main line, as the topography demanded. Sometimes portions of this location were modified and re-run. Streams were then surveyed and gauged, neighboring elevations beyond the limits of the canal taken with the aneroid, and the entire work plotted on a four-hundred-foot scale with a ten-foot contour. The boring party then went over the line, boring on all summits and in all depressions, and penetrating to the level of the canal-bottom unless rock was encountered sooner. Borings were also made on the sites of all locks, dams, and embankments.

Two perfectly practicable routes of about equal cost were found, either of which is far superior to any other route across the isthmus; and when the day comes, as it surely will, when one canal cannot accommodate the traffic seeking it, then the other can be built, and give one canal for eastward and one for westward bound vessels. The computations of the notes of the surveys being yet incomplete, precise quantities and estimates cannot now be given. In general terms the quantities in the sections where no modifications are made will be the same as those of 1885, while the saving from modifications will be from ten million to fifteen million dollars. The item of earth excavation, with its varied plant of excavators, cars, locomotives, etc., and its attendant expense of maintaining and shifting tracks and handling material in rainy weather, is reduced to a minimum, and the construction of the canal provided for practically under the three heads of hydraulic mining, rock-excavation, and dredging, all independent of drainage and rains. The work can be prosecuted day and night without interruption. Numerous borings have made an end of the bottomless swamps, semi-liquid quicksands, and numerous other subterranean bugbears which have been conjured up against this route, and have shown that in no portion of either line is there any trouble about foundations. In the worst swamps the boring implement, after sinking with its own weight perhaps ten or at most fifteen feet, reached a stratum of firm red clay extending to bed-rock. The experience of the expedition is worth volumes as evidence concerning the effects of the climate of Nicaragua. During the seven months it was in the field, not a man out of nearly two hundred was lost, and there was not a single case of serious illness. The size and capacity of the canal will not vary materially from the plans of 1885. The number of locks will be reduced to six, and possibly five, and the time of lockage to thirty minutes. The general dimensions and methods of construction of the locks are not changed, but the double lock at La Flor is a new feature.

C. K. Remington's plea for cremation was very much contested by various members of the section. The paper was illustrated with diagrams on the blackboard, and the process of incinerating a body was fully explained. The description of the construction of a crematory was especially interesting. In answer to questions propounded, Mr. Remington stated that cremation was necessary as a sanitary measure. He also contended that the land used for cemeteries was needed. He thought it much better that a body should be reduced to dust in an hour than for it to lie in the ground for years.

Mr. Henry Farquhar gave, under the title 'Economic Value of Binary Arithmetic,' a paper that was more interesting from a theoretical point of view than from a practical. He explained the advantages that would accrue from the substitution of two for ten as a basis for counting. Instead of having to commit sums of figures to memory, we would perform addition by simply counting the marks of similar shape. There would be no multiplication table to learn, all multiplication being resolved into displacement of symbols on a regular plan. This would bring a considerable degree of arithmetical skill within reach of many who cannot possibly attain it at present.

On Tuesday J. R. Dodge read an interesting paper on 'The Agricultural Surplus.' He pointed out that the United States have a surplus of agricultural products very large in proportion to the total volume. He considered this fact an element of strength and of weakness, and at the same time a subject of congratulation and regret. "The congratulation," he said, "is found in the ability to relieve the deficiencies of needy nations, while swelling the plethora of domestic wealth: the regret is for the tendency to over-production of certain crops, and its inevitable result. This is the reduction of prices for the benefit of the foreign purchaser, without any advantage to the producer. Very few people know the extent of our net surplus in agriculture. Almost every one exaggerates it." Mr. Dodge continued to show that the value of the exported product at farm prices is less than $400,000,000. The value of the deficiency supplied by import very nearly reaches $350,000,000. Thus we have a surplus sufficient to pay for our deficiency, and little more. This is the net result of our boast of feeding the nations. We feed them just a little more than they feed us. The lesson we learn from these facts is, that no nation can afford to have a deficiency of the raw products of agriculture; and, as a rule, nations do not. There is one notable exception, and that is apparent more than real. Great Britain seems to have a large deficiency. Really it is largely made good by shipments from her own colonies, of the dividends of her own capital, under the technical name of 'imports.' Our agriculture, therefore, should seek to supply deficiencies rather than to swell surplus crops; to meet the present wants of domestic markets, and create new wants by a greater variety of edible products, especially the fruits; and afterwards supply any deficiency of foreign nations that is practicable or possible.

