SCIENCE

NEW YORK, MARCH 18, 1892.

THE PERSISTENCY OF FAMILY TRAITS.

NOT long ago we met a young friend, a bright, charming fellow, who said he was a student of ancestry. Having a weakness in that direction ourselves, we soon became engaged in conversation upon subjects of mutual interest until we remarked upon the extraordinary persistency of peculiar traits in members of the same family for long periods of time. To our astonishment he immediately informed us that the notion that there is such a thing as "family traits" had been consigned by all the leading genealogists to the realm of myths, and that there is positively no such thing to be met with in human experience. He proceeded to state that old people with active imaginations and defective sight and hearing thought they saw in their descendants the peculiar traits that in youth they had noted in their ancestors. Take from this, he says, the element of imagination, and there remains nothing but the recurrence of the traits of character common to humanity, and that once in a brief interval of time are emphasized in individuals.

He then produced a genealogical chart that showed the ancestors of A. B. through nine generations. A. B. was a direct descendant from L. B., who came from England early in the seventeenth century, about 250 years ago. The chart was of the usual semicircular form, with A. B. in the centre, and arranged in concentric semicircles, each semicircle devoted to a generation, with the right quadrant devoted to the ancestry on one side and the left quadrant devoted to those on the other. Of course, if such a chart was complete, as they very seldom are, the second semicircle would contain the names of two parents, the third of four grandparents, the fourth of eight great-grandparents, the fifth of sixteen, the sixth of thirty-two, the seventh of sixty-four, the eighth of one hundred and twenty-eight, and the ninth of two hundred and fifty-six. The whole number is five hundred and eleven individual ancestors of both sexes in nine generations. Assuming that no marriages took place between parties of even remote relationship, which is not likely to occur when the nine generations remain locally in the same neighborhood, the chart would show five hundred and ten ancestors, among which the direct line of B. comprised nine individuals, and occupied a perpendicular line in the centre of the chart.

"Now," says my friend triumphantly, "do you suppose that that line, mixed with nearly five hundred other lines, will preserve anything originally characteristic of it? The idea is preposterous." He continued further, "You will admit that ancestry consists of two elements, heredity and environment. In this case the environment has been the general conditions of New England farm and village life — practically the same; we can therefore leave that out. Now, heredity remains; do you suppose that anything peculiar remains in A. B. of any one of the two hundred and fifty ancestors from whom he is descended in the eighth generation from his own?" We answered, most emphatically, "Yes; and they would chiefly lie in the perpendicular line of B." To this declaration he dissented with equal emphasis, and appealed to the chart to prove it. We admitted that, as a geometrical demonstration, the chart was unanswerable, and urged without avail the fallacy of submitting a problem in biology and psychology to mathematical proof. The chart was, he assured us, the genealogist's compass and pole-star, from which there was no appeal.

Further conversation led to numerous citations of examples from our own knowledge and experience, which has been widely extended for many years among the descendants of John Doe. These examples, he assured us, were all mere coincidences that would cease to be examples beyond the range of the present generation; that, generally speaking, no man's knowledge extended beyond his grandfather, and that so-called family traits were eliminated by ignoring the great mass of dissimilars, and exaggerating the importance of the few similars. Finally, he challenged us to show that our examples proved anything beyond the observation of a few coincidences.

The problem briefly stated is this: Do persons bearing the same surname and remotely of the same family exhibit traits of character that are common, or in any sense to be considered as "family traits?" The facts within our observation and knowledge we believe to be susceptible of explanation upon a purely scientific basis of well-established principles, without any recourse to either imagination or chance coincidence. John Doe settled in one of the New England colonies about 250 years ago. The name is common among the middle-class English and is very old, one of the name having held a high ecclesiastical position in the thirteenth century, and others appearing among the lesser nobility a few centuries later. John Doe had a numerous family, of which five sons married, and have descendants now living in localities not far apart in New England and in many localities west of the Hudson River. There are descendants of these different brothers living as neighbors in several instances who do not know that they share a common ancestry. Now, it is or is not a matter of fact and observation whether these people, bearing a common surname and descended through from five to eight generations from a common ancestor, exhibit certain traits, or rather a combination of certain traits, which may be called in the aggregate a "Doe character." From our knowledge of the family taken as a whole, that is, the descendants of the five brothers taken together, we declare that there is an unmistakable "Doe character."

If you ask us to describe this character we must decline to do so. It is not necessary. Like all human character it is a mixture of good and bad. Moreover, it might be recognized, and we might be restrained from exhibiting our thesis with scientific clearness and precision. Again, there are subtle elements of human character that defy adequate expression in words, and yet are quickly recognized. Nevertheless, we will state how it has been proved to us as an individual: In the first place, by our own observation directed for several years by a knowledge of certain principles acquired in breeding animals; again by remarks made to us, neither solicited nor suggested by us, by members of the "Doe family," who had no knowledge of each other's exis-

tence, and who were separated by from five to seven generations; again, by similar judgments passed, not upon individual "Does," but upon the "Does" as a whole, by women who had married "Does," having no knowledge of each other's existence, and whose judgments had been passed upon different generations of "Does."

If "family traits" are a delusion to be explained away by the dilution of a geometrical chart amounting to one two hundred and fiftieth in eight generations, why can independent outside observers, the Does themselves and the women who marry Does, recognize a Doe character in the eighth generation? It is simply because heredity does not involve geometrical elements, in reality is only very inadequately represented by geometry.

Of what, then, does heredity consist? Of a vast number of extremely subtle influences determined by laws as yet but dimly comprehended, but few of which have as yet found adequate expression. Among others there are three laws or principles for which we do not know any name, but which, in their effects, are generally recognized among breeders of animals. First among these may be named the influence of race, which among breeders of animals would be equivalent to "a breed" and the varieties within it. A genealogical register of a family bearing a surname found among the seventeenth century settlers of New England may be fitly compared to the pedigree of any family of thoroughbreds, as, for instance, the St. Lamberts among Jerseys, or the Douglas among Ayrshires. It is often said that human beings are as to their breeding mongrels; but such a statement is not generally true, nor is it particularly true when applied to the better class of families who from the English middle class came to this country 250 years ago, and have here with a goodly showing of self-respect intermarried almost or quite exclusively in their own rank of social, religious, and political race. There has thus grown up under unwritten social customs a race, or breed, of New England citizens of pure English ancestry as carefully bred as to race and as to families within the race as any breed of thoroughbred cattle, a century older than the oldest breed in the world. Many of these families run back for several centuries in England before they emigrated to this country. We may, therefore, expect to find, and do find if we know where to look for them, the same effects of race that are observed in thoroughbred cattle, namely, persistency of race types as to the whole and of family types as to families. This persistency in the race is maintained through the persistency of the family type, and the family type is perpetuated by breeders through conformity with biological principles that, so far as is known, are active among all domesticated animals, and man considered as an animal.

It is a well-recognized fact that the first pregnancy of a female is of much greater importance as determining the character of her offspring than any and all others, and also that the influence of the male as determining the character of the offspring increases with each successive pregnancy of the female by the same male. Every breeder of cattle knows that a pure-bred heifer that is first coupled with a mongrel bull is ruined for breeding purposes, as the impression and characteristics of the first male will appear in the offspring of every succeeding pregnancy. A mare that is first coupled with a jack and gives birth to a mule will afterwards, when coupled with a stallion, give birth to horses with long ears and scant tails and saddle-marks across the shoulders and stripes upon the legs resembling mules. Horses marked in this way are very common in regions where mules are produced. A very handsome Morgan mare was once owned by an acquaintance of the writer that possessed unusual speed and great endurance. The condition of her udder showed that she had once borne a foal. She was coupled with a very fine thoroughbred stallion, and brought forth a perfectly worthless Canadian scrub, without a single characteristic of either parent.

Among human beings the infrequent marriage of widows as compared with the whole number of marriages renders a reference to examples in demonstration of this law of heredity somewhat difficult. Cases are not wanting, however, where women of high character have unfortunately married profligate first husbands, and have sought in a second marriage with men of honor to realize the happiness of which they had been deprived, only to see in bitterness the vices of the first husband return to curse them in the offspring of the second union. In less unfortunate marriages of this character the father fails to recognize in the aliens around his board either the virtues or vices of his kindred, and the personal appearance of his children is as foreign as their other characteristics.

The conditions under which animals are bred offer but few opportunities to demonstrate the increasing influence of the same male through successive impregnation of the same female. Among human beings illustrations are very numerous. Certain aspects of this case — perhaps the lowest — the marriage of colored women with white men and colored men with white women, are the most remarkable. Among the children of such unions the influence of the white man upon the colored woman produces a series of types with more or less strongly marked negro features and a successively lighter skin until a nearly white negro is produced, an example of which we once saw in Louisville, Ky., much more repulsive in appearance than a veritable negro. When a colored man marries a white woman a series of increasingly black children is the result. The children of such unions are in every sense mongrels, and are found to resemble in many respects mongrels among animals.

