act as secretary, vacated the chair in favor of Prof. A. H. Chamberlain, of Clark University, Worcester, Mass.

Papers were then read on "Canadian Folk-Songs," by Mr. J. Reade of Montreal; on "Some Popular Oaths," by Mr. J. M. LeMoine, of Quebec, and by Prof. Heli Chatlain, of Loanda, Africa, on "Some Causes of the Retardation of Civilization in Africa." Mr. Chatlain's paper was the first-hand testimony of one who knew them intimately by years of residence and close association, to the superiority of the African race (the Bantu) physically and intellectually. He confessed that he had been educated to regard the negroes as the lowest in the scale of human creation, an unsuccessful attempt at man-making and a clog on the wheels of progress, and that the sooner it was made to give place to the European race the better it would be for the world. But his prejudice had gradually yielded to the logic of facts. He found natives of Africa, he said, not only on a par with Portuguese, German and English, when they were given the same advantages of education, but even in advance of them. He gave instances of such superiority in business, in the professions, in literature and science, from the German and Portuguese settlements in which he had resided. How then, their intellectual powers being thus unsurpassed, has it happened that the natives of Africa have been left so far behind not only by the white, but the yellow and, some say, even the red races? To this natural question M. Chatlain replies that, after nine years of personal experience and a much larger period of study, he had come to the conclusion that the causes for the stagnation of the African race were: (1) Seclusion; (2) The lack of a system of writing; (3) Polygamy and Matriarchy; (4) Slavery, and (5) The Fear of Witchcraft. Each of these points the essayist treated clearly from his own experience of the working of the system or defect which he condemned. Professor Chamberlain having thanked Mr. Chatlain for his valuable paper and invited discussion on it, some of the members questioned the correctness of Mr. Chatlain's estimate of the negro's intellect, and declined to accept a few examples of proficiency as the basis of so sweeping a theory. Prof. Chatlain replied to these criticisms, giving the reason for his belief, which was an actual acquaintance with the negroes of several of the Portuguese, German and British colonies.

In the evening a conversazione, which showed some novel features, was held in the Recital Hall, St. Catherine street, and was well attended. It consisted of illustrations of the music of Canadian folk-songs; of examples of Montreal street cries, repeated by phonograph, with lantern views of the criers exercising their callings. The musical part of the programme was in charge of Mr. H. C. St. Pierre, Q. C., and Mr. St. Pierre, and the cries, the success of which was largely due to Dr. W. G. Nichol, were in the care of Mr. Prowse. Ex-Mayor H. Beaugrand gave a lecture on pictographs, with lantern illustrations from La Hontan, etc. Altogether a pleasant and not uninstructive evening was spent.

On Thursday, the 14th, Professor Penhallow presiding, the reading of papers was continued. Mr. Newell treated of "The Study of Folk-Lore, Its Material and Objects." Having defined folk-lore, in its most comprehensive sense, which transcended the bounds set by the literal meaning of "folk" as virtually equivalent to the Latin "vulgus," with which it is allied, he went on to show the vast range of the science. Contemplating its mental and spiritual bearings, he suggested, as possibly acceptable generations hence, the term "palæo-noology" (analogous in formation to palæontology) to indicate the scientific history of mind through the long course of its development. Then, after surveying the field in the old world and the new he directed attention to the great mass of practically unknown folk-lore existing in Canada. Of this he urged the importance of a systematic quest.

Professor Chamberlain read (in part) a paper on "The Mythology of the Columbian Discovery," pointing out the far-reaching revival of Hellenized Celtic and other myths due to the disclosure of cis-Atlantic land four centuries ago. He referred to the Terrianoge (or land of perpetual youth), Valhalla, Avelion, St. Brendan's Voyage, Chicora, Cebola, Norumbega, Eldorado, as well as to the old Atlantic myth, the Garden of the Hesperides, the Insulæ Fortunatæ and other divagations of Greek and Roman mythology, and from passages in Shakespeare, his contemporaries and the writers that followed them down to a comparatively recent date, he showed how the renascence of these old-world stories influenced the minds of succeeding generations. He mentioned the Quetzalcoatl-St. Thomas hypothesis and other theories of white culture heroes visiting the western world; Madoc, the Amazons, the notion of Albino and negro Indians and other imaginary or monstrous beings.

