

INTERMEDIATE FORMS OF ABSTRACTION.¹

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HAVING thus acquainted ourselves in the two previous *Open Courts* with the factor of speech, which as an instrument of abstraction becomes steadily more and more important, we can take up the subject of abstraction from the point at which we left it. In passing from the absence to the presence of the word, from the lower to the intermediate forms of abstraction, we must again insist on our principal aim: viz., to prove that abstraction and generalisation are functions of the completely evolved mind. They exist in embryo in perception, and in the image, and at their extreme limit involve suppression of all concrete representation. This conclusion will hardly be contradicted. The difficulty is to follow the evolution step by step, stage after stage, and to note the difference by *objective* marks.

For intermediate abstraction, this operation is very simple. It implies the use of words; it has passed the level of prelinguistic abstraction and generalisation. We may go farther, and—always *with the aid of words*—establish two classes within the total category of mean abstraction:

1. The lower forms, bordering on generic images, whose objective mark is the feeble participation of the word: it can indeed be altogether foregone, and is only in the least degree an instrument of substitution.

2. The higher forms, approximating to the class of pure concepts, and having as their objective mark the fact that words are indispensable, since these have now become an instrument of substitution, though still accompanied by some sensory representation.

¹ Translated by Frances A. Welby.

The legitimacy of this division can be justified only by a detailed comparison of the two classes.

I.

Before giving examples that determine the nature and intellectual trend of the lower forms, a theoretical question presents itself which cannot be eluded, albeit any profound discussion of it belongs to the theory of cognition rather than to psychology. It is as follows: Is the difference between generic images and the lowest concepts, one of nature or of degree? This question has sometimes been propounded in a less general and more concrete form. Is there any radical difference, any impassable gulf between animal intelligence¹ in its higher, and human intelligence in its lower aspects? Some authors give an absolute negation, others admit community of nature, and of transitional forms.

I shall first reject as inadmissible the argument that identifies abstraction with the use of words. Taine seems at times to admit this: "We think," he says, "the abstract characters of things by means of the abstract names that are our abstract ideas, and the formation of our ideas is no more than the formation of names which are substitutes."² Clearly if abstraction is impossible without words, this operation could only begin with speech. All that was said in previous articles proves the inanity of such an assertion.

Let us, in order to discuss the question profitably, sum up the principal characteristics of generic images on the one hand, of inferior concepts on the other.

Generic images are: (1) simple and of the practical order; (2) the result of often-repeated experiences; (3) extracts from very salient resemblances; (4) a condensation into a visual, auditory, tactile, or olfactory representation. They are the fruit of *passive* assimilation.

The inferior concepts most akin to them, which we are studying in the present instance, are in character: (1) less simple; (2) less frequently repeated in experience; (3) they assume as material, similarities mingled with sufficiently numerous differences; (4) they are fixed by a word. They are the fruit of *active* assimilation.

It may be said that the two classes, when thus opposed to each

¹ Intelligence is taken here in its restricted sense, as the synonym of abstracting, generalising, judging, reasoning.

² *De l'intelligence*, Vol. I., Bk. IV., Chap. 1, p. 254, first edition.

other, present but minimal differences, save for the addition of words. For the moment, indeed, the word is only an instrument handled by a bad workman, who ignores its efficacy and highest significance, as will be proved below. But were it otherwise, and were the delimitation between the two classes in no way fluctuating, the thesis of a progressive evolution must needs be given up, unless it be admitted to begin only with the appearance of speech.¹

Romanes describes the passage from the generic image to the concept as follows :

“Water fowl adopt a somewhat different mode of alighting upon land, or even upon ice, from that which they adopt when alighting upon water ; and those kinds which dive from a height (such as terns and gannets) never do so upon land or ice. These facts prove that these animals have one receipt answering to a solid substance, and another answering to a fluid. Similarly, a man will not dive from a height over hard ground, or over ice, nor will he jump into water in the same way as he jumps upon land. In other words, like the water-fowl, he has two distinct receipts, one of which answers to solid ground, the other to an unresisting fluid. But unlike the water-fowl, he is able to bestow upon each of these receipts a name, and thus to raise them both to the level of concepts. So far as the practical purposes of locomotion are concerned, it is, of course, immaterial whether or not he thus raises his receipts into concepts ; but, as we have seen, for many other purposes it is of the highest importance that he is able to do this. Now, in order to do it, he must be able to set his receipt before his own mind as an object of his own thought : before he can bestow upon these generic ideas the names of “solid” and “fluid,” he must have cognised them as ideas. Prior to this act of cognition, these ideas differed in no respect from the receipts of a water-fowl ; neither for the requirements of his locomotion is it needful that they should : therefore, in so far as these requirements are concerned, the man makes no call upon his higher faculties of ideation. But, in virtue of this act of cognition whereby he assigns a name to an idea known as such, he has created for himself—and for purposes other than locomotion—a priceless possession ; he has formed a concept.”²

In point of fact, the transition is not so simple. Romanes omits the intermediate stages : for with fluid and liquid we pene-

¹ *De l'intelligence*, I., Bk. IV., Chap. I, p. 254, first edition.

