SCIENCE

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PERSONALITY AS REVEALED BY THE CONTENT OF IMAGES[1]

CHARACTER study and the investigation of personality have recently assumed, on account of the present tendency to apply psychology, a psychological importance they did not formerly possess, and since it has given rise to a general interest in any work looking towards the possibility of getting additional information regarding the individual consciousness, it has seemed to me I could not do better to-day than to outline the results of an investigation which I have made to ascertain whether it is possible through the examination of the content of an individual's images to obtain an insight into the predominating features of his personality, that is, the psychical and physical activities which characterize and distinguish him from others.

The experiments were made with 20 persons, largely professors and students connected with the Stanford University. In half of these experiments (S.) the observers allowed visual images to arise of themselves and in the other half (V.) they aroused them. It is scarcely necessary to add that the experiments were "*unwissentlich.*"

The most important fact that comes out in examining the tabulated results and what was given to protocol is *that visual images reveal the mental and physical peculiarities and preferences of an individual.*

In what follows, I shall take up in detail the results of but 3 observers, to show that the data ob-

[1] Address of the vice-president and chairman of Section H, Anthropology and Psychology, American Association for the Advancement of Science, New York meeting, December, 1916.

tained reveals the observer's personality, that is, his mental and physical activities as shown by what has been stated concerning him in "Who's Who in America" (W.), "American Men of Science" (C.), his general reputation in the university community, the opinion that his intimate friends have of him, my own knowledge of him, and by what he himself said at the close of the experiments when questioned regarding the personality-revealing power of the content of the images he had reported.

The first individual results to which I wish to direct especial attention are those obtained with R.—(C.W.)—professor of electrical engineering at Stanford University, formerly at Cornell. Born in 1866. Has not traveled in Europe. At the time of the experiments was preparing for a demonstration and discussion at the approaching summer meeting of the American Association for the Advancement of Science of the insulation of electric currents at high voltage.

R.'s images for the most part as regards frequency follow the general time law. The interesting peculiarities to note are that the willed images have, more frequently than the spontaneous, an imaginative character, and that the future gives more images in the case of willed images than of spontaneous. That is, the imagination images are concerned with the future; they have a creative rather than a reminiscent character and have more largely to do with electrical work. The difference in content between the spontaneous and willed images of R. is due doubtless to the course of training as regards the putting aside of his electrical and, indeed, of all work of an inventive character during the hours devoted to rest, which he has been obliged to give himself in order to restore and preserve his health.

R.'s images are connected with the east, where he has engaged in electrical work, with Stanford University, especially his laboratory and home, with the Panama-Pacific Exposition in San Francisco, with Owens Valley and La Jolla, where he watched the construction of the Los Angeles Aquatic Power Project as consulting electrical engineer, and with places where he has gone on pleasure excursions in his automobile, as, for example, a series of views on a drive from San Francisco and San José to Stanford.

People, interiors (his own laboratory, particularly), electrical instruments and machinery, automobiles, electric cars and landscapes, especially the scenes along a country road, are evidently of the greatest interest to R. It is noticeable that when he uses his will, not people or landscapes are the image-producers, but his work as an electrician, the improvement and adaptation of electrical instruments and machinery that he contemplates taking up in the near future in getting ready for the demonstration just mentioned.

Through curtailed summary just given of the content of R's images I am able to give but a very general idea of the information conveyed through them regarding his mental and physical activities. The results, however, obtained with him and with the other observers do show that through using the image method one is able to obtain very detailed information regarding a person's individual peculiarities.

W.—Major in history, Stanford University. Born 1890 in Los Angeles, where his family has since lived. Captain of the baseball team. Visited Japan and Hawaiian Islands with the team in 1913. The experiments were made during the baseball training season.

W.'s spontaneous images are largely confined to the present and to Stanford University. Those that are willed also include images of the trip he made with the team. His Stanford images show that his thought is taken up with the men of the baseball team, the athletic field, the training house, and with other places and things connected with the playing of baseball. The images give, without doubt, a true picture of the life of a college student devoted to athletics. It is said this observer has been tempted to give up the idea he formerly had of going into scientific farming and has even seriously considered devoting himself to professional baseball. One is made to realize more fully in examining these images how college athletics may largely absorb a student's thought and become, as in this case, a menace as far as the particular student is concerned to the college itself as an intellectual center.

FF.—Born in Palo Alto in 1901 and has lived there continuously, except for a year and a half spent in the eastern part of the United States and the eleven summers of perhaps four weeks each, spent at Carmel, and the four summers of eight weeks each at Tahoe. Up to within a year or so she studied at home, but is now in a private school.