Last of all we mention W. F. Switzler's sketch of the history of statistics, in which he showed that at the earliest stages of civilization attempts to ascertain statistical data were made, and in which he traced the gradual development of that science. He dwelt upon the importance of statistics to the statesman, whose art is thus made "to rest on the solid masonry of well attested and accomplished facts, the granite pedestal of recorded history. It is no longer a speculation: it has become a mathematical demonstration. It is no longer a prophecy: it is a revelation." The paper closed with an interesting history of the methods of gathering statistical data.

The meetings of this section were well attended, and there was sufficient material on hand to keep the section busy until the end of the meeting.

EVIDENCES OF THE ANTIQUITY OF MAN IN EASTERN NORTH AMERICA.[1]

IN studying the history of man we have to adopt the same methods and draw the same inferences as have been done in tracing the evolution of animals. This, strangely enough, seems repugnant to very many, who feel that any relationship, however remote, with less intelligent creatures, is a reflection upon their own intelligence.

To determine at what precise point in geological time man appeared upon the earth, is, it seems to me, obviously impracticable, from the fact that the dividing-line separating humanity from the non-human cannot be drawn. It were as easy to name the moment when the gloaming merges into night, or shout with confidence, 'Now!' as the dawn brightens into day. Nor is it demonstrable, with our present knowledge, to point to that country where the momentous change first took place, if it occurred but once. At present, however, we can safely say that miocene man is extremely problematical, and pliocene man a question as yet unsettled; the auriferous gravels of California being pronounced late tertiary by Whitney, and by LeConte as representing "the beginning of the glacial epoch."

At all events, we have neolithic man as far back as the glacial epoch, and possibly in the pliocene. Man in the tertiaries, therefore, championed by my honored predecessor, Professor Morse, becomes something more tangible than a hypothetical creature. Professor Putnam has arrived at the conclusion that the western coast of our continent was inhabited by man in earlier geological times than the eastern half.

Mr. Warren Upham has examined the drift formation of Little Falls, Minn., where Miss Babbitt found those extremely rude but unquestionably worked quartzes, and describes it as the flood-plain of a river of the glacial epoch.

In 1883, as the result of exhaustive studies of glacial deposits, from New Jersey westward, across Ohio, Rev. G. Frederick Wright predicted that traces of paleolithic man would be found in the latter State.

[1] Abstract of an address before the Section of Anthropology of the American Association for the Advancement of Science, at Cleveland, O., Aug. 15–22, 1888, by Charles C. Abbott, vice-president of the section.

Paleolithic implements, concerning which there can be no doubt, have not been discovered in abundance as yet, but Professor Wright's belief proves to have been well founded. Dr. C. L. Metz of Madisonville, O., has discovered two specimens which set the matter at rest. Both were found at significant depths, one of them nearly thirty feet below the surface. The region where found is one characterized by immense gravel-deposits of glacial age and origin.

They show that in Ohio, as well as on the Atlantic coast, man was an inhabitant before the close of the glacial period. We can henceforth speak with confidence of interglacial man in Ohio. It is facts like these which give archæological significance to the present fruitful inquiries concerning the date of the glacial epoch in North America.

Mr. Hilborne T. Cresson has discovered two chipped implements of argillite which he found *in situ*, at a depth of several feet from the surface, in railroad cuttings through the old terrace of the Delaware River near Claymont, Del. The geological position of these specimens will excite discussion, but their great age will not be questioned. Of particular interest, in relation to discoveries in the gravels at Trenton and Ohio, is the discovery of a large flint implement found by Mr. Cresson in the glacial gravel in Jackson County, Ind.

From evidence so far obtained, it seems that on either seaboard paleolithic man lived in great numbers, and that as a coast-dweller he pre-eminently flourished. In the valley of the Delaware River paleolithic man has left such abundant traces of his former presence, in the form of rudely fashioned stone implements, that for long they were considered as the hasty or unfinished work of the later Indians.

