October 23, and was examined, with the following interesting results:

ANALYSIS.

Temperature.... = 58° F.

Specific Gravity, = 1.006819.

| SOLIDS. | GRAINS PER GALLON. |
|---|---|
| Sodic Carbonate | 4.160 |
| Calcic Carbonate | 23.616 |
| Magnesic Carbonate | .569 |
| Ferrous Carb nate | .081 |
| Sodic Chloride | 27.312 |
| Sodic Sulphate | 4.844 |
| Potassic Sulphate | 9.730 |
| Calcic Sulphate | 67.231 |
| Baric Sulphate | trace. |
| Magnesic Sulphate | 264.505 |
| Aluminic Oxide | .034 |
| Ammonia | trace. |
| Silicic Oxide | .038 |
| Organic Matters | 1.178 |
| | 403.298 |

| GASES. | CUBIC INCHES PER GALLON. |
|---|---|
| Carbonic Anhydride | 23.178 |
| Nitrogen | 4.330 |
| Oxygen | 1.493 |
| Hydrogen Sulphide | trace. |
| | 29.001 |

Not enough thus far is known of the water to enable me to present any reliable data concerning its therapeutic value; but physicians here and elsewhere, who have tried it, pronounce it an exceedingly valuable water.

MISSOURI SCHOOL OF MINES,
ROLLA, *November* 26, 1880.

## THE ANTHROPOLOGICAL SOCIETY.

The Anthropological Society, of Washington, met on Tuesday evening, December 7, in the Smithsonian Institution, Professor Otis T. Mason in the chair. The following papers were announced: "Superstitions," by Mr. A. S. Gatschet, and "Savage and Civilized Orthoepy," by Professor Lester F. Ward. Mr. Gatschet, after giving the definitions of different authors and finding them too narrow, ascribed to superstition the following meaning: A belief in a physical power operating either within or without us, acting miraculously to affect our bodies or our minds, and which can be influenced to grant our requests. The word is derived from *super stare*, to survive. There are two kinds of superstition, the religious, relating to the world of spirits, and that of the physical nature, relating to all the phenomena of sense. It is hard to draw the line where religion ends and superstition begins, but the latter most generally represents the forces of nature as deified or anthropomorphic. The existence of superstition is manifested in names of gods, those of the American gods representing the sun, moon, and forces of nature.

Symbolism plays an important part in this connection, as well as the cultus of dreams, augurytaboo, omens and prognostics; such as cheiromancy and fortune-telling, hunting and fishing signs, witchcraft, medical jetishes, meteoric showers, comets, amulitism, etc.

The causes of superstition are mental inertia and ignorance of the real causes of things, coupled with the insatiable desire to account for phenomena. Isolation is also a very fruitful source of these beliefs. They are valuable to us only when we can trace their origin; then they lead to a knowledge of savage psychology, and are of very great use. The author of the paper illustrated the various points taken up by many myths and superstitions from our Indians and other sources.

Mr. Gatschet, having spent several years in personal contact with the aboriginal mind, is very competent to form an opinion as to the rationale of our Indian superstitions.

Dr. Morgan took the ground that superstition is natural to our race, having found in his practice that few of his patients were free from it.

Mr. Mason drew attention to the worthlessness of these innumerable stories unless they are brought together in classes, so that out of them some clue may be found to their origin. Every intelligent mortal passes his life between two worlds, the known and the unknown. Between these two is a border land, where superstition dwells. Its inhabitants are different for different individuals or tribes, and vary with our growing years. For Mr. Haeckel it is peopled with atom-souls, and, for the savage, with the concrete souls of things.

## NEW YORK ACADEMY OF SCIENCES.

### THE MAN OF THE CAVES.

BY PROFESSOR W. BOYD DAWKINS, F.R.S., Owens College, England.*

The questions which we have to put to ourselves are these: At what time in the geological history of the earth did man appear? and what manner of man was he? The answers to these questions are to be found in the recent discoveries, in the deposits of ancient rivers, and in the accumulations in caverns, which have been explored in the Old World during the last 60 years. Inquiry into the antiquity of man falls within well defined limits in point of time. Since there were no living species of the higher mammalia in the earlier stages of the tertiary period, the Eocene and the Miocene, it is hopeless to look for a highly specialized being such as man, nor in the succeeding Pliocene is it likely that he will be discovered, since but very few of the living, higher mammalian forms were then on the earth. When we examine the next stage, or Pleistocene, a period characterized by the presence of numerous living mammalia in both the New and Old Worlds, the field is fairly opened before us for our inquiry. The conditions of life at that time were precisely those in which man would be expected to exist, and it will be my object to put before you the evidence as to the earliest man of which we have any certain knowledge.

