

THE RELEVANCE OF VISUAL IMAGERY
TO THE PROCESS OF THINKING.

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1. *Introduction.*

THE difficulty of bringing an indictment against a nation is notorious, yet it does not prevent one from believing that the representatives of certain countries have tastes which differ from one's own. And so, though I know many philosophers and psychologists do not hold the views discussed in this article, those who do seem numerous enough to justify this attempted statement of opinion.

In this paper will be expressed the difficulties which prevent me from believing that visual images are necessarily lowly vehicles of thought and that they are often irrelevant to or discrepant from the thought which proceeds independently of or even hampered by them.

Now, though I believe that the visual image has been scurvily treated of late, I do not regard it as a Dulcinea. And this attitude is strengthened by a distaste for charging philosophical windmills. I will therefore try to describe what I believe to be misunderstandings implicit in the modern treatment of visual imagery. Explicit misunderstandings will not be discussed here.

The symposium is definitely restricted to the consideration of *visual* imagery. With visual imagery I have constant daily and frequent nightly acquaintance. Of imagery other than visual I shall not write here, not knowing whether the image's production is governed by the same laws as those which govern the coming-about of the auditory image. I see few reasons why they should, and several why they should not be identical.

The following considerations will be suggested:

(1) That the characteristics of visual imagery are extremely numerous and varied.

(2) That its development as a vehicle for thinking passes through different stages, that these stages ought to receive different names and ought not to be confused.

(3) That, while at some of these stages the visual image is disadvantageous for efficient abstract thinking,

(4) other ways of arriving at truth along visual routes may be uniquely efficient, and that this fact is more familiar to artists than to psychologists.

(5) That considering the patchy growth of recent psychology, it is quite credible if less creditable that workers should differ about the 'irrelevance' or 'discrepancy' of visual imagery.

(6) That to the results of some experiments investigating the usefulness of imagery in thought an unjustifiably wide significance has been attributed.

(7) That in considering the use of visual imagery the 'biological importance' of the situation in which it functions should not be neglected.

(8) That in many experiments, the situations were already 'half-abstracted,' and so might discourage visual imagery even in a visualizer.

(9) That the apparent irrelevance of their imagery is sometimes experienced by visualizers themselves. Yet this irrelevance raises problems which require for their solution the concept of the unconscious.

(10) That the distinction between 'concrete' and 'abstract' imagery is not helpful.

(11) That the nature of visual imagery makes it difficult to record, that this hindrance may be minimized, with results which will be shown.

Let us now consider these subjects separately.

2. The numerous and varied characteristics of visual imagery.

With some exceptions, writers on the functions, as distinct from the structural details of imagery, do not treat fairly the several attributes of visual imagery, which differ greatly in individuals. Visual images may

vary in frequency, clearness, quickness of recall, and (not so easy a matter as may appear) relevance or usefulness. In the Galtonian days, clearness was the criterion most obvious at first sight. And many statements about imagery in general relate implicitly to clearness.

Now the correlations between these several functions may vary infinitely. For example, a clear image may be useful because of its clearness. Sometimes this property may stultify thought. And occasionally the unclearness of a visual image cruelly depicts this attribute of the thought which it symbolizes.

Other attributes of visual imagery are important variables. Such is the interest or emotional colouring (possibly attributable to bodily factors at different levels of complexity) which seems to determine whether an image shall stay in consciousness, and if so, in what direction it shall develop. Such interest seems to be important in encouraging or discouraging the appearance of colour, form and movement in the visual image. Whether such interest is less or more potent than 'natural capacity' is difficult to say. Possibly this is the problem of the hen and the egg in a new form.