As to time, FF.'s images follow the law, except that their number is greater in 1909–07 than in 1911–10. This is probably due to the fact that a year and a half of this time was spent in the eastern part of the United States, for the majority of the images of this period are reproductions of occurrences connected with this eastern visit.

As to location, FF.'s images have to do with Palo Alto (her home, school, etc.), the places where her summers have been largely spent (Carmel and Tahoe) and with the experiences, as was said, of the year and a half residence in the east. The year in the east, considering the time involved, has a very much greater image-producing power than has her own home in Palo Alto. The same is true of her life at Carmel and Lake Tahoe, the last furnishing more images than does Carmel, where she spent more time and the time was more distributed. The importance of vacation periods in the intellectual life clearly comes out here, as well as in case of some of the other reagents.

I suspect the pleasure-giving power of an image often determines its arousal in FF.'s case. At any rate, no image of her experiences at Carmel in 1906, when she had scarlet fever and suffered a great deal, arose, and moreover, every one of her images has an agreeable content and she showed much pleasure in describing them. Not only pleasure, but the newness of an experience is also, doubtless, an important factor as regards its being imaged. This explains probably why FF. reproduces in her images so rarely the members of her own family, to whom she is devoted. One must not, however, over-emphasize pleasure and interest as image-producing factors in her case, for the results show other factors often enter in and control their arising. For example, FF. went to the Exposition two days during the time the experiments were being carried on and was greatly interested and took much pleasure in what she had seen, but the fifteen images recorded after her return from the Exposition do not reproduce what she saw there.

FF.'s predominating interests are evidently those enumerated by her mother, before she knew the distribution of her images—Tahoe, Carmel, people, school, horses, in fact, all animals, plants, especially flowers, water and landscapes. Some of the images classed under people had a landscape background or were accompanied by another image-arousing subject such as an animal; a person, for example, was on horseback, or a dog or cat was with a person, but such images as to content have been classed under people, because it was quite evident that the person or persons were the real centers of interest. That FF. is a close observer, as her mother says, is evident from the presence of details in her images which most persons would not have noticed in examining the particular object visualized, as for example, the way in which the sunlight fell upon certain parts of a dress, was reproduced in them.

A comparison of FF.'s images with those of her brother LF. shows that her visualizations are much more personal and in general less valuable as regards content. LF. for example visualized Lake Michigan, an aeroplane at the Exposition, the plains in New Mexico, scenes described in a book on the south pole, speed boats at the Exposition, views of Pittsburgh, a glacier, picture of Whistler, harbor at Sandusky, etc. FF. Gertrude Jones on her wheel, Mrs. Jordan at a picture, Dr. Lane shooting at little cans, Mrs. Ely with a rose in her hair singing, etc. As FF. is an intelligent girl, it is probable that the unimportant content of her images is due to her secluded education and the greater emphasis laid by those who have had to do with it on the less important matters of life. What is true of the content of FF.'s images is also true of the images of the other girls who took part in the experiments.

The results with FF. show very clearly the diagnostic significance of these experiments from an educational standpoint. FF.'s mother, with whom I studied the results, I found later, had made an application of what she had learned. FF.'s reading had been altered and family discussions were now more often connected with matters of world interest.

The results also show that *visual images reveal the attitude of an individual as regards the world around him.* The activities pictured in the image and the observer's relation to such activities show whether he is a participator, an actor in the scene, or only an observer of it, that is, whether an objective or subjective attitude of mind marks him.

Before leaving the discussion of the general facts it ought to be said, perhaps, that the results do not show that a study of a person's visual images alone, even where such images are very strong and detailed, will *completely* represent his personality. To obtain such a representation, as well as to determine the laws of thought in general, not only must the content of other images, as the tactile, auditory and kinesthetic, be studied in themselves and in a comparative way but the relative signif-

icance of each kind of imagery in the observer's life should be investigated. His imageless thought should also be examined. Taine, in saying that the laws of thought can be determined by studying images, was only correct in the main. There is, as I have previously shown, some of our thinking which is not represented by images, even in case of those having a strong visual memory which is actually measurable and this *unanschaulich* residue must not, of course, be neglected in a complete investigation of personality.

Where an observer does not have visual images other images could doubtless be similarly employed, but where he has fairly strong visual images their use is to be preferred, in that an observer is instructed to examine a thing having a reality and objectivity comparable with that of a positive and negative after-image, where the possibility of measurement is universally admitted. What I mean to say is that in examining visual images a reagent's observing powers are called into play as they would be in making a study of a sensory object and the demands made upon his introspective powers are therefore much less than in examining other images and imageless thinking.