Mr. Newell read an interesting paper by Mr. F. D. Berjeur on "Dextral and Sinistral Ceremonial Circuits," which treated of popular ideas as to the direction in which certain processes, culinary, industrial, medicinal and religious, should be conducted. A paper was also read on "Devil-Worshippers of India," by Dr. Thomas S. Bulmer, of Salt Lake City. Papers on the folk-lore of the Azorian Portuguese of New England, by Prof. W. R. Lang; a comparative study based on one of the Brer Rabbit cycle of folk-tales, by Professor Gerber; a paper on Irish folk-lore, by Mrs. E. Fowell Thompson, etc., were presented by the Secretary.

The Committee on Nominations made the following report:

President, Prof. Alcée Fortier, New Orleans; First Vice President, Capt. W. Matthews, U. S. A., Fort Wingate, N. M.; Second Vice President, Rev. J. Owen Dorsey, Bureau of Ethnology, Washington, D. C.; New Councillors, Professor Penhallow, Montreal; Prof, M. M. Curtis, Hudson, O.; Dr. A. H. Chamberlain, Worcester, Mass.; Curator, Stewart Culin, Philadelphia. The other officers are, W. W. Newell, Cambridge, Mass., Permanent Secretary; Prof. J. Walter Fewkes, Boston, Mass., Corresponding Secretary; Dr. John H. Houton, New York City, Treasurer. The committee proposed as honorary members the following: J. Lawrence Gomme, President of the English Folk-Lore Society; Prof. E. B. Tylor, LL.D., Superintendent Pitts-River's Museum, Oxford; H. Gaidoz, editor of *Melusine*, Paris; Paul Sebillot, Secretary of the Societe de Traditions Populaires, Paris; Dr. F. S. Krauss, Vienna; Jean Karlowitz, Warsaw; Dr. Kaarle Krohn, Helsingfors, Finland; Dr. Giuseppe Pitre, Palermo, Sicily; Prof. J. C. Coelho, University of Lisbon; John Batchelder, Hakodate, Japan; Horatio Hale, M. A., Clinton, Ont.; Major J. W. Powell, Director of the Geographical and Geological Survey and of the Bureau of Ethnology, Washington; Dr. D. G. Brinton, University of Pennsylvania, Philadelphia, Pa.

The foregoing nominations being submitted to the meeting, were approved. New Orleans was proposed as the next place of meeting, but no decision was arrived at.

R. V.

SOME REMARKS ON THE KINETIC THEORY OF GASES.*

BY S. TOLVER PRESTON, HAMBURG, GERMANY.

THE theorem that the velocities of the molecules of a gas vary "between zero and infinity" (between zero and a

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velocity indefinitely great) would seem to give the idea that the velocities are enormously great sometimes.

But it would appear that there are distinct physical conditions tending to limit the velocities of the molecules of a gas (*i. e.*, the velocities capable of being acquired in the accidents of collision). First, there is the friction of the molecules in their passage through the æther. This must be considerable at high velocities, since meteoric dust is measureably retarded from this cause; and the relative friction or resistance to passage increases as the size of the body diminishes. So that probably by the known small size of molecules, the friction must be very great. Second, the resistance to passage is augmented from the fact that the molecule is in vibration (or some analogous motion about its centre of gravity) in the æther. The molecule is like a rough body then, stirring up the æther during its translatory motion, which must greatly augment the resistance to passage. That there is friction in the æther by the passage of molecules is also confirmed, as it seems, by the fact that waves of heat and light contain energy. For how should a vibrating molecule impart energy to the æther without friction or resistance? The resistance is, in fact, a measure of the energy imparted. It appears a question whether, if the amplitude of the vibration (or motion which stirs up the æther) of molecules were known, the friction or resistance could not be calculated therefrom. For we know the number of vibrations accurately by the spectroscope, and the energy imparted to the æther (or contained in the waves), by the thermopile. To deduce the resistance to passage represented by the act of vibrating or swinging, we only appear to require the amplitude of vibration then. Perhaps a limiting value for this could be approximately arrived at.

Another cause tending to reduce the velocity of translatory motion possible to the molecules of gases in the accidents of collision, consists obviously in the fact that the internal motion of the molecule (vibration, rotation, &c.) is proportional to the translatory velocity. So if a molecule attained an excessive translatory velocity, it would acquire an excessive vibration. This vibration would soon dissipate the energy in the æther in the form of waves of heat; and at the next succeeding collisions, the molecule would acquire a relatively slower translatory motion, as it could not retain the necessary vibratory motion (internal motion) which is the essential accompaniment of a very high translatory velocity. So, therefore, from all these causes, the speeds capable of being acquired by the molecules of gases in the accidents of their encounters, are probably moderate; and far less, perhaps, than might be inferred from the theorem that the velocities vary between zero and a velocity indefinitely great.

