MENTAL IMAGERY.

THERE are great differences in the power of forming pictures of objects in the mind's eye; in other words, of visualising them. In some persons the faculty of perceiving these images is so feeble that they hardly visualise at all, and they supplement their deficiency chiefly by memories of muscular strain, of gesture, and of posture, and partly by memories of touch; recalling objects in the same way as those who were blind from their birth. Other persons perceive past scenes with a distinctness and an appearance of reality that differ little from actual vision. Between these wide extremes I have met with a mass of intermediate cases extending in an unbroken series.

We must establish clearly what we are talking about by contrasting in general terms the physiological basis of sight itself with that of sight-memory. Let us put the question to ourselves, "What should we expect to be the effect on our nervous system, first, when a sudden light is flashed on the eye, and, secondly, when we recall an image of that flash?" If we had means of watching what took place, we should no doubt be aware, in the first case, of a sudden irritation in the spread-out terminations of the optic nerve behind the retina. This would rapidly propagate itself along the nerve itself to the brain, where it would be distributed in various directions, becoming confused with other waves of irritation proceeding from independent centres, lingering here and there longer than elsewhere, and finally dying away.

In the recollection of a flash a similar sequence of events would take place, but they would occur in the *reverse order*. A variously distributed irritation in the brain, due to one or more of a multitude of possible causes, into which we need not stop to inquire, would propagate itself outwards, becoming fainter the farther it travelled. The same links of the same nervous chain would be concerned in both cases, but the tension would be differently distributed among them. When the faculty of sight-memory is strong, the vigorous propagation of a central impulse towards the optic nerve must be habitual; when it is weak the propagation will not take place except in peculiar states of the nerves, as in dreams, in delirium, in high excitement, or under the influence of certain drugs.

These physiological considerations, vague as they are, will nevertheless suffice to establish the existence of a true kinship between mental imagery and ordinary vision. They enable us to define Shakespeare's phrase of seeing "with the mind's eye" as a condition in which the activity of the nervous centre bears a higher ratio to

that of the nervous terminations than it does in actual sight. They also justify us in ascribing the marked differences in the quality, as well as the vividness, of the mental imagery of different persons, to the various degrees in which the several links of a long nervous chain are apt to be affected.

The mental images of which I am about to speak are those which are habitually suggested by well-known associations. Even when the subject is thus limited, it is almost too large for the compass of a single memoir. Therefore, I shall do my best at present not to encroach upon that other very interesting branch of it, which treats of the visions and hallucinations that flash into view without any connection with the subjects of conscious thought. It is my purpose to point out the conditions under which mental imagery as above defined is most useful, and the particular forms of it which we ought to aim at developing, and I shall adduce evidence to show that the visualising faculty admits of being educated, although no attempt has ever yet been made, so far as I know, to bring it systematically and altogether under control.

I draw my conclusions from no small amount of testimony. In addition to a large quantity of oral information of which I have made notes, I have received separate letters and replies by the hundred to a long list of questions which I circulated, besides obtaining batches of replies to the same questions from various schools. The answers on the whole have been written in a style that testifies to much careful self-analysis, and the general accordance of those that were derived from independent sources, together with the satisfactory way in which I have found many of the statements to bear cross-examination, have convinced me of their substantial truth.

I find the distribution of the visualising faculty, in respect to its vividness, by a simple method I have described elsewhere.[1] I take a haphazard bundle of returns, mark them as an examiner would mark the papers of candidates, sort them in the order of their marks, and clip them into a portfolio. If I open the book in the middle I read the medium value; if I open it at one-quarter from the beginning I read the highest quartile value; if at one-quarter from the end, the lowest quartile. If I open it at one-eighth of its thickness I read an octile value; and if at one-sixteenth, a sub-octile.

Between the first and last quartiles extends the broad middle class. It includes the two middle quarters, or the central half of the population, whose characteristics are pretty uniform; it is at the beginning and end of the book that the exceptional cases lie in this, as in all other similar collections of statistics.

