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THE CHEROKEES IN PRE-COLUMBIAN TIMES.

V.

THE close agreement between the testimony of the mounds and the traditions of both Cherokees and Delawares is somewhat remarkable, and justifies us in believing that they have a basis of truth. We are at least warranted in accepting the theory that the first-named people formerly dwelt in Ohio, and built some of the noted monuments of that State. The number and character of the defensive works indicate that there was a long contest and an obstinate resistance on the part of the original inhabitants. The geographical position of these works makes it apparent, as has often been remarked by writers on this subject, that there was a pressure by northern hordes which finally resulted in driving the inhabitants of the fertile valleys of the Scioto and Muskingum southward. Some of these writers take it for granted that they fled through Kentucky and Tennessee into the Gulf

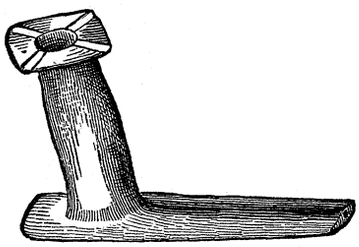

FIG. 10.

States, and became incorporated with the tribes of that section. If this be assumed as correct, it only tends to confirm the theory of an Indian origin.

A study, however, of the pipes alone, makes it evident that this conclusion cannot be maintained. That the mound-builders of Ohio made and used pipes is proven by the large number found in the tumuli, and that they cultivated tobacco may reasonably be inferred from this fact. Although varied indefinitely by the addition of animal and other figures, the typical or simple form in use among them appears to have been that known at present as the "Monitor" pipe, shown in Fig. 68, "Ancient Monuments," and Fig. 177, Rau's "Archæological Collection of the National Museum." The peculiar feature is the broad, flat, and slightly curved base or stem, which projects in front of the bowl to an extent equal to the perforated end. This form is so peculiar that it must be considered ethnic or local. However, as will be seen by reference to the "Proceedings of the Davenport Academy of Natural Sciences" and the "Smithsonian Report for 1882," it is found in eastern Iowa and northern Illinois, and appears to be the only form found in that region: hence it cannot be considered local.

Now, it is somewhat remarkable that nearly all the pipes of this form and the modifications thereof, ending in the modern form shown in Fig. 6, are found in a belt commencing in eastern Iowa, running thence through northern Illinois, eastern Indiana, southern Ohio, and thence bending south through Kanawha valley, and ending in western North Carolina. The first modification is seen in Fig. 8, and found in Ohio, the Kanawha valley, and North Carolina; the second, shown in Fig. 10, is found in Ohio and the Cherokee district; the third, shown in Fig. 5, is found in East Tennessee; and the last, shown in Fig. 6, is found in the North Carolina mounds.

Although specimens, chiefly of the first modification, have been discovered in New York and Massachusetts, it is not known that the "Monitor" or any of its manifest modifications prevailed, or was even in use, at any point south of the belt mentioned. Pipes in the form of birds and other animals are not uncommon, as may be seen by reference to Plate XXIII. of Jones's "Antiquities of the Southern Indians;" but the platform is a feature wholly unknown in the Gulf States or middle Tennessee, as are also the derivatives from it.

This fact stands in direct opposition to the theory that the mound-builders of Ohio fled southward across Kentucky and Tennessee, and became incorporated with the tribes of the Southern States, as it is scarcely possible that such sturdy smokers as they must have been, would have abandoned all at once their favorite pipe. The change, as it was in the other direction, would have been gradual. This evidence, however, has a very significant bearing on another point; for, if the testimony introduced justifies the theory advanced in this paper, then it is probable the Cherokees entered the immediate valley of the Mississippi from the north-west, striking it in the region of Iowa. This supposition is strongly corroborated, not only by the presence of the "Monitor" pipe and its derivatives along the belt designated, but also by the structure and contents of many of the mounds found along the Mississippi in the region of western Iowa and eastern Illinois. So striking is this resemblance, that it has been remarked by explorers whose opinions could not have been biassed by this theory.

