calcite form in the proportion of about three to two. Both aragonite and calcite are apparently very partially soluble in sea water which does not contain free or loosely combined carbonic acid, but when these dead shells are in contact with decaying organic matter, giving off carbonic acid, they are rapidly dissolved. An experiment with Globigerina ooze in a sea water containing additional carbonic acid showed that the thin walls of the chambers of the shells were first dissolved, leaving rings of the thicker portions of the Pulvinulina shells, for example. Decaying organic matter has a powerful solvent action on carbonate of lime, due to two causes: (1) By the carbonic acid formed as one of the products of this decay, and (2) on account of the formation of sulphides and sulphureted hydrogen, due to the reduction of the sulphides present in sea water.—John Murray, in *Natural Science*.

EDWARD DRINKER COPE, NATURALIST.*

I.

Bitter constraint, and sad occasion dear
Compels me to disturb your season due;
For Lycidas is dead, dead ere his time
Our Lycidas, and hath not left his peer.†

On the morning of April 13, in a car on my way from a funeral in New York to Washington, a newspaper notice of the death the day before of my old friend E. D. Cope caught my eye. Shocked by the intelligence, I dropped the paper, and memory recalled various incidents of our long acquaintance.

The threnody of Milton‡ in commemoration of his friend Edward King also rose to recollection, and the lines just quoted seemed to me to be peculiarly fitted for the great man just dead. He was, indeed, no longer young and had attained his prime, but he had planned work for many years to come and had well advanced in the execution of some of it. He had truly died before his time and had left no peer; the greatest of the long line of American naturalists was prematurely snatched from science and from friends.

My acquaintance with Cope began in 1859. While looking through the part of the *Proceedings of the Academy of Natural Sciences*, of Philadelphia, for the month of April, in which my first paper published by the Academy had appeared, I found one by E. D. Cope "On the Primary Divisions of the Salamandridæ." It seems that the papers by Cope and myself had been passed on by the Committee on Publications on the very same day (April 26) and appeared in print in juxtaposition. I had not previously heard of the new devotee of science and read his article with as much interest as my own. A well equipped man had evidently come upon the field, and this was the first of the numerous articles that were destined to appear in an uninterrupted flow for nearly four decades. A few months afterward I met the author in Philadelphia at the Academy. A young man, nineteen years old, about five feet nine or ten inches high, with head carried somewhat backward, and of rather robust frame, stood before me. He had an alert, energetic manner, a pronounced, positive voice and appeared to be well able to take his part in any trouble. His knowledge was by no means confined to herpetology, but covered a wide range of science, and his preliminary education had been good. We afterward met from time to time in Philadelphia and Washington, and found we had many sympathies in common and some differences.

In one of our first interviews we had quite an argument on the nature of the family group in zoology, resulting from criticisms I made on the extended scope he had given to that category in the classification of the salamanders. Another controversy, I remember, had reference to the vertebral theory of the skull. In an article on the venomous serpents, published in the *Proceedings of the Academy* for 1859, he had defined the group in terms involving the adoption of that theory, and I ventured to dissent from its reality. I had myself been much impressed with it in former days, and when sixteen years old had copied in colors an illustration of Owen's so-called archetype reproduced in Carpenter's *Physiology*. Subsequently, however, the fact that there was only an approximation to the realization of it in the most specialized of fishes and not at all among the lower or higher vertebrates, with other considerations, turned me from it, and I gave my reasons for dissent to Cope. Ultimately he admitted the force of the argument and also abandoned the theory at one time so popular in England and America.

Our acquaintance thus begun in 1859 continued uninterruptedly till death divided us. We rarely met, indeed, that we did not express difference of opinion respecting some subject, but the difference was never of a serious nature and generally little more than sufficient to enliven intercourse.

The future naturalist was born in Philadelphia on July 28, 1840, and the name Edward Drinker was given to him. He was the descendant of a prosperous line long established in Pennsylvania. His father, Alfred, was a man of cultivated literary taste and did much to train his son's mind in early youth. He had retired from active business and lived in luxurious ease in Germantown, a suburb of Philadelphia. There he had formed an arboretum containing most of the American trees which would thrive in the climate of that region. Amid such surroundings the youthful Cope grew up.