A personal example may illustrate this. Colour in my images is usually very fleeting and faint, as if the sun had momentarily lighted them. My first winter sports holiday left behind it an amazing crop of imaged colours, vivid, lasting, interesting, and relevant to a degree greater than I ever remember before. Sometimes, too, the images were (as they are while I am writing, fourteen months later) semi-abstractions of colour from form; vivid patches of colour with no well-defined shape; serving merely to identify the various pictures of my chromatic acquaintances. And this should be an important point for those who write about 'concrete' imagery. Apparently my casual and fleeting colour images were unworthy to represent this dazzling Alpine and aniline triumph. Perhaps enhanced images emerged from the fusion of these two mighty forces.

Personal interest, then, seems to be very important in this question of imagery, a matter perhaps easier to keep in mind in the Alps than in the laboratory.

Looking at this matter from the opposite end, laziness (and this verbal hold-all hides a heap of psychological odds and ends) seems to discourage a visual image from staying or from developing. There is a popular belief that a visualizer should be good at card games, "because it is so easy for him to see in his mind which card is out." I should not be surprised to find that the correlation between the ability to visualize

concrete scenes or faces, and that to remember which playing-card is out, is low. For this is just one of those jobs which can be done well, or better, by words, or even by imageless thought if such a lofty mechanism be mobilized, such a simple matter. The visualizer may prefer to use verbal records which a performance. For continuous visualizing is a strain, while repeating verbal formulae is not; a truism sometimes forgotten in politics and psychology.

This encouragement of images by interest is also true of visual images of movement, though such a phrase is ambiguous. It may mean (*a*) visual images in which the movement is actually seen taking place, (*b*) a static depiction of some phase of the movement, as if the picture were cut from a cinematograph film, or (*c*) a felt movement of the eyes over the image. (*c*) may occur with either (*a*) or (*b*).

Now since the image may show differences in all these attributes we cannot be too sure about its limitations. That such imagery can be cultivated seems probable. Since my interest in human movement has increased I enjoy visualizing a human being in movement, instead of getting a slow succession of static images of the performance. Yet often this pleasant aesthetic appreciation of a very concrete visual image is based upon knowledge gained through more abstract images or words, *e.g.* through notations or diagrams. These are the indispensable raw material out of which the new image grew.

Now this offers an interesting problem. The image has surmounted the words, or even the imageless thought. For aesthetic pleasure from imaging the apparent simplicity of certain complicated movements implies a previous analytical knowledge. This knowledge involves references to gravity, to friction, to the parallelogram of forces, to the art which conceals art. So perhaps this naïvely concrete image has had a philosophically respectable ancestry, even including an occasional strain of pure thought. Far from being a lowly hanger-on, it may even, like a commanding officer on parade, 'take over' when words (the N.C.O.'s) and thoughts (the captains) have completed their subordinate tasks of collection and formation.

These examples of colour and movement in the image illustrate how its contents may become specialized, abstracted, emphasized, skewed, thrown into a new focus or put into a new perspective. As a result of any or all of these processes its meaning may be refined, deepened, enriched, accented. Visual imagery has its own technique of elaboration and abstraction.

3. *The development of visual images as a vehicle for thinking.*

There are probably many ways in which the contents of a visual image change so that it may function more effectively as a vehicle for thinking. The following are only approximate descriptions of the changes. Visual images may become (a) attenuated, (b) enriched, (c) the vehicles of another meaning, (d) structured, (e) associated with dispositions underlying emotions, sentiments, complexes, or constellations other than those with which they were originally connected.

The attenuation of visual imagery is shown in the tendency of some minds to visualize diagrams for the appreciation of complex matters, these diagrams appearing non-voluntarily. When I think of a writer ignoring one half of a subject my image is of a circle, half-black and half-white. But to me, since the image means hemianopia, it needs no words.

Enrichment is one result of Freud's 'condensation.' Two images may fuse, but, unlike their perceptual prototypes, sometimes they can be kept apart and at other times they cannot. As I write, I have a very clear visual image of a scene, but I know it to be partly condensed with a striking photograph, which I often see. At present it is difficult to dissociate them, but at other times I find this possible. I have seen scores of different photographs of a famous actress. But they do not interfere with a very clear visual image of her as she was when I saw her act. (They did not do so while I was writing, but on revising my manuscript the confusion between the images had increased.)