Mr. William McAdams, in an address to the American Association for the Advancement of Science, remarks that "mounds such as are here described, in the American bottoms and low lands of Illinois, are seldom found on the bluffs. On the rich bottom-lands of the Illinois River, within fifty miles of its mouth, I have seen great numbers

of them, and examined several. The people who built them were probably connected with the Ohio mound-builders, although in this vicinity they seem not to have many earthen embankments or walls enclosing areas of land, as is common in Ohio. Their manner of burial was similar to the Ohio mound-builders, however, and in this particular they had customs similar to mound-builders of Europe." Two mounds in Calhoun County, Ill., one of which was opened by Mr. McAdams and the other by one of the Bureau assistants, presented the clay mass in the regular form of the Ohio "altar." But what is strange, though not without parallel, is the fact that we find the structure and contents of some of the eastern Iowa mounds similar to what is seen in the Cherokee district of North Carolina and East Tennessee. Here, among other things, are seen the cubical piles or "altars" of unhewn stone with bones about them, precisely as found in some of the North Carolina burial-places, pottery bearing a strong resemblance to that of Ohio, and mounds with stone strata. A mound in Franklin County, Ind., described and figured by Mr. Homsher in the "Smithsonian Report for 1882," presents features strongly resembling those observed in tumuli attributed to the Cherokees. Here we see the rectangular heaps of cobblestones like those in the North Carolina mounds, and stratification and arrangement of skeletons as in the East Tennessee mounds, also the stone stratum observed in the Iowa works.

Having now traced the tribe back to the western boundary of the mound region, we are prepared to take a glance downward along the line of migration, bridging by deduction such breaks as appear in the testimony.

According to the data presented, we find them first on the west bank of the Mississippi, a tribe of comparatively limited numbers, slowly extending their settlements or shifting up or down the stream between the mouth of the Des Moines River and what is now the northern boundary of Iowa. If we may judge by their works, it would seem that it was necessary only at this northern point of their extension to fortify against enemies. A suggestion as to who these enemies were will be offered a little further on. It is impossible to give any satisfactory estimate of the length of time they occupied this locality; it was long enough, however, for them to acquire certain peculiar customs, some of which were not wholly dropped until they came into contact with the whites many centuries later. It is possible that here they began to build mounds, but explorations westward of this area have not been carried on to a sufficient extent to speak with certainty on this point. It was here, no doubt, that the platform pipe with animal figures came into use. The ornamentation of their pottery, and the forms of their vessels, suggest the possibility of contact or intercourse with southern mound-building tribes. There is also abundance of evidence that they had acquired the art of manufacturing cloth, and were acquainted with copper. The evident admixture, however, in these mounds, by intrusive burial, of articles of more recent times with those of the original burials, renders it somewhat difficult to decide positively as to the advance made in art by this people while residing in this locality.

After passing to the east side of the river, it appears that they moved some distance farther to the south, their utmost limits in this direction being in Calhoun County, Ill. The reason for this may have been the presence of the same enemies who opposed their northward movement on the opposite side of the river. Of course, without the knowledge of all the mound testimony, any attempt to descend into details of the movements of the tribe would carry us wholly into the realms of speculation.

All that the mounds teach us in regard thereto is the extent of the area occupied, and the encroachments of works of other types which may or may not be contemporaneous.

It is a fact perhaps worthy of notice, that, while the remains of the effigy-builders on the west side of the river reach but little south of the fortified point before alluded to, they are found on the Illinois side as far south as the latitude of Peoria.

Passing on eastward, we next find indications of their presence in eastern Indiana, whence it seems they gradually moved into central Ohio, finding, as we judge from some works along the southern border of their line of migration, some opposition. Their stay in this attractive region must have been long, and for most of the time a period of peace. The reasons for this conclusion are, first, the indications of the growth of the tribe, judging by the number of works and the statements in the Delaware tradition, which imply that it had spread northward near to the lakes; and, second, the localities of the defensive works, which indicate that their chief contest was with a northern foe. If the latter supposition be correct, it would seem to imply that until this contest they had not found it necessary to build defensive structures.