In every family that can be studied in successive generations the action of this principle explains many seemingly inexplicable facts. To go back to the descendants of John Doe, we have asserted without any fear of possible contradiction that there are "family traits" that may be observed among those who are separated from a common ancestor by six or seven generations. In one case among them a most extraordinary personal likeness was preserved through three generations. They were the fifth, sixth, and seventh generations from John Doe; they were the fifth, third, and fourth children of their respective parents. In the eighth generation the type was continued in the first child, but it is much less marked, and in the ninth generation, the son being the second child, with the influence of the mother very strong. Still, in both the eighth and ninth generations the Doe traits are unmistakably present. In the ninth generation the fourth child is a daughter, and generally admitted to be a Doe in every fibre of her being. Here is another case from the Does. In the sixth, seventh, eighth, and ninth generations a daughter has appeared in the relations of niece, aunt, great-aunt, and great-great-aunt. We have known them all. In the sixth generation she was the second child, in the seventh the sixth child, in the eighth the fifth child, and in the ninth the third child. They were and are all lighter in complexion than the others of their respective families, with a peculiar cast of features, resembling each other more than they resemble their mothers or sisters. They

also possessed in common certain temperamental peculiarities, and their voices would instantly remind the hearer of each other.

Now to go back to our friend's chart, where the perpendicular line represents nine successive male Does. If every one of these eight male Does was a first child of each successive marriage, the Doe influence would be at a minimum and the transmission of the peculiar traits of the Does most feeble and uncertain. If each one of the eight was the youngest child in a family of six, the persistency of Doe traits would become more intense with each successive generation. For some purposes the tradition of the seventh son of the seventh son becomes something more than a mere superstition. If, however, in the third or fourth generation the surname was transmitted by a son whose father was the second husband of a widow who had borne children by a former husband, the family traits of the Does would doubtless be conspicuous by their absence. There have been no such marriages in the line of Does above mentioned for eight generations.

Too little is known concerning this subtle and intricate question to enable one to venture an estimate of the percentage of tendency towards family traits along the line of nine Does as compared with any other line from any given individual of the two hundred and fifty of the first generation from the ninth; but we think the challenge of our friend has been accepted and met, and sufficient proof has been submitted to show to any candid mind that a vastly greater proportion than one two hundred and fiftieth may be expected to flow along the line represented by the eight individuals who transmit the surname from the first to the ninth generations. Indeed, we think we are treading on solid ground when we assert that in the letters written by the Doe who was an ecclesiastic of the thirteenth century, and which have come down through six hundred years to the present time, the "Doe traits" are strikingly evident.

We should be gratified to learn if others familiar with other families than the Does are not fully satisfied that "family traits" are very persistent along the line of the surname.

AN ENQUIRER.

"SCIENTIFIC" GENEALOGY — A REJOINDER.

FROM the commencement of interest in the history of old American families the marked tendency has been, and is, for the chronicler to depart from the strict records, and attempt to trace reputed traits and oftentimes marked physical characteristics of the original emigrant ancestor and founder of the family through eight and nine generations, and connect the aforesaid qualities with the persons now bearing the surname descended from him. And a pride in one's ancestry is not reprehensible so far as these ancestors were healthy, energetic, honorable citizens, not less as honoring them than as taking satisfaction in the probably clear minds and strong constitutions we inherit, barring an untoward environment. But where the historian, considering a living person's little tricks of habit, peculiarities of appearance, and the like, ascribes these as in fact undoubtedly inherited from the original ancestor of nine generations previous, it becomes necessary to direct the attention of the sincere seeker for truth to certain self-evident truths, which are none the less patent and far-reaching, if comparatively unheeded and little studied in the past. To instance an average case: John Brown is a living person of the ninth generation from the first James Brown, who, we will suppose, came to this country about 1630. A simple mathematical computation shows that John Brown has had 510 distinct ancestors in these generations, of whom, at a liberal estimate, 50 may be duplicates owing to intermarriage of relatives. If there is a person in New England who can state his ancestry since 1630 completely with proofs, the writer, after some years careful research and acquaintance with men pursuing such study, has failed to discover him. As a matter of fact, the genealogist who has discovered and proved half his grandparents is exceedingly uncommon, and probably not one-twentieth of the persons who have chronicled the genealogy of a surname have known over 50 of their ancestors. They have paid, usually, almost their entire attention to the one surname in which they were interested and which filled their mind to the exclusion of the greater number.

In the writer's opinion he probably inherits from the 256 emigrant ancestors such a blending of qualities and physical characteristics, that to ascribe peculiar traits of any particular one of them to a living descendant is a fallacy, unsupported by reliable circumstantial evidence and persisted in in spite of the fact that the 255 other ancestors of the first American generation had qualities and traits of which he knows nothing, nor even the names of most; and probably, as far as the historian can surmise, each of the other 255 were fully as instrumental in bequeathing peculiar qualities, etc., as the one whose surname sexual distinction has given him. How does the matter look faced in the following manner? James Brown was one of 256 of John Brown's original American ancestors; is it likely or probable or a desirable thing for a genealogist to prove that $\frac{1}{256}$ part of the whole, when, as far as mortal can tell, all had probably much the same influence on the descendant, that this $\frac{1}{256}$ part has determined in a prominent and noticeable way the identity of the descendant? If one of the 256 were a person of color, an African, in the fourth generation, much more the ninth, the scientists tell us the color trace is well-nigh obliterated as far as discoverable. The writer does not for a moment combat the well exhibited inheritance of peculiar appearance and traits of a man from his father or mother, his grandparents or great-grandparents, or in rare cases from great-great-grandparents, but beyond these limits the historian has little to encourage him in his attempt beyond uncertain and traditionary tales.

The writer is descended from two ancestors, for both of whom the respective historians have claimed qualities and pronounced appearances of person, and remarked them prominently in all the living descendants; and the writer as yet fails to discover, after a candid if somewhat anxious self-examination, any of these characteristics. How often the mother's relatives fondly see clearly her look, her habits and character in a child for whom the father's family claim the self-same points; and the writer is familiar with the facts in a case where well-meaning friends have told parents of the strong likeness a child bore them, not knowing the child to be of entirely foreign parentage — adopted. My experience has been that a good part of the grounds for the side of the question I disbelieve in are as insecure as those just instanced. It is an old saying that one finds what he seeks for; that is, he thinks he finds it, which answers the same purpose for him.

To compare the human race to any of the brute creation as regards this question is unjust and mistaken, as in selection, cohabitation, and kindred vital processes, the cow — for instance, of Jersey or other strain — has the advantage of careful and long-continued selected inbreeding, where the human being is the result (even for nine generations) of over

four hundred different stocks as against a very few mated in the case of the cow.

Such deductions as the writer opposes are, in his opinion, misleading, rest on unstable bases, namely, imagination and tradition, and are better avoided and the time better spent in legitimate genealogical work. To eke out with such matter what is feared will otherwise prove dry and without interest is unscientific and wrong. With the belief that this review, though hasty, may appeal to the common sense of the conscientious reader the subject is left, the writer believing a simple brief statement of fact preferable to a long and confusing rehash of unnecessary arguments.

VERITAS.

A COMPARISON OF THE DESERTS OF NORTH AMERICA WITH THOSE OF NORTH AFRICA AND NORTHERN INDIA.

IN a paper read before the Geographical Society of Berlin Jan. 2, Professor Johannes Walther made some interesting observations on the deserts of North America, North Africa, and Northern India. It was with the object of being able, from his own observations, to institute a comparison between these deserts that the author took the opportunity afforded by the meeting of the Fifth International Congress of Geologists of visiting the North American deserts.

The most striking contrast between the North American deserts and those of north Africa consists in the far greater wealth of vegetation which characterizes the former. In every direction the eye is met by yellow blossoming halophytæ, silver-gray artemisiæ, and prickly cacti; between the opuntias are found cushions of moss, and at the foot of the hills juniper-trees seven feet high with trunks a foot thick. Such are the features of the landscape of the deserts of Utah, where plant-growth has completely disappeared only in those places where the saline composition of the soil kills vegetation. The Van Horn deserts in western Texas, the Gila deserts in California, are equally rich in vegetation; the altitude of those deserts above the sea level makes no important difference. Either the mean rainfall in the American deserts is greater than in those of Africa, or else the flora of the American deserts is better adapted to a dry atmosphere. Although the deserts of the two continents present fundamental differences as regards vegetation, there is a surprising similarity between them as regards certain important and characteristic desert phenomena, especially with regard to the topography of the country. There is the prevalence of plains, with mountains rising from them like islands, with no intervening heaps of *débris* passing from the plains to the steep mountain slopes. This phenomenon is the more striking as there are no rubbish deltas, even at the outlet of valleys 1,000 feet in depth. Another feature common to both is the large number of isolated "island" mountains and of amphitheatre formations in the valleys; also the intensive effect of insolation, which splits the rocks and flints, and disintegrates the granite into rubbish. The denudating influence of the wind is visible not only in the characteristics of the surface forms just mentioned, which differ in important points from erosion forms, but it can be directly observed in the mighty dust-storms which rush through the desert. In North America, as in north Africa, four types of denudation products are found — gravel beds, sand dunes, loam regions, and salt deposits.