The results of another series of experiments where the observer was instructed to arouse, respectively, let arise, a feeling image or experience, showed that not alone the sensory image, but also the feeling image or experience method, should be employed, as in some observers emotion plays so important a rôle as even, for example, to transform major image centers into minor and vice versa. Not alone as a matter of confirmation and supplementation should the feeling image method be used, but to obtain information concerning the energizing and non-energizing effect of emotion as regards thinking and acting.

Supplementation and modification of the series just outlined would be desirable as, for example, the effect on imagery of shifting the environment systematically, or, again, experiments in which the experimenter suggested the subjects of the images would be useful in showing the initiative imaging and thinking power of an observer. In reading a piece of poetry or prose, one is often able to represent what is presented, but is painfully aware that he has not sufficient intellectual initiative power in the particular direction to have had the images and ideas arise spontaneously.

The tabulations show further that

Memory images predominate in the visualization of the observers.

Certain subjects are more likely to be reproduced in the form of imagination images by some observers than others.

Memory images are usually definitely located as to the time of the corresponding experience.

The shorter the time since an experience occurred, the greater the probability of its being visualized.

The probability of the visualization of a more recent experience does not decrease with the age of the observer, as might have been expected from Ribot's investigations.

The observer's present environment is often determinative as regards the images which arise.

Certain places, objects and activities are more likely to be visualized.

While the range of visualization as regards time, place and subjects, differs with different observers, it is in general constant in case of the same observer.

The range of visualization as regards the amount included in the image differs.

Previously connected experiences are evidently not as closely bound together above

and below the threshold of consciousness in case of some of the observers as of others.

The time taken for the arising of spontaneous and willed images varies greatly in the same and different observers.

With some observers the preimage, that is, subconscious mental activity, is much more frequent and has much more influence as regards the kind of willed image that arises.

Subconscious activity is sometimes revealed in the willed images that arise.

The spontaneous images give a survey of the static and dynamic condition of the subconscious.

The following is a brief summarization of some other matters of practical and theoretical interest brought out by the examination of the experimental results: It is possible through using the image method, to determine the richness and poverty of the subconscious in a given individual as regards quality and quantity; his tendency to react along the lines of habit-thought (spontaneous ideas and images); whether he has naturally or has acquired the ability to direct the course of his thought, in short, whether he is really able to free himself from habit-thoughts and start new lines of thinking; to ascertain how to enrich or render non-effective, when desirable, what is subconscious in an individual; to foretell the probable effect of a given environment, as regards momentary thinking and the storing up of thought material upon a particular observer and upon observers in general, and the length of residence most desirable as regards such storing up; again, the prevailing thought-constellations in a given observer can be ascertained through the method as well as whether it is possible and desirable to strengthen such natural groupings or to break them up through education; whether the levels and strata of the subconscious in a given observer can and should be shifted; also, whether marked vacillations of attention in a person are not sometimes due to persistent preimages and if so whether it is not possible for such images to be excluded or transformed into more useful forms; again, whether work may not sometimes be more rapidly and effectively done by an observer by letting himself go and waiting for the problem to solve itself under the threshold of consciousness and spring into consciousness, that is, whether too much or too little emphasis is being laid on will in his case; to make out whether permanency or vacillation characterizes a person's thinking and the effect of this on his life as an actor; to get at the strength of will of an observer and to determine the possibility of weakening or strengthening it; to determine the direction and strength of a reagent's memory and imaginative power for the purpose of getting information concerning his ability and weakness along observational lines and correcting them where desirable; to decide whether it is better to let one's subconscious thinking take care of itself or to make an effort to educate it; to examine the effect of weariness and sickness on an individual's intellectual life, as it is possible that these are not entirely detrimental from the standpoint of the storing up and destruction of thought material; to get hints regarding a reagent's fitness for a given vocation; in short, to make a diagnostic, prophylactic, and therapeutic study of the consciousness of a given individual.

In examining the work being done to-day along the line of mental tests my criticism has been that nearly everywhere it seems to end in the diagnosis, that is, the therapeutic significance of what is learned from the diagnosis is too much ignored. For this reason I have asked myself and have made some experiments to ascertain what the image method had to offer in a therapeutic

way. My preliminary experiments show that where persistent images are found, as in the various forms of hallucinations of normal persons, or persistent ideas as in the incipient forms of delusions, one can break them up and ultimately destroy them in some cases and in others substitute for them images and ideas having a more agreeable nature. The breaking down and destructive process was actually accomplished in cases of apparitions, accounts of which I have already published. I am now working upon experiments having to do not so much with the possibility of supplanting spontaneous images having a disturbing character by those that are more agreeable, for that I now know is possible, but more particularly with the various modes of bringing it about. I can already see that the photograph, stereopticon views, the moving picture and its accessories appealing to the other senses and the phonograph will be very useful in the building up and supplanting process just mentioned.