The medium quality of mental imagery among Englishmen may

(1) See an article by myself in *Mind* (July, 1880), p. 301, on "Statistics of Mental Imagery," and the references in the foot-notes to it.

be briefly described as fairly vivid, but incomplete. The part of the picture that is well defined at any one moment is more contracted than it would be in a real scene; but by moving the mental eye from point to point, the whole of the image, so far as it is remembered at all, may be successively brought into view. If this description be heightened a little, it will suit the high quartile; if it be lowered a little it will suit the low quartile, so that with small variations it will apply to the whole of the middle class. When we arrive at the high and low octiles the tenor of the returns is considerably changed; but we will pass by them and rest at the sub-octiles. At the highest of these the image is firm and clear, at the lowest there is scarcely any image at all.

This brief statement gives a scientifically exact idea of the distribution of the faculty among the inner fourteen in every sixteen Englishmen. I do not go further here, because I wish to specify the extent to which the faculty generally admits of being educated, and not to hold out ideals which are impossible of attainment except by very few. I shall submit direct evidence of what teaching can accomplish, but it will I am sure be allowed, in the meantime, that there is a probability of being able to educate a faculty among the great majority of men to the degree in which it manifests itself, without any education at all, in at least one person out of every sixteen. When speaking, as I shall soon do, of the various qualities of the faculty, I shall keep as now, as far as possible, to the commoner cases.

The power of visualising is higher in the female sex than in the male, and is somewhat, but not much, higher in public schoolboys than in men. I have, however, a few clear cases in which its power has greatly increased with advancing years. There is reason to believe that it is very high in some young children, who seem to spend years of difficulty in distinguishing between the subjective and objective world. Language and book-learning certainly tend to dull it.

The visualising faculty is a natural gift, and, like all natural gifts, has a tendency to be inherited. In this faculty the tendency to inheritance is exceptionally strong, as I have abundant evidence to prove, especially in respect to certain rather rare peculiarities, of which I shall speak, and which, when they exist at all, are usually found among two, three, or more brothers and sisters, parents, children, uncles and aunts, and cousins.

Since families differ so much in respect to this gift, we may suppose that races would also differ, and there can be no doubt that such is the case. I hardly like to refer to civilised nations, because their natural faculties are too much modified by education to allow of their being appraised in an off-hand fashion. I may, however, speak of the French,

who appear to possess the visualising faculty in a high degree. The peculiar ability they show in prearranging ceremonials and fêtes of all kinds, and their undoubted genius for tactics and strategy, show that they are able to foresee effects with unusual clearness. Their ingenuity in all technical contrivances is an additional testimony in the same direction, and so is their singular clearness of expression. Their phrase "figurez-vous," or "picture to yourself," seems to express their dominant mode of perception. Our equivalent of "imagine" is ambiguous.

It is among uncivilised races that natural differences in the visualising faculty are most conspicuous. Many of them make carvings and rude illustrations, but only a few have the gift of carrying a picture in their mind's eye, judging by the completeness and firmness of their designs, which show no trace of having been elaborated in that step-by-step manner which is characteristic of draughtsmen who are not natural artists.

Among the races who are thus gifted are the despised, and, as I confidently maintain from personal knowledge of them, the much underrated Bushmen of South Africa. They are no doubt deficient in the natural instincts necessary to civilisation, for they detest a regular life, they are inveterate thieves, and are incapable of withstanding the temptation of strong drink. On the other hand, they have few superiors among barbarians in the ingenious methods by which they supply the wants of a difficult existence, and in the effectiveness and nattiness of their accoutrements. One of their habits is to draw pictures on the walls of caves, of men and animals, and to colour them with ochre. These drawings were once numerous, but they have been sadly destroyed by advancing colonisation, and few of them, and indeed few wild Bushmen, now exist. Fortunately, a large and valuable collection of fac-similes of Bushman art was made before it became too late by Mr. Stow, of the Cape Colony, who has very lately sent some specimens of them to this country, in the hope that means might be found for the publication of the entire series. Among the many pictures of animals in each of the large sheets full of them, I was particularly struck with one of an eland, as giving a just idea of the precision and purity of their best work.