In the Pleistocene period the physical conditions of Europe were wholly unlike those which it now presents. The sea-board of the Atlantic reached to the 100-fathom line, or 100 miles to the west of the coast of Ireland. The British Isles formed a part of the Continent of Europe, and the area of the North Sea formed a shallow valley, abounding in mammalia of various kinds. The Mediterranean Sea also was much smaller than it is now, a land barrier extending North into Spain by the way of Gibraltar, and another passing in the direction of Malta, Sicily, and Italy, while what is now the bed of the Adriatic Sea was dry land, and most of the islands in the Ægean Sea were the tops of ranges of hills overlooking rich and fertile valleys. The living mammals appearing on this tract of land consisted of Southern species—the hippopotamus, spotted hyena and others—which ranged as far north as Yorkshire.

A second division is composed of the Northern animals, such as the reindeer, the musk sheep, and the like, which ranged as far to the South as the Alps and the Pyrenees, while yet a third division, such as the stag, bison, and horse, ranged over nearly the whole of Middle and Southern Europe. The remains of these animals, lying side by side with extinct species, such as the mammoth and the woolly rhinoceros, characterise the Pleistocene deposits of Europe. There were great climatal changes in Europe during the Pleistocene age. The temperature gradually lowered, and in the North large masses of ice spread over certain regions. When the temperature was lowest the Northern animals advanced furthest to the South, and when the temperature was warmest the Southern animals advanced furthest to the North, and from the intimate association of their remains in ancient river deposits and in caves may be inferred that the Winters were very cold and the Summers very warm

* Lecture delivered before the Academy, December 6, 1880.

Besides the seasonal variations, there was a gradual lowering of the temperature which produced the phenomena known as Glacial, and which characterized the Glacial period, as it is generally termed. The appearance of man at this stage may be conveniently studied from the point of view of the river deposits of Crayford, in Kent, a place remarkable for the large number of mammoths, bisons and horses, which have there been exhumed. Numerous flint splinters of unmistakeable human workmanship were discovered in the Spring of the present year, under conditions which indicated the exact spot on which an ancient hunter sat and chipped them, and these chips being so little disturbed that it was found possible to put together several large masses, and to restore some of the original nodules from which the implements were made. In one case I was fortunate enough to discover an implement rudely chipped all around which indicated that the primeval hunter of the mammoths, bisons and horses of that neighborhood was in the same state of culture as the man who hunted reindeer in the valley of the Thames in the next or the latest stage of the Pleistocene period. The river valleys of the south of England are covered with sheets of gravel termed river drift, and these contain vast numbers of reindeer, as well as bisons and horses, and were accumulated at a time when the climate was severe. In these, numerous implements were discovered, extending from Peterborough, in the north, as far as the channel. Similar implements are also met with in France, and occur in Spain, Italy, Greece, Northern Africa, and Egypt; they also occur in Asia Minor, and have been found throughout the peninsula of India. They indicate a primeval condition of savagery from which mankind has emerged, which was uniform over the whole of this area. It is not a little strange that the river-drift hunter should have used implements of precisely the same shape and material in the Indian jungles, in the forest-clad shores of the Mediterranean, and in the wilds of Middle and Northern Europe. No human remains assignable to this age are sufficiently perfect to allow of our passing opinion of man's physique, but they tell us that he was a man and not a "missing link." The researches of Dr. Abbott on the river gravels of Trenton appear to establish the fact that the river-drift man was an inhabitant of America during the time when the mammoth was living in the valley of the Delaware. The paleolithic implements of the ate Pleistocene river beds are rude and simple, although they show a considerable advance from the simple flake, which is the only trace left by the man of the middle Pleistocene. As regards the man of that period, it is probable that the plateau of Central Asia was the centre from which the race diverged.