In view of such agreement of important and incidental geological phenomena in regions so remote from each other, the phenomenon of desert formation must be considered to be a telluric process which runs its course according to law, just as the glacial phenomena of the polar zone or cumulative disintegration in the tropics. Water, which is such a predominating influence in temperate regions, destroying the rocks, dissolving them chemically, while the frost pounds them up mechanically, has in the deserts about sixty days in the course of the year to do its work of destruction among the rocks and to carry away *débris*. During the remaining 300 days of the year denudation in the desert is at a standstill, but not entirely. Small and large stones are split by the heat, and huge granite blocks are severed in two by immense fissures; and thus the rocks are destroyed by dry heat at a time when denudation by means of water is reduced to a minimum. In this way the process of destruction goes on in one form or other uninterruptedly throughout the whole year. The disintegrated material is then carried away by the desert rains or by the storms, which whirl great masses of loose matter high into the air and transport it further. It is clear, therefore, that dry denudation possesses an intensive power which, although not equal to the denuding effect of water, may be compared with it.

NOTES AND NEWS.

IN the death of Thomas Hockley, which occurred on the 12th of March, in Philadelphia, the scientific institutions in that city have suffered a serious loss. Mr. Hockley was a member of nearly all the local learned societies, and as an officer of many of them did much to promote scientific work. As treasurer of the University Archæological Association, the Department of Archæology of the University of Pennsylvania, the Numismatic and Antiquarian Society, as well as of the Zoological Society and the Fairmount Park Art Association, he gave his services without pecuniary profit or even the prominence which he deserved, and he will be remembered as one who did much to advance public interests through self-sacrificing devotion to the general good.

— At the Berlin Geographical Society, on Jan. 2, Herr L. Cremer read a report upon the journey undertaken by him in the summer of 1891 to Spitzbergen, with the object of exploring the coal beds there. The author in the course of his six weeks' journey travelled along the west coast as far as Magdalena Bay, and found, besides the coal beds in Ice Fjord and Bell Sound, which were discovered by Swedish explorers, various other coal-veins which appear to be well worth working.

— In the second lecture of the Lecture Association of the University of Pennsylvania's course on "Early Religious Ideas," on Feb. 28, Mrs. Cornelius Stevenson spoke as follows: "The primitive animism of the men of the age of stone always remained at the foundation of the religion of Egypt, and continued to develop its superstitious practices, whilst the national faith had assumed an ever-growing metaphysical character. At the opening of history the Egyptians had already recognized the unity of the life-giving principle, but whatever may have been the ideas of their advanced thinkers with regard to the nature of the unity, there is no doubt that, to each local worshipper, the god he prayed to was strictly the god worshipped in his locality — and this did not exclude the recognition of the other gods. The whole structure of the Egyptian religion rested upon a belief in the divine nature of life, and, in its immortality through transformation, man could attain his immortality, not (in early times) through his merits, but through physical means. Hence the precautions taken to preserve the remains, and the statues made in his image, on which the spirit might lean in case his body should be destroyed. Metaphysical speculation on the nature of the universal soul grew out of solar worship, and, influenced by Aryan contact, at last superseded it. But even then the primitive animism, preserved in the cultus of the sacred animals regarded as incarnations of the divinity, although it assumed in the sanctuary a symbolic char-

acter, took a larger place than ever in the popular religion, and so it came to pass that fetishism was never more conspicuous in Egypt than at the time when the ideal absolute God, 'self-begotten,' had been realized in man's most noble thoughts, and been fitly described in man's most noble words."

— The death, on Feb. 20, of Professor Hermann Kopp is announced by *Nature*. He died at Heidelberg, after a long and painful illness, in the seventy-fifth year of his age.

— The friends of the late Henry Edwards have subscribed $10,000 and the American Museum of Natural History has subscribed $5,000 for the purchase of the Edwards Entomological Collection, consisting of more than 350,000 beautiful specimens of insect life, and this scientific treasure goes to the American Museum. The widow of Mr. Edwards will receive $15,000. This enterprise has been carried through by A. M. Palmer, and is one of the many good works done by that energetic manager and public spirited citizen of New-York.

— Two international scientific congresses are to be held at Moscow in August, as we learn from *Nature*. One will relate to anthropology and archæology, the other to zoology. There will be exhibitions in connection with both congresses, and appeals have been issued for the loan of objects which are likely to be useful and interesting. Among the things wanted for the Anthropological Congress are phonograms of the language and songs of different races. French will be the official language of the two meetings. The more important papers will be printed before members come together, so that discussion may be facilitated.

— The prevalent notion that the mistletoe is injurious to the apple or other tree on which it grows is disputed, says *Nature*, by Dr. G. Bonnier, the professor of botany at the Paris Sorbonne, who maintains, not only that this is not the case, but that it is actually beneficial to its host, the relationship being not one of simple parasitism, but rather one of symbiosis. He determined from a series of observations on the increase in the dry weight of the leaves, that, while in summer the mistletoe derives a large portion of its nutriment from the host, in winter these conditions are reversed, and the increase in weight of the mistletoe is less than the amount of carbon which it has obtained from the atmosphere — in other words, that it gives up to its host a portion of its assimilated substance.

— In order that the exhibition of weeds at the World's Columbian Exposition may be large and representative of all sections of the country, Byron D. Halsted, New Brunswick, N.J., having this feature in charge, asks for specimens of the worst weeds from all States and Territories. It is suggested that each botanist or local collector who may be pleased to assist in the work secure at least three specimens each of the worst weeds in his State or section. In making the specimens it is important that the following points be considered: 1. Seeds are especially desired; 2. seedlings are important in various stages of development; 3. the root system is essential, also, 4, the flower and flower cluster, and 5, the seed vessel. It may be necessary, therefore, to secure these various essentials at different times during the coming season. If the weed is a large one, stress is laid upon the procuring of specimens while they are small enough so that the whole plant, roots and all, can be mounted without bending upon an herbarian sheet of ordinary size; that is, not over a foot in length. They are not to be mounted, however, by the collector. That unnecessary duplication may be avoided, persons who contemplate collecting specimens should signify their intention to Professor Halsted, and allotments will then be made, the assignments depending largely upon the locality. It is hoped that each State in the Union may be represented by specimens in this national exhibit of our worst weeds. The collecting must all be done during the present season, and the specimens sent in for mounting, labelling, etc., by Dec. 1.

—The January number of *Petermann's Mitteilungen* contains an interesting map, by Dr. E. Hahn, of the "Kulturformen" of the earth, showing the areas within which different methods of getting a living out of the soil are employed. Dr. Hahn discards the old-fashioned division into hunters, fishermen, shepherds, and agriculturists as containing a fundamental error; for these three successive "stages" he substitutes six "forms." The simpler forms may have been more widely spread in the earlier periods of the world's history, but all exist side by side at the present time, as methods of cultivation arising from the physical and climatic conditions of the regions in which each is employed. The simplest form is hunting and fishing. The large area which Dr. Hahn assigns to this form in North-eastern Europe and Asia is somewhat remarkable. Next comes what Dr. Hahn calls Hackbau, which we may translate by hand-tillage. This form is characteristic of Central America, the basins of the Orinoco and Amazons, tropical Africa, Further India, and the Malay Archipelago, with the exception of certain coast districts. Plantations, the third form, are found wherever coffee, rice, sugar, are grown on a large scale. Next comes what Dr. Hahn calls "our European and West Asiatic agriculture," characterized by the use of the plough, the employment of oxen as beasts of burden, and the growing of corn. Originating in Mesopotamia, this form has spread with but slight changes over all the more civilised parts of the world. With regard to the fifth form, cattle farming, Dr. Hahn states that the only circumstance which was considered characteristic of the shepherd's life was the fact of his being a nomad. This excluded all whose herds consisted of other animals than sheep or goats. Larger cattle require better food than could always be obtained on the march. He therefore puts all owners of herds in one category, whether nomads or settlers. They are spread over all Central and Northern Asia, and are found in Arabia, on the borders of the Sahara, in South Africa, and in certain portions of Northern Europe, America, and Australia. A curious feature is a long, narrow strip extending from Somaliland into South Africa at varying distances from the East Coast; by his own account, however, it should not have been reckoned to the cattle-farming regions, as the cowherds make little or no use of the milk given by their animals, which are looked upon as mere standards of value and wealth. The last is the elaborate form of cultivation in small plots, which is the only method by which the exhausted soil of China can be got to maintain its huge population.

— Dr. Ira Remsen, professor of chemistry in Johns Hopkins University, Mar. 11, addressed a communication to President Harper of the Chicago University, declining his invitation to a professorship in that institution. Professor Remsen's decision is the cause of great gratification in Baltimore university circles.