As the first to point out what is now maintained by competent archæologists to be their real significance, I may be pardoned for devoting the conclusion of my address to a consideration of that region, — the Delaware valley, — so far as its physical character and the traces of prehistoric man found there have a bearing on the question of the antiquity of man in America.

The question may now be asked, What is a paleolithic implement? It is not very readily defined, as there is considerable variation in the shape; but, as I understand the significance of the term, it is properly applied to coarsely chipped masses of flinty rock, upon which a distinctly designed cutting edge is formed, to which is often added an acute point. Furthermore, they show unmistakable evidence of antiquity by the weathering of their surfaces; and they are found as a rule, but not necessarily always, in deposits of glacial or river drift with which they agree in age.

How far do these Trentonian implements meet with these requirements?

My own impressions of their true character was not suddenly reached. The evidence of other kind, of the antiquity of the Indian, led me to consider them as rude objects made for some trivial purpose and discarded. Later, I became convinced that they were older than ordinary surface-found relics, and assumed that the Indian of history commenced his career in this valley while in the paleolithic stage of culture.

Thus, while pursuing my collecting of Indian relics, it was gradually forced upon my mind that these rude implements were more intimately associated with the gravel than with the surface of the ground and the relics of the Indians found upon it.

Acting upon this, I continued for two years to examine most carefully both the surface of our fields and every exposure of the underlying gravels; and in June, 1876, after having found several chipped implements *in situ*, expressed the opinion that the Delaware River, "now occupying a comparatively small and shallow channel, once flowed at an elevation of nearly fifty feet above its present level; and it was when such a mighty stream as this, that man first gazed upon its waters, and lost those rude weapons in its swift current, that now, in the beds of gravel which its floods have deposited, are alike the puzzle and delight of the archæologist. Had these first-comers, like the troglodytes of France, convenient caves to shelter them, doubtless we should have their better wrought implements of bone to tell more surely the story of their ancient sojourn here; but, wanting them, their history is not altogether lost, and in the rude weapons, now deeply embedded in the river's banks, we learn, at least, the fact of the presence, in the distant past, of an earlier people than the Indian."

Thus it will be seen that I have been fairly cautious in my statements, and slow in reaching any conclusions with reference to these implements which separated them from ordinary Indian relics.

But, admitting that a given class of stone implements is characteristic of a given deposit of gravel (and I think we must admit this now), what is the geological history of this deposit? Is it too recent to be of special import, or too ancient to be of archæological significance? Both views have been held, and neither proves tenable. That the former view should have found supporters is indeed strange. Certainly there is now no movement of the gravel by the river, whatever its condition or freshet stage; and certainly, if these rude forms were of identical origin with common Indian relics, then rude and elaborate alike — jasper, quartz, porphyry, and slate together; axes, spears, pottery, and ornaments, all of which are found upon the surface — should have gradually become commingled with the gravel, even to great depths. Any disturbance that would bury one would inhume alike the various forms of neolithic implements. Such, however, is not the case.

How old, and not how recent, are the Delaware valley, or, as they are now known, Trenton gravels? This, it is all-important, should be definitely determined. A clear light has been thrown upon these questions by G. F. Wright, who shows that these gravels are the last important result of the glacial epoch, the direct result of the melting of the glaciers, as they retired northward; and that, while this was in progress, the rude implements of paleolithic man were lost and embedded in them.

Admitting this, how long ago did it take place?

If we accept the most moderate estimate of the length of post-glacial time, some six thousand years, we have of interglacial time (i.e., between the first and second epochs) from eighteen thousand to sixty thousand years; and to this, as I understand the matter, must be added the long stretch of time during which the second epoch of cold continued. Assuming, therefore, that geologists have made no mistake, archæology has time enough and to spare. At no time was the continent uninhabitable, however thick and wide-reaching the ice, or deeply submerged the lower-lying areas. Still there was land enough for mammalian life in all its glory, and it flourished at the very foot of the advancing ice-sheet, and re-entered every tract as the glaciers withdrew. Then we had the mastodon and mammoth, reindeer and bison, musk-ox and moose, and man familiar with them all.