Before suggesting a new method of studying personality one naturally employs other methods to test and control his own. Biographical, autobiographical, historical, observational, introspective, etc., methods have actually been employed in the course of these experiments, in that the opinion that images are betrayers of personality is based, as has been said, upon the general agreement between what the images reveal regarding the observer and what others, including myself, know of him and of what he himself said regarding their revealing power.

It is everywhere evident that the more impersonal, systematic, and exact observation and introspection employed in the image method, give more reliable information regarding an individual than the chance and uncontrolled observation and introspection used in the methods just mentioned. Again, the observer's powers of discrimination in employing the image method are not called upon to the extent they would be if he was asked to make a series of judgments upon his own characteristics, since he was not informed until the experiments were completed as to the object of the investigation. What was learned by the image method was much more intimate and detailed than by the others. The experiments yielded not alone information agreeing with what was previously known of the observer by others and by myself, but what was not even known to the observers themselves until after the investigation had been made, that is, the images actually brought characteristic reactions to the observers' attention which they had not noticed before.

As it is in the association methods that one would expect to find the image method competitors, I determined to make some direct tests and asked each of the observers who took part in these experiments to write one hundred words in succession. The words written show that very much more can be learned through using the image method. The same thing was shown in applying the Kent-Rosanoff associative method.

It may be said in a general way regarding all the association methods, and among these I include the methods of psychoanalysis, that the image method gives results as regards personality that are far more definite and clear cut.

The experiments of Ach and Barrett along the lines of temperament and character mark an important step in experimental psychology, and it would be very interesting to compare results obtained by applying their methods and material with those obtained by the image method. However, the confining of character study largely to data having to do with choice,

and choice in connection with such very simple material as they used, is much too limited to give an adequate idea of an observer's personality, and for this reason, unless the experimental material were enormously increased and the method so modified as to introduce other mental activities than will, I am confident the use of this method also, as regards the image method, would be one of control and support and perhaps of supplementation. Taken all in all, it seems to me, the image method is more information bringing than any of other methods which have been proposed.

In the way of a general summary and conclusion it may be said that the results everywhere show that images are not isolated entities, but are closely bound together, supporting and supplementing each other as information-bearers and that for this reason one gets through taking them apparently at random, typical examples of the entire range of an individual's imagery. Since images are in general the "high-points" of *unanschaulich* thinking, one may also obtain from them a very complete idea of an individual's general manner of thinking and acting. Stated briefly, the experiments show that the image method is a mode of "sampling" which is adequate for a satisfactory diagnosis of a personality.

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THE INDUSTRIAL FELLOWSHIPS OF THE MELLON INSTITUTE[1]

IT is again my privilege to report to SCIENCE progressive growth in both the number of industrial fellowships in operation and the amounts subscribed for their support. This makes evident the confidence which industrialists have in the Mellon Institute and the genuine value to industry of the industrial fellowship system.

The following table presents the number of industrial fellowships which have been established at the Mellon Institute from March to March of each year, 1911 to 1917; the number of researchers, or industrial fellows, who have been employed thereon, and the total amounts of money contributed for their maintenance by the industrial fellowship donors.

March to March	Number of Industrial Fellowships	Number of Industrial Fellows	Amounts Contributed
1911–1912..	11	24	$ 39,700
1912–1913..	16	30	54,300
1913–1914..	21	37	78,400
1914–1915..	21	32	61,200
1915–1916..	36	63	126,800
1916–1917..	42	64	147,000

As indicated in last year's report,[2] when the industrial fellowship system passed out of its experimental stage—when the Mellon Institute occupied its permanent home in February, 1915—twenty-three fellowships were in operation, while on March 1, 1916, there were thirty-six fellowships. It was mentioned in that report that the growth of the institute had about reached the stage where we should be obliged to decline further industrial investigations temporarily, since our laboratories were almost filled up to capacity. Notwithstanding that fact, the impetus imparted to the investigational activity in American chemical manufacturing, the direct result of the appreciation of urgent action in industrial research, induced us to arrange for the acceptance of six new fellowships during the institute year, March 1, 1916, to March 1, 1917. At the present time (March 1, 1917) there are forty-two fellowships and four additional ones have recently been arranged for, to begin later in the year.

[1] For previous reports on the status of the system of cooperation between science and industry in operation at the Mellon Institute, see Duncan, SCIENCE, N. S., Vol. XXXIX. (1914), 672; and Bacon, *ibid.*, XLIII. (1916), 453.

[2] SCIENCE, N. S., Vol. XLIII. (1916), 453.