— Dr. C. W. Stiles, medical zoologist of the U. S. Department of Agriculture, has been elected foreign corresponding member of the Société de Biologie, Paris, France, to fill the vacancy caused by the death of Professor Joseph Leidy of the University of Pennsylvania.

— Joel Chandler Harris's new book, "On the Plantation," is said to contain fresh stories of Brer Rabbit, Brer Owl, Brer Buzzard, and other characters immortalized in "Uncle Remus." Much of the book, however, is understood to be the story of the author's own life, and it is described as a singularly fascinating narrative. E. W. Kemble has illustrated the book, which is to be published immediately by D. Appleton & Co.

— E & J. B. Young & Co. of New York have sent us a copy of the "Star Atlas," for amateur astronomers, with explanatory text by Dr. Hermann J. Klein, and translated and adapted for English readers by Edmund McClure, M.A., M.R.I.A. It contains eighteen maps printed by E. A. Funke, Leipsic, and is published, under the direction of the Committee of General Literature and Education appointed by the Society for Promoting Christian Knowledge, London, at the low price of three dollars. The maps show all the stars from 1 to 6.5 magnitude between the North Pole and 34° south declination, and all nebulæ and star clusters in the same region which are visible in telescopes of moderate powers. The "Atlas" is an imperial 4°, strongly bound in cloth, with illuminated cover, and contains 72 pages of descriptive text, with 18 charts beautifully printed from heliographical reproductions of photographs. It is a model of its kind, being handy, compact, accurate, and of practical service to amateurs, comet-hunters, and students.

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THE NEW STAR IN AURIGA.

ON Feb. 2 of the present year Professor Copeland of the Edinburgh Observatory received an anonymous postal card upon which was written the following: "Nora in Auriga, in Milky Way, about two degrees south of Chi Aurigæ, preceding 26 Aurigæ; fifth magnitude, slightly brighter than Chi,"

In No. 1,164 of *Nature* the discoverer of the new star establishes his identity by a short notice of the manner in which he found the Nora. His name is Thomas D. Anderson, and he lives in Edinburgh, Scotland. The following is an abbreviation of his statement: —

"It (the star) was visible as a star of the fifth magnitude for two or three days, very probably even for a week, before Professor Copeland received my postal card. I am almost certain that at two o'clock on the morning of Sunday, January 24, I saw a fifth magnitude star making a large obtuse angle with Beta Tauri and Chi Aurigæ, and I am positive that I saw it at least twice subsequently during that week. Unfortunately, I mistook it on each occasion for 26 Aurigæ, merely remarking to myself that 26 was a much brighter star than I used to think it. It was only on the morning of Sunday, the 31st of January, that I satisfied myself that it was a strange body."

Mr. Anderson then, in a frank manner, speaks of his knowledge of astronomy and the instrumental means at his disposal. Of the former he says, it is of meagrest description, while the latter consist of a pocket telescope and a copy of Klein's "Star Atlas."

Since discovery the new star has been very generally observed at all the prominent observatories in Europe and America. The telegram announcing the discovery was received at the Naval Observatory on the afternoon of February 6. I observed the star the same evening with our 4-inch comet-seeker. To me it then appeared about half a magnitude brighter than Chi, and was of a dark straw color. Using a low-power eye-piece, I could bring both Chi and the new star into the field at the same time. With the meridian transit I observed the star for its Right Ascension, and Professor Frisby, with the 9-inch equatorial, determined its declination. The large transit circle is now dismounted, undergoing repairs prior to its removal to the new Observatory. The place of the star for 1892.0 is, R.A. 5 h. 25 m. 3.4 s.; Dec. $+30°$ 21′ 41.0″. The magnitude was 4.6.

Professor Copeland, upon examining the star with a prism between the eye and the eye-piece of the 24 inch reflector, observed that it seemed to possess a spectrum very much like that of the Nora of 1886, the recognized variable, named Tau Coronæ.

The star was photographed at Harvard College Observatory on Dec. 1, 10, and 20, two months before it was known to be a new star. This came about by Prosessor Pickering and his assistants photographing the region of the sky in which the Nora is located in the course of the photographic mapping of the stars and their spectra now being carried on at Harvard College Observatory. On the 1st of December, 1891, the Nora was faint, on December 10 bright, and on the 20th maximum. Spectrum unique. The above is a statement given out by Professor Pickering.

From No. 3,076 of the *Astronomische Nachrichten* we glean the following interesting points relative to the new star. At Bonn, Feb. 2, Professor Kustner made a careful comparison of the magnitude of the Nora with three neighboring stars. He estimated it as half a magnitude fainter than Chi, little, if any, brighter than 14 Aurigæ, and decidedly brighter than 26 Aurigæ, the resulting magnitude being 5.5.

The region of the sky in which the new star is located was examined for the Bonn Durchmusterung by Schonfeld, March 26, 1856, and Kreuger, Feb. 16, 1857; also again by Kreuger in the revision-zone, March 23, 1858, on which date he observed a star of the 9.5 magnitude distant from the place of the new star 2.5s. and 0.8′. This faint star has, however, been observed anew at Bonn and Hamburg.

At Upsala on Feb. 2 its magnitude was estimated as 5.5, and its color as yellow. On observing its spectrum a very bright line was seen at the red end, and another in the blue-green. On Feb. 3 the star was almost as bright as Chi, but the next night it was fainter.

At Kiel, Mr. Kroeger observed the spectrum on Feb. 2. It was brilliant and visible throughout all the colors from the red far into the violet. A broad, black band was seen near C. In the red and orange there were three groups of lines, separated by equal intervals and of nearly equal width and intensity, all wide, but faint.

Mr. Yendell, living near Boston and an expert in variable star observing, is authority for the statement that between Feb. 9 and 22 the star appeared to him of a bluish white color with no tinge of red. This observation of the color of the star is directly opposite to that reported by the English and German observers, and also that of mine made on several occasions. The star has each time that I have observed it, ten or twelve times, always appeared to me of a dark straw color. I have observed it with two instruments, the 4 inch comet-seeker and the meridian transit. Mr. Lockyer, the English spectroscopist, has secured several photographs of the spectrum. He estimated the color of the star as reddish with a purple tinge. Mr. Fowler, one of his assistants, estimates it as reddish yellow; while another, Mr. Baxaudall, estimates it as purplish.

Mr. Lockyer, commenting upon the photographs taken on Feb. 7, says, "The bright lines *K*, *H*, *h*, and *G* are accom-

panied by dark lines on their more refrangible sides. With the 10-inch refractor and Maclean spectroscope, C was seen to be very brilliant, and there were four very conspicuous lines in the green. Several fainter lines were also seen, and a dark line was suspected in the orange. Mr. Lockyer noticed that some of the lines, especially the bright ones near *F* on the less refrangible side, appeared to change rapidly in relative brightness, and this was confirmed by Mr. Fowler. All the lines in the spectrum of the Nora are broad, although in a photograph of the spectrum of Arcturus, taken with the same instrumental conditions, the lines were perfectly sharp. It is also important to note that the broadening of the lines is not accompanied by any falling off of intensity at the edges, as in the case of the hydrogen lines in such a star as Sirius.

Judging from the testimony here given, it is undoubtedly true that a new star has appeared to our vision, and given astronomers an opportunity to study its make-up. It cannot, however, be said that the object has suddenly come out to its present magnitude. The probability points to the fact that the new star is a variable of long period, and one that at its minimum sinks to invisibility. The verification of this statement must rest upon future observations. We have no record that indicates that a star as bright as the tenth magnitude has ever occupied the place in which the new star has been found. All speculation as to its future history is valueless, because we know nothing of its past history.

The star is now being constantly watched by all the powerful telescopes and spectroscopes of the world, its image is almost nightly caught upon the photographic plate handled by men of experience, and it will not sink back into invisibility without leaving behind a record of great value.

GEO. A. HILL.

Washington, D.C., March 9.

THE TIMBER TREES OF WEST VIRGINIA.

THE Guyandot Coal Land Association, which is the owner of over 200,000 acres of land in the basins of the Guyandot and Twelve-Pole Rivers, in the Counties of Wayne, Logan, and Lincoln, near the south-west corner of West Virginia, has recently had the large timber trees on about 9,000 acres of land counted and measured, thus securing reliable information as to the actual present condition of the Trans-appalachian forests of that region. The diameter of the trees was taken, with calipers, at about four feet above the ground; then the length of the trunks suitable for cutting into logs or for long timber was carefully estimated by the eye of the skilful timber measurer. No trees were measured that were less than eighteen inches in diameter, except the hickories and locusts, which were measured from ten inches and upward. The detailed tables of this counting and measuring have been furnished me for inspection. I think that a summary of the detailed count of the results of the measurements on one single tract will be of interest to the readers of *Science*. For this purpose I select a tract of 655 acres on the top of the dividing ridge between the waters of the east and the west forks of Twelve-Pole River, two miles north-east of the new mining town of Dunlow on the Ohio extension of the Norfolk and Western Railroad, about forty miles by rail south-east from the Ohio River at the new town of Kenova, one named from the abbreviation names of the three States that are there adjacent.

