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Contents.

(Illustrated articles are marked with an asterisk.)

THE GOAL OF EVOLUTION.

"Her 'prentice han' she tried on man,
And then she made the lassies, O!"

So the gallant Burns sang of mother Nature, intending to compliment the lasses. Had he lived till this more scientific age, he might have stayed his hand, or else have had the lasses fashioned first. The handiwork of Nature seems to have lost care or cunning toward the last.

In the details of the skeletons of the other animals, says Professor Cleland (in his address as Vice-President of the Department of Anatomy and Physiology at the late meeting of the British Science Association), one sees the greatest precision of form; but there are various exceptions to this neatness of finish in the skeleton of man. Witness the variations of the breast bone, which, especially in its lower portion, is never shapely, as it is in the lower animals; witness the coccygeal vertebra, which are the most irregular structures imaginable; even in the sacrum and the rest of the vertebral column, the amount of variation finds no parallel in other animals. In the skull, except in some of the lower forms of humanity, the *dorsum sellæ* is a ragged, warty, deformed, and irregular structure, never exhibiting the elegance and finish seen in our poorer relations. The curvature of the skull and the shortening of its base, which have gradually increased in the ascending series of forms, have reached a degree which cannot be exceeded; and the nasal cavity "is so elongated vertically that, in the higher races, Nature seems scarcely able to bridge the gap from the cribriform plate to the palate, and produces such a set of unsymmetrical and rugged performances as is quite peculiar to man." Other examples of similar conditions, he tells us, will occur to every student of human anatomy.

Thus it would appear that man, the highest product of evolution, is physically the least perfectly finished. His bony framework is more open to variation than that of the lower types of the animal world. This fact would seem to indicate a certain newness of character, as though Nature had not yet had time to settle down to stereotyped forms of human detail. To some it might also hint of possibilities of further development, perhaps of the evolution of human or superhuman, yet animal, types which may surpass the present human as that does the antecedent brute. Professor Cleland, on the contrary, sees in them curious indications rather of the "formative force nearing the end of its journey." Animal life, he thinks, has reached its preordained climax in humanity, and that the future progress of evolution is to be traced from man, not to other animal forms yet to appear, but through his physical (*qy.* psychical?) nature into the land of the unseen.

The reasons for this sudden spring into ether do not clearly appear, the only hint of a physical basis for it lying in the observation that the variations of structure which have been noted are principally to be found in the head, the part of the body most closely connected with the development and expression of the mental character.

Just here we may note a singular circumstance in connection with the present stage of discussion in regard to the possibilities of human progress, individually and collectively considered. Last year, from the standpoint of matter, Professor Tyndall traced the line of individual evolution into the infinite azure, where personal identity is lost; and half mankind were set by the ears in consequence. This year, before a section of the same society, Professor Cleland, from the standpoint of the speculations of the authors of the "Unseen Universe," argues from physical data the continued evolution of humanity in "the land of the unseen," wherein personal identity is said to be eternally preserved: and not a word is said of his transcending the strict domain of scientific inference!

INSTINCTIVE CALCULATION.

A writer in the *Cornhill Magazine*, who claims to be something of a natural calculator himself, attempts the rather difficult task of advancing a satisfactory explanation of the peculiar arithmetical feats performed by the well known engineer Zerah Colburn, during his early youth. Mr. Colburn was an American and the founder of the English journal, *Engineering*. In a biography of him which we published at the time of his death, five or six years ago, we mentioned his remarkable mental precocity, some phenomena of which may be recalled in the present connection. When eight years of age, it is said that Colburn instantly answered such questions as: Find the cube root of 268,335,125, how many seconds are there in 48 years, raise 8 to the sixteenth power, and others of similar difficulty, which even the most expert of mathematicians would have been unable to solve by any mere mental process. In looking for parallel cases of children with like abilities, we find three others, something regarding each of which it is well to note before passing to the consideration of the possibility of an explanation.

In 1839, Vito Mangiamele, a Sicilian boy eleven years of age, was examined by Arago and several other eminent members of the French Academy of Sciences. To him, questions equally knotty with the above were given, and these together with such posers as:" What number complies with the following propositions: that if its cube be added to five times its square, and then forty-two times the number and the number forty be subtracted from the result, the number is equal to zero." To this the boy gave the correct answer, (five) just as the questioner had repeated the sentence for the second time. An earlier case is that of Jedediah Buxton, a child almost totally uneducated. Of him it is related that if he heard a sermon or other speech he instinctively counted the words; if a period of time were mentioned in his hearing, he computed the seconds; or if he walked over a piece of ground his mind was busily employed in calculating the number of inches. He solved mentally such a problem as: How many cubical eighths of an inch are there in a quadrangular mass which measures 231,145,789 yards long, 5,642,732 yards wide, and 54,965 yards thick? And besides, he possessed the curious faculty of being able to suspend his calculations at any point, turn to other subjects for any length of time, and yet resume his mental work at the proper place. Like Mangiamele, he could give no account of how he accomplished his task.

The last instance is that of George Parker Bidder, who subsequently became a noted English civil engineer. His gift lay more in a natural taste for figures than through the instinctive calculating power which Colburn, Mangiamele, and Buxton possessed. He accustomed himself to count up to 1,000,000, and thus became familiar with large numbers. He besides was an inventor, and devised new arithmetical processes. From all accounts it would seem that, his was an acquired power, aided of course by natural genius, and this view finds further corroboration from the fact that in after life, Bidder retained his abilities, while the other three individuals lost theirs. In 1856 he gave an account of how his operations were worked, which goes still further to show them to be the results of acquired skill, more especially as neither Colburn, Buxton, or Mangiamele were ever able to give any explanation whatever of their mental processes Bidder, therefore, is hardly to be considered in conjunction with them.