A small but interesting sheet of copies of Bushman drawings was presented by Colonel Moncrieff, C.B., of gun-carriage celebrity, to the Christie Collection, which is now incorporated with the British Museum. Many notices of them are to be found in Barrow's travels in South Africa, and elsewhere.

The method by which the Bushmen draw is described in the following extract from a letter written to me by Dr. Mann, the well-known authority on South African matters of science. The boy to whom he refers belonged to a wild tribe living in caves in the

Drakenberg, who plundered outlying farms, and were pursued by the neighbouring colonists. He was wounded and captured, then sent to hospital, and subsequently taken into service. He was under Dr. Mann's observation in the year 1860, and has recently died, to the great regret of his employer, Mr. Proudfoot, to whom he became a valuable servant.

Dr. Mann writes as follows:—

"This lad was very skilful in the proverbial Bushman art of drawing animal figures, and upon several occasions I induced him to show me how this was managed among his people. He invariably began by jotting down upon paper or on a slate, a number of isolated dots which presented no connection or trace of outline of any kind to the uninitiated eye, but looked like the stars scattered promiscuously in the sky. Having with much deliberation satisfied himself of the sufficiency of these dots, he forthwith began to run a free bold line from one to the other, and as he did so the form of an animal—horse, buffalo, elephant, or some kind of antelope—gradually developed itself. This was invariably done with a free hand, and with such unerring accuracy of touch that no correction of a line was at any time attempted. I understood from this lad that this was the plan which was invariably pursued by his kindred in making their clever pictures."

It is impossible, I think, for a drawing to be made on this method unless the artist had a clear image in his mind's eye of what he was about to draw.

Other living races have the gift of drawing, but none more so than the Eskimo. I will therefore speak of these, and not of the Australian and Tasmanian pictures, nor of the still ruder performances of the old inhabitants of Guiana, nor of those of some North American tribes, as the Iroquois. The Eskimos are geographers by instinct, and appear to see vast tracts of country mapped out in their heads. From the multitude of illustrations of their map-drawing powers, I will select one from those included in the journals of Captain Hall, at p. 224, which were published last year by the United States Government under the editorship of Professor J. E. Nourse. It is the fac-simile of a chart drawn by an Eskimo who was a thorough barbarian in the accepted sense of the word. That is to say, he spoke no language besides his own uncouth tongue, he was wholly uneducated according to our modern ideas, and he lived in what we should call a savage fashion. This man drew from memory a chart of the region over which he had at one time or another gone in his canoe. It extended from Pond's Bay, in lat. 73°, to Fort Churchill, in lat. 58° 44′, over a distance in a straight line of more than 960 nautical, or 1,100 English miles, the coast being so indented by arms of the sea that its length is six times as great. On comparing this rough Eskimo outline with the Admiralty chart of 1870 their accordance is remarkable. I have seen many route maps made by travellers in past years, when the scientific exploration of the world was much less advanced than it is now, and I can confidently say that I have never known of

any traveller, white, brown, or black, civilised or uncivilised, in Africa, Asia, or Australia, who, being unprovided with surveying instruments, and trusting to his memory alone, has produced a chart comparable in extent and accuracy to that of this barbarous Eskimo. Their powers of accurate drawing are abundantly testified by the numerous illustrations in Rink's work, all of which were made by self-taught men, and are thoroughly realistic.

So much for the wild races of the present day; but even the Eskimo are equalled in their power of drawing by the men of old times. In ages so far gone by, that the interval that separates them from our own may be measured in perhaps hundreds of thousands of years, when Europe was mostly ice-bound, a race which, in the opinion of all anthropologists, was closely allied to the modern Eskimo, lived in caves in the more habitable places. Many broken relics of that race have been found; some few of these are of bone, engraved with flints or carved into figures, and among these are representations of the mammoth, elk, and reindeer, which if made by an English labourer with the much better implements at his command, would certainly attract local attention and lead to his being properly educated, and in much likelihood to his becoming a considerable artist.