An active and intelligent interest in nature became manifest at a very early age. When only about seven years old, during a sea voyage to Boston with his father, the boy is said to have kept a journal which he filled with drawings of "jelly fish, grampuses and other natural objects seen by the way." When eight and a half years old he made his first visit to the museum of the Academy of Natural Sciences of his native city; this visit was on the "21st day of the 10th month, 1848," as entered in his journal. He brought away careful drawings, measurements and descriptions of several larger birds, as well as of the skeleton of an ichthyosaurus. His drawing of the fossil reptile bears the explanatory legend in Quaker style: "two of the

sclerotic plates look at the eye—thee will see these in it."

At the age of ten he was taken upon a voyage to the West Indies.* What were the impressions he derived from that voyage we have not been told. But what has been communicated amply justified Professor Osborn in his declaration that "the principal impression he gave in boyhood was of incessant activity in mind and body, reaching in every direction for knowledge, and of great independence in character and action." His school education was mostly carried on in the Westtown Academy, a Quaker institution about twenty-three miles west of Philadelphia. One of his instructors was Dr. Joseph Thomas, a well known literary worker of Philadelphia and future author of a "Universal Pronouncing Dictionary of Biography and Mythology" (1870), and said to be an "excellent linguist." Under his guidance Cope obtained a passing knowledge of Latin and Greek. He appeared to have had no instruction in any biological science and had no regular collegiate training. He did, however, enjoy the advantage of "a year's study (1858-59) of anatomy and clinical instruction at the University of Pennsylvania," in which the illustrious Leidy was professor of anatomy. But, in the words of his literary executor (Professor W. H. Osborn), "it is evident that he owed far more to paternal guidance in the direct study of nature and to his own impulses as a young investigator than to the five or six years of formal education which he received at school. He was especially fond of map drawing and of geographical studies."†

While a school boy he relieved his studies of the classics and the regular course in which boys of his age were drilled by excursions into the fields and woods. Reptile life especially interested him, and he sought salamanders, snakes and tortoises under rocks, stones, fallen trees and layers of leaves, as well as in the ponds and streams of his vicinage. The trophies of his excursions were identified from descriptions in the works in which they were treated, as well as by comparison with identified specimens in the museum of the Academy. He early and almost without guidance learned to use the library and collection of the Academy, although he did not become a member until he came of age in 1861.

Cope's first contribution to the *Proceedings of the Academy* appeared in the part covering April and was "On the Primary Divisions of the Salamandridæ, with Descriptions of the New Species."‡ In this maiden paper he instituted important modifications of the systems previously adopted in the United States. He soon afterward catalogued the serpents preserved in the museum of the Academy of Natural Sciences and likewise improved upon the systems previously in vogue. He continued with various papers, describing new species and giving synopses or brief monographs of sundry genera of lizards and anurous amphibians.

For five years his publication was confined almost exclusively to the reptiles and amphibians. (The continuity was only interrupted once, in 1862, when he described a new shrew caught by himself in New Hampshire.) Not until 1864 did he begin to extend his field. In that year he described various fishes and a supposed new whale, and gave his first contribution to paleontology in the description of the stegosaurian amphibian called *Amphibamus grandiceps*. But although his attention had become thus divided, he never lost his interest in herpetology and continued to the end of his life to devote much attention to that department. His studies extended to every branch of the subject, covering not only specific details and general taxonomy, but also the consideration of anatomical details, the modifications of different organs, geographical distribution, chronological sequence, genetic relations and physiological consequences. So numerous were his memoirs, so entirely did he cover the field of herpetology, and so marked an impression did he make on the science, that he was well entitled to apply to himself the boast of the Virgilian hero, "Pars magna fui."

In his earliest essays he manifested the independence and critical spirit which were so characteristic of him later. One knowing all the circumstances of the case may be amused in coming across a passage expressed in the tones of a veteran published by him when twenty years old: "In proposing the name *Zaoeys* . . . we are giving expression to an opinion long held by us as to the unnatural association of species in the so-called genus *Coryphodon*. . . . In it we find cylindrical terrestrial species united with compressed subarboricole species, upon a peculiarity whose value as an index of nature appears to us entirely imaginary. The very nature of the coryphodontian type of dentition, as distinguished from the isodontian and syncranterian, would lead us to infer its inconstancy;" and so on.§ Bold as was the criticism of such herpetologists as Duméril, Bibron and Günther, it was justified by the facts, and the young author's conclusions have received the indorsement of the best succeeding herpetologists, including even the latest author criticised.