To return now to the *Cornhill Magazine* writer and his theory, the latter is essentially that the calculator does not regard the numbers set before him as abstractions, but rather as definite groups of concrete objects, as, for example, dots. The mental process required then to multiply 24 by 3 is to picture 24 as two columns of dots of ten each, and one column of four. To multiply by three, the imperfect columns are imagined as brought together, making one column of ten, and two over. The one is added to six columns pictured at the same time, making seven columns of ten, and one of two, that is, 72. We need not explain the supposed method of division, as it is essentially similar; for we believe the objection will at once occur to the reader that this plan cannot answer for dealing with great numbers, as it can in no wise be conceived that any mind can form a perfect picture of millions multiplied or divided by millions. It is very possible for the mind to be trained so as to conceive detail to an astonishing degree; and imagination, in conjunction with memory, in some people will reproduce scenes with every feature intact, of which only the most salient characteristics would remain fixed in the average mind. Robert Houdin, the French conjurer, could walk quickly past a shop window once, and then name every article in it, and the size, color, and position of each. This was purely acquired, though Houdin had the ability to make the acquirement in the beginning. Every artist who produces a design draws upon the same faculties; so do skilled chess players, who are able to play a dozen or more games at once; so do musicians, who can hear a harmony or melody by looking at the printed score. All of these instances we should class with Bidder, but not with Colburn or the other two mentioned.

What Turner was in color and Mozart in music, we believe Colburn and his peers to have been as regards numbers. Turner's perception of gradation of color—not mere light and shade, but color—was instinctive, purely inborn. He felt color, not outlines or form; and no one, before or since, in that respect has ever approached him. Mozart felt music; at the age of six he could compose difficult harmonies; he could distinguish accurately and instantly announce variations in sound equal to one sixty-fourth of a tone. Now no one pretends to explain Turner's coloring or Mozart's music from a mental standpoint, for the simple reason that there is no explanation. Both artists were born with wonderful gifts, gifts as inexplicable to their possessors as they are to the average man; and there the matter rests. Colburn, Buxton, and the Sicilian boy had a like sensation of the relations of numbers. They went through a kind of calculating process, probably as instinctively as Turner handled a brush to place his colors, or Mozart moved his fingers to grasp the chords of the harpsichord or organ. This mental operation, we believe, however, was unconscious cerebration; and the same genius or instinct, or whatever term by which we may agree to designate the faculty, which rendered it unnatural for Turner to make inharmonious contrasts, or Mozart to strike discords, prevented Colburn and the others from false calculation, and caused them to feel, as it were, the relations of numbers.

PINEAPPLE AND BANANA FIBERS.

It is from the fiber of the pineapple that the natives of the Philippines weave the celebrated web *nipis de piña*, considered by experts the finest in the world.

In his travels in that promising but badly managed Spanish colony—all Spanish colonies are badly managed, for that matter—the German traveller Jagor had the good fortune to witness the process by which the fiber is prepared.

When plants are intended for the growth of fiber, the fruit is not allowed to ripen, the leaves thereby taking on a larger development. The fiber is separated by hand. A leaf is placed on a board on the ground, with hollow side upwards. Sitting at one end of the board, a woman holds the leaf firmly with her toes and scrapes its outer surface with a potsherd, using the rounded edge of the rim.

The scraping reduces the leaf to rags, disclosing a layer of coarse fiber running lengthwise of the leaf. This is dextrously lifted up and drawn away in a compact strip: after which the operator scrapes again until a second fine layer is laid bare. Then turning the leaf round, she scrapes its back down to the layer of fine fiber, which she quickly draws to its full length away from the back of the leaf. The fiber is then washed, dried in the sun, combed, and sorted. It is from material thus crudely prepared that the *nipis de piña* is woven, of such exquisite fineness that robes of it are valued as high as $1,500, at Manilla.

The pineapple fiber is also exceedingly strong: a cable 2½ inches in circumference has been known to endure a test strain of over 6,000 pounds.

Another noted fiber, Manilla hemp, takes its name from the chief city of the Philippines. It is not hemp, however, but the fiber of a species of banana, which does not differ greatly from the edible banana, and is probably a variety of the same species. Thus far, according to Jagor, the serviceable fiber has been exclusively obtained from the southern portion of the Philippines, all attempts to make its culvation profitable in the western and northern provinces having failed. A species of banana grows in great luxuriance in Western Java, but it has not been utilized as a fiber plant to any great extent. Great efforts have been made in the Celebes to cultivate this fiber, but Bickmore repeats that it has been abandoned in favor of coffee, which is found to be far more profitable. For domestic purposes, the banana fiber—known to commerce also as *abacá*—is made use of in many tropical countries, and in time will doubtless be largely supplied; but for the present the supply comes, as already stated from the Philippines.

The plant thrives best on the shaded forest-covered slopes of volcanic mountains, such as abound in Albay and Camarines: on level ground not so well, and on marshy land not at all. The plant requires, on an average, three years to produce its fiber in a proper condition. For the first crop only one stalk is cut from each bunch: later on, the new branches grow so quickly that they can be cut every two months. In full growth the yield is 30 cwt. to the acre, whereas from an acre of flax not more than 4 cwt. is obtained. After the plantation is once established, the plants flourish without any care or attention, the only trouble being to collect the fiber. One plant may yield as much