been distilled several times can remain exposed to the air for six or eight days without the slightest augmentation of resistance, in regard to the needle, being apparent. Besides, in the measures taken with distilled water, the entire preparation of the experiment from the moment when the liquid was poured into the capsule until the needle, was left to itself, occupied but five minutes; then during the ten partial measures afterward effected, no increase of resistance was observable. Could particles of dust floating about in the atmosphere produce an effect during those five minutes? Is it admissible? Indeed, M. Hagen has shown us conclusively that the superficial tension of distilled water decreases perceptibly when the liquid is exposed to the air; but this diminution is gradual and continued, and in order to produce any visible effect requires several hours. The peculiar fact M. Hagen describes, therefore, appears to me to bear no relation whatever to the resistance shown to the needle's movements; and inasmuch as air on the other hand, exercises no chemical action upon distilled water, and moreover as we are unable to invoke the influence of particles of atmospherical dust, we are led to attribute the fact established by M. Hagen to a cause arising from the interior of the liquid.

Now, in reference to the actual state of the case, I shall say again that it is useless to have recourse to a coating of dirt whose existence we cannot account for, and also that it is much more simple to admit the presence of an atomic organization peculiar to the superficial layer of the liquid.

As far as M. Van der Mensbrugghe's theory is concerned, M. Marangoni expresses himself in the following manner:

"The mass of the liquid effectually diminishes the variations of temperature produced upon the surface, which, in its turn, also decreases the variations of tension; in ordinary cases the latter are but trifling when compared with the variations attributed to dirt."

According to this remark, we should believe that the surface of the saponaceous solution, which, M. Marangoni states, possesses an undeniable coating of dirt, resists the movements of the needle more forcibly than the distilled water which could have hardly any dirt on its surface. In my experiments however, directly the opposite of this has occurred. The ratio of time required for the needle to describe an angle on the surface and beneath it when distilled water was used was, 1, 92, while when soap was used it was but 1, 82.

M. Van der Mengsbrugge's theory certainly deserves some attention in regard to the phenomena in question; but owing to the above remark of M. Marangoni, and the considerable dimension of the needle, relatively speaking, we may be permitted to doubt that any notable effect can result from it. Besides, if it did, we should find it again in those liquids of weak tension which do not produce bubbles, that is to say, alcohol, spirits of turpentine, olive oil, etc.; at least we should be able to observe a feeble rotation of the entire surface; now, this is by no means authenticated.

Finally, before attributing these phenomena to any other cause than that of a peculiar viscidity of the outer coating, it would be necessary to refute those arguments which have led me to the conclusion that the superficial coating of liquids possesses more atomic mobility than the interior portion. M. Marangoni is perfectly silent in regard to this part of my work.

After this examination of M. Marangoni's theory however, I consider myself justified in maintaining my opinion; but I forego all ulterior discussions referring to the subject, and leave all those physicists who may be interested in the question, to compare for themselves M. Marangoni's writings with mine, and to try to discover, if possible, which of us is right.

ON THE STRUCTURE OF THE ORANG OUTANG.

By Henry C. Chapman, M. D.

From the paper on this subject in the Proceedings of the Academy of Natural Sciences, of Philadelphia, we take the following facts:

The subject dissected was a young male Orang Outang (*Simia Satyrus*), about three years old. The first thing to strike Dr. Chapman was the length of the upper extremity, it being three inches longer than the lower one, agreeing nearly in this respect with the Gorilla, the difference in the extremities of that animal being 3½ inches, whereas in the Chimpanzee a difference of 1¾ inches only was found. The foot in the Orang, however, was ½ inch larger than the hand, whereas in the Gorilla the hand was ½ inch larger than the foot; in the Chimpanzee the difference in this respect was ⅜-in. in favor of the foot. Indeed, the distinctness of hand and foot superficially is more marked in the Gorilla than in the other anthropoids. The same facial muscles are found in man and the Orang Outang, with the exception that there is but one zygomaticus, possibly corresponding to the zygomaticus minor of man. The facial muscles, however, are not differentiated as in man, rather hanging together. The upper extremity of the Orang, in its muscles, differed essentiallyfrom that of man in the absence of the flexor longus pollicis, and extensor primi internodii pollicis and in the presence of the additional tendons to the ring and middle fingers

The Orang agreed with the Gorilla in not having a flexor longus pollicis, but disagreed with it in having the pronator radii teres, arising by two heads in the presence of a palmaris longus, in the additional tendons for ring and middle fingers, and in not having the extensor primi internodii pollicis.