It is not at all improbable that these prehistoric men had the same geographical instincts as the modern Eskimo, whom they closely resemble in every known respect. If so, it is perfectly possible that scraps of charts scratched on bone or stone, of prehistoric Europe, when the distribution of land, sea, and ice was very different from what it is now, may still exist, buried underground, and may reward the zeal of some future cave explorer.

I now return to my principal topic, the mental imagery of the English race, and I will mention some of the chief peculiarities I have noted in it. When the faculty is strong it is apt to run riot. There are a few persons, including men and women of no mean capacity, who cannot disentangle even the letters of the alphabet from the oddest associations with colours, formed in some half-forgotten period of childhood. To some of these persons it may be that an *a* will always convey the sense of blackness, an *e* that of greenness, an *i* will be blue, an *o* white, and a *u* red. The consonants will also for the most part have their separate tints, so that every word seems parti-coloured to their fancy; and a description of scenery in a book produces an effect upon their imagination very different from what the author could have foreseen. The same is true in respect to numerals, days of the week, and months of the year. I have collected perhaps twenty good accounts of these bizarre tendencies from independent sources, and find them to run strongly in families. They are not communicated by teaching or imitation, because those who have these peculiarities are usually disinclined to talk about

them, recollecting how they were laughed at on the few occasions when they did so. The fact of their being common to scattered members of the same family has often been discovered for the first time through my inquiries. I should say that I have found no general accordance between particular letters and colours. The relationship between them appears to be in each case a haphazard one; but having been once formed it is durable.

Another and much more common oddity is the tendency to visualise numerals in a peculiar manner, which characterizes, as I have roughly reckoned, about one woman in every fifteen, and one man in every thirty. Those who do so are never able to dissociate any single number from its own particular place in the field of their mental view, so that when they think of a series of numbers they always visualise them in a certain form. Either the numbers are all visible at once, as if they were printed on cards and hung in space, according to some grotesque pattern, or the mind travels along a blank but familiar path to the place where the number that is thought of is known to reside, and then it starts into view. There are many weird varieties of this singular tendency to visualise numbers in forms, which I have lately described [1] and will not here repeat. Suffice it to say, that they date from an earlier period than that to which recollection extends. They manifest themselves quite independently of the will; they are invariably the same in the same person, but are never the same in two different persons, and the tendency to see them is strongly hereditary. I have now a collection of hundreds of them, not only from English men and women, boys and girls, but from American, French, German, Italian, Austrian, and Russian correspondents. They are found useful in the simpler kinds of mental arithmetic.

Those who see number-forms have usually some equally persistent scheme for dates, based more or less upon the diagrams of the schoolroom. I am well acquainted with an accomplished student of history whose mnemonic form for all historical events is a simple nursery diagram, which has blossomed, as it were, into large excrescences whereon the subsequently acquired facts are able to find standing room. These diagrams are really helpful because their shape is correlated with the subject they portray. They are not like the jingling nonsense verses and bad puns upon which many persons base their memory of facts.

The persistency of the forms under which numerals and dates are visualised testifies to a want of flexibility in mental imagery which is characteristic of many persons. They find that the first image

(1) "Visualised Numerals," a Memoir read before the Anthropological Institute, March 9, 1880, about to be published in the forthcoming part of their journal of this year. See also a previous Memoir in *Nature*, Feb. 15, 1880.

they have acquired of any scene is apt to hold its place tenaciously in spite of subsequent need of correction. They find a difficulty in shifting their mental view of an object, and examining it at pleasure in different positions. If they see an object equally often in many positions the memories confuse one another. They are less able to visualise the features of intimate friends than those of persons of whom they have caught only a single glance. Many such persons have expressed to me their grief at finding themselves powerless to recall the looks of dear relations whom they had lost, while they had no difficulty in recollecting faces that were uninteresting to them.

