mapping it is well to turn such angles that the deduced course may be in even quarters of a degree. This permits the use of an ordinary traverse table when the method of platting by latitudes and departures is used.

Many engineers advocate the use of the compass alone in running preliminary lines, claiming that it is accurate enough for practical purposes. For mere exploration lines this is certainly true, but when the preliminary is also intended as the framework for a location, it seems to me the transit should be used. Its use and careful mapping will obviate the necessity of backing up and re-running in order to make the location lie where it is intended to be placed.

II.—LOCATION.

After preliminaries have been run over every route deemed worthy of one, the results are compared and a decision as to which is the best, is reached; upon this the location is to be laid.

If the preliminary has been run with a transit and under the direction of the engineer who is to locate the line, the location can be laid with reference to it as a frame work. Otherwise another preliminary is generally run over the

same route in the manner heretofore described.

By the aid of topography and an inspection of the ground, the locating engineer fixes the points through which the best line should run; these, placed upon the map, determine the tangents and curves, which are fitted in by means of the straight edge and curve templets. From the map the transitman can then scale off his directions.

The P. C.'s and P. T.'s are fixed with reference to the preliminary, and in the case of a long tangent one or two intermediate points also fixed, (*i. e.* so many feet to right or left of a certain station of the preliminary.)

If the field work and mapping are correctly done the work will check up very closely, otherwise it is necessary to back up and re run the faulty part. Should a tangent strike to the right or left of the point intended, the angle to put into or take out of the preceding curve can be readily calculated with the aid of a table of tans. and cots. A good rule of thumb to remember in the absence of a table, is that the tangent for 1° is .0175, Thus a change of one degree angle throws the line 1.75 feet to the right or left at the end of one station. Then to find any angle giving a certain perpendicular in a given distance; divide the perpendicular in feet by the distance in stations and then divide the quotient by 1.75, the result is the required angle in degrees and decimals of a degree.

The method of running tangents to an intersection should be practised in a flat country. In mountainous regions, however, it is generally impracticable to run to an intersection and the curve data must all be ascertained by plotting. At least two checks on the preliminary line should be taken in sight of every P. T. Upon throwing off the tangent from the plotted P. T. it can then be rendered correct in direction by swinging to the right or left by the preceding methods.

If the tangent thus corrected in direction lies to one side or the other of its proper place it can be moved in the following manner. Pull forward or push back the P. C. a distance equal to the quotient obtained by dividing the distance the tangent is to be moved laterally, by the sine of the total angle through which the curve

passes. Re-run the curve from the new P. C.

Engineers differ regarding the length of the chords to be used in running curves. Some advocate a 50 foot chord for all curves, while others allow curves as sharp as a 6° to be run with 100 foot chords. In my opinion it is well to use a 100 foot chord up a 3° curve, and a 50 foot on curves sharper than this. If a curve sharper than a 15° is run, 25 foot chords ought to be used; such a curve, however, is a great rarity in railway work.

The reason for using chords of less than 100 feet is that it makes the curve conform more nearly to a circle and has a practical advantage in the construction of the road bed.

Of methods of keeping curve notes there is no end, and every transitman is ready to contend that his particular way is the best. Many methods involve unnecessary work. The easiest one I have so far seen is one that has been passed around from one engineer to another for years, but which has not appeared in a field book. General attention has been called to it by a letter to the Engineering News (Sept. 22, '88) to which I refer you for a description. After a year's use I can give this mode of keeping curve notes my endorsement.

In running in the location no pains should be spared to make the line instrumentally exact, for careless running may cause a swing which, when discovered, would seriously affect the prospects of the transitman. Hence the transit should be kept in perfect adjustment and every turning point set with the greatest care.

Long tangents are the hardest lines to run; the ability to run a *straight* line for miles is the sign of a good transitman. On such tangents it is well to set the tacks by reversing; that is, set the point carefully in the ordinary way, then unclamp, turn the telescope around 180° , take another back sight and set the point ahead again. This may differ from the first one by a small amount, and in that case a point half way between the two will be the correct turning point.

As the stakes set every 50 or 100 feet will mark the centre line of the road-bed, every one of them should be exactly on line. It is also a good plan to drive a small peg flush with the ground at every station. Upon them the level-

man can take his elevations, and they will serve two purposes, (1) preserve the stations should the stakes be knocked down and (2) give points from which elevations can be taken in cross-sectioning.

A short backsight is a fertile cause of inaccuracy, and ought to be avoided when possible. When one is necessary the transitman should try to sight on a pencil point held on the tack; if this is impossible, the backsight can be taken upon a plumbline suspended over the point. A back flagman with a little practice will become expert at rigging up a "plumb bob sight" which will give much more satisfaction at short range than an ordinary sight rod.

Offsets are inadvisable when they can be avoided, and this is generally the case. It is better to fell even large trees than to offset around them. Of course fruit trees are an exception, complications with the owner are apt to arise when one is cut.

In case a building is struck, it is better to set the transit on top, rather than triangulate around.

Two observers are needed when the transit is set upon a roof, one for the backsight and one for the foresight, this prevents walking around the instrument which would be sure to throw it out.

On more than one occasion I have been able to get a line through a log cabin by knocking out the chinking and literally sighting through the house, to the open wonder of the bare-footed, jeans-clad inmates.

