

THE HIGHER FORMS OF ABSTRACTION— THEIR NATURE.¹

BY PROF. TH. RIBOT.

IT is unnecessary to enter in detail into the researches of the last thirty years as to the seat and the nature of images. Yet since these have been the point of departure of the following inquiry, the results may be briefly summarised.

It is generally admitted that the image occupies the same seat as the percept of which it is a weak and incomplete residuum, i. e., in order to produce itself in consciousness it demands the putting into activity of certain definite portions of the cerebral centres. The energy of the representative faculty does not merely vary from individual to individual in a general manner: there are particular forms of imagination, constituted by the very marked predominance of a certain group of representations, visual, auditory, muscular, olfactory, gustatory.

Normal observations, and still more pathological researches, have thus determined certain types. We may also (though this is mere hypothesis and difficult to verify) admit a "mixed" or "indifferent" type, in which the different species of sensations are represented by corresponding images of equal clearness and vigor, without marked predominance of any one group, whilst still maintaining their relative importance: e. g., it is clear that in man the visual and olfactory images cannot be equivalent in absolute importance. Excluding this indifferent type, we have three principal "pure" types: visual, auditory, muscular or motor, signifying a tendency to represent things in terms borrowed from vision, from sound, or from movement. If we push the investigation further, we find that these types again imply variations or subtypes. Thus there may be a lively faculty for representation of complex visual

¹Translated from the French by Frances A. Welby.

forms (faces, landscapes, monuments) along with a weak sense for graphic signs (printed or written words) and so on.

The numerous works devoted to this subject, and too well known to be insisted on here, lead us to this conclusion: that there is no general faculty of imagination. This is a vague term which designates very different individual variations: these last alone have any psychological reality, and are alone important in cognising the mechanism of the intellect.

May it not be the same for the faculty of conception? May not the word "general idea" or "concept" be in its kind the equivalent of the word image, namely a vague formula,—its psychological reality lying in types or variations as yet undetermined? I am exposing for ideas, the problem that has already been set forth for images, while recognising its much greater obscurity. The psycho-physiological conditions of the existence of concepts are practically unknown: this is a *terra incognita* wherein the new psychology has hardly adventured itself, and where it would indeed have been chimerical to tread before the preliminary study of the image.

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The question I have set myself to elucidate is very modest, very limited and circumscribed, representing only part of the problem indicated above. It may, however, teach us something of the ultimate nature of concepts. It is as follows:

When we think, hear, or read a general term, what arises as sign in consciousness, *directly and without reflexion?*

I have purposely italicised these words in order to emphasise my principal aim, which was to discover the *instantaneous* operations (conscious or unconscious) that occur in such a case, in persons whose habits of mind are widely different. I endeavored as much as possible to eliminate reflexion and to seize the mental state. With time and effort, minds that are least apt in abstraction will arrive at a more or less successful translation of general terms, or at the substitution for them of some mangled and halting definition. I set myself as far as possible to suppress this secondary phase of the mental process, and to arrest it at the first, in order to determine what the word evokes immediately and in what degree this differs with the individual.

In order to make the answers more exactly comparable, I interrogated only the adults of both sexes, excluding all children. It was indispensable to my investigation that it should comprise people of very different degrees of culture, habits of mind, and profes-

sion. The principal classes were mathematicians, physicists, doctors, scientists, philosophers, painters, musicians, architects, men of the world, women, novelists, poets, artisans. The last class made such confused replies that I must regard their data as worthless. Too much is left for individual interpretation. The total number of persons interrogated amounted to one hundred and three.

The method was invariably the same. We said to the subject : "I am going to pronounce certain words ; will you tell me directly, without reflexion, whether this word calls up anything or nothing in your mind ? If anything, what is suggested to you ?" The reply was noted down at once ; if delayed beyond five to seven seconds, it was held to be null, or doubtful. In the case of naïve subjects, I employed certain preliminaries : before pronouncing abstract words, concrete terms (designating a monument, or person) such as would evoke a simple image, were heard ; then the impulse being given, I proceeded to the enumeration of general terms.