Others have a complete mastery over their mental images. They can call up the figure of a friend, and make it sit on a chair or stand up at will; they can make it turn round and attitudinise in any way, as by mounting it on a bicycle or compelling it to perform gymnastic feats on a trapeze. They are able to build up elaborate geometric structures bit by bit in their mind's eye, and add, subtract, or alter at will and at leisure. This free action of a vivid visualising faculty is of much importance in connection with the higher processes of thought, though it is commonly abused, as may be easily explained by an example. Suppose a person suddenly to accost another with the following words:—"I want to tell you about a boat." What is the idea that the word "boat" would be likely to call up? I tried the experiment with this result. One person, a young lady, said that she immediately saw the image of a rather large boat pushing off from the shore, and that it was full of ladies and gentlemen, the ladies being dressed in white and blue. It is obvious that a tendency to give so specific an interpretation to a general word is absolutely opposed to philosophic thought. Another person, who was accustomed to philosophise, said that the word "boat" had aroused no definite image, because he had purposely held his mind in suspense. He had exerted himself not to lapse into any one of the special ideas that he felt the word boat was ready to call up, such as a skiff, wherry, barge, launch, punt, or dingy. Much more did he refuse to think of any one of these with any particular freight or from any particular point of view. A habit of suppressing mental imagery must, therefore, characterize men who deal much with abstract ideas; and as the power of dealing easily and firmly with these ideas is the surest criterion of a high order of intellect, we should expect that the visualising faculty would be starved by disuse among philosophers, and this is precisely what I have found on inquiry to be the case.

Here, however, a fresh consideration comes in, which shows that the tendency to visualise is liable to be over-corrected, especially by those who are accustomed but not obliged to visualise in hard and persistent forms, and that they lose thereby the only means of obtaining a cor-

rect mental picture of a species or race. I proved two years ago[1] that a generalised picture did as a matter of fact admit of being produced. I threw magic-lantern portraits of different persons on the top of one another, on the same screen, and elicited a resultant face which resembled no one of the components in particular, but included all. Whatever was common to all the portraits became intensified by combination; whatever was peculiar to each portrait was relatively too faint to attract attention, and virtually disappeared. I made a great variety of experiments; in some I optically superimposed images by arrangements of lenses, mirrors, stereoscopes, or doubly refracting crystals; in others I combined separate photographic impressions upon a single sensitised plate. The result was that I invariably found it possible to make a generalised picture having a remarkable appearance of individuality, out of a collection of separate portraits, so long as the latter bore a moderate resemblance to one another, and were taken from the same point of view, and were of the same size.

I argue that the mind of a man whose visualising faculty is free in its action, forms these generalised images of its own accord out of its past experiences. It readily reduces images to the same scale, through its constant practice in watching objects as they approach or recede, and consequently grow or diminish in size. It readily shifts images to any desired point of the field of view, through its habit of following bodies in motion to the right or left, upwards or downwards. It selects images that present the same aspect, either by a simple act of memory or by a feat of imagination that forces them into the desired position, and it has little or no difficulty in reversing them from right to left, as if seen in a looking-glass. In illustration of these generalised mental images let us recur to the boat, and suppose the speaker to continue as follows:— "The boat was a four-oared racing boat, it was passing quickly just in front of me, and the men were bending forward to take a fresh stroke." Now at this point of the story the listener ought to have a picture well before his eye. It ought to have the distinctness of a real four-oar going either to the right or the left, at the moment when many of its details still remained unheeded, such as the dresses of the men and their individual features. It would be the generic image of a four-oar formed by the combination into a single picture of a great many sight-memories of those boats.

In the highest minds a descriptive word is sufficient to evoke crowds of shadowy associations, each striving to manifest itself. When they differ so much from one another as to be unfit to combine into a single idea, there will be a conflict between them, each being prevented by the rest from obtaining sole possession of

(1) *Journal Anthropological Institute*, "Composite Portraits," vol. viii. (1878), p. 132. *Journal Royal Institution*, "Generic Images," ix. (1879), p. 161.

the field of consciousness. There would, therefore, be no definite imagery so long as the aggregate of all the pictures that the word could reasonably suggest, of objects presenting similar aspects, reduced to the same size, and accurately superposed, resulted in a mere blur; but a picture would gradually evolve as qualifications were added to the word, and it would attain to the distinctness and vividness of a generic image long before the word had been so restricted as to be individualised. If the intellect be slow, though correct in its operations, the associations will be few and the generalised image based on insufficient data. If the visualising power be faint, the generalised image will be indistinct.[1]