To a visualizer the fact is familiar that a visual image may become the vehicle of a subsequent different meaning. I have before me two photographs of scenery, which I can image vividly. The first, taken in brilliant sunshine, shows all the shadows as sharp black patches. The other is a symphony in grey. I have noticed that these two pictures, originally bought to remind me of favourite scenes, appear, together or apart, as images when I am thinking about delicate beauty or photographic technique. This was made possible when these and other relationships between the two pictures were seen.

Sometimes this shift of meaning seems to be symbolized by a shift of the spot-light, so to speak, from one part of the image to another. And this process underlies a certain type of wit and of invention. But when this shift is directed successively upon different *related* features of the image, its meaning thereby becomes more general. Probably some images are especially suitable material for this process.

After many such changes an image may represent a vast structure of

meanings, and so 'structuration' may be attributed to it. Moreover, at times when the emotional significance of an image changes it may become the vehicle of an entirely different kind of thought.

4. *The visual image's 'irrelevance' and 'discrepancy.'*

Writers about the human mind take very different views of psychological relevance. Irrelevance seems scarcely to exist for Wordsworth and for Freud. To the behaviourist, most things are irrelevant. Yet we should not be encouraged by this difference of opinion to ignore the problem, as it arises in considering images. Visualizers occasionally experience images which they would call irrelevant. In myself, some hypnagogic images appear to be quite disconnected with my everyday life. During a period of insomnia I used to know when I was falling asleep because then my images changed in character, seeming to have nothing to do with everyday worries and desires, while the ordinary images, which seemed to keep me awake, were pictures of them. The 'foreign' images were usually of demons or fairies, in miniature, often dancing as on a stage. Though clearer than my ordinary images they were never taken to be percepts.

It is possible that analysis, connecting these demons and fairies with deep-lying complexes, would show their relevance. Yet I would urge that the apparent irrelevance of visual images is admitted by the visualizer. To consciousness the images are irrelevant while they may be unconsciously relevant.

Ultimate causes form no part of the material for this discussion. But certainly one root of the idea of discrepancy or obsolescence is to be found in Galton's *Inquiries*. He records his surprise that geometricians who, one might have thought, would naturally have employed visual images, did not do so, or had outgrown them. From this one might surmise that the use of geometrical figures in experiments upon visual imagery may encourage the *non*-visualizer.

And Napoleon's famous dictum¹ has impressed many, that "those who . . . form a picture (*tableau*) of everything . . . are unfit to command." But if Napoleon said exactly that, did he mean more than that he had no use for introverts? Dr Henry Head records that some of his intelligent air-force officers were visualizers. Napoleon might have found visual imagery more helpful in an aeroplane than on a horse. And undoubtedly the remark contains the vicious 'faculty' assumption that any visualizer is equal to any other visualizer.

¹ Quoted in *Inquiries into Human Faculty*, London, p. 78.

Binet's picturesque assertion "With a thought of a hundred thousand francs one has images of four sous"¹ is also famous. But to use images in a war on images is to invite reprisals.

The famous experiments on thinking, by the Würzburg school and others, have shown conclusively that under certain conditions, subjective and environmental, certain types of mind can solve certain types of problem without the aid of images or even, sometimes, of words. But it is fair to remark that the problems were abstract, so that in them much of the important working-up of the raw material had already been done. Some of the observers were famous for such thinking performances and even the student observers had been already skewed towards philosophy. Often the solutions of the problems set were not biologically urgent. Furthermore, Miss Claire Comstock's experiments² demonstrate the impossibility of assuming that a person who habitually uses visual imagery in abstract thinking would have solved these problems without such aids, or that such a person could have solved them at all.