In 1863 he paid a visit to Europe, partly for the benefit of his health, which had suffered from overwork, and partly for the purpose of seeing the great museums of England, France, Holland, Austria and Prussia. Notwithstanding his ailments, he made good use of his time abroad and systematically examined the collections of reptiles in the chief centers of science. He did not even restrict his studies to herpetology, but extended them to various other subjects.

On his return from Europe, in 1864, he was appointed professor of natural science in Haverford College, an institution chiefly supported by Quakers, but retained the position only three years. During this time, in 1865, he married Miss Annie, daughter of Mr. Andrew Pinn, of Chester County, Pa.

In and after 1864, too, he enlarged the range of his studies and publications, and also extended them to ichthyology, mammalogy and paleontology. He had always been interested in the philosophical aspects of science and early adopted the conception of descent with modifications to account for the variations of animals and the differentiation into species and higher groups, and in 1869 began to give expression to his peculiar views.

On the death of his father he became heir to a considerable fortune. Part of this was invested in mines,

which for a short time gave promise of good returns, but, it is said, the majority of the stock was held by others, and owing to the incapacity of superintendents and the operations of the controlling stockholders he lost his interests. While in the enjoyment of his fortune he spent large amounts in collections and personally conducted or sent out expeditions to various places. One of the most important was sent to South America. He filled a large house from cellar to top-most story with his collections and resided in an adjoining one.

In 1871 he conducted an expedition to Kansas and especially investigated the Cretaceous beds of that State and collected their fossils. In 1872 and 1873 he became connected with the United States Geological Survey, and for the fossils visited Wyoming in the former year and Colorado in the latter. In 1874 he joined the survey under the command of Lieutenant Wheeler, of the engineers, and explored New Mexico.

The collections made during these expeditions were large, and the unwearied industry and energy, as well as cares, of Cope were rewarded with many well preserved fossils. These were described in many communications to the Academy of Natural Sciences and the American Philosophical Society, and later in large volumes published by the general government as reports of the respective surveys with which he was connected.

The various investigations thus opened were continued through the succeeding years. His collections continued to grow in spite of reduced means. He refused even to sell portions for which he was offered liberal sums and, at the cost of personal discomfort, held on to them and made his home, for much of the time, in the midst of them, having sold his residential house but kept his museum.

In 1878, he purchased the rights of the proprietors of the *American Naturalist* and removed it to Philadelphia. Professor Packard, one of the original proprietors, co-operated with him in the editing of it for some years and he was also assisted by various eminent specialists.

In this journal numerous articles of all kinds, including reviews and editorial comments, were published by him. His last words appeared in numbers issued after his death, the leading article in the number for June having been written shortly before his death. It treats of the remarkable mammals of South America known as *Toxodontia*.

(To be continued.)

THE COMMON ACCIDENTS OF SUMMER TOURISTS.

By JAMES E. PILCHER, M.D., Captain in the Medical Department of the United States Army.

FOREIGN BODIES.

IN camping parties particularly, insects are liable to find their way into the auditory meatus and produce great annoyance and sometimes no little pain. It will do no harm to hold a bright light to the ear in the hope that the intruder may be attracted to emerge, but it is better that every person should know how readily foreign bodies can be floated out of the ear by injections of warm water.

The eye is even more subject to travel accidents of this kind than the ear, and unless the body be embedded in the cornea or conjunctiva, which is comparatively unusual, no emergency is more readily relieved. There is no reason why the laity should not understand the simple maneuver of exposing the lining of the lower lid by looking up, while gentle pressure is made just below the eyelid. The drawing of the upper lid down over the lower is equally easy and often effective in removing the foreign body. In case of failure, the removal may be attained by drawing across the eye, under the upper lid, a little corner of a very soft linen handkerchief moistened with the patient's saliva. Sufferers from this accident should be informed that a slight conjunctival abrasion, produced by a foreign body which has been removed, will continue the sensation of the presence of the body even after it has disappeared.

CUTANEOUS ACCIDENTS.