Having made clear, I trust, what is meant by paleolithic man, and shown also that he *was* a fact and *is* not a fancy, the question naturally arises, What was his fate? Did he, like the mastodon, become extinct, or has he descendants still living on this continent? If the paleolithic implements were strictly confined to the gravel-deposits, like fossils in the underlying marl-beds, then, as it seems to me, we would be unable to refer paleolithic man to any branch of the human race now alive; but, as a matter of fact, there is no such break, — no evidence of an hiatus of greater or less duration between paleolithic man and the Indian. The former continued to dwell here until the last pebble of the great gravel-deposit had been laid down, and possibly into the soil-making period, but not now, as paleolithic man. The significant advance to the manufacture of more specialized implements took place; the rude argillite paleolith, the same in form the world over, giving way to spears and other definite forms. The form of the product altered, but the same material, argillite, continued in use. There was no pottery, no polished stone, little if any attempt at ornamentation; still, when we compare these later objects of argillite with the earlier and original patterns, we see what a tremendous forward stride had been made.

Next we have to consider the important fact that the flint implements known as Indian relics belong to the superficial black soil, while at the base of this deposit of soil the argillite implements occur in greatest abundance.

This briefly covers the range of evidence, first, that paleolithic man did not become extinct; second, that his descendants attained to an advanced degree of culture in the land of their forefathers. What, then, was this people's subsequent career? Were it not for the three skulls found in the Trenton gravels, we could still main-

tain that we have their descendants in the Eskimo, and that they were finally driven north, after contact with the Indians, who, as is conceded by all students, migrated hither, at, archæologically considered, a not exceedingly remote period. The Indian traditions assert that they found the region occupied; and for once, at least, we have evidence which confirms tradition.

However others may be impressed by what I have now presented, for myself, as I wander along the pleasant shores of the Delaware River, seeing it but a meagre stream between high banks in midsummer, or in winter swollen and choked with ice until these are almost hidden, I recall what time this same stream was the mighty channel of glacial floods, pouring seaward from the mountains beyond, and picture the primitive hunter of that ancient time, armed with but a sharpened stone, in quest of unwary game. And later, when the floods had abated and the waters filled but the channel of to-day, I recall that more skilful folk who with spear and knife captured whatsoever creature their needs demanded, — the earlier and later chippers of argillite.

These pass; and the Indian, with his jasper, quartz, copper, and polished stone, looms up as the others fade away. His history, reaching forward almost to the present, I leave in the hands of others to record.

SCIENTIFIC NEWS IN WASHINGTON.

A Great Medical Meeting to be held in Washington. — Interesting to Mariners: a Simple Method of computing a Ship's Course and ascertaining her Distance sailed on the Great Circle between the Point of Departure and the Point of Destination, about to be published by the Hydrographic Office: a Valuable Set of Charts nearly completed. — Terrible Death Rates in India.

The First American Medical Congress.

THE first triennial meeting of the Congress of American Physicians and Surgeons will begin in Washington, Sept. 18, and will continue three days. Three years ago one of the societies constituting the congress conceived the idea of bringing together once in three years representatives of the great medical societies of the country. The plan was presented to all of them, and indorsed by ten. These eleven societies, in accordance with the general plan suggested, each appointed one of their number to constitute an executive committee. The committee met, and decided that an association should be formed with the name given above.

This committee is composed as follows, the names of the societies they represent being appended: C. M. Martin, Mobile, American Surgical Association; John P. Bryson, St. Louis, Genito-Urinary Surgeons; J. Solis Cohen, Philadelphia, American Laryngological Association; A. L. Loomis, New York, American Climatological Association; William Pepper, Philadelphia, Association of American Physicians; William H. Carmalt, New Haven, American Otological Society; William F. Norris, Philadelphia, American Ophthalmological Society; L. C. Gray, New York, American Neurological Association; J. E. Atkinson, Baltimore, American Dermatological Association; H. P. Bowditch, American Physiological Society; N. M. Shaffer, New York, American Orthopedic Association.

The committee also determined that a meeting should be held in this city once in three years: the September session will therefore be the first. It is also proposed that the several societies constituting the congress shall hold their annual meetings at the same time, each being conducted according to its own special programme. This will make the occasion one of the most important to the medical profession of the United States that has ever occurred. The separate societies will each hold meetings twice a day, while the meeting of the congress will take place on Tuesday, Wednesday, and Thursday evenings.