These, of course, are speculations, and only advanced as such; but there is one thing in relation to their removal from this region for which there appears to be historical, traditional, and mound testimony, and which has some bearing on the preceding suggestions. This is, that their departure was in separate bodies, and at intervals of considerable length.

That some were in their historic seat before the time of De Soto's expedition, and possibly as early as the thirteenth century, has been shown. On the other hand, we have the statement of Bishop Ettwein, in a communication made to Gen. Washington, that the last of them did not remove from the region of Ohio until about the year 1700. We also find in the mounds of Ohio indications of intercourse with people residing in the mountain region of North Carolina.

It has been objected, with some show of reason, that the theory advanced in this paper cannot be correct, because there are no such enclosures in North Carolina and East Tennessee as those in Ohio, because no true "Monitor" pipes have been found in the mountain section, and because no engraved shells have been found in the Ohio mounds. The first of these objections has already been alluded to; but we may add, that this people found themselves able, in their mountain fastnesses, to protect themselves against all their Indian foes without erecting artificial defences. The second objection, as we have already shown, is answered by a somewhat remarkable historical statement by Adair. When he speaks of pipes "full a span long, with the fore part commonly running out with a short peak, two or three fingers broad and a quarter of an inch thick, *on both sides of the bowl lengthwise*," he can refer to no other known pipe than the "Monitor," or the very slightly modified form with

straight base, found also in the Ohio mounds. As the author quoted wrote before any specimens had been unearthed from mounds, he must have seen in use that of which he speaks. This, we repeat, is somewhat remarkable, and forms a link connecting the Cherokees and mound-builders of Ohio sufficient to warrant the theory here advanced, were there no other evidences bearing on the question.

The fact that no engraved shells bearing designs like those found in North Carolina and Tennessee have been discovered in Ohio forms no objection to the theory. Arts and customs are not always ethnical or tribal: some are acquired by contact and intercourse with other tribes. The custom of carving and wearing these shell gorgets did not originate with the Cherokees, but was acquired by contact with other tribes, after they had reached their southern home.

These objections do not militate against the theory, which is established on too broad a basis of facts and resemblances to be set aside by its failure to account for all the discoveries made. Investigations in regard to the origin and use of these ancient monuments must be made chiefly by comparisons and deductions, as historical evidence is in most cases wanting, and absolute demonstration impossible.

Attention was called in the first part of the paper to the conclusion reached by linguists, that the language of this tribe belongs to the Huron-Iroquois family, thus necessitating the inference that we must look to the same locality for the origin of both. This throws a faint ray of light on the history of our tribe preceding their arrival on the banks of the Mississippi. But before attempting to follow this slender clew, attention is called to some general considerations drawn from a comprehensive study of the monuments of the mound section.

In entering upon a discussion of the routes by which the mound-builders came into this section, an examination of the general distribution of the prehistoric remains is necessary. At present we are concerned only with what may be considered the boundaries thereof. Although the data are not sufficient to determine these limits accurately, enough has been ascertained to indicate what will probably be found in the end to be true.

Limiting the consideration to what are usually classed as the genuine works of the mound-builders, the eastern boundary extends from central New York along the Appalachian range to Virginia, diverging thence south-eastward so as to strike the Atlantic coast in South Carolina. The Gulf coast, west of Florida, appears to be generally bare of mounds (with the exception of shell and refuse heaps) for some distance toward the interior. On the north, the lakes and Rainy River form a tolerably well defined border, but west of the source of the Mississippi there is a northward extension into Manitoba which has not been fully traced; yet the indications are that but few ancient works will be discovered north of the Assiniboin region. Most of the mounds of this section which have been explored appear to be somewhat recent, though others bear evidence of being contemporaneous with the works of Wisconsin. On the west the plains appear to form the boundary from North Dakota to Texas, a line of recent works along the Missouri River forming the only exception, so far as known.