The words which served as material for the inquiry were fourteen in number, proceeding from the concrete to the highest abstractions. They were enunciated in an indifferent order and were as follows : *dog, animal, color, form, justice, goodness, virtue, law,¹ number, force, time, relation, cause, infinity.*

The inquiry was invariably oral, never in writing, the greatest care being taken to prevent the person from knowing the end in view, unless afterwards : which led in certain cases to interesting explanations. The very nature of my method prevented me from extending it as widely as I could have wished. I could not, as was done in England, distribute printed questions among the public, because it was necessary to note the spontaneous answer immediately before it was corrected by later reflexion. Moreover, I needed unsophisticated subjects, ignorant of my purpose, and therefore eliminated all whom I suspected of being even indirectly acquainted with it.

The majority were interrogated on the fourteen terms cited above, others on a few only : so that the total number of responses was over nine hundred. It would be beside the mark to publish them here. They are nothing more than data which have to be interpreted. Three principal or pure types appear to stand out

¹ The word "law" was purposely chosen for its ambiguity; physical laws, moral or social laws. The immense majority of answers were in the juristic sense. Ex., Code, Law of the Twelve Tables, a judge, woman with scales, etc.

from them, besides the failures or mixed cases. These may be termed the *concrete* type, the *visual typographic* type, and the *auditory* type. Each of these corresponds with a particular mode of representing the general idea. We will examine them separately.

I. CONCRETE TYPE.—Here the abstract word nearly always evokes an image, vague or precise; usually visual, sometimes muscular. It is not a simple sign, it does not represent the total substitution, it is not dry, and finally reduced. It is immediately and spontaneously transformed into a concrete. In fact the persons of this type think only in images. Words are for them no more than a kind of vehicle, a social instrument of mutual comprehension. When a sequence of general or abstract terms passes through their minds, what really passes is a succession of concretes, save for the very abstract words which “evoke nothing.” This is an answer I have often received, and which, in virtue of its importance, will be considered in another article.

The concrete type appears to be the most widely distributed; it obtains almost to exclusion among women, artists, and all who have not the habit of scientific abstraction. I have selected a few examples from among the many observations belonging to this type.

A painter.—*Cause*: nothing. *Relation*: relations of terms; recital, written report. *Law*: judges in red robes. *Number*: vague. *Color*: contrast between green of plant, and red of drapery. *Form*: a round block, a woman's shoulder. *Sound*: a murmur. *Dog*: ears of a dog running. *Animal*: vague collection, as in certain Dutch pictures. *Force*: hits out with his fists. *Goodness*: his young mother, seen vaguely. *Time*: Saturn with his scythe. *Infinity*: a black hole.

A woman.—*Cause*: I had been the cause of her son's success. *Law*: the government is bad. *Color*: sees an impressionist picture by her son. *Form*: names a beautiful person. *Goodness and Virtue*: names two people who each have this quality. *Force*: sees men fighting. *Relation*: social relations between husband and wife. *Justice*: sees an audience-hall and judges. *Dog*: sees a dog that bit one of her parents. *Infinity*: nothing. *Time*: a metronome.

These two interrogatories are complete. I might proceed by another method: that of taking each general term (law, cause, number, etc.) and quoting all the answers received, among which many would be identical. Such an enumeration would be long and superfluous: we cannot, however, neglect a few of the particulars. For the word *cause*, several persons (women, artists, people in so-

ciety) replied "*cause célèbre*," "*procès célèbre*," for the most part mentioning one only, and that some recent trial. At first this reply annoyed me, and appeared to be useless for my inquiry. Later, on the other hand, I felt it to be instructive, because it characterises better than any description the type which I have denoted as concrete, and the particular turn of this kind of mind, in which the abstract sense does not present itself, at any rate at the beginning.

I may also note two answers given me immediately by a celebrated painter:—*Number*: I see many brilliant points. *Law*: I see parallel lines. (Is this the unconscious idea of levelling by the law?)

The terms *goodness* and *virtue* suggested answers which are easily summarised: they fall into two categories. (1) Nothing; this answer does not belong to the concrete type; (2) a definite person, who was always named and who thus becomes the incarnation, the concrete representation.

Nearly all the images evoked belong to the visual sense; the word *force*, however, most frequently called up pure muscular images, or the same accompanied by a vague visual representation. Example—Seeing somebody lifting a weight; I vaguely see something pulling; a weight suspended by a ring; a string drawing on a nail; pressure of my fist in a fluid; the Marshal of Saxony breaking an *écu* of six pounds, etc.