About one-half of this particular tract of land, say 325 acres, lies on the east side of the dividing ridge, slopes from the divide and faces to the north of east, and drains into East Twelve-Pole River. The other 325 acres lies on the west side of the divide, slopes to the south of west and drains into West Twelve-Pole River. The crest of the divide is not far from 1,000 feet above the level of the sea. The following statement shows the whole number of large timber trees now growing on this tract of 655 acres, by kinds and exposures. This tract was found to have growing on it, 16,989 trees; an average of about 26 large timber trees to the acre.

Kinds of Trees.	Western Slope.	Eastern Slope.	Trees of Each Kind.
White oaks	1,256	730	1,986
Chestnut oaks	3,803	2,083	5,886
Black oaks	734	366	1,100
Red oaks	494	242	736
Hickories	1,556	991	2,547
Chestnuts	1,203	697	1,900
Locusts	148	59	207
Maples	224	106	330
Birches	159	174	333
Tulip-poplars	386	472	858
Pines	563	376	939
Lindens	93	74	167
Totals	10,619	6,370	16,989

The proportionate percentage of the hardwood trees of the above table, all those named except the tulip-poplars, pines, and lindens, is quite remarkable. The softwood trees are: 1,042 on the westward slope and 922 on the eastward slope, a total of 1,964, or less than ten per cent of the whole number of trees on the western slope, over fourteen per cent of those on the eastern slope, and nearly twelve per cent of the whole number of trees, leaving over ninety per cent of the westward slope trees and near eighty-six per cent of the eastward slope ones as hardwoods. So these hardwood trees constitute eighty-nine per cent of all the large counted and measured trees now growing on this tract of land. The figures of the table indicate that the large hardwood trees are more abundant on the westward exposure of the dividing ridge.

The record of the diameter and length of each of the trees embraced in the above list, that now lies before me, shows that most of these trees are of large size, the oaks ranging in diameter from eighteen to sixty inches, and in trunk length from twenty to sixty feet. The hickories range from ten to twenty-seven inches in diameter, and from fifteen to sixty feet in trunk length; the pines from eighteen to forty inches in diameter, and twenty to seventy feet in trunk length; and the tulip-poplars from twenty to sixty-six inches in diameter, and from thirty to eighty feet in trunk length.

JED. HOTCHKISS.

Staunton, Va.

THE SPECIALIST.[1]

"MANY scientific men of excellent reputation are to-day guilty of the crime of unnecessary and often premeditated and deliberately planned mystification; in fact, almost by common consent this fault is overlooked in men of distinguished ability, if, indeed, it does not add a lustre to the brilliancy of their attainments. It is usually regarded as a

[1] A few thoughts suggested by the address of the retiring president of the American Association for the Advancement of Science, delivered at the Indianapolis meeting, August, 1890, from which the quotations here given are taken.

high compliment to say of A, that when he read his paper in the mathematical section no one present was able to understand what it was about; or of B and his book, that there are only three men in the world who can read it." . . . "There is a strange and unwholesome prejudice against making science intelligible, for fear that science may become popular." . . . "There is an unfortunate and perhaps a growing tendency among scientific men to despise the useful and the practical in science, and it finds expression in the by no means uncommon feeling of offended dignity when an innocent layman asks what is the use of some new discovery."

The progress of science during the last half-century has been especially remarkable. We are enjoying the product of the mental endeavor of all the past; one forward step has been followed by another, until, in scientific attainments, we are far in advance of the broadest views held a century ago. The age of the earth, its motion and gravitation no longer cause excited controversies. The existence of fossils now occasions no alarm; whether found upon the mountain-top or in the depths of the sea, the explanation is equally satisfactory.

Geology, like the fabled giants of old, has taken wonderful strides; has stepped off, as it were, a thousand years at a pace, and the sermons inscribed on nature's tablets have quickened the understanding and broadened human conceptions. Our knowledge of astronomy and geology has enabled us to cast out the coiled serpent of superstition, and given us truth in its stead. Can the most fertile imagination conceive of loftier heights than chemistry has reached when it is able to measure the five-millionth part of a grain of our far distant sun?

The use of anæsthetics is almost entirely a growth of the last fifty years; like a beneficent angel, conquering pain, annihilating as with magic breath the sufferings of thousands of human beings. Witness now the electric light, and think in comparison of the feeble glimmer of tallow candles. Not many years ago even the lonely light-house tower afforded nothing better than tallow candles to guide the traveller on the storm tossed sea. Until recently electricity has been like a wild ungovernable force, but skilful hands are bringing it more and more under subjection. It is taking the place of brawn and muscle. The courier is no longer needed to despatch our messages on land or by sea. Here and there it has been harnessed to the street railway, and its practical applications are numberless.

It is but a few years since we have had any definite knowledge of bacteria, but who now is not familiar with at least the depredations of these insidious foes? Foes we may well call them when it is estimated that four-fifths of all diseases of humanity are caused by these pathogenic microbes, and that they destroy more lives than war or famine, fire or shipwreck.

Who has enabled science, this second Hercules, to open nature's doors and bring forth her treasures? Who is it that has gleaned her truths and read her laws, but he who has made a special study of them? There is not a practical application of a force of nature and scarcely a material substance that we use which has not resulted from the experimental researches of specialists. Is it not the geologist who has told us the story of the earth? Is it not the chemist who analyzes the sun, the biologist who unfolds for us the life histories of our invisible foes?

It is obvious that a geologist must have worked in geology, that a botanist must have done special work in botany; and in order to have taken up special work they must necessarily have done elementary work. There must be a foundation laid before the super-structure of special work can be reared. There is no royal road to knowledge, and there is no short cut to special work. The disciplinary work which leads up to special work must be done by each individual for himself; skill in manipulation cannot be acquired at second-hand, and judgment is gained through experience alone. The specialist does not simply devote a few years to his chosen work and imagine his investigations cease when he takes his Ph.D.; not at all; the devotion of a lifetime is bestowed on his speciality, which broadens out before him, luring him on with the mysterious charm of unexplored labyrinths. The work of the specialist is to investigate, to find out the truth. He must divest himself of all prejudice, and with unbiased mind "read from the manuscripts of God" the truths there written, whether found on the granite rock or in the story of embryonic life

In the simplest forms of life there is no specialization of organs. Take, for example, the amœba, which is but a tiny speck of protoplasm — an undifferentiated mass; having no organs of locomotion, no mouth, no stomach, it yet moves about, finds its own food, appropriates and digests it. How does it accomplish these complex operations? It moves by pushing out a tiny slimy thread of protoplasm, and the whole mass flowing after it; when it comes in contact with an object which will serve it as food, it flows over it, wraps itself around it, absorbs the nutritious parts, and flows away from the *débris*. Thus this little animal is at times all legs, again all mouth, and still again all stomach, but possesses no differentiated specialized organs This we call the lowest type of animal life; the higher we ascend, the greater the specialization, reaching its culmination in man. The stomach prepares the food, the blood distributes it, the lungs take charge of ventilation, the liver looks to sanitation; the heart is general manager, and the brain, if you please, cultivates "social science." It is plain to everyone that the work done by the amœba is extremely rudimentary compared with that accomplished by man. The amœba fulfils the two essential purposes of life, maintenance and reproduction; mankind does the same, but who can measure the difference in degree?

Is not the work of the general student and that of the specialist in a measure comparable to that of the lowest and highest types of life? The general student who claims an equal familiarity with all branches of knowledge possesses but the rudiments of each. And mark the interdependence of the most specialized organs! No one of them can carry on the work alone; and it is thus with the sciences, advancement in any one of them means general advancement of the whole commonwealth.

All organic life is built up of cells; take any herb, shrub or tree; its tissues are made up of individual cells: each cell is filled with protoplasm, and though the cell walls are apparently continuous, having no visible openings even under high powers of the microscope, it has nevertheless been found that infinitesmal streams of protoplasm extend from cell to cell, connecting the entire plant as with a sympathetic nerve into one continuous whole. And so there is an invisible cord which binds all nature into one harmonious unity. There is a kinship, a brotherhood, a great sympathetic nerve which runs through all branches of natural science. To the general student they may appear independent of each other, but the specialist digs down beneath the surface where the roots are found ramifying in all directions; meeting, overlaping, interlocking with each other.

What can the specialist in physiology do without some knowledge of physics and chemistry? Geology, zoology and botany are hedged with problems whose solution are interdependent. If the sciences are united as with a network, a specialist in any one of them must have some knowledge of those which claim near kinship with his own.