As compared with the Chimpanzee, the Orang agreed in reference to the pronator radii teres and palmaris longus, but in the absence of the flexor longus pollicis as a slip from the profundus, and in the presence of the additional extensor tendons it differed.

Dr. Chapman differed from Bischoff, Owen, Huxley and others, in seeing no essential difference between the *scansorius*, of Traill, and the glutæus minimus in man, an opinion, it appears, which had been previously expressed by Prof. Barnard in 1876.

The leg and the foot of the Orang, as compared with man, differed in the absence of the peroneus tertius, plantaris, flexor longus hallucis and transversus pedis, in the fibular origin of the soleus, and in the presence of the external origin of the accessorius only, in the distribution of the perforating and perforated tendons of the toes, in the interossei, and in the presence of an opponens for the big toe. In this latter respect, the Orang differs not only from man, but from all the other monkeys and anthropoids, the foot having a very hand-like appearance, as compared with that of the Gorilla and Chimpanzee. The foot of the Orang differs further in the absence of a special flexor for the big toe. This is supplemented, to a certain extent, by the opponens, and in a partly developed accessorius.

If Professor Huxley's canon can be accepted that the distinction between a hand and a foot consists in the latter possessing tarsal bones, the peroneus longus and brevis, the short extensor and short flexor muscles, then the posterior extremity of the Orang terminates in a foot.

Dr. Chapman, however, appeared to think that the difference between the hand and the foot in Man, the Gorilla, and Chimpanzee, and the lower monkeys, is greater than that observed between the corresponding members of the Orang.

It is usually stated that the uvula is absent in the Orang, and on looking into the mouth, at first sight this appears to be the case, as it does not hang down as in man, between the pillars of the fauces. Nevertheless, Dr. Chap-

man found it to exist. Professor Bischoff, however, mentions finding the uvula in the Orang.

The stomach of the Orang is not so human in its form as that of either the Gorilla or the Chimpanzee. Nothing peculiar was noticed about the spleen or pancreas.

The quadrate lobe of the liver was absent. In the small intestine five fine specimens of the *Ascaris lumbricoides*, and one in the large, were found, and in the cæcum a *Trichocephalus dispar*, perhaps the first time these entozoa have been found in the same anthropoid. Dr. Chapman did not notice anything special about the heart different from the human.

The brain was examined and described, but as the researches of Dr. Spitzka in this direction have been published in "SCIENCE," we need not here state the peculiarities which exist.

Dr. Chapman draws the following general conclusions respecting what can be inferred from the general organization of the Orang as to its relation to the primates.

The Orang, like man, has twelve ribs, whereas the Gorilla and Chimpanzee have thirteen; on the other hand the carpal and tarsal bones are nine in number in the Orang, while the Chimpanzee and Gorilla agree with man in having eight. The Chimpanzee and man are alike in this respect, at least the slip from the flexor longus digitorum in the former is functionally a flexor longus. In the absence of a flexor longus hallucis, and in the presence of an opponens hallucis, the Orang differs from man, the anthropoids and all monkeys. The great blood vessels arise from the arch of the aorta in the Gorilla and man in the same way; the same disposition is usually seen in the chimpanzee, rarely in the Orang. The lungs in the Orang are not divided into lobes as in the Gorilla, Chimpanzee and man. The stomach in the Gorilla and Chimpanzee is human in its form; in the Orang, however, it is quite different. The peritoneum in the Gorilla, Chimpanzee and Orang is like that of man; in the lower monkeys it is different. The brain of the Orang in its globular form, in the cerebellum being usually covered by the cerebum, and in the development of the first occipital gyrus, resembles man more than that of the Gorilla and Chimpanzee. On the other hand, the frontal and temporal lobes in the Orang are not as much convoluted as in the chimpanzee, and still less than in man, and the Island of Reil is not convoluted at all, at least in the Orang here described. It will be seen that from the above illustrations, of which many others might be given, that the gorilla and man, in some respects, agree with and differ from the Chimpanzee and Orang, while from other points of view the Orang approaches man more closely than either the Gorilla or Chimpanzee, and that as regards certain muscles, man and the lower monkeys agree in having them, while they are absent in the anthropoids.