The statement frequently made, that the works of the mound-builders continue across Texas into Mexico, appears to be without any foundation; for up to the present time but few have been discovered south of Red River, except in the eastern part of Louisiana.

So far, therefore, as the facts ascertained are concerned, the distribution of the works of the mound-builders affords but little evidence on which to base a theory in regard to the lines along which the authors of these works entered the mound section. The exceptions, if any, are to be found in Florida and the North-west. But this statement must not be taken as indicative of a theory held by the writer, for he is not inclined to the opinion that the mound-building element, except possibly that of southern Florida, entered through this peninsula. Although he has reached no settled conclusion on this subject, he has been inclined to look more to the north-west and west for the lines of immigration than elsewhere, but freely confesses that he finds but little in the works along the border on which to base any theory on this subject.

While this is true considering the section as a whole in its relation to the other comprehensive archæological divisions of the continent, there are, on the other hand, decided indications of movements within the mound section.

The works of the effigy-mound district, confined chiefly to the southern half of Wisconsin and the immediately adjoining sections, are peculiar, and formed a puzzling factor to those holding the theory of one great nation of mound-builders. The study of these appears to lead all those who have devoted attention to them to the conviction that the more elaborate forms, are, as a rule, older than the simpler ones.

Following up the slight clew thus afforded, and using the faint rays of light thrown on the history of the builders by the distribution of the mounds, we are led to believe that their entrance into the district was most likely at its south-western corner, about what is now the north-eastern part of Iowa, and that the area longest occupied was the south-western portion of Wisconsin. The indications are, that they shifted back and forth between the Mississippi River and Lake Michigan, and finally made their exit at the north-western boundary of the State, a part going as far north as southern Manitoba. From there they at length passed southward into Dakota, where the mounds fade out, and the presence of the descendants of the builders—who, we are inclined to believe, pertain to the Dakotan stock—is indicated only by surface figures.

Another movement, traced by certain classes of works and vestiges of art which we ascribe to the ancestors of the Cherokees, was that already mentioned, extending from eastern Iowa through Illinois, Indiana, Ohio, and West Virginia, to the mountain region of North Carolina and East Tennessee.

A third line is indicated by certain types of prehistoric remains extending from Michigan, along the southern shore of Lake Erie, into New York; but nothing has been found in these remains by which to determine the direction of the movement. There is little doubt, however, that the works along this line are attributable to one or more tribes of the Huron Iroquois family.

Another class of works forms an irregular line extending from southern Illinois, through Kentucky and middle Tennessee, to the north-east corner of Georgia; the area of chief

occupation, and position of longest quietude, being that portion of the Cumberland valley in middle Tennessee. The works along this belt, which we attribute to the Shawnees, consist chiefly of stone graves of a particular type, and mounds; they fail, however, to give any satisfactory evidence as to the direction of the movement. Nevertheless there are, along portions of the line, some evidences of a shifting back and forth; and the minor vestiges of art prove beyond question that the authors were contemporaneous with the builders of the mounds of East Tennessee and North Carolina.

Although the banks of the Mississippi are lined with prehistoric monuments from Lake Pepin to the mouth of Red River, showing that this was a favorite section to the ancient inhabitants, yet a study of these remains does not give support to the theory that this great water highway was a line of migration during the mound-building age, except for short distances. It was, no doubt, a highway of traffic and war-parties, but the movements of tribes were across rather than up and down it. We do not assert this as a theory or simple deduction, but as a fact proven by the mounds, whatever may be the theory in regard to their origin or uses. The longest stretch, where those apparently the work of one people are found on one bank, is that from Dubuque to the mouth of the Des Moines. As we move up and down, we find repeated changes from one type to another. In addition to this, is the intermingling of other types, and indications in most places of successive occupation by different tribes. It is a very natural supposition that the people first reaching the bank of this broad stream, or of any of the other large streams of our country, would continue their course along it, but the mounds give no support to the theory.