5. *Concrete and abstract imagery.*

A distinction which may be attractive before it is applied to actual examples is that between 'concrete' and 'abstract' visual imagery. But it confuses the content or structure of the image with its function. Even the most definite or concrete perceived object may carry either a concrete or an abstract meaning. A masonic symbol, for instance, is as concrete an object as can be. But to many uninstructed persons it represents only the general meaning of brotherly goodwill. To a widow who has been helped by the organization, the symbol may carry the most concrete, poignant personal meaning.

This dual function of the physical object is matched in the image. 'Abstract' images may carry concrete meanings, and *vice versa*. Many visual images, even if 'photographic' (whatever that may mean, for even the camera abstracts) or 'mimetic' (and so notoriously, does the mime), may carry the most abstract or the least abstract of meanings.

This seems to be the place to record my difficulty in understanding what is meant in the common belief that an image *copies* an object. My visual images are all abstractions, in the sense that they do not revive all the visual aspects of the original perception. In those which are

¹ *Année Psychologique*, 1911, p. 10.

² "On the Relevancy of Imagery to the Processes of Thought," *American Journ. of Psych.* 1921, xxxii, 196 f.

biologically significant, this abstraction has usually gone far. Moreover, often this abstract image, when it appears, has fused with others whose meaning has also been fractionally distilled. Yet the *meaning* of such a resultant image (twice or thrice or more times removed from reality) may be either concrete or abstract.

As I now write, an image of the Jungfrau appears with silver gleams on its graceful shoulders, and an evening star swung high above a crag like a castle in the *Ring*. In one way this image outstrips the original perception, for it defies the cramping laws of binocular vision. From that spot an eagle might see the Jungfrau's front and this crag together; no man could.

The details of this image—a memory of leaving Wengen at sunset—are thrillingly concrete. But its meaning that evening was Wagnerian; one was leaving gods and gnomes. To-morrow its meaning may taper to a point—if I go south, shall I change at Spiez?

As I made rough notes for this paper, an image appeared of the face of one of the most beautiful persons I have ever seen; unusually beautiful too, because it was an idealization of many other images. At that time it appeared with a mysterious imaged background of a dark cave; my train was passing through the rock-cuttings in Derbyshire.

Now both these images carry complex meanings. The first meaning admittedly has reached a high level of generality. The images represent in different ways the mystery of superlative beauty. The first meaning is obviously due to the mighty abstracting powers of Wagner; the second to painters and poets innumerable.

The verbal thinker might express these experiences in a few phrases. Maybe (I cannot know) his phrases will bring as much pleasure as my images. And he can share the sound or sight of them with others; if I could share my images I should not be writing about them. But if our problems in thinking-experiments are set in words, are we not investigating special, though lofty, types of abstraction, generalization and thinking? I am not unmindful of the careful investigations of the process of abstraction in which words were not the only material used. But (*a*) the problems were usually chosen for the subject, and did not arise out of his personal private needs, (*b*) some of the material used, such as diagrams, would not appeal to some visualizers, being more attractive perhaps to non-visualizing geometers. For some visualizers are bored by diagrams which they have not invented themselves, just as they resent illustrations in a novel. They are perhaps more interested in their own visual abstractions than in other people's.

Now the importance of abstracting a general meaning from specific instances is undoubted. Yet one way of amplifying this is to say that the determining tendencies underlying the abstracting process are all-important, and that whether they eventually issue in a word or a visual image is comparatively unimportant. I cannot see how this opinion is reached, for the differences between the functions of picture-vehicles and word-vehicles seem to be very significant.

6. *The use of words in thinking by the visualizer.*

Even the extreme visualizer occasionally performs what has been impolitely termed 'sub-vocal muttering.' But it feels quite different from his usual thinking.

It is naturally not easy to observe oneself while thinking. But I notice that sometimes I say words with vocal or sub-vocal muttering, when attempting to strengthen an intention. Recently I found myself formulating, 'Take a line and stick to it'; occasionally I seem to hear, sub-vocally, 'Suaviter in modo....' But both these are examples of situations in which a previously-made determination needs stabilizing. And at such times M. Coué's beliefs are easier to grasp.