To do good work one must become acquainted with his instrument, for transits have as many peculiarities and idiosyncrasies as have different people. Be sure you know what they are in the particular instrument you are running. Almost anyone can run a good line with a perfect transit, but to do good work with a wretchedly poor transit requires almost unlimited patience and skill. Never assume that the transit you have just commenced running is a perfect one, although it be as handsome and bright as bronze and brass can make it. Many new transits do not hold their adjustments well; and old transits, besides constitutional weaknesses, often are afflicted with those diseases which follow a long, eventful and trying existence. Sometimes an

instrument when once adjusted, will remain true for months, and again it may get out before it is set over the first hub. Therefore watch it, and if the reward of care and labor comes not in this world, let us hope it will do so in the next.

With the best wishes for the prosperity of the Gillespie Club, and with a hearty approval of the policy that has led to its revival, I will abstain from further encroaching upon its patience.

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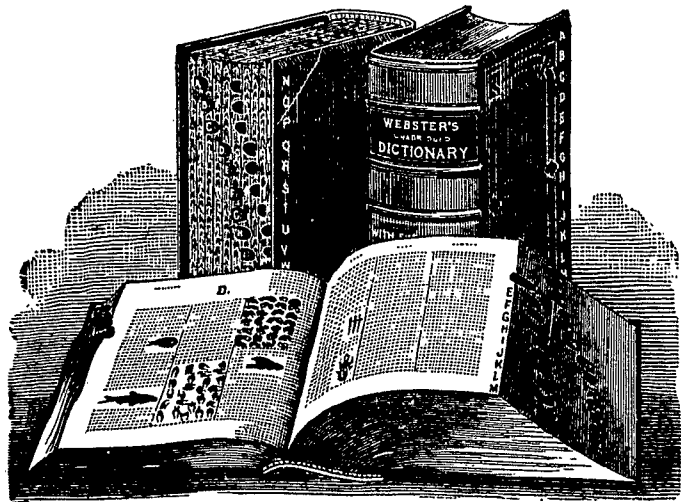
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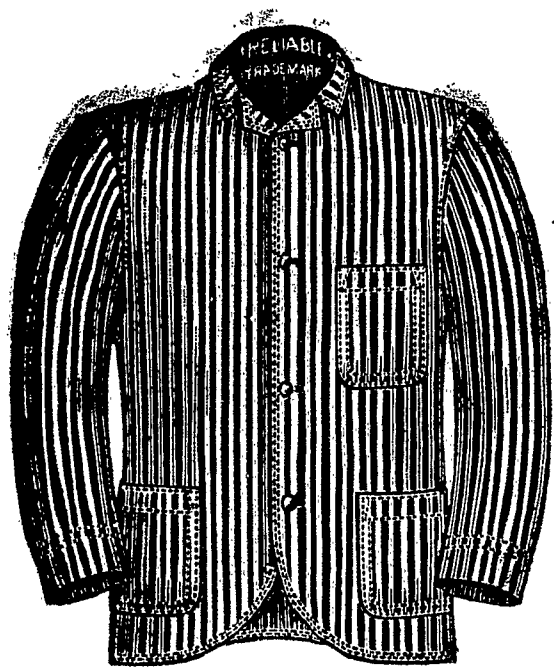
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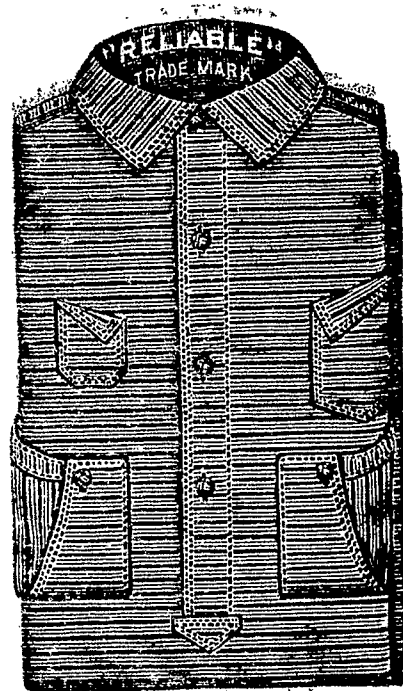
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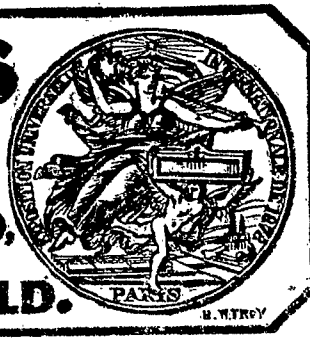
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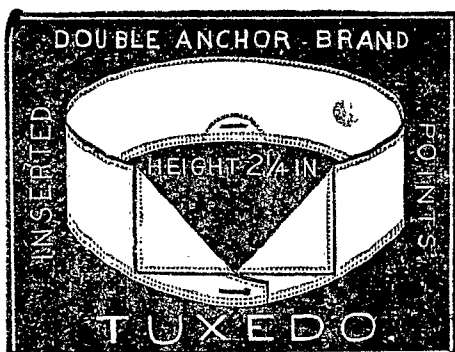
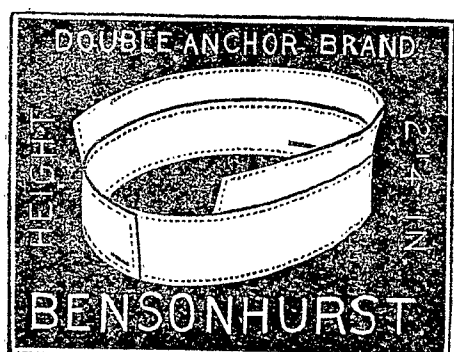
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