² *Mental Evolution in Man*, pp. 74 and 75.

trate into a more elevated order of concepts than those immediately bordering on the generic image. What he well brings out is that the bare introduction of words does not explain everything. It must not be forgotten that if the higher development of the intelligence depends upon the higher development of speech, this last is conditioned, not simply by the faculty of articulation, which exists among many animals, but by anterior cerebral conditions that have to be sought out.

For these, we must return to the distinction loosely established above, between passive and active assimilation. We know that the fundamental mechanism of cognition may be reduced to two antagonistic processes, association and dissociation, assimilation and dissimilation; to combine, to separate; in brief, analysis and synthesis.¹ In the formation of the generic image, as we have seen, assimilation plays the principal part; the mind works only upon similarities. In proportion as we recede from this point, we have the contrary; the mind works more and more upon differences; the primitive and essential operation is a dissociation; the fusion of similarities only appears later. The further back we go, the more analysis preponderates, because we are pursuing resemblances more and more hidden by differences. Coarser minds do not rise above palpable similarities. The peasant who hears a dialect or patois closely akin to his own understands nothing of it; it is another language to him; whereas even a mediocre linguist immediately perceives the identity of words that differ only in accent.

We may represent the differences between generic images and these general notions that most nearly approximate to them, by the following symbol:

I. <i>A B C d e</i> <i>A B C e f</i> <i>A B C g h</i> , etc.	II. <i>A b c d e</i> <i>x y z A f</i> <i>g A h k m</i> , etc.
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where each line corresponds to an object, and each letter to one of the principal characters of the object. Table I is that of the generic image. A part, *A B C*, is constantly repeated in each experience; moreover, it is in relief, as indicated by the capitals; the elimination of differences is almost passive,—self-caused; they are forgotten.

Table II is that of a fairly simple general notion. Here *A* has to be disengaged from all the objects in which it is included. It

¹ As Paulhan remarks, "L'abstraction et les idées abstraites" (*Revue Philosophique*, Jan., 1889, p. 26 et seq.), these two processes are initially linked one with the other, so that we find analytical syntheses, and synthetical analyses.

still has a salient character, indicated by capitals, and recurring in each object ; but as it is merged in the differences, as it represents but a poor fraction of the total event, it is not disengaged spontaneously; it exacts a preliminary labor of dissociation and elimination.

Thus understood, the difference between the two processes consists only in the faculty of greater or less dissociation, and we are in no way authorised in assuming a difference of nature.

But the question may be propounded in a different manner,—more precise and more embarrassing. I formulate it thus: the generic image is never, the concept is always a judgment. We know that for logicians (formerly at any rate) the concept is the simple and primitive element ; next comes the judgment, uniting two or several concepts ; then ratiocination, combining two or several judgments. For the psychologist, on the contrary, affirmation is the fundamental act ; the concept is the *result* of judgments (explicit or implicit), of similarities with exclusion of differences. If in addition to this we recall what was said above : that speech commences with phrases only, that in its simplest form it is the word-phrase ; then the debated question may be thus transformed : Is there, between the generic image and judgment in the lower forms, a break in continuity, or a passage by slow transformation ?

For the partisans of the first theory, the appearance of judgment is a “passage of the Rubicon” (Max Müller). It is as impossible to deny this as to affirm it positively and indisputably. Romanes, who makes a stand against the “passage of the Rubicon,” admits the following stages in the development of signs, taken as indicative of the development of intelligence itself.

1. The indicative sign ; gesture or pronominal root ; a dog barking for a door to be opened, etc.
2. The denotative sign which is affixed to particular objects, qualities, or actions ; for example, the parrot which on seeing a person utters the name of the person, or some word which it has associated with him, and which for the animal has become the distinctive mark of the person.
3. The connotative or attributive sign, which, rightly or wrongly, is attributed to an entire class of objects having a common quality ; for instance, the child which applies the word *star* to everything that shines.
4. The denominative sign ; or the intentional employment of the sign as such, with a full appreciation of its value ; for example, the word *star* in its meaning to the astronomer.

5. The predicative sign, or a proposition formed by the apposition of two denominative signs.¹

This hierarchical order, while in some measure open to criticism, indicates at least schematically the progressive passage from the concrete to the higher abstractions, and may therefore be accepted.

It is clear that the two first stages scarcely pass beyond the concrete.