A study of this subject ought to lead us to the proper conclusion, for it is evident that the natural condition of a mound-building people is one of permanency: hence their movements are governed largely by pressure from other tribes, and not by choice. No evidence has yet been found in the mounds pointing to the first-comers into the section. On the contrary, all the evidences of migration point at the same time to pressure or obstacles in one or more directions. For example: the mound-builders of Wisconsin must have found some obstacle which prevented them from continuing their course eastward around the southern end of Lake Michigan, while the pressure which drove them from the area they had occupied so long seems to have come from the north-east.

The singular course of the people who buried in the stone graves south of the Ohio, whether moving eastward or westward, can be explained only on the theory of the presence of other tribes to the north and south; and this is probably true, as has been suggested, in regard to the people who travelled from eastern Iowa to Ohio.

Indications of movements are found in other portions of the mound section, but those mentioned are all which have any immediate bearing on the subject under consideration at present.

Returning now to the point where we paused in our journey backward along the pathway of the Cherokees, the inquiry arises, "From what point, or along what line, did they come to their halting-place on the banks of the Mississippi?" As has already been stated, it is now conceded by linguists that their language is an offshoot of the Huron-Iroquois family,—a relationship long ago surmised by Dr. Barton and Mr. Gallatin. We may therefore, in answer to the above inquiry, though in a somewhat broader sense than given, adopt the language of Mr. Horatio Hale in speaking of the more closely allied branches of this family: "There can be no doubt that their ancestors formed one body, and indeed dwelt at one time (as has been well said of the ancestors of the Indo-European populations), under one roof. There was a Huron-Iroquois 'family pair' from which all these tribes were descended. In what part of the world this ancestral household resided is a question which admits of no reply except from the merest conjecture." He adds, however, "that the evidence of language, so far as it has yet been examined, seems to show that the Huron clans were the older members of the group; and the clear and positive traditions of all the surviving tribes, Hurons, Iroquois, and Tuscaroras, point to the Lower St. Lawrence as the earliest known abode of their stock."

If the evidence presented in this paper be considered sufficient to justify the belief that the Cherokees entered the Ohio valley from the west, we are, then, forced to one of two conclusions, which may be stated briefly as follows: 1st, That this tribe, breaking away from the family in its eastern home, wandered westward, passing between Lake Superior and Lake Huron into what is now Wisconsin, and onward to the border of the plains, turning thence southward to the point on the banks of the Mississippi where we first find them; or, 2d (which is fare more likely), the original stock was at one time in the distant past located in the region north-west of Lake Superior, and while here the Cherokees separated from their brethren, and moved southward to the banks of the Mississippi, while the latter, being pressed onward, moved eastward, north of the Lakes, to the banks of the St. Lawrence. If this supposition accords with what really was the direction of the movement, then it is highly probable, that, when they reached the Ottawa River, a portion followed down its course, while others turned southward into what is now Ontario, and were in that section when the Lenape appeared on the scene.

The first of these suppositions presents a movement so unlikely, though not entirely without a parallel in Indian history, that we feel constrained to reject it, so long as there is a theory consistent with the known data that is more simple and reasonable.

The evidence presented by Mr. Hale in the "Iroquois Book of Rites" leaves no doubt that the earliest known seat of the Huron-Iroquois family was on the Lower St. Lawrence; but it is scarcely presumable that their first appearance on the continent was in this eastern region. It is more likely that they had reached this point from some western section, and as they increased in numbers were forced to partially retrace their steps.

Although it is apparent that the authors of the ancient works east of the Rocky Mountains were substantially in the same culture state, and belong to the same race in the broad sense, yet there are some reasons for supposing (if we include the ancient works of New York under the general term "mounds") that the custom of building mounds origi-

nated independently in some two or three different sections. This is inferred from the fact that there appear to be at least three comprehensive classes of works: first, those of the Huron-Iroquois region; second, those of the Dakotan district; and, third, those of the southern section. These are not limited by ethnic lines, as the people who built the works along what we have designated the Cherokee and Shawnee belts probably derived the custom from the southern mound-builders.