The burns of the stage of rubefaction and sometimes of slight vesication, produced by the exposure to the rays of the sun of persons unaccustomed to outdoor life, are common to summer tourists. The recognition of the fact that this accident is a genuine burn renders its treatment readily understood. The numerous cold creams and other unguents sold in the apothecary shops serve well enough, but nothing can be better for general use in these cases than the carbolated petrolatum everywhere available.

The same may be said of the lichen tropicus or "prickly heat," to which delicate skins are subject in hot weather. The intense itching of this trifling but exceedingly annoying affection is also usually readily brought within the limits of endurance by carbolated applications. The little jar of carbolated petrolatum is a most advantageous constituent of every tourist's summer outfit.

The more severe inflammation produced by contact with the various species of *rhus*, the "poison ivy," the "poison oak" and the "poison sumac," is often temporarily treated with advantage in the same manner. These injuries, however, pre-eminently come under the category of matters in which the "ounce of prevention" is particularly applicable, and it is well for persons going into the country for an outing to be able to distinguish them from the harmless growths which they resemble.

The beautiful woodbine or Virginia creeper is distinguished from the venomous "poison vine" by the fact that the leaf of the harmless growth consists of five leaflets given off from a common stem, while that of the toxiferous plant has but three leaflets upon the main stem. The "poison oak," or *Rhus toxicodendron*, may be detected by the same conformation of leaf. The "poison sumac" or *Rhus venenata*, which produces a cuticular inflammation similar to those already mentioned, may be distinguished from the ordinary harmless sumac by the fact that, instead of bearing close bunches of red berries at the ends of its branches, its fruit consists of slender clusters of small white berries given off from the axils of the leaves.

WOUNDS.

It is difficult to realize that in this day and genera-

* Presidential address by Prof. Theodore Gill before the annual meeting of the American Association for the Advancement of Science, August 9, 1897.

† In the extract from Milton's poem time has been substituted for prime and our for young.

‡ Milton, poems xvii.

* Osborn in *Science*, N. S., v, 706.

† Osborn.

‡ *Proc. Acad. Nat. Sci. Phila.*, 1859, pp. 122-128.

§ *Proc. Acad. Nat. Sci. Phila.*, 1860, p. 543.

tion any person can be so ignorant as to treat slight wounds with anything but cleanliness and gentle pressure. But the cobwebs, tobacco quid and filthy mud heresies all still have enthusiastic partisans, and slight wounds are exceedingly liable to be transformed into poisoned wounds of considerable extent by the employment of such agents. It is well then to impress upon the traveler the fact that in the wounds of no severity simple cleanliness and gentle pressure, maintained by a clean compress held by a clean bandage, comprise all the requisite treatment. It is worth while indeed to go farther and explain that filthy agents should be eschewed in any kind of wound. Why fresh cow dung or dust permeated cobwebs should be considered to possess healing qualities is a question that the wisest cannot answer. But, with the predilection for those dressings which possesses the bucolic mind, it is a most wise precaution to warn contemplating travelers against them and in favor of clean applications, and to explain that anything contaminated with animal secretions is dangerous, from the mucus laden handkerchief to the sweat saturated shirt—clean paper being better than soiled linen, the ink of the printed sheet being rather an advantage than otherwise. The removal of a barbed fishhook by thrusting the point out through the skin, and then, after breaking off the barb, easily withdrawing it, is so simple a procedure that it seems hardly necessary to mention it, but experience has shown how few of the uninitiated bethink themselves of this very natural maneuver. It should also be understood that the temporary treatment for severe wounds, after checking hemorrhage and placing the parts in a comfortable position, is identical with that for slight ones.

BLEEDING.

The most alarming feature of the more severe wounds is the bleeding, which, in case of an injury to an artery, may be dangerous to life. Every person should understand the difference between arterial, venous and capillary bleeding. The bright red hue and spurting flow of the wounded artery should be recognized as an indication of danger promptly to be treated. The fact that pressure between the wound and the heart will control such bleeding should be impressed on every mind. The simple construction of a tourniquet from a large handkerchief, a bit of a garment, a suspender, or any simple article which can be bound firmly about a limb, and the method of tightening the bandage thus created by thrusting under it a rod of any kind and twisting it until the pressure exerted checks the bleeding, should be a part of the elementary knowledge of every one. To this should be added the fact that firm pressure directly upon the wound, in other than arterial bleeding, is the proper method of restraining the hemorrhage. The laity should be cautioned, however, to immediately apply pressure with the hands directly upon the wound, even in case of an arterial injury, until the extemporized tourniquet can be put in place. Death has been known to occur from an arterial wound while the amateur surgeon was so much interested in manufacturing his tourniquet that he neglected to control the bleeding in the meantime.