I have been describing the ordinary and principal form of the concrete type. It consists in the immediate and spontaneous substitution of a particular case (fact or individual) for the general term. In certain observations a slightly different *variation* may be detected; I have encountered it among several historians and learned men. In the ordinary type, the whole (general) is thought by means of the part (concrete); in the variation, the thinking is by analogy, and the mechanism seems to be reduced to pure association. A few examples will explain the distinction. The replies in duplicate were given by different persons. *Number*: the "Language of Calculation," Pythagoras. *Cause*: Hume's theory of causality; Kant's theory. *Law*: the "Tables of Malaga," Montesquieu's definition. *Color*: the chemistry of the spectrum. *Justice*: Littré's definition. *Animal*: the *περὶ ψυχῆς* of Aristotle. *Time*: a vague metaphysical theory. *Relation*: discussion of Ampère and Tracy on this subject. *Infinity*: books on mathematics. *Color*: treatises of photography, etc.

It might be objected that there is a certain association in ordinary cases as in these; but the distinction will readily be per-

ceived. The former proceed from that which contains, to the content—from the class to the fact: they think the whole by means of the part; there is an internal association. The latter form associations beside and from without. Apparently these do not reach to the concrete, they stop half way; for a complete generality they substitute a semi-generality. Further than this, my data are neither sufficiently numerous, nor clear enough, for the point to be insisted on.

2. VISUAL TYPOGRAPHIC TYPE.—Nothing is easier to define. In its pure form it consists in seeing printed words and nothing more; in three cases words were seen *written*. Among some the vision of the printed words was accompanied by a concrete image as in the first type, but only for semi-concrete concepts (dog, animal, color); but for the higher abstracts (time, cause, infinity, etc.) the typographical vision alone exists.¹ This mode of representation is widely distributed among those who have read much; but there are many exceptions.

No doubt many of my readers will discover from self-observation that they belong to this type. I have further noticed that all who have this mode of representation regard it as normal, and necessary, in any one who knows how to read. This is a fallacy. I do not possess it myself in the faintest degree, and have met many others who resemble me.

Thus I was little prepared to discover this type; and had even reached my thirtieth observation without suspecting it, when I encountered such a clear case as to put me on the track. I was interrogating a well-known physiologist. To every word except *Law* and *Form*, he replied "I see them in printed characters" and was able to describe these accurately.

Even the words *dog*,² *animal*, *color*, were unaccompanied by any image. He volunteered further information which may be reduced to the statement, "I see everything typographically." The same holds good for concrete objects. If he hears the names of his intimate friends whom he meets every day, he sees the names printed; it is only by an effort of thought that he sees the image. The word "water" appears to him as if printed, and he has no vision of a liquid. If he thinks of carbonic acid, or nitrogen, he sees indifferently either the words printed or the symbols CO₂, N. He does

¹ For the word *infinity*, those who fall under this type see the printed word, or the mathematical sign ∞ .

² It should be noted that he lived among these animals and experimented with them almost daily.

not see the complex formula of organic chemistry, but the words only.

Surprised (from the reasons above indicated) at this observation—of the sincerity and precision of which there could be no doubt—I continued my investigation, and discovered this mode of thinking in general terms to be sufficiently common. Several cases indeed were as pure and as detailed as the one just cited. Thenceforward I adopted the habit of invariably asking at the close of my interrogatory, “Did you see the words printed?”

Several people remarked that they had read a great deal, and corrected many proofs, and that this would account for their belonging to the typographical visual type. The influence of habit is certainly enormous, but is no adequate explanation here, since there are many exceptions. I have myself read and corrected many proofs, but no word ever appeared in my consciousness as printed, unless after considerable effort, and then vaguely. Hence this mode must be due in great part to natural disposition.

Among the compositors questioned I found: (1) That they saw my fourteen words printed in some special type, which they occasionally specified; (2) they had a concomitant image for semi-concrete terms; (3) for abstract terms no image accompanied the typographical vision. Here we have the superposition of two types: the one natural, and of primitive formation (concrete type), the other acquired, and of secondary formation (typographical visual type).

In short,—in many minds the existence of the concept is associated with a clear vision of the printed word and nothing beyond it.