The southern Dakotans, as the Quapaws and cognate tribes, also built mounds of the southern type. It is possible, however, that future discoveries in the north-west and south-west may throw additional light on these questions, and modify the views here advanced, which are based, as a matter of course, only on the data so far obtained.

The attempt to estimate the time that has elapsed since the arrival of the Cherokees on the banks of the Mississippi (assuming the theory advanced to be correct) or since their meeting with the Lenape must be almost wholly conjectural. Mr. Hale says the time which has elapsed "since the Tallegwi were overthrown" is variously estimated, but that the most probable conjecture places it at a period about a thousand years before the present day, which would carry it back to the ninth century. Basing the estimate on the traditional evidence, for mound evidence gives but little aid in this respect before contact with the whites, it would seem to be more nearly correct to place the event in the eleventh or twelfth century. How long they had remained in this region when the war with the Lenape occurred is a question that must be left wholly to conjecture until other data than those we now possess are obtained; but it must have been a stay of some centuries, during which, as before said, they had lived in comparative peace. There are some reasons for believing that during this time another tribe had pushed its way up the Ohio River to the region about the mouth of the Miami. It is even probable that bands had crossed to the north side of the Ohio, and established themselves along the banks of the two Miamis. These I am inclined to believe, as heretofore remarked, were Shawnees who probably entered the Mississippi valley after the advent of the Cherokees. There is some evidence, however, in this region, of the presence of another small tribe which must have been driven out or destroyed. The remains which indicate the presence of this tribe are peculiar stone heaps and stone graves. It is possible that the presence of other people in this part of the Ohio valley caused the Cherokees to retreat up the Kanawha instead of southward across Kentucky.

The importance archæologically of the questions here discussed does not end with their bearing upon the history of a single tribe, for at almost every point there are side connections with other peoples. If it be admitted that the Cherokees were mound-builders down to the appearance of the white race on the continent, the mystery of the builders of our ancient monuments is virtually dispelled; for the lines which radiate from this point are so numerous and so far-reaching, that, when traced out to their utmost extent, the whole realm of mound-builders will have been traversed. This is a view of the subject which has not received due consideration on the part of those who admit that some of the works are attributable to Indians, yet claim that others are due to a different and more highly cultivated race. An illustration by partially tracing one or two of these lines will serve to impress the reader with the importance of investigation in this direction.

Reference has already been made to the fact that engraved shells similar to those found in the mounds of North Carolina and East Tennessee have been discovered in stone graves of a particular type, and that stone graves of this type often occur in mounds assigned, even by disbelievers of the Indian theory, to the true mound-building age. As the designs on these shells are peculiar, it is reasonable to conclude that the builders of the two classes of works were contemporaneous, or that there was an overlapping to some extent chronologically. Following up this line, which is traceable by other indications than merely the form of the sepulchres in which the dead were buried, we are led in one direction to the banks of the Delaware, where, history and archæology inform us, the Indians of that locality were burying their dead in tombs of the peculiar type mentioned, as late as the time of William Penn. It carries us in another direction, to southern Illinois, where links are found connecting unmistakably with the historic tribes of that section.

Going back to the Cumberland valley, the chief seat of these stone-grave builders, other lines start out which lead to the ancient works of south-eastern Missouri. Speaking of objects taken from "the peculiar stone graves of the Southern States," especially those of the Cumberland valley, Professor Putnam states that he has classed these "as belonging to the southern mound-builders, from the fact that the careful exploration of thousands of the graves, under the direction of the Museum, shows that their contents, including the human remains, are of the same character as those of the burial mounds in general, in the same region. . . . We have conclusive evidence, in the objects here arranged, that the stone-grave people of the south-west, and at least one group of the mound-builders, were one and the same people."

In another place he says, "Many of these carved disks of shell have been found in the graves and mounds of Tennessee and Missouri, and, with the identity of the associated pottery from the two localities, go far to prove the unity of the people, notwithstanding some slight differences in burial customs."