FRACTURES.

Some points with regard to fractures may be of the greatest value to the summer tourist—the main point being aptly expressed in the Latin motto, *noli me tangere*. Fractures and dislocations are so frequently aggravated by meddlesome handling that the dictum to do nothing more than place the injured part in the most comfortable position possible for the patient and retain it there, should be most emphatically impressed upon the lay mind. Extemporized methods of immobilizing the parts in the easiest position should be generally understood, including the utilization of canes, umbrellas, sticks and the like as temporary splints to prevent the accentuation of the pain and the aggravation of the injury by motion at the point of fracture.

SPRAINS

are sometimes fully as painful and disabling as fractures, and, like fractures, they should not be made the object of unnecessary meddling. No injury is more frequent with the summer tourist than the sprain, particularly of the ankle. The mode of vacation life, with its admixture of athletic sports and unaccustomed exercise, particularly predisposes to this accident. The laity should learn to avoid arnica, turpentine, and other abominations in favor of immediate immersion in hot water for a considerable period, followed by elevation of the extremity and gentle retention of the parts by a bandage, the material for which may well consist of elastic flannel.

HEAT STROKE

or heat prostration is one of the more frequent results of exposure to unexpected exercise in summer traveling. It is well for tourists to understand the danger of prolonged exposure to the sun in very hot weather. The use of alcoholic stimulants or the drinking of water in excess should be avoided before going out, and the advantages of applications of cold water to the head in these cases should be well understood.

DROWNING.

As the water enters largely into the plans of summer excursionists, the list of summer casualties naturally presents a large number of cases of drowning. While the great majority of these cases are beyond recovery before the body is taken from the water, there are still many in which artificial respiration, persistently and effectively applied, may restore the pulmonary and cardiac action. The Sylvester method is the most popular, consisting—the patient lying upon his back—of alternate contraction and expansion of the chest, by alternately pressing the arms upon the chest and raising them strongly over the head, from twelve to fifteen times a minute, all this of course after the water in the air passages has been emptied by gravitation. The best authorities believe that artificial respiration is often too soon discontinued, and advise that it be persisted in for from thirty minutes to an hour. It should be remembered that the body, until the lungs become filled with water, is buoyant and will float, not high up, but still with its upper surface above the water; and the addition of the merest trifle of assistance, such as is afforded by a small board, not to speak of an oar or larger floating body, will enable the head to be kept

well out of the waves. If, then, one can have self-possession in the very disconcerting moment of submersion, he may be able to keep himself afloat until aid can arrive, or possibly until he can reach the shore unaided.

There are many other points in first aid, easily acquired and readily remembered, the application of which may not only contribute greatly to the comfort and ease of the ill and injured, but will also materially assist the practitioner in his future treatment of the case, should the accident require the ultimate action of a physician; but those here mentioned are perhaps of the greatest importance to the summer tourist. The whole subject is an important one, however, and the question of general instruction in connection with it is coming to be recognized as of steadily increasing consequence, while the number of persons qualified to stand in the breach in emergency is constantly growing, all of which is destined to result in a great saving of suffering in future injuries and a vast diminution in the mortality of future accidents.—Medical Record.

A NEW LAW OF HEREDITY.

THE truth of a law of heredity proposed by Mr. Francis Galton has been verified in particular instances, in a memoir* read by him before the Royal Society on June 3.

He first put forward the law, with hesitation, in his book "Natural Inheritance" (Macmillan & Company, 1889), page 134, because it was founded at that time almost wholly upon *a priori* grounds. Now, being found to hold good in a large group of cases, there is strong reason for its acceptance, as applicable generally to all qualities in all the higher (bisexual) animals. When it is applied to individual cases, minor corrections should, of course, be made in respect to sexual limitations, prepotencies of particular ancestors, and the like.