3. AUDITORY TYPE.—In its pure form this seems to be rare. It consists in having in mind nothing but signs (auditory images) unaccompanied either by the vision of printed words or by concrete images. Possibly it may preponderate among orators and preachers; of this I have no documentary evidence. Musicians do not appear to belong to this type.

One very clear and complete case of the kind I have, however, encountered. This was a polyglot physician known as the author of several works, who for many years had lived among books and manuscripts. He has no trace of typographical vision, but all words “sound in his ear.” He can neither read nor compose without articulating; as the interest of his book or work grows upon him he speaks aloud—“He must hear himself.” In his dreams there are few or no visual images; he hears his voice and that of

his interlocutors: "His dreams are auditory." None of my words, even when semi-concrete, evoked visual images.

In most cases the auditory type is not clear. For very general terms the heard word alone exists, but in proportion as the concrete is approached, the sound is accompanied by an image; thus returning upon our former type.

It is worth while to note that the term *flatus vocis* "*nomina*," first employed in the Middle Ages and which has since become the formula of Nominalism, seems by its nature to indicate that it was originally invented by persons who belonged to the auditory type, and I may even hazard an hypothesis. The typographical visual type did not exist (printing not being invented); it is true that a substitute might have existed in the *graphic* visual type (reading of manuscripts). But considering that in the Middle Ages instruction was essentially oral, that learning came rather through listening than by reading, that the oratorical jousts and arguments were daily and interminable, it is undeniable that the conditions of developing the auditory type were highly favorable here.

I need hardly say that the three types described above are rarely met with in the pure and complete form. As a rule a mixed type prevails: a concrete image for certain words, and typographical vision, or auditory images, for others. To sum up: all cases seem to be capable of reduction to the following: (1) The word heard; beyond this, *nil* (we shall subsequently have to examine this "nothing"); (2) typographical vision alone; (3) the same, accompanied by a concrete image; (4) the word heard, accompanied invariably by a concrete image.

4. Prior to the commencement of this inquiry I felt much hesitation on one point: should one in questioning use *general words* or *general propositions*? I decided in favor of words because these are brief, simple, isolated, and undisguised, and have the advantage of being understood directly, while they in no way suggest to the subject what line he is to follow.

I still however felt scruples in the matter. Was not the investigation as conducted on these lines a little artificial? In point of fact, general terms most frequently occur as members of a phrase, co-operating with others, and connected with them by certain relations. I therefore recommenced my inquiry, using the same method, but replacing words by phrases. The general propositions employed are purposely trite, to avoid contradiction, and to ascertain the immediate mental state. They were as follows:

Cause invariably precedes effect.—Infinity has several mean-

ings.—Is Space infinite?—Has Time any limits?—Law is a necessary relation.—I need not enlarge upon the results: they are *precisely the same* as for words. In every case, and for each person, there is one predominating word which absorbs all the content of the phrase, and is a substitute for it. On this the instantaneous mental operation is concentrated.

If of the concrete type, the subject sees images. In the second phrase, e. g., everything converges on the word *infinity*. Replies: Sensation of obscurity and depth, vague luminous circles, a sort of cupola, a never-receding horizon, etc. If a typographic visualist, the printed sentence is seen less clearly than the simple words: “in minute characters; no capitals”; some persons glimpse it rapidly: others see only “the principal word printed.”

For the pure auditory type, the answer is always very simple. “I hear the sentence, I see absolutely nothing.”

The new method therefore simply confirms the previous observations, with no variations. This identity of result seems to me to militate against a distinction admitted by many authors. In the classical treatises a distinction is made between “necessary ideas” and “necessary truths” (I use their terms uncritically), i. e., general concepts and general propositions. Example: cause, principle of causality. In my opinion there is merely a difference of form between the two positions, the one psychological, the other logical. A concept is a judgment in a state of envelopment, or of result. The proposition is a word in the state of development. The difference is not material, but formal; it is the passage from synthesis to analysis.

I thought that after an interval of two years it might be interesting to repeat the same inquiry on the same people; but the results were not encouraging in this direction. Some, remembering the previous investigation, declared that “they felt themselves influenced beforehand.” Others, who had a more vague recollection (perhaps because they did not understand the object of the inquiry) gave answers analogous to their former replies. In short, notwithstanding the lapse of time, and change of circumstances, each seemed to be consistent with his former self.