But the specialist is accused of couching his discoveries in language which is unintelligible, of being unpractical; of trying as it were to hide his light under a bushel. Are these accusations well-founded? Are they true? Is it reasonable to suppose that one who studies in nature's laboratories a lifetime should think it desirable to erect a wall about science lest it become popular? Are not specialists numbered among the world's great leaders? To whom is due the great advancement in medical science but to specialists, who in their laboratories patiently sought for answers to problems of whose importance the common mind has no conception? A few years ago a war of words waged high over the theory of spontaneous generation; who but the specialist was able to settle forever this formidable question. Did the world imagine for one moment that the investigations which resulted in the establishment of the "germ theory" would lead to practical results? Physicians, surgeons and boards of health but apply the principles elucidated by the specialist. Enter a laboratory and behold a specialist in the midst of his bacteriological investigations. Would the observation be likely to call forth predictions of practical results? You would see "cultures" under bell-jars, microscopes, and various apparatus; "but," you exclaim, "what bearing do they have on human welfare?" Under the supervision of the bacteriologist they touch the very heart of humanity, bidding it look to its drains and sewers, to its drinking water, to the air it breathes and the purity of its food. Our knowledge of disinfection comes from the same source; who can measure the practical results? Practical applications of investigations in *fungi* reach out to the horticulturist and the farmer, who anxiously look to the specialist for remedies against their microscopic enemies. When the results of the investigations of specialists radiate like the rays of the sun to all humanity, offering balm for its wounds, remedies for its ills, shall they themselves be deemed unpractical, having no concern for human welfare? When they stand face to face with nature and read the histories she has written on shell and stone, on land and sea; when they recognize the bond of union in the division of labor, shall they be charged with "deliberately planned mystification" of the truths they would gladly sow broadcast over the land? Specialization is a law of nature which is stamped on every blade of grass, and on every flower that blooms. Heredity emphasizes this law in every phase and form of life. If it were not so, no individuality would exist. The oak tree does not take upon itself the production of roses, apples or grapes, nor does the rose ever dream of producing acorns or of elaborating material which will ultimately form an oak tree. Each individual cell in every plant contributes to the building up of its own special tissue.

Suppose we take the musical notes of some grand symphony, and scatter them at random on the musical staff; rendition would create but jarring discords. Let a Mozart or a Beethoven place each note where it belongs, and the resulting harmony "wakens in the soul a feeling earthly speech can ne'er declare." May not mankind be compared to these musical notes, creating discord in society because the individuals are not so placed as to enable them to gratify their best and highest aspirations, to do their special work? Is it utopian to hope that each individual, like each note in a musical conception, may some day swell the grand choral of the universe?

MRS. W. A. KELLERMAN.
Columbus, O.

ON A RECENT DISCOVERY OF THE REMAINS OF EXTINCT BIRDS IN NEW ZEALAND.[1]

A DEPOSIT of moa bones, larger than has been found for many years, has just been discovered near the town of Oamaru, in the province of Otago, in the South Island of this colony. Their presence was indicated by the disinterring of a bone during the ploughing of a field, by the proprietor of which the circumstance was communicated to Dr. H. de Lautour of Oamaru. This gentleman, who is well known through his papers on the diatomaceous deposits discovered by him in his district, at once inspected the spot. Finding that the deposit was large, he first secured, through the kindness of the proprietor, the inviolability of the ground, and then telegraphed the information to the Canterbury Museum. I lost no time in proceeding to Oamaru with one of my assistants, and superintended the digging out of the bones in a systematic manner. The site of the deposit was at Enfield, some ten miles to the north-west of the town, on ground elevated several hundred feet above the level of the sea, in a shallow bayleted hollow, into which the unbroken surface of the expansive slope gently descending from the Kurow hills to the open vale of the Waireka (a stream that rises further to the west) has sunk here for some seven to eight feet below the general level, and which, proceeding with a gentle gradient valleywards, becomes a ditch-like conduit for a tributary of the Waireka. In the centre of this depression, which does not exceed ten or twelve yards in width, the ground was of a dark brown color, damp and peaty. On removing the upper layer of soil for a depth of three to four inches round where the bones had first been brought to the surface, and whereon was strewn abundance of small crop-stones, a bed of very solid peat was reached, and firmly imbedded in it were seen the extremities of numerous Dinornis bones, most of them in excellent preservation, though dyed almost black. Further digging showed that certainly many of the skeletons were complete, and had been but slightly, if at all, disturbed since the birds had decayed. Owing, however, to the close manner in which they were packed together, and especially in which the limbs were intertwined, it was rarely possible to extricate the bones in the order of their relations, or to identify with certainty the various bones of the same skeleton, each bone having to be extracted as the circumstances of the moment directed. In many cases, again, only the pelvis and femora could be traced *in situ*, the vertebræ and remaining leg-bones being indistinguishable in the general agglomeration. It seemed evident that the birds had not died in an erect posture, but more probably with their limbs bent under them or in the same plane with the body. In some instances, beneath the sternum were found, lying quite undisturbed, the contents of the stomach, consisting of more or less triturated grass mingled with crop-stones. The quantity of these smooth, rounded (chiefly white quartz) pebbles — in size from that of a bean to that of a plum — mingled with the bones was enormous, and would, if collected, have formed more than a cart-load. Except where the bones were, there were no pebbles of any sort, no small stones, nor even sand, anywhere around. The nearest place where pebbles of the same composition are to be found is, I was informed, several miles distant.

[1] From Nature.

Four trenches, or pits, in all, were sunk. The dimensions of the first, which was excavated entirely in peat, did not exceed three feet square and three and a half to four feet in depth. When it was exhausted of its treasure, a second search was made about twenty to twenty-five feet higher up the hollow. The dimensions of this pit extended to about seven feet square and to the same depth as the first. Two more trenches, a few feet part, were dug at about thirty yards still further up the depression. They were not so large as the other two, but they extended down to about the same depth, three and a half to four feet, the bottom of both being (as it was in the second) a bluish clay, with which, in the pit furthest up, was sparingly mingled a small deposit of the finest silt. In the first pit portions of both Cnemiornis and Hæpagornis bones were found in abundance, and remains of several hundreds of moas of all ages. It was from the second pit, however, that the largest deposit of moa bones was obtained, and the most perfect specimen of food remains from beneath a sternum. Here, also, numerous bones of the giant buzzard and of the great extinct goose were exhumed, and a cranium as large as, if not slightly larger than, that of Cnemiornis, but of a species with complete bony orbits, as in the Cape Barren goose, and indistinguishable from Cereopsis. Bones from other parts of New Zealand now in my possession, which I hope shortly to describe, indicate with certainty that several species of Cnemiornis formerly existed in this colony. Some of these bones are remarkable for their slender elegance, and indicate species less in size and lighter in build than Cnemiornis calcitrans. Among the bones so far examined, I have observed no remains of Aptornis, of Ocydromus, or of Notornis; but I possess an adult tibia of a rail smaller than Porphyrio melanotus, yet larger than any other existing New Zealand species. The tarso-metatarsus of a species of Anas, about the size of Anas finschi, the metatarsus and sternum of Apteryx Oweni, and crania of A. australis, are among the bones recovered at Enfield, in addition to the metatarsus of a Biziura, somewhat larger than Biziura lobata, the musk duck of Australia, an interesting species for which I have proposed the name of Biziura de Lautouri, after the gentleman to whom I am indebted for the acquisition of these bones. There are still other bones which I have not yet been able to identify. The Dinornis remains belong chiefly to the species elephantopus (of unusually large proportions), to ingens, and to rheides. Very fine specimens of pelves and sterna have been obtained, with numerous crania more or less perfect. In this second trench the excavation penetrated through the peat into a bluish clay charged with water (which was, indeed, reached in all the diggings at about four feet below the surface), and into this clay the bones just protruded, but no more. The osseous remains dug from the last two holes belonged to the same species as those from the others. Digging and probing the ground beyond the boundaries of the trenches showed us that we had exhausted their contents; while the probing of the ground in the neighborhood for a considerable radius around, and in other peaty spots not far off, failed to afford indications of other deposits.