The law shows the proportion of the heritage that is contributed on the average by each parent, grandparent, great-grandparent, and so on. There must be an average contribution, drawn from each ancestral place independently of all the rest, because cases are familiar to observers in which a peculiarity found in some single ancestor has appeared in one or more of the offspring; the present law expresses its amount.

The general considerations upon which the law was originally founded are four in number, but not equally cogent; there is only one solution that satisfies them all. (1) The consequence of limitation in space on particular germinal matter, which necessitates the loss of one-half of the total germinal material contributed by the two parents. This is confirmed by the commonly (though not universally) accepted fact of observation in the life history of the germ. (2) The remark already made, that any ancestor however remote may contribute his peculiarity independently of the rest. (3) The contribution of the two parents to the child, being analogous to that of the 4 grandparents to the 2 parents, of the 8 great-grandparents to the 4 grandparents, and so on, make it probable that the latent links of the chain of ancestral contributions form a geometric series of terms, diminishing as we proceed from the ancestor downward. (4) The sum of the contributed heritages must be equal to 1.

These four conditions are satisfied by the series $\frac{1}{2} + \frac{1}{4} + \frac{1}{8} + \frac{1}{16} + \dots$ etc. In other words, by the supposition that the two parents contribute between them $\frac{1}{2}$ of the total heritage of the child; the four grandparents, $\frac{1}{4}$; the eight great-grandparents, $\frac{1}{8}$, etc. Or again, that a single parent contributes $\frac{1}{4}$; a single grandparent, $\frac{1}{16}$; and a single ancestor in the *n*th generation $\frac{1}{2^n}$. A noteworthy consequence of this is that all the 16 great-grandparents taken together are no more efficient than a single grandparent, and only one-quarter as efficient as a single parent.

This supposition does not run counter to the commonly accepted view that the true line of descent stretches from germ to germ, and not (except in, perhaps, a small degree) from person to person; the person must on the average be a fair average representative of the germ; consequently statistical averages which are true of the one would be true of the other also.

The verification of the above theory is the object of Mr. Galton's memoir. Appropriate materials for the purpose were at last found in the registered colors of the pedigree stock of Basset hounds. This stock was started some twenty years ago by Sir Everett Millais, who purchased on the Continent 93 selected hounds for the purpose, and has subsequently interbred their most valuable descendants. A Basset Club has long been established, which publishes an occasional stud book (the latest was in 1896) containing the registered name, parentage, date of birth, and breeder of each hound. The colors are not printed in it, but they are always entered on the form sent by the breeders to the club, and Sir E. Millais kindly had them copied for his use. Now there are two, and only two, recognized varieties of these colors: the one technically known as lemon and white (the word "lemon" standing for any shade between yellow and reddish-brown), and the other known as tricolor, from its containing black as well. So there are only two alternative conditions to be considered: "with black" and "without black;" or "tricolor" and "non-tricolor"—say for brevity, T. or N. It is asserted that intermediate and doubtful cases between T. and N. hardly exist.

The result is a collection (1) of 817 hounds of registered colors, T. or N., descended from parents whose colors are also known. (2) Of these, in 567 cases, the colors of all four grandparents are known; again (3) of these, in 188 cases, the colors of all eight great-grandparents are known. These three sets form the material that is tabulated and discussed, and supplies the requisite means for comparing calculated results with observed ones.

There are numerous points dealt with in the memoir, and explained away, of which there is not space to speak of here; one only need be mentioned, namely the question whether either the sire or the dam is so prepotent in transmitting color as to make it necessary to treat the sexes apart. It proves that the dam is prepotent over the sire in this respect, but only in the proportion of 6 to 5; also that the neglect of sex made no sensible difference in a test case. Consequently all

* "The average contribution of each several Ancestor to the total Heritage of the Offspring," by Francis Galton, D.C.L., Sc.D., F.R.S.

ancestral places in the same generation are treated as of equal average efficiency. In short, if *n* be the order of any given generation (counting *n* = 1 for parents, = 2 for grandparents, etc.), there are 2^n ancestral places in the *n*th order, and these contribute between them $1/2^n$ of the total heritage; consequently each ancestral place contributes $1/2^n$ of it. If the same hound fills more than one ancestral place, he has to be rated separately for each of them.