I must admit that in the preceding research the psychological nature of the concepts was studied under a particular aspect. This objection was made at the London Psychological Congress¹ by the

¹The results of the investigation were published, partly in the *Revue Philosophique*, October 1891, partly at the International Congress of Psychology, second session, London, 1892 (*International Congress of Experimental Psychology*. London: Williams & Norgate, pp. 20, et seq.).

President, Professor Sidgwick, whose remarks may be summarised as follows :

First, Professor Sidgwick believes that the act of suddenly calling attention to a word, in a person not accustomed to introspective observation, evokes a response which does not exactly correspond to the state ordinarily aroused by such words. In his own particular case he has found that the images evoked (usually visual) were extremely feeble, but that when he dwelt upon them they were enlivened. Secondly, the images vary a great deal according to the terms employed; for example, when he is occupied with mathematical and logical trains of thought, he sees only the printed words. If he is engaged upon the subject of political economy, the general terms sometimes have for their concomitants extremely fantastic images: like *value*, for instance, which is accompanied by the indistinct and fragmentary image of a man placing something upon the pan of a balance. Thirdly, when for such words as *infinity*, *relation*, etc., the subject answers *nothing*, the only conclusion justified is that the subject is incapable of describing the confused elements which exist in his consciousness. Fourthly, Professor Sidgwick's own experience points to the conclusion that my types may succeed each other in the same person.

On this last point—the co-existence of several modes of conception in the same person—I am quite in agreement with Professor Sidgwick, and my own data, drawn up from personal observations, would provide me with sufficient evidence. At the same time the object of my investigation was not to determine the manner in which each individual conceives, but the forms under which men as a whole think of concepts. Nor did I profess to follow the work of the mind when it resolves its general ideas into concretes, when it makes coin out of its bank-notes, but only to seize the subjacent labor that accompanies the current and facile use of general terms, in speaking, listening, reading or writing. No doubt it would be advisable to treat the subject in another manner by studying—no longer the momentary state that corresponds with the presence of the concept in consciousness—but the stable organised turn of mind due to a long habit of dealing with concepts. To this end it would be desirable more especially to question mathematicians and metaphysicians. My data are neither numerous nor clear enough to permit of my hazarding any dictum on this subject. Some mathematicians have told me that they *invariably* require a figured representation, a construction, and that even when these are considered as purely fictitious their support is indispen-

sable to the train of reasoning. *Contra* those who think geometrically, there are others who think algebraically, eliminating all configuration, or construction, and proceeding by simple analysis with the aid of signs : which (with the necessary corrections and descriptions) would bring the first under the concrete, and the second under the audito-motor type. Among metaphysicians the typographical visual type seems largely to predominate. One (who is well known) belongs to the pure auditory type. All this, however, is inadequate ; the investigation would have to be followed out, by and upon others.

A young Russian doctor, M. Adam Wizel, who was interested in the subject, put the same questions (following the method indicated above) to persons in the hypnotic state. Admitting the unconscious mental activities to preponderate in this state he asked whether by this procedure it would not be possible to penetrate farther into the unknown substrate of consciousness. His experiments were undertaken at the Salpêtrière, in Charcot's, clinique, upon six women—hysterics of the first order. The subjects were first put into a state of somnambulism, then after a preliminary explanation were questioned, as above. After getting the answers Wizel ordered the subjects to forget all that had happened, and then woke them. He now began again in the waking state, asking the same questions, so that he was able to compare the answers given successively in the two cases. They are nearly always clearer and more explicit during somnambulism than during the waking state, as may be judged by the following example (taken from the third observation) :

QUESTIONS.	SOMNAMBULISM.	WAKING STATE.
Dog :	A big grey animal	Nothing
Form :	A red cardboard head	Nothing
Law :	A tribunal	Nothing
Justice :	A magistrate	State of justice
Number :	Figure 12 in white	The number of a note (?)
Color :	Green	Blue

Where the replies are concrete in the two cases I note a tolerable analogy between them. M. Wizel (who eliminated all doubtful cases, and any accompanied by crises) never encountered the typographical visual type, nor the pure auditory type, in his experiments. His six hysterics belong to the concrete type, with the predominance of *visual* images—much more rarely of motor images, provoked by the word “force.” The answer “nothing” is very frequent ; less so, however, during somnambulism than during the waking state.