The number of perfect femora of Dinornis brought away exceeded 600; a large number were so decomposed as to fall to pieces in the handling; while a great many others disintegrated, after removal from the ground, on exposure to the atmosphere. I believe I do not over-estimate, therefore, in saying that from 800 to 900 moas at least were entombed in this shallow hollow. So many moas (leaving out of the reckoning the other species of birds) could not by any possibility have found standing-room, however crowded together, in the entire area of the depression. It would appear evident, therefore, that they did not perish all at one time. To account for their burial in such numbers in areas so circumscribed seems to me at present impossible. That their bodies were entire when they were deposited is clear, from the presence in such abundance of the crop-stones, from the position of the bones, and from the finding of the intact contents of the gizzard. No stream of any size could find origin in the immediate neighborhood, and no stream which could have transported the entire carcasses of birds of such huge proportions as Dinornis ingens or D. elephantopus could ever have occupied this ravine-head without leaving traces of its action on the surface which would be visible to-day, or without washing away the very fine silt mixed with the clay on which the bones lie, in the bottom of the most upland of our excavations. None of the bones are waterworn. This little hollow was, in the early days of its present proprietor, very wet and boggy, and several springs have origin in it. If the moas made this a highway from one part of the country to another, it seems difficult to believe that birds so powerful of limb, and standing at least 10 to 12 feet in height, could stick fast in so shallow a bog; and to conjecture why eagles of powerful flight, slender rails, small ducks, and comparatively light-footed kiwis also should become ensnared. Driven by fire in the surrounding bush — which may have covered the country then, for the plough has, I am informed, brought to light the stools of many large trees at no great distance, while logs of wood were found among the bones — did they, in a struggle for life in a narrow space, trample each other to death? The presence of the strong-winged Harpagornis in considerable numbers seems to militate against this explanation, and no calcined bones have been discovered. An explanation offered some years ago, to account for the presence of a great number of moa and other bird bones in a somewhat similar situation in the Hamilton swamp — that during severe winters these birds congregated at the springs rising warmer from below, and were overtaken by a severe and fatal frost as they stood in the water — appears unsatisfactory in the present case, as there are numerous springs and equally boggy ground near at hand, round which no remains can be found, and so close to the sea such excessive frosts are now unknown. That these were individuals who, during an excessive drought, arrived at the springs too far exhausted to revive — an occurrence common enough in Australia — and that the water there was charged with poison, have also been offered as explanations. But the permanence of glacier rivers, highest in the hottest seasons, precludes the idea of animals dying of thirst in this island, or at all events in this locality so near to the great snow river Waitaki. Poisoned water-holes or exhalations of carbonic acid might be a sufficient reason, yet in those springs elsewhere where bones have been found chemical analysis has failed to detect any substance harmful to life in their waters at the present day. Not a single indication of human intervention was observed. No bones were discovered which had been broken in their recent state; neither kitchen-middens, nor remains of ovens or of native encampments, occur anywhere near the deposit.

One piece of egg-shell dug out of the highest trench is not sufficient evidence on which to base the supposition that the spot was frequented as a nesting-place.

At Glenmark, in the north of this province, the historic spot where the original (somewhat larger than the present) find of Dinornis reliquiæ was dug out by my predecessor,

the late Sir Julius von Haast, the bones of numerous species of birds besides moas were found. Their occurrence in the situations where they were discovered, and the way in which they were lying — entire bodies with their sterna covering crop-stones *in situ* — have been explained by the supposition that the moas were overtaken by a fierce and sudden storm, and their entire carcasses piled by wind and flood into vast heaps, an explanation against which the presence here also of the same powerful buzzard and other flying birds rises as an objection. Yet there is nothing either in the situation or the disposition of the bones to make it impossible; still I cannot help feeling that that cannot be the true explanation which satisfies only one instance out of so many assemblages of dead birds of nearly always the same species in situations almost similar. I hope, however, that when I have made a thorough examination of all the localities where, and the conditions under which, moa remains have been found, in the light of the personal experience gained in the exhumation of the present deposit, and when I have completed the identification (on which I am now engaged) of the smaller bird bones associated in them with the moa bones, some light may have been gained on this at present mysterious episode in the history of the ancient Avians of New Zealand.

HENRY O. FORBES.

Christchurch, New Zealand.

LETTERS TO THE EDITOR.

**** Correspondents are requested to be as brief as possible. The writer's name is in all cases required as proof of good faith.*

On request in advance, one hundred copies of the number containing his communication will be furnished free to any correspondent.

The editor will be glad to publish any queries consonant with the character of the journal.

Need of Physiology and Anatomy in Psychological Training.

IN a recent article in *Science*, by Dr. E. W. Scripture of Clark University, some valuable and practical ideas are advanced concerning "the need of psychological training," in which the necessity of a practical knowledge of physics is made clear. But no less necessary is a like knowledge of physiology and anatomy.

Physiological psychology is no misnomer for modern psychology, because it is as much if not more physiological than psychological. That, consequently, a somewhat extensive knowledge of physiology is a *sine qua non* for the thoroughly trained modern psychologist goes without saying; and this is as true whether there be sympathy or not with the modern view, for, in the latter case, the psychologist can hardly avoid discussing some of the results of physiology; aud such discussions, to be trustworthy and valuable, must be based upon knowledge. And here is not meant mere book knowledge, but experimental knowledge gained in the physiological laboratory, otherwise when one speaks of sensations, reflex action, afferent and efferent nerves, etc., it is difficult to understand how he can have any adequate insight into the objective reality of these phenomena. It is not intended that any large amount of time be required for purely physiological laboratory work. A term's course, say of six hours a week, might be the minimum; in this case it is assumed that the student has a general knowledge of human and comparative physiology.

If the above requirements are necessary for one who proposes to study physio-psychological questions, it may be inquired further as to anatomical knowledge. That a proper conception of physiology is not possible without anatomy is so obvious as to be commonplace, and yet there are some who are serious students of physiological psychology who have no practical knowledge of anatomy. A general dissection of the body and special dissection of the sense-organs and brain, while it would require more time than the physiological course, would be well worth the extra trouble, since it is preliminary foundation-work, and is also necessary for the investigation of pathological clinical cases, some of which are of the highest importance for the physiological psychologist. For this and other reasons an elementary course in practical histology is necessary. Thus it is not clear how any student without practical knowledge of coarser and finer anatomy can study and discuss intelligently questions concerning cerebral localization, cranial and spinal nerves, spinal column, medulla oblongata, etc.

It may be objected that many of the facts learned in such a course of study would not be of direct utility, but this could be urged against almost any course of study. The value of such negative knowledge consists in serving as a sort of ballast in aiding the student in avoiding mistakes.

It may be said that if practical courses in anatomy and histology are requisites, why not also similar courses in pathology and psychiatry. It is true that these would be valuable; but there must be a limit; perhaps the student could take up individual pathological cases as they came in the course of his work, provided he has the physiological and anatomical knowledge of normal man before mentioned. It is assumed that the specialist in physiological psychology will read the writings of specialists in physiology, anatomy, and pathology when they treat of topics that bear directly on his own studies. To read such literature, appreciate the points of discussion, and make decisions as to weight of evidence, requires at least a practical elementary knowledge of the subjects.

But it may be objected that, with accurate book learning and good diagrams, one can gain sufficient insight without going to the trouble of taking the practical courses. This objection is more real practically than rationally, for many do not care for vivisection, and much less dissection. It is a well-known difficulty, common to medical schools, to obtain faithfulness in dissection. There seems to be a natural disinclination, not of the nature of dread or disgust that may appear on first entering the dissecting room, but quite another feeling, that is easier experienced than described. The physiological psychologist who has had no medical training is very liable to have a strong disinclination to practical work in anatomy, even if he believes in its utility and necessity. Then there is sometimes the feeling that it is so much easier and saves time to sit quietly in one's own room and study the books and diagrams.

It may be said that some good workers in physiological psychology have never had this preliminary training, but this is rather in spite of such training. As is well-known, many students of philosophy, having become dissatisfied with its methods and results, have turned their attention to experimental psychology, and have neither time nor opportunity to return to preliminary work, which they could have done had they known beforehand the subsequent direction of their studies.

The fact that the majority of leaders in the department of physiological psychology were previously physicians or students of medicine indicates the direction which the training in physiological psychology should take.

A. MACDONALD.

Washington, D.C.

Anthropology.

THE science of anthropology has so far progressed that it is desirable to keep a satisfactory account not only of its operations but of its resources. Under this head should be included: 1. Encyclopædic works, general treatises, annual addresses, courses of lectures, dictionaries, general discussions, and classifications of the science as a whole. 2. Societies, their organization, scope, history, enterprises, and publications, as well as annual assemblies, caucuses, congresses, national and international. 3. Periodicals, devoted as a whole or in part to anthropology. 4. Museums and laboratories, public and private, expositions and loan exhibitions. 5. Libraries, galleries, portfolios, etc., including instructions to collectors.

At this time it is desirable to know what is doing in each State along the line of anthropology. We all know pretty well the work doing in Massachusetts; but where should we look for the

archæological and anthropological resources of Maine, New Jersey, Kentucky, Oregon, etc. There are in all the States societies of natural history, and it would be pleasant to know whether they discuss anthropological topics. Many private collections of great value are to be found in the States; who knows about them? Now I shall be delighted to have the following questions answered with reference to every State in the Union: 1. Name of society, publication, or collection, public or private, devoted to the whole or a part of anthropology. 2. The nature of this relation to the science with lists of printed books or references in print to these. 3. The name and address of the person who will be glad to give information.

O. T. MASON.

Smithsonian Institution, Washington, D.C., Mar. 11.

The Aboriginal American Tea.

COMMENTING on my recent query as to any recent use of *Ceanothus Americanus* as a substitute for China tea, Professor W. J. McGee of the United States Geological Survey writes me: —

"Your little note in a current number of *Science* on aboriginal tea is before me. The eastern portion of the Great Plains, including Iowa, Illinois, and parts at least of Missouri, Minnesota, and Wisconsin, is a favorite habitat of the so-called "red root" or "red-root tea" (Ceanothus Americanus); and during war times, when the prices of tea and coffee were prohibitory, so far at least as first settlers in that country were concerned, many substitutes were employed. The common substitute for tea was the red-root, and it was very largely used in this way. The commonest substitute for coffee was rye, usually mixed with a small quantity of the coffee berry, both roasted and browned in the usual way. I should say, perhaps, that the identification of *Ceanothus Americanus* is partly my own and may possibly be erroneous."