On the bottom of the caves of Creswell, in Yorkshire, were found river-drift implements in association with vast numbers of gnawed bones of both living and extinct animals, brought in by hyenas, while in the upper portions were found implements of a higher type, composed of flint and carved bone. Among these was the incised figure of a horse; these imply a higher type than that of the river-drift, and belong to a state of culture known as that of the cave man. It seems to be unquestionable that the cave men were preceded in their habitations by the river-drift men, in some places at least, and that of the two sets of implements now found the ruder belongs to the latter race. It has been a debated question whether the civilization of the cave man was the outcome of the development of that of the river-drift man. The evidence seems to indicate that they must be classed either as two distinct races or as two sections of the same race, which found their way into Europe at widely different times—the river-drift men being of far greater antiquity in Europe than the others. The discoveries of late years tend to confirm the identification of the cave men with the Esquimaux. We infer that the cave men clothed themselves with skins, for instruments for dressing skins are found precisely like those now employed for that purpose by the Esquimaux. That they wore gloves is shown by carvings which represent them, and there is reason to believe that they were in the habit of decorating their persons in various ways. The art of representing wild animals in carvings and by sculpture was carried to a high stage of excellence by the cave-dwellers, and it is doubtful if an artist of the present time could do better work, or even as good, with the rude instruments used by them. One of the most interesting examples of their skill is shown by representation of a mammoth, and we know that the extinct creature is faithfully por-trayed, because its remains have come down to us perfectly preserved in the ice of the northern latitudes. In various ways the habits of the cave men correspond to those which now prevail among the Esquimaux.

## NATURAL SELECTION.

A curious instance has occurred showing the difficulty of explaining the true theory of "Natural Selection," even to scientific men; it is therefore not surprising to find that those who are opposed to the principle from religious motives, fail to realize what is understood by the term. In a letter to *Nature*, Mr. Charles Darwin states he is sorry to find Sir Wyville Thompson does not understand this principle of natural selection as explained by himself and Dr. Wallace, as, if he had done so, he would not have wrttten a sentence found in his introduction to the voyage of the *Challenger*, as follows; "The character of the abyssal fauna refuses to give the least support to the theory which refers to the evolution of species to extreme variation, guided only by natural selection." This, says Mr, Darwin, is a standard of criticism not uncommonly reached by theologians and metaphysicians, when they write on scientific subjects, and asks, "can Sir Wyville Thompson name any one who has said that the evolution of species depends only on natural selection?" and continues, "as far as concerns myself, I believe no one has brought forward so many observations on the effect of the use and disuse of parts, as I have done in my 'Variations of Animals and Plants under Domestication,' and those observations were made for that special object. I have also there adduced a considerable body of facts, showing the direct action of external conditions on organisms, though, no doubt, since my books were published, much has been learnt on this head."

## PROPAGATION OF SOUND BY LIGHT IN 1811.

In searching a volume, dated 1811, for papers relating to the introduction of illuminating gas, we noticed a paper by Modeste Parolette, entitled "Inquiries Concerning the Influence of Light on the Propagation of Sound," taken from the *Journal de Physique*, Vol. LXVIII.

Although Parolette cannot be said to have anticipated those physical facts, the knowledge of which enabled Edison to design that wonderful instrument, the *Tasimeter*, and since developed by Bell in his *Photophone*, still Parolette seemed to be on the right track.

In opening his subject, Parolette states that the object of his inquiry was the relation which subsists between the action of light and the vibrations of sonorous bodies, and he actually made an instrument for measuring the effect of light on sound-vibrations, and called it the *Phonometer*.

Parolette's experiments were rude compared with those of more recent date, but it most be remembered that they were made seventy years ago. He used no mirrors for concentrating a beam of light, but relied merely on the natural properties of light without such aids. He says, "As it is known that the vibrations of elastic fluids are always analogous to those of the particles of the sounding body, and that if two strings, belonging to two instruments, be in unison, when one is touched the other will vibrate and emit a perceptible sound; I availed myself of these properties in the construction of my apparatus, and in determining the object of my inquiry.

The *Phonometer* consisted of two violins placed on a horizontal plank ten feet long and eight inches wide. Having tuned these instruments to the Paris diapason, he fixed a piece of paper to the second string of one of them to