Although it is probable that Professor Putnam is not justified in concluding that the people of the two sections were tribally identical (if this be his meaning), yet the strong similarity in the forms, ornamentation, and character of the pottery leaves no doubt that they were contemporaneous, and, in consequence of contact or intercourse, had adopted in some respects similar customs.

Thus it is seen, that, commencing with the mounds of the Cherokee district, the connecting lines lead to the modern and non-mound-building tribes of the Delaware valley, to the historical tribes of Illinois, and to the veritable mound-builders of middle Tennessee and south-eastern Missouri. Nor do these complete the list of points to which the branches of this single diverging line lead us. As there are other diverging lines, it is apparent, that, when all have been traced out along their various branches, a large portion of the mound area will have been traversed.

This renders it highly probable that there was no manifest break in the mound-building age. It may have continued,

and probably did, for many centuries, but there is no satisfactory evidence found in the monuments that there were two distinct mound-building ages. On the contrary, the historical, traditional, and archæologic testimony is decidedly in favor of the theory that our prehistoric works are attributable to the Indian tribes found inhabiting this country at its discovery, and their ancestors. CYRUS THOMAS.

NOTES AND NEWS.

SINCE the article on the Kiowa County meteorites was published (*Science*, June 13, 1890), we learn that another mass, weighing 219 pounds, has been found at Brenham Township, Kiowa County, Kan.

—We learn from *Nature* of June 12 that the measurement of the Rhone glacier in a comprehensive and systematic way has been carried on since 1874 by the Swiss Alpine Club, and the abundant data obtained will shortly be published in separate form. It appears that the glacier was in recession till 1888, but since last year it has been advancing.

—By the new law on education of 1891, Sloyd is made obligatory in all the schools of Norway. The Norwegian Government has invited Mr. Akkel Mikkelsen, director of the Danish Sloyd-training College, to give a course of instruction at Christiania to the teachers of all the training-colleges in Norway. The courses for Sloyd at Nääs, in Sweden, will be held from May 27 to July 8, from July 29 to Sept. 8, and from Nov. 4 to Dec. 15.

—The Appalachian Mountain Club has issued a special circular relating to the twenty-fifth field meeting, at the Deer Park Hotel, North Woodstock, N.H., July 1–8, and excursion to Randolph July 8–14. Further information may be obtained by addressing John Ritchie, jun., Box 2725, Boston, Mass., or J. Allen Crosby, 70 Boylston Street, Jamaica Plain, Mass. Members of the club who would be interested in a trip to the Dead River region, Maine, in September or October, visiting Mounts Abram Bigelow, Snow, and Parlin Pond Bald, are invited to communicate with R. B. Grover, 11 Durham Street, Boston, Mass.

—A noteworthy event in the movement for the higher education of women, as we learn from the London *Journal of Education*, was the laying of the foundation stone of the Janet Clarke Buildings at Trinity College, Melbourne, Australia, on March 17. In 1883, Trinity College authorities decided, with some misgivings, to admit women students to their lectures. The next step was the establishment of a collegiate home, and a house in the neighborhood of the college was rented as a residence for lady students. To put this home on a permanent basis, Lady Clarke promised a donation of £5,000, which will go far towards defraying the cost of the new building. Sir M. H. Davies has given £2,000 as the nucleus of an endowment fund. Miss Hensley, a former student of Newnham College, has been engaged by the council as lady principal of what will be the first Australian women's college.