Some persons have the power of combining in a single perception more than can be seen at any one moment by the two eyes. It is needless to insist on the fact that all who have two eyes see stereoscopically, and therefore somewhat round a corner. Children, who can focus their eyes on very near objects, must be able to comprise in a single mental image much more than a half of any small thing they are examining. Animals such as hares, whose eyes are set more on the side of the head than ours, must be able to perceive at one and the same instant more of a panorama than we can. I find that a few persons can, by what they often describe as a kind of touch-sight, visualise at the same moment all round the image of a solid body. Many can do so nearly but not altogether round that of a terrestrial globe. An eminent mineralogist assures me that he is able to imagine simultaneously all the sides of a crystal with which he is familiar. I may be allowed to quote my own faculty in this respect. It is exercised only occasionally and in dreams, bnt under those circumstances I am perfectly conscious of embracing an entire sphere in a single perception.

This power of comprehension is practically attained in many cases by indirect methods. It is a common feat to take in the whole surroundings of an imagined room with such a rapid mental sweep as to leave some doubt whether it has not been viewed simultaneously. Some persons have the habit of viewing objects as though they were partly transparent; thus they can see the north and south poles of a globe, but not the equatorial parts, at the same time. They can also see into all the rooms of an imaginary house by a single mental glance. A fourth class of persons have the habit of recalling scenes, not from the point of view whence they were observed, but from a distance, and they visualise their own selves as actors on the mental stage. By one or other of these ways, the power of seeing the whole of an object, and not merely one

(1) It may possibly interest some persons, in connection with this topic, to refer to my "Psychometric Experiments," either in the *Nineteenth Century* of 1879, or in *Brain* of the same year.

aspect of it, is attained by many persons, and might probably be attained by all.

A useful faculty, easily developed by practice, is that of retaining a mere retinal picture. A scene is flashed upon the eye; the memory of it persists, and details which escaped observation during the brief time when it was actually seen may be analysed and studied at leisure in the subsequent vision.

The place where the image appears to lie differs much in different persons. Most see it in an indefinable sort of way, others see it in front of the eye, others at a distance corresponding to reality. There exists a power which is rare naturally, but can, I believe, be easily taught, of projecting a mental picture upon a piece of paper, and of holding it fast there, so that it can be outlined with a pencil. The Bush-boy of whom I spoke must have had something of this faculty.

We may now foresee that education is likely to accomplish much, for most of the more important peculiarities of which I have spoken are naturally present in a high degree in at least one person out of sixteen. It can hardly be doubted that any of these might be developed by education to a useful amount in, say, twelve out of the remaining fifteen (thus raising all who ranked above the lowest quartile to at least the level of the highest sub-octile).

The forms of the visualising faculty which we ought to aim at producing appear to me to be as follows:—

The capacity of calling up at will a clear, steady, and complete mental image of any object that we have recently examined and studied. We should be able to visualise that object freely from any aspect; we should be able to project any of its images on paper and draw its outline there; we should further be able to embrace all sides of the object simultaneously in a single perception, or at least to sweep all sides of it successively with so rapid a mental glance as to arrive at practically the same result. We ought to be able to construct images from description or otherwise, and to alter them in whatever way we please. We ought to acquire the power of combining separate, but more or less similar, images into a single generic one. Lastly, we should learn to carry away pictures at a glance of a more complicated scene than we can succeed at the moment in analysing.