I hope we may have other such interesting and valuable replies.

JED. HOTCHKISS.

Staunton, Va.

The Date of Discovery of the Galapagos Islands.

I AM indebted to Dr. H. Wichmann, the editor of *Petermann's Mitteilungen*, for an answer to my question in *Science* of Jan. 15, 1892: "At what time were the Galápagos Islands discovered?" Dr. H. Wichmann kindly calls my attention to a paper on the history of discovery of the Galápagos Islands, by Timénez de la Espada, published in *Boletin de la Sociedad Geogr. de Madrid*, Oct.-Dec., 1891., XXXI., Nos. 4–6. From this it is evident. Dr. Wichmann writes, that the discovery of the islands, "Archipélago Encantado," was made the 10th of March, 1535, by Fray Tomás de Berlanga, Bishop of Castilla del Oro, whose report is printed in the paper.

G. BAUR.

Clark University, Worcester, Mass., Mar. 14.

CALENDAR OF SOCIETIES.

Philosophical Society, Washington.

Mar. 12. — B. Pickman Mann, An Attempted Solution of a Social Problem; Alex. S. Christie, Remarks on the Diurnal Variation of the Barometer; G. M. Searle, On a Simple Form of a Double Image Micrometer.

Society of Natural History, Boston.

Mar. 16. — J. Walter Fewkes, The Moki Snake Dance.

Oriental Club, Philadelphia.

Mar. 17.—Cyrus Adler, An Account of his Recent Travels in the East.

Publications received at Editor's Office.

COLBERT, E. Humanity in its Origin and Early Growth. Chicago, Open Court Pub. Co. 12°. 409 p. $1.50.

HOOGEWERFF, J. A. Magnetic Observations at the U. S. Naval Observatory. Washington, Government. 4°. Paper. 99 p.

MARSH, C. C. Report upon some of the Magnetic Observatories of Europe. Washington, Government. 4°. Paper. 37 p.

U. S. NAVAL OBSERVATORY. Meteorological Observations and Results, 1883-1887. Washington, Government. 4°. Paper. 261 p.

U. S. COAST AND GEODETIC SURVEY. Results of Magnetic Observations at Los Angeles, California, 1882-1889. Part I. Washington, Government. 4°. Paper. 42 p.

——Early Expeditions to the Region of Bering Sea and Strait. Washington, Government. 4°. Paper. 14 p.

——International Geodetic Association, Ninth Conference. Washington, Government. 4°. Paper. 12 p.

——Notes on an Early Chart of Long Island Sound. Washington, Government. 4°. Paper. 4 p.

——On an Approximate Method of Computing Probable Error. On the Determination by Least Squares of the Relation between two Variables. Washington, Government. 4°. Paper. 16 p.

——On the Use of Observations of Currents for Prediction Purposes. Washington, Government. 4°. Paper. 12 p.

——The National Phototypes of the Standard Metre and Kilogramme. Washington, Government. 4°. Paper. 23 p.

——The Relation of the Yard to the Metre. Washington, Government. 4°. Paper. 5 p.

——Tides at Sandy Hook. Observed and Predicted Times and Heights during the year 1889. Washington, Government. 4°. Paper. 10 p.

WHYMPER, EDWARD. Travels amongst the Great Andes of the Equator; with Supplementary Appendix. New York; Charles Scribner's Sons. 8°. 2 vols. Pp. 486, 175.

Business Department.

Exchanges.

[Free of charge to all, if of satisfactory character. Address N. D. C. Hodges, 874 Broadway, New York.]

For sale or exchange, Das Ausland, 10 vols., 1832 to 1891, including 6 vols. bound, 4 in numbers. Wheeler Survey, vol. 1. Geog. Report; also vol. 6, Botany; Production of gold and silver in the United States, 1880, '1, '2, '3, '5; Selfridge Isthmus of Darien. Will sell at very low prices. J. F. James, 1443 Corcoran St., Washington, D. C.

Chemical Library for sale. Fresenius Zeitschrift für Analytische Chemie. Complete 30 volumes, bound, at $4 50 per volume. Fehling's Handworterbuch der Chemie, 5 volumes, bound, and 5 parts of Vol. 6 (not yet completed), at $5 each for the bound volumes, and 40 cts. per part for the subsequent numbers. A list of other chemical and mineralogical works will be furnished on application. Address P. O. Box 477, Wauwatosa, Wis.

For exchange.—A fine thirteen-keyed flute in leather covered case, for a photograph camera suitable for making lantern slides. Flute cost $27, and is nearly new. U. O. COX, Mankato, Minn.

Wants.

Any person seeking a position for which he is qualified by his scientific attainments, or any person seeking some one to fill a position of this character, be it that of a teacher of science, chemist, draughtsman, or what not, can have the 'Want' inserted under this head at 10 cents a count line. Nothing inserted at less than 50 cents a time prepaid by stamps, if most convenient.

TRANSLATOR wanted to read German architectural works at sight (no writing). One familiar with technical terms desired. Address "A.," Box 149, New York Post Office.

WANTED.—A position in a manufacturing establishment by a manufacturing Chemist of inventive ability. Address M. W. B, care of *Science*, 874 Broadway, N. Y.

WANTED.—Books on Anatomy and Hypnotism. Will pay cash or give similar books in exchange. Also want medical battery and photo outfit. DR. ANDERSON, 182 State street, Chicago, Ill.

WANTED.—A college graduate with some normal training, to teach the sciences, at $1 800 per year, in a Southern college. A Baptist or a Methodist preferred. Must also be a first-class Latin scholar. A. H. Beals, Box K, Milledgeville, Ga.

A PROFESSORSHIP in Chemistry is wanted by one who has had five years' experience in that capacity. Would prefer to give instruction by lectures and experiments rather than by text-book methods. Would like a position in a college or university where there is a good student's laboratory. Special points of strength claimed are: (1) Thorough control of a class and good order during lectures and recitations. (2) Accuracy in experimenting with chemicals and skill in the manipulation of chemical apparatus. The permission of several distinguished educators has been given to refer to them if required. Would not care to accept a position paying less than $1,500. Address B. E, care of *Science*, Advertising Dept., 47 Lafayette Place, New York.

ADDRESS WANTED.—Will some one please send the address of the Secretary of the American Philological Society. Also that of Herbert Spencer. "ADDISON," Room 84, 164 Madison St., Chicago, Ill.

ADDRESSES of Old Book Dealers wanted.—Wishing to obtain a number of old books out of print, I very much desire the addresses or catalogues of rare second-hand book dealers. If there is a directory or list of such dealers I should like to obtain possession of one. W. A. BLAKELY, Chicago, Ill.

WANTED.—(1) A white man versed in wood and iron working, able to work from specifications and plans, suited for an instructor of boys; his business to have charge of shops of school, outline and direct the work for foremen and students; salary to be $1,000 per annum (nine months). (2) A man (black preferred) to teach the colored, iron working and forging, subordinate to the preceding; salary, $720. (3) A man (white) competent to take classes in engineering (assistant's position), but with the ability to perform any of the work required in any of the ordinary engineering courses of our universities; salary from $1,000 to $1,500. A. H. BEALS, Milledgeville, Ga.

BOOK-REVIEWS.

A Manual of the Steam-Engine. Part II: Design, Construction, and Operation. By R. H. THURSTON. New York, Wiley. 8°. $7.50.

THE first part of the "Manual of the Steam-Engine" we have already noticed. Its purpose was twofold: (1) the development of the mathematical theory from the simple form applicable to the Carnot engine to a form that would assist the mechanical engineer in following the flow of energy into the engine of practice and its conversion into power or loss in many ways; (2) the application of the principles of thermo-dynamics and the data obtained by experiment to the computation of the quantities of heat, steam, and fuel required for the production of power in a given engine, and the determination of the proportions of engine and distribution of steam that would give the best result.

But so much has been gained by experience, simply, in the design and construction of engines, aside from the progress based on theoretical considerations alone, that the author has preferred Part II. of his Manual to cover the more usual methods of design, construction, and operation of the steam-engine. Part I. contains the scholastic foundation; Part II., the practitioner's super-structure.

The two volumes already issued, it is proposed by the author, are to be followed by a third, which shall contain working drawings of the latest and best modern machinery of this class. The third part will, therefore, provide an atlas of such drawings, with concise accompanying text.

After treating the portions of his subject which are recognized as belonging to mechanical engineering, our author, in the last chapter, treats of the financial element in the theory and practice of steam-engine construction. This is something quite novel, and Professor Thurston looks to his friends for such criticism as will lead to the further development of this branch of the subject. Designing for a minimum cost is a matter which every experienced member of the profession has constantly been compelled to consider; but scientific methods of computation of minima rarely have been known or practised.