To the third, Romanes attaches capital importance: judgment begins with it. It may, however, be asked if affirmation really exists at this stage. For my own part I am inclined to admit it as included in the generic image in its highest degree (for here too there are degrees), under the form *not of a proposition, but of an action*. The hunting dog assuredly possesses generic images of man and of different kinds of game, under the visual and more especially the olfactory form. When it starts off on the scent of its master, of a hare, or of a partridge, this is surely a judgment of a certain kind, an affirmation, the least doubtful of all, seeing that it is an act. The absence of verbal expression and of logical information in no way alters the fundamental nature of the mental state. We have already spoken in a previous *Open Court* of *practical* judgments and ratiocinations; it is needless to reiterate.

The transition from the third to the fourth stage is even more important. It is here that the true concept appears; this point attained, an almost unlimited progress is possible. Now the true cause of the true concept is reflexion. This formula appears to us the simplest, the briefest, the most clear, and the most exact. There is the possibility of concepts where there is the possibility in the mind of detaching a single character (or several), extracted from among many others, of setting it up as an independent entity, of raising it into a *known* object, i. e., determined in its relations with ourselves, and with other things. Example: to form the general idea of a vertebrate. But this fundamental act—reflexion—is not without antecedents, it does not spring forth as a new apparition. It is the highest degree of attention, i. e., of a mental attitude that we encounter very low down in the animal scale.

Discontinuity of evolution, in the passage from lower to higher, is thus far from being established. Doubtless this, like all other questions of genesis, leaves much to hypothesis, and can only be decided on probabilities: yet these do not appear to favor a rupture in continuity, and opposition of nature.

¹ *Op. cit.*, VIII., 158-165.

In sum—to confine ourselves to what is least contestable: given the cerebral and psychological conditions for speech (not for articulate language alone), and application of words to qualities and attributes raised little by little into independent entities,—and the decisive step has been taken. Such is intellectual progress, and we may remark in passing that the process which creates the true concept, leads fatally by the same issue to faith in idols, in the entities realised.

Without for the moment pausing at this last point, let us under a more positive form, and strictly on the lines of experimental psychology, examine the nature of the lower forms of intermediate abstraction, determining it by examples. At the same time we shall fix the intellectual level that corresponds to the moment of transition between generic images (animal form), and the higher abstracts which have still to be studied in detail. The best method is to take as a type such human races as have remained in the savage or half-civilised state: these are more instructive than childhood, because they represent fixed and permanent conditions. We can draw on two principal sources: their languages, and their systems of enumeration. Their religious beliefs might also be studied with the same results, but this would take too long, and would moreover be less definite.¹

1. *The languages*, considered under their most general characteristics, reveal a notable impotence for transcending the simplest resemblances, an incurable incapacity for extended generalisations; they hardly rise above the concrete. Words play a very indistinct part; they are the most incomplete substitute—hardly more than a mark, a sign, like gestures—differing from the latter only in the future they carry within them. The study of the ascending progress of generalisations is in effect the study of the successive phases of the emancipation of speech up to the time when it becomes preponderant and dominating. At the actual stage, which might be termed *concrete abstract*, it is not yet emancipated; it is a minor, under tutelage.

Let us take in turn substantives, adjectives, and verbs.

The indigenes of Hawaii, says Max Müller (*Lectures on the Science of Language*, Second Series, II., p. 19), have but one word,

¹We have touched on this subject incidentally in *La psychologie des sentiments* (Part II., IX, § 2, pp. 305 et seq.). Many tribes do not get beyond polydemonism, peopling the universe with innumerable genii; this is the reign of the concrete. A certain progress is marked by subordinating the genius of each tree to the god of the forest, the different genii of a river to the god of the river, etc. At a degree higher, the intellect constitutes a single god for water, one for fire, one for the earth, etc. Thus there come to be genii of individual, specific, and generic origin.

“aloba,” to express love, friendship, esteem, gratitude, benevolence, etc.; on the other hand, words to express variations in the direction of the force of the wind are very numerous, proving once more how at its origin abstraction or dissociation is governed by practical causes. In savage languages there are terms to express not merely each species of dog, but their age, the color of their hair, good or bad qualities, etc. So, too, for the horse; there are special words to designate its varieties, and all its movements; to indicate if it is mounted, not mounted, frightened, running away, and the like. The North American Indians have special words for the black oak, the white oak, and the red oak, but none for the oak in general,—still less for tree in general. The indigenes of Brazil can point out the different parts of the body, but not the body as a whole (Lubbock). Among several tribes of Oceania, a special word is employed for the tail of a dog, another for the sheep’s tail, and so on, but they have no designation for tail in general. Again, there is no common term for the cow, but there are distinct words for red, white, or brown cows (Sayce).