7. *Evidence of the value of visual imagery in carrying meanings, and of its effective attenuation with the passage of time.*

It has now been admitted that the visual image is of inferior value for some problems which some philosophers, on their lawful but not always urgent occasions, have set themselves. For other kinds of abstraction, however, they may perhaps be uniquely useful. Instances will now be offered in which they seem to function quite effectively.

In the following records there are perhaps some relatively novel features. The experiences were observed under very favourable conditions. They were of the greatest interest, both personal and scientific, to the recorder. The motives for wanting to utilize the knowledge carried by their representative images are very cogent. By the aid of a dictaphone, the use of which has become habitual, the details concerning the images could be dictated with unusual rapidity, and without the disturbing presence of a second person.

(July 8th, 1926.)

On July 1st, 1926, from 2 to 4 p.m. I visited the Wimbledon Lawn Tennis Championship contests for the first time. I could stay only two hours. My interest was chiefly psychological, and I was less attentive to the outcome of the games or the individual scores. I wished to appreciate the play and, so far as possible, to see the bad players' faults focused against the relative perfection of the Wimbledon performances.

Three points emerged very clearly in memory. One was the fault of standing still after the service, so that one has less time to 'get a move on.' Possibly some good players succeed if they stand still: those whom I saw did not. They moved often towards the net; sometimes in another direction. This was illustrated by the fact that if they served a 'fault' they always had to return to the base-line, sometimes as far as ten feet.

The second point (an obvious one, but very strikingly so at Wimbledon) was the suicidal effect in a 'doubles' of leaving any part of the court open, especially against the Americans.

The other useful memory was of the very extensive preliminary swing-back of the racket before making a back-hand drive, even when to a novice it seemed excessive.

Now these are all commonplace facts to good players, probably even to readers of books about the game. Why are they brought forward here? Because these three object lessons were carried, hours after I had left Wimbledon, in vivid visual imagery of the players actually making these strokes. It might be objected that since I have the knowledge, I could carry it in words, as indeed writing it down must necessitate. This is true, but in actual fact it was carried by visual images which, seven days afterwards, were still very clear and insistent. It was then that with the dictaphone I made a record from which the following passages are literally transcribed (with no alterations of grammar or style).

I will now describe, as photographically as possible, without any reference to the function of these visual images, those which arise when I shut my eyes and think about the play a week ago at Wimbledon. It is obviously necessary to hold one image to the exclusion of others as they tend to press in.

(1) I am standing at or near one corner of the Centre Court. I *know* that the grand-stand opposite is packed with people. Nevertheless it is an entire blank of black, as if it was night, while only here and there, there are whitish blotches suggesting the presence of people. . . .

Next comes the net, very vivid and tightly stretched, and the groundsmen slowly retiring after having tested its height. Mademoiselle Vlasto is at my end, Mrs Godfree at the other. Immediately they change places, Mrs Godfree is at my end and I cannot see her opponent. A very white ball flashes backwards and forwards in the middle of a visual image which consists now of nothing but a (word lost, probably 'schematic') net and a grey darkness. The pace of the ball and its angle are very striking. I believe the pace of the ball is not exaggerated but is exactly the same as at Wimbledon. Passes between two very vague rackets with no suggestion whatever of any players at all. Now I can see Mademoiselle Vlasto focused very clearly against the blackness of the grand-stand. Her brown arms show out, in very clear detail. Now Mrs Godfree replaces her: a flashing image of the upper part of her body shows the tremendous swing back of her right arm in the forehand drive.

The next picture is one of Lycett and Austin on my side of the net, Austin caught out of position while one of the Americans makes a perfect 'railroad' drive, just skimming the net with the greatest ease. The same () is carried by a picture of Lycett looking physically distressed, and racing back to back up Austin and nearly colliding with him. In this picture the sun is blazing vividly on the players, and though they seem to be very near to me, at the present moment, neither of their

faces really corresponds with the actual players. They seem to be mere (? schematic) figures to point a moral. . . .