There is abundant evidence that the visualising faculty admits of being largely developed by education. The testimony on which I would lay especial stress is derived from the published experiences of M. Lecoq de Boisbaudran, late Director of the École Nationale de Dessin, in Paris, which are related in his *Éducation de la Mémoire Pittoresque*.[1] He trained his pupils with extraordinary

(1) Republished in an 8vo, entitled *Enseignement Artistique*. Morel et Cie. Paris, 1879.

success, beginning with the simplest figures. They were made to study the models thoroughly before they tried to draw them from memory. One favourite expedient was to associate the sight-memory with the muscular memory, by making his pupils follow at a distance the outlines of the figures with a pencil held in their hands. After three or four months' practice, their visual memory became greatly strengthened. They had no difficulty in summoning images at will, in holding them steady, and in drawing them. Their copies were executed with marvellous fidelity, as attested by a commission of the Institut, appointed in 1852 to inquire into the matter, of which the eminent painter, Horace Vernet, was a member. The present Slade Professor of Fine Arts at University College, M. Légros, was a pupil of M. de Boisbaudran. He has expressed to me his indebtedness to the system, and he has assured me of his own success in teaching others in a similar way.

I could mention instances within my own experience in which the visualising faculty has become strengthened by practice; notably one of an eminent engineer, who had the power of recalling form with unusual precision, but not colour. A few weeks after he had replied to my questions, he told me that my inquiries had induced him to practise his colour-memory, and that he had done so with such success that he was become quite an adept at it, and that the newly-acquired power was a source of much pleasure to him.

The memories we should aim at acquiring are chiefly such as are based on a thorough understanding of the objects observed. In no case is this more surely effected than in the processes of mechanical drawing, where the intended structure has to be portrayed so exactly in plan, elevation, side view, and sections, that the workman has simply to copy the drawing in metal, wood, or stone, as the case may be. It is undoubtedly the fact that mechanicians, engineers, and architects possess the faculty of seeing mental images with remarkable clearness and precision.

A few dots like those of the Bushmen give great assistance in creating an imaginary picture, as proved by our general habit of working out new ideas by the help of marks and rude lines. The use of dolls by children also testifies to the value of an objective support in the construction of mental images. The doll serves as a kind of skeleton for the child to clothe with fantastic attributes, and the less individuality the doll has, the more it is appreciated by the child, who can the better utilise it as a lay figure in many different characters. The art of strengthening visual, as well as every other, form of memory, lies in multiplying associations; the healthiest memory being that in which all the associations are logical, and towards which all the senses concur in their due proportions. It is

wonderful how much the vividness of a recollection is increased when two or more lines of association are simultaneously excited.

It is a mistake to suppose that a powerful exercise of the will can vivify a faint image. The action of the will is negative, being limited to the suppression of what is not wanted and would be in the way. It cannot create thought, but it can prevent thoughts from establishing themselves which lead in a false direction; so it keeps the course clear for a logical sequence of them. But if appropriate ideas do not come of their own accord, the will is powerless to evoke them. Thus, when we forget a familiar name, it is impossible to recall it by force of will. The only plan in such cases is to think of other things, till some chance association suggests the name. The mind may be seriously dulled by over-concentration, and will only recover its freshness by such change of scene and occupation as will encourage freedom and discursiveness in the flow of the ideas.

All that remains to be said refers to the utility of the visualising faculty, and may be compressed into a few words. A visual image is the most perfect form of mental representation wherever the shape, position, and relations of objects in space are concerned. It is of importance in every handicraft and profession where design is required, because workmen ought to visualise the whole of what they propose to do before they take a tool in their hands. Thus, the village smith and the carpenter, who are employed on odd jobs, require it no less for their work than the mechanician, the engineer, and the architect. The lady's-maid who arranges a new dress requires it for the same reason as the decorator employed on a palace, or the agent who lays out great estates. Strategists, artists of all denominations, physicists who contrive new experiments, and in short all who do not follow routine, have need of it. The pleasure its use can afford is immense. I have many correspondents who say that the delight of recalling beautiful scenery and great works of art is the highest that they know. Our bookish education tends unduly to repress this valuable gift of nature. A faculty that is of importance in all technical and artistic occupations, that gives accuracy to our perceptions, and justness to our generalisations, is starved by disuse, instead of being cultivated in the way that will bring most return. I believe that a serious study of the best method of developing the faculty of visualising is one of the many pressing desiderata in the new science of education.

F. G.