—In the *Journal of the Bombay Natural History Society* (vol. iv. No. 3) Mr. E. Giles records a curious fact, which ought to have some interest for entomologists. In June, 1888, he was standing one morning in the porch of his house, when his attention was attracted by a large dragon-fly of a metallic blue color, about two inches and a half long, and with an extremely neat figure, who was cruising backwards and forwards in the porch in an earnest manner, that seemed to show he had some special object in view. Suddenly he alighted at the entrance of a small hole in the gravel, and began to dig vigorously, sending the dust in small showers behind him. "I watched him," says Mr. Giles, "with great attention; and after the lapse of about half a minute, when the dragon-fly was head and shoulders down the hole, a large and very fat cricket emerged like a bolted rabbit, and sprang several feet into the air. Then ensued a brisk contest of bounds and darts, the cricket springing from side to side and up and down, and the dragon-fly darting at him the moment he alighted. It was long odds on the dragon-fly, for the cricket was too fat to last, and his springs became slower and lower, till at last his enemy succeeded in pinning him by the neck. The dragon-fly appeared to bite the cricket, who, after a struggle or two, turned over on his back and lay motionless, either dead or temporarily senseless. The dragon-fly then, without any hesitation, seized him by the hind-legs, dragged him rapidly to the hole out of which he had dug him, entered himself, and pulled the cricket in after him, and then, emerging, scratched some sand over the hole and flew away; time for the whole transaction, say, three minutes."

—In a lecture on "Foam," Lord Rayleigh insisted that foaming liquids were essentially impure, for pure liquids will not foam. For instance: neither water nor alcohol can be raised into a froth, although a mixture of the two may be to a certain extent. The addition of gelatine to water in the proportion of 1 in 100,000 develops the foaming quality quite noticeably. Of course, the best-known foaming liquid is a solution of soap, such as the children use for blowing bubbles. A liquid foams when its films have a certain durability. In all liquids these films exist, since a bubble as it rises is covered with a thin film. Now, the most striking property of films is their tendency to contract, and they may be regarded as being in the condition of a stretched membrane, as of India-rubber, with the difference that the tendency to contract never ceases. An air-bubble will force the air back through the pipe, and a loop of silk floating on a film will be forced into a circle the moment the film inside it is ruptured. Oil forms a film on the surface of water, and covers it entirely, even if the mass of the oil be collected into drops. This is well shown by dropping a particle of oil on to a vessel of water lightly covered with sulphur flour. The sulphur will be immediately driven to the edge by the spreading film. The reason of this is that the tension of the water air film is greater than the combined tensions of the water-oil and oil-air films, and consequently pulls out the oil-film. It is possible to reduce the surface tension of water by mixing it with various substances, such as ether and camphor. Camphor scrapings placed on the surface of pure water enter into vigorous movement, because the dissolved camphor diminishes the surface tension of the water; but, if the water be contaminated by the least quantity of oil or grease, the motion ceases. Lord Rayleigh made several experiments to find what thickness of oil-film would accomplish this: he found it to be about $1\frac{1}{2}$-millionth of a millimetre. This thickness bears to an inch the same ratio that a second of time bears to half a year. Lord Rayleigh explains the calming action of oil on the sea as follows: as the waves advance, the surface has to submit to periodic extensions and contractions. At the crest of a wave the surface is compressed, while at the trough it is extended. So long as the water is pure, there is no force to oppose this; but, if the surface be contaminated, the contamination strongly resists the alternate stretching and contraction. It tends always, on the contrary, to spread itself uniformly, and the result is that the water refuses to lend itself to the motion which is required of it. The film of oil may be compared to an inextensible membrane floating on the surface of the water, and hampering its motion.

—The visit of the Iron and Steel Institute of Great Britain to the United States in the autumn is likely to be in every way most successful. There will be three different sets of meetings,—the meetings of the American Institute of Mining Engineers, which take place in New York on Sept. 29 and 30; the meetings of the Iron and Steel Institute of Great Britain, which take place in the same city on Oct. 1, 2, and 3: and the international meeting promoted jointly by those two societies, which will take place about the middle of October at Pittsburgh. The excursions which have been planned by the American reception committee, of which Mr. Andrew Carnegie is chairman, provide for about three thousand miles of free transportation through the United States. According to *Nature*, the principal excursions will take place to the iron ore and copper regions of Lake Superior; to Philadelphia, Harrisburg, and Chicago, where there are large iron and steel engineering works to be inspected; and to the new iron-making district of Alabama. About three hundred members of the Iron and Steel Institute and one hundred German iron-masters have intimated their intention of taking part in the meetings; and already many have booked passages in the Hamburg-American Company's