From these facts we may reasonably infer that the ancestral form of man was intermediate in character as compared with the living anthropoids or lower monkeys, agreeing with them in some respects, and differing from them in others. The Orang is closely allied to the Gibbons, the Cnimpanzee to the Macaques, and the gap between these and the *Semnopithecus* is bridged over by the *Mesopithecus* of Gaudry. Until, however, the paleontologist will have procured more material like that from Pikermi, and interpreted it as ably, it seems to Dr Chapman premature to offer any detailed genealogical tree of the Primates.

Mr. A. D. Anderson, author of "The Silver Country or The Great South-West," has prepared a brief narrative of all efforts since the time of Cortez to effect interoceanic transit across the Isthmus of Tehuantepec. The book will be published at once by Messrs. A, S, Barnes & Co., of New York,

ON THE ORIGIN OF ANTHRACITE.*

BY T. STERRY HUNT, LL.D., F.R.S.

From my comparative studies of carbonaceous minerals I, as long ago as 1861, reached the conclusion that petroleum and anthracite form the extremes of a series, all of which may have been derived from organic matters, by natural processes at ordinary temperatures.†

To this is opposed the ordinary view that anthracite, on the one hand, and petroleum on the other, result from the action of heat on matters of intermediate composition, the one being a distillate and the other a residuum. Late geological studies, however, show that such an hypothesis is untenable for petroleum, and the author, while not denying that a local coking of bituminous coals must naturally result from the proximity of igneous rocks, has long taught that it is equally so for our anthracite fields. The prevalent notion has hitherto been that the difference between these and the bituminous coals farther West is in some way connected with the mechanical disturbance of the strata in the former region; but to this is opposed the fact that, while the undisturbed coals of Arkansas are anthracite, the highly disturbed coals of northeastern America, Belgium, and other regions are bituminous.

These considerations I have for many years presented to my classes in Geology, and have maintained that the change which results in the conversion of organic matters into anthracite was effected before the disturbance of the strata; that the hydrogen was removed, as ordinary vegetable decay, in the forms of water and marsh-gas; and that differences in aeration during the process of change and consolidation of the carboniferous vegetation are adequate to explain the chemical differences between anthracite and bituminous coals.

Prof. J. V. Lesley, to whom I have explained my views, has pointed out that there is an apparent connection in the great Appalachian coal-basin, between the more or less arenaceous and permeable nature of the enclosing sediments and the more or less complete anthracitic character of the coal, while Principal Dawson informs me that he has observed similar facts in the coal-measures of northeastern America. Inquiries which promise to throw farther light on this question are in progress, and the present note to the Academy is to be considered as only preliminary to a farther discussion of the subject.

NIMRAVIDÆ AND MIOCENE CANIDAE.*

PROF. EDWARD D. COPE.

The *Nimravidæ* is a new group resembling the cats, but differing from them in the presence of six pairs of foramina which are characteristic of other families of *Carnivora*. They are older than the *Felidæ* occuring in Miocene formations commencing with the lowest horizons. Some of the species are supposed to occur in the upper Eocene. The family includes the primitive cats, the false sabre-tooths, and the primitive sabre-tooths, which correspond respectively with the true cats, and the true sabre-tooths, forming heterologous terms of two homologous divisions.

The genera of Miocene *Canidæ* in North America are *Amphicyon Tennocyon*, and *Galecynus*, all distinguished by the presence of the epitrochlean foramen. Other genera are *Enhydrocyon* and *Ieticyon*.

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* Read before the National Academy of Sciences, N. Y., 1880.

†Canadian Naturalist, July, 1861, and Report Smithsonian Institution for 1862; also Chem. and Geol. Essays.