The topics for discussion at the three meetings of the congress will be as follows; on Tuesday evening, 'Intestinal Obstruction in its Medical and Surgical Relations' (Drs. R. H. Fitz of Boston, and Nicholas Semm of Milwaukee, will open the discussion, and they will be followed by others whom the executive committee may designate); on Wednesday, 'Cerebral Localization in its Practical Relations' (Dr. Charles H. Mills of Philadelphia, and Dr. Roswell Park of Buffalo, will open the discussion, and they will be followed by Mr. Victor Horsley and Professor Ferrier, of London, Eng.); on Thursday evening the congress will meet in the hall of the National Museum, and Dr. John S. Billings, U.S.A., of Washington, president of the congress, will deliver an address on 'Medical Museums.' At the close of this session a reception will be given in the Army Medical Museum building, to which members and invited guests, their wives and daughters, will be invited.

In addition to the reception on Thursday evening, a complimentary dinner will be given to the guests of the congress by the members, on Monday evening, at Willard's Hotel. Some of these invited guests are as follows: Sir Spencer Wells; Sir Andrew Clark; Sir William McCormac; Drs. W. O. Priestly, William Ord, and Grainger Stewart; Mr. Lawson Lait; Mr. Victor Horsley; Mr. Thomas Bryant; Mr. Thomas Annandale; Professors Ferrier, Esmarch, and Gerhardt; Drs. Rafael Lavista of Mexico, J. L. Reverdin of Geneva, O. W. Holmes and H. J. Bowditch of Boston, Joseph Leidy of Philadelphia, W. Kingston and Eccles of Canada.

An informal collation will also be served at Willard's Hotel from ten to twelve o'clock Tuesday evening, to which only members of the congress, and other physicians who may be in the city, will be invited. The following-named gentlemen compose the committee of arrangements for the meeting: Samuel C. Busey (chairman), J. Ford Thompson, R. T. Edes, E. C. Morgan, W. W. Johnston, and S. O. Richey, of Washington; J. E. Atkinson, H. Newell Martin, and Samuel Theobald, of Baltimore; A. Sydney Roberts of Philadelphia; and A. T. Cabot of Boston.

Neither the congress nor the individual societies will transact any business during the meeting. The object of the congress and of the several societies is the consideration of subjects pertaining to medical science. The discussion of medical ethics and kindred topics, even, is excluded. The congress will not even elect officers. Dr. Billings has been chosen by the executive committee to preside, and the presiding officer of the next congress will be selected by one of the societies represented in the congress. The object of the gathering may be more definitely stated to be to consider and discuss professional topics of a scientific nature, and nothing else will be brought to the attention of the members. The expenses of the congress will be paid by the members, whose contributions will all be voluntary. Headquarters for the registration of members will be opened at Willard's Hotel on the Saturday preceding. Dr. Busey expects that there will be an attendance of about five hundred members. Three other medical societies not connected with the congress will hold their annual sessions in Washington at the same time. They are the American Gynecological Society, the American Association of Obstetricians and Gynecologists, and the Pediatric Society.

'Recent Developments in Great-Circle Sailing.'

In view of the increasing recognition among mariners of the sound principle of conducting a ship along the arc of the great circle joining the points of departure and destination, and of the great advantages to be gained by a knowledge of this branch of nautical science, a work bearing the above title has been prepared in the Hydrographic Office, which has for its object the collection into one volume of all the analytical processes, and a description of all charts and devices which have been constructed, for the navigation of the great-circle track. It thus forms a history of the development of methods of great-circle navigation, and reveals the present state of the science, and is also a treatise on the subject, so arranged as to give a clear conception of each method, and to form a directory to sources where more extended information may be found.

The work presents the methods, among others, of Towsen, Airy, Chauvenet, Lieutenant Hilleret (French Navy), Commander C. D. Sigsbee, U.S.A., and Mr. Gustave Herrle of the United States Hydrographic Office. The latter method is undoubtedly the simplest yet found for practical use in great-circle sailing.

The simplicity of the methods necessary for navigating the really circuitous track of the Mercator projection, and the long duration of its usage, have so popularized them with seamen, that no method of handling charts dissimilar to them will be received with favor. Another essential consideration in the construction of great-circle sailing-charts is a method that enables one to measure the course and distance, from the actual position of the vessel, independently