Kinsey's superbly cool method of walking across the court is now shown by a vivid and accurate picture of him (eyeshade complete) walking with the slightest suspicion of a swagger. Then suddenly he makes a perfect back-hand drive almost along (?) the next court from left to right. The sun blazes out and the next picture is of a lob twinkling high above the grand-stand.

Service is very clearly illustrated by Miss Ryan's characteristic movements. The image now consists chiefly of Miss Ryan's arms up in the air, then they vanish and a racket swings across from left to right. Then a schematic image of Miss Ryan's quick dash to the net and rapid alternation of balance from one foot to the other. Then a vivid image of the court () and (this apparently the first time since I began to describe) of the stand, with as many people as there were at the time. Then away on the right in Court No. 1, the score-board, the names J. Brugnon, Cochet, J. Borotra and a long French word which seemed to contain about nine letters and the syllable -ing.

At no time can I visualize the four Frenchmen anywhere near the base line. Probably for the sufficient reason that they were never there as far as I remember. But a very clear image of Borotra waiting for a chance, which he eventually gets, to drive hard between his two opponents exactly across the centre of the net. This image occurs several times, from which I assume that it may have happened several times in the game.

(2) My imagery to-day differs from that at midnight, or thereabouts, on July 1st in that it is to-day far more under control¹. I can select from a number of images, all searching for admission to consciousness, with greater ease than a week ago. Then they were insistent, vivid, exciting, and much fuller of actual movement. If I had been in the dark while having them, I think I might easily have been troubled by them before going to sleep. The bedroom, however, was not dark and the conditions for a hypnagogic image were not favourable. In any case, as far as I know, this imagery did not prevent me going to sleep. But I remember that it was more vivid and less schematic. For instance, I remember that I felt I could have painted or modelled Mademoiselle Vlasto or made a carving in ivory. To-day any image of her is partial and more like a diagram. Last week the people on the grand-stand and their vivid dresses in the sunshine (I was in the shade looking over towards the sunny side) were very much as in reality. The sparkle of the new balls, something which I have never seen in tennis before, which was also noticed that day by a newspaper critic) played a great part in the images a week ago. Unless I wish to bring it up, it plays no part now. The facial details, as for example of Lycett, whose face I can visualize very easily because he is like a friend of mine who is about his own age, were then very clear. Also the faces of Kinsey and Richards. *Now* I can say that both these Americans are caricatured by my image. Kinsey is very little more than a lean face

¹ *Comment on this description:* It is obviously open to criticism to offer as evidence my memory on July 8th of the images as they presented themselves to me on the evening of July 1st. My images on July 1st were so vivid, impressive, and in certain respects so unlike those on July 8th that on the latter date a comparison forced itself on me which I also recorded by dictaphone.

with spectacles under an eyeshade, a tightly belted waist and a way of walking which is American rather than English. Richards's boyish face is now puffed up. Mrs Godfree is chiefly a large white jockey-cap and some extraordinarily active legs and arms. In almost every case, however, what remains is the distinctive feature of the player, what has gone is what they share with others. For instance, I doubt if I could visualize Borotra without his round cap, or Miss Ryan without her muscular arms and her nervous way of dancing about the court.

I should say then from this and other experiences, that my visual images a week later have lost in detail, but the detail which has been lost is very frequently irrelevant to the purpose. They have become more diagrammatic. It is quite possible that this selection has been caused by my putting my knowledge into words. But this seems to me only to fix the knowledge in a way in which it can be more readily reproduced, by myself or others, and criticized.

What seems to me to be important in the present case is this. These visual images give a very intense real colouring to the past experience. They are the way in which such lessons appeal to my particular type of mind. It is quite possible (though I think far from certain) that this is an inferior way. Even I, when I can, put such knowledge into diagrams, notations or words. But I do not believe that criticism of the use of visual images by persons who either do not possess them or do not make use of them, is very helpful in the present case.