The contributions from the unknown ancestry are reckoned as follows: It was found that 79 per cent. of the parents of T. hounds are T. also, and that 56 per cent. of the parents of N. hounds are T.; consequently the unknown grandparents, great-grandparents, etc., of the T. hounds would have probably $(0.79)^2$, $(0.79)^3$, etc., of T., and those of the N. hounds would have $(0.56)^2$, $(0.56)^3$, etc., of T. A simple calculation shows that the sum of the T. contributions to the offspring of the unknown ancestry of each T. grandparent would be 0.0408, and that of each N. grandparent would be 0.0243; these values are used in discussing the set (2). In set (3) the great-grandparents are known, ignorance beginning above that stage; in this case, the pre-ancestral contribution of T. through each T. great-grandparent is found to be 0.0102, and that through each N. great-grandparent is 0.0061. There is no need here to allude to minor corrections, noticed in the memoir, whose effect is too small to be worth regarding.

It thus becomes a very simple matter to determine the contribution from each several known ancestor as well as that from the unknown ancestry of each of them, and, by adding these together, to obtain a coefficient appropriate to any given group of similar cases, such as, when multiplied into the total number of offspring, shall give the "calculated" number that are T.

The test of the truth of the theory lies in the accordance between these calculated numbers and the observed number.

Owing to the large proportion of T. hounds and to selective breeding in favor of T., the different possible matings are by no means equally common, those in which the known ancestry are all (or nearly all) N. being non-existent. The results for such as occurred are summarized below (excluding seven cases, falling into three groups, that lay outside the limits of the table for set 3). The coefficients are added to show the degree of variety in the test conditions. Fuller information is to be found in the tables published in the memoir, out of which these figures are extracted:

CALCULATED AND OBSERVED VALUES COMPARED.

Set 2												
Coefficient...	'91	'83	'75	'68	'65	'58	'51	'43	'35	'28	—	Total
T. calculated	108	59	21	8	24	92	30	3	5	1	—	391
T. observed	106	101	24	8	20	79	36	4	7	2	—	387

Set 3.												
Coefficient...	'96	'94	'92	'90	'87	'85	'83	'81	'79	'77	(continued)	
T. calculated	2	24	13	14	16	18	13	5	2	3		
T. observed	2	25	14	15	17	19	14	6	2	3		

Set 3 (continued).												
Coefficient...	'75	'69	'67	'65	'64	'62	'60	'58	'56	'54	'52	Total
T. calculated	2	1	1	6	1	17	8	18	5	2	7	180
T. observed	2	1	0	5	1	16	12	8	9	1	7	181

Comparing the totals of each of the two sets, we see that the calculated results are practically identical with the observed ones, 391 with 387; 180 with 181; grand total, 571 with 568. There is therefore no constant error, the errors in individual cases balancing one another. When we examine the several groups, 32 in number, which contribute toward the above totals, a remarkable amount of agreement is shown throughout between calculation and observation, such as would raise the art of breeding to a science of considerable precision. The most notable exception is in the sixth column of set 2, where the numbers are 92 and 79, but, as is shown in the memoir, the observed values run there so irregularly with their neighbors that they cannot be accepted as true representatives. The causes of heterogeneity undoubtedly include the disturbing effects of close interbreeding, because particular hounds of good shape that have also considerable prepotency are largely bred from.

The author mentions that he had made experiments with the coefficients, altering them slightly and recalculating, and that he found in every case a notable diminution in the accordance between calculation and observation; the test that the law has successfully undergone thus appears to be even more severe and searching than might have been anticipated.

It is hardly necessary to insist on the value to breeders of a trustworthy law of heredity. Vast sums are spent annually in rearing pedigree stock of the most varied kinds, such as horses, cattle, sheep, pigs, dogs, and other animals, besides flowers and fruits. Certainly no popular view at all resembles that which is put forward and justified in Mr. Galton's memoir, which is epitomized here so far as space admits.—Nature.

CLAY INEBRIATES.

In some sections of the country a number of people are found who daily use clay as an article of food. It is used so ravenously and with so much relish, and its effects are so marked, that it can be called a veritable inebriety. The clay eaten is of dirty white color, and has a particular oily appearance and does not crumble, but becomes sticky when moistened. It is held in the mouth until it dissolves, and is swallowed in small quantities. It evidently possesses some nourishment, and the opinion prevails that persons can subsist on it for days without any other food. The