Referring to a letter received from the late Prof. Clerk Maxwell, I find that—"The number of molecules whose velocity is more than five times the mean velocity is an exceedingly small fraction of the whole number, less than one millionth. But if there were 10^{100} molecules, many millions of these would have velocities greater than five times the mean, and yet this would produce no appreciable effect on the whole mass."

It seems, then, from the above that the number of molecules attaining high speeds is relatively rare. But it appears none the less worth noting distinctly that an indefinitely great velocity would mean a velocity indefinitely greater than the speed of light even. Suppose a few molecules to attain extreme stellar velocities of say 200 miles per second; it is evident that the friction in the æther (appreciable in the case of meteoric dust) would commence to tell in reducing the velocity. And as for a molecule supposed to acquire the speed of light itself, the molecule would (in traversing the æther) resemble much a cannon ball moving through the air at the normal speed of the air-molecules themselves—about 1600 feet per second—where the resistance to passage is very considerable, so it seems that there are in practice physical conditions limiting the velocities attainable by the molecules of gases; the resistance to passage augmenting more than in proportion to the velocity. It is not at all as if those molecules were moving in empty space. A molecule, if assumed to acquire an infinite velocity, would certainly have to be assumed to possess an infinite energy. It may be questioned whether even the total energy of translatory motion of the stars in the collective universe is infinite in sum; if not, then a single molecule with a supposed infinite velocity would require to have a greater total energy than this. The expression "infinite velocity" apparently only comes into the mathematical calculations applicable to a gas, supposed infinite in extent. But in these calculations it seems tacitly to be supposed that the molecules are moving in empty space, which is, however, not a fact. On the contrary†, the molecules move in a resisting substance whose obstruction to motion increases in a high ratio with the velocity of the bodies which traverse the resisting substance.

DISCOVERY OF ANOTHER ANCIENT ARGILLITE QUARRY IN THE DELAWARE VALLEY.

BY H. C. MERCER, DOYLESTOWN, PA.

On June 23, 1893, with the help of my assistant, Edward Frankenfield, I discovered another ancient argillite quarry, on the left bank of Neshaminy Creek, on the Warner farm, about three-quarters of a mile above the mouth of Mill or Labaska Creek (Bucks County, Pennsylvania).

No artificial hollows as at Gaddis Run have yet been found in the surrounding woods, but the rock here rising in a low cliff above the stream is argillite, and the water eating away the bank below it has revealed layers of chips, charcoal, large worked masses, pitted as if to split with the grain, pebble hammer stones and "turtle backs." A broken yellow jasper spear blade was found by Frankenfield 100 yards higher up the stream.

While the Gaddis Run quarry (noticed in *Science* of

†The late Prof. Clerk Maxwell arrived at some data as to the size, etc., of molecules. If we assume a hydrogen molecule to vibrate through an amplitude (say) two-thirds of its diameter at a certain temperature, we can obviously get the total distance traversed through the æther in one second by the molecule through its vibrations, i. e., the total distance equal to the sum of the amplitudes of all the vibrations of the molecule in one second. That is, add together all the amplitudes, and find what distance that would make in a straight line. The size of the molecule is taken from Maxwell. I find this distance to be about ninety miles, i. e., the molecule vibrates at the rate of ninety miles per second, by the above assumed amplitude of vibration in terms of dimensions of molecule (which seems quite possible). According to Maxwell, two million hydrogen molecules placed in a row would occupy a millimetre. Hence it appears practicable that molecules can vibrate at a greater rate than a planetary velocity, which may seem surprising to some, considering how small the dimensions of molecules (and therefore their amplitudes of movement). The velocity of the earth in its orbit, for instance, is eighteen miles per second, as is known. The above comparatively high estimate for vibratory velocity of molecules (ninety miles per second, only a rough estimate, of course) may account rationally for the energy contained in the heat-waves of gases and other bodies, which (energy) is a measure of the friction or resistance opposed by the æther to the vibration or movement of a body in it. Calculations of this kind, although, of course, only approximate, may give us conceptions or ideas of the æther structure. If I had by me data as to the energy of the waves emitted by a gas (radiating power), it would obviously not be difficult to compute the static resistance opposed by the æther to the vibratory movement or swing of the molecule in it, in terms of the weight of the molecule, i. e., in terms of gravity. Whether we have here a swing of the molecule, a movement of rotation oscillatory in its nature, or any movement of a repeated kind, the same considerations evidently in principle apply. In the above computation, the wave length of a hydrogen molecule is taken to average one thirty-nine thousandth of an inch.