X has often urged that I should give an account of the memory of something which really matters, and really has practical results. This seems to me to be one.

8. *The image as irrelevant to or discrepant from the process of thinking.*

Some psychologists, who believe the value of the image in thinking to be small, write of it as irrelevant, others as discrepant. Webster gives the meanings of discrepant as "discordant, at variance, disagreeing, contrary, different." Speaking only of my own visual images, I doubt if any (excepting possibly hypnagogic images, which seem to be of another type) appearing at first glance to be discrepant or irrelevant are really so. When examined, they prove to be closely associated with the subject of thought. But this matter has been exhaustively treated, both theoretically and practically, by Comstock¹. Her conclusion was that there is no irrelevant imagery, and the reader is referred to her paper for answers to many questions which the present article may seem to raise.

Moreover, psycho-analysis has made it impossible for us to be satisfied with the fact that images at first glance appear discrepant. Everyone who relates a dream notes images that appear to be discrepant. But it was with some such fact in mind that Freud wrote his *Traumdeutung*. And until the writers on thinking and the writers on dreams acknowledge

¹ *Op. cit.*

each others' existence, this part of psychology will continue to progress with an ataxic gait.

9. *The usefulness of visual imagery.*

Evidence is therefore available from experiments like those of Comstock, from the findings of psycho-analysis and from records such as those on pp. 10–12, that visual images are generally relevant and useful, and that in some types of abstraction they may be uniquely useful. Yet the experiments of Dr Betts¹ and of Dr Nellie Carey² are sometimes cited as showing the uselessness of visual images in problems where their utility had formerly been presumed. But concerning these experiments I would urge certain considerations.

Betts' subjects were, for example, asked to answer questions about a cube painted red, sawn into inch cubes. Carey used drawings, consisting of five or six straight lines, and cut holes in folded paper. And both these classes of material are more than half-way to complete abstraction. Even the visualizer would use words about them.

Dr Carey's experiments also seem to have provoked the primary memory image. The results are significant, yet the 'primary memory image' is not a *memory* image in the ordinary sense. It is a transition between perception and ordinary mental imagery, a distinction drawn by Jaensch, Allport³ and others. Dr Carey cannot be reproached for not knowing about the eidetic image, which was not reported until fairly recent times. But the relationships between any person's eidetic or primary memory images and his highly structured memory images, occurring at a much later time after the perception, cannot be assumed.

The results of both Betts and Carey are not surprising. I have often noticed that problems which could be solved either visually or verbally were solved by using words, and believe they were often done more easily through words. But these problems were abstract. A visualizer may be bored as stiff as anyone else by five or six straight lines joined in a variety of irregular ways; why not? And, like the verbalizer, he may not visualize the shape of a hole cut in folded paper, not because he cannot, but because there are less strenuous methods of attaining his aim.

I would suggest that in devising material for experiments upon imagery and mental tests the bias of some investigators towards geometry

¹ *The Distribution and Functions of Mental Imagery*, 1909.

² "Factors in the Mental Processes of School Children." *This Journal*, 1915, VIII, pp. 70–92.

³ *This Journal*, XVI, pp. 99–120.

has already gone too far. To assume that a person's ability to deal with abstract problems can be measured by his memory for, or intellectual manipulation of, geometrical figures invokes the doctrine of 'faculties' too light-heartedly.

10. *Evidence of deprivation.*

In Martin's experiment¹, where 150 cards were shown to five subjects, the subjects were told to suppress all images altogether. This, it is reported, they found themselves quite able to do.

It seems likely that if these problems were half-abstracted, if they did not matter much to the subjects, or if the subjects were not habitual visualizers, the images could quite easily have been suppressed. It is equally reasonable to urge, both from introspection and from acquaintance with normal and abnormal visualizers, that 'quite easy' suppression does *not* succeed with biologically urgent images.

¹ *Zeitsch. für Psych.* LXX, 1914-15.