There are, however, cases of very clear progress in generalisation; the significance of a word extends itself; from specific it becomes generic. This metamorphosis exists *in vivo* among the Finns and Laplanders. The former have a name for the smallest stream, and none for river; originally again there was a term for each finger, none for finger in general; but latterly the term used for thumb alone has come to designate the fingers collectively. Among the second race, certain tribes who had a special denomination for each kind of bay, have now adopted one that serves for all kinds (Max Müller).

The same holds good of the poverty of the adjective, the abstract term proper. The case of the Tasmanians has often been quoted, how they could only express qualities by concrete representations: hard=like a stone; long=legs; round=like a ball, like the moon, etc. (Lubbock). A less familiar case, termed by linguists “concretism,” is met with even in certain more developed idioms, like a survival of the time when the mind was unable to detach itself from the concrete, or to forego a complete and detailed qualification. Instead of saying ten merchants, five hens, the idiom is merchants ten men, hens five birds, and so on for similar cases.

The verb is able to express all degrees of abstraction and of generalisation as well as the adjective and substantive. At this period, it exactly repeats the type (as described above) of the sub-

stantive with its burdensome multiplicity,—for want of a generalisation simple enough, according to our judgment. The North American Indians have special words for saying: to wash one's face, another person's face, the linen, utensils, etc.: in all, thirty words, but none for washing in general. So, too, for eating bread, fruits, meat, etc., striking with the hand, foot, axe, etc., for cutting wood, meat, or any other objects: for all these there are special terms, but none for saying simply, to eat, to knock, to cut (Sayce, Hovelacque). On the other hand, here is a case of transition, analogous to that of the Lapps and Finlanders. Certain tribes in Brazil have a few verbs of general, simple significance: eat, drink, dance, see, etc., even love, thank, etc. (Lubbock).

We need not multiply examples; these will suffice to throw into relief the extreme impotence in generalising, so soon as the mind loses its hold on the concrete. We might also recall the difficulty so often experienced by missionaries. They find it almost impossible, even by creating new words, or by changing the meaning of others, to translate the sacred books into these idioms, from their paucity of concrete terms.

2. *The numeration*, taking its development as a whole, appears to sub-divide into three principal periods: concrete numeration, as studied above, in animals and children; concrete-abstract numeration, with which we are now occupied; purely abstract numeration, which we shall examine later, as translated into organised arithmetic.

We have seen that speech at its origin was so humble as to need gesture to complete and to elucidate it. During its concrete-abstract period, numeration is in an analogous position. At first its extension is very limited: it progresses slowly and painfully from unity. Further, it can operate only when sustained by the concrete; it must have a material accompaniment. Counting is accomplished by the enunciation of words, with the aid of enumerated objects, as perceived at the same time, or with that of the fingers: which, let it be remarked, is the first essay in substitution. There is simultaneously concrete or digital, and verbal numeration.¹

We know that many Australian and South American tribes can count verbally to two only; some say two-one = three; two-two = four; others by the same process arrive at six (two-three = five, three-three = six): everything else is "much." For the most part

¹ Tylor, *Primitive Culture*, I., gives abundant data on this question. Chap. VII. is entirely devoted to it.

they count without words, with the aid of fingers or of articulation ; even when they employ words, the two numerations—digital and verbal—are performed simultaneously.¹

This manner of counting is in first degree concrete ; the concrete-abstract form is only there in embryo. A great advance, made early enough in many tribes, consisted in counting by five, taking the hand (five fingers) as a new unit, superior to the simple unit. Then : one hand = 5 ; two hands or half a man = 10 ; two hands, one foot = 15 ; two hands, two feet, or a man = 20. Such is the evident origin of the quinary, decimal, and vigesimal numerations. Sometimes fingers, as instruments of numeration, have been replaced by objects of a typical number. Ex. : 1 = moon or sun ; 2 = the eyes or legs, etc.

However varied these processes (of which only a few have been mentioned) in different races and periods, they are fundamentally identical to the psychologist. They may be reduced to this ; numeration is performed more particularly with the aids of sensible perceptions ; words are but an insignificant accompaniment, a superfluity—existing only as a proliferation—of so little utility that they are for the most part neglected.

Though it is less often spoken of, we may remark that the measure of continuous quantity passed through the same concrete-abstract phase ; and here it appeared at a somewhat early stage, owing to practical and social wants. Hence we find at the outset the foot, the finger, the thumb (inch = Fr. *pouce*), the palestra (four fingers' length), span, cubit (arm's reach = *coudée*), fathom, etc., the stadium (distance a good runner could cover without stopping).² The concrete character of all these measures is obvi-

¹ In the account of his travels among the Damaras (*Tropical South Africa*, p. 133) Galton says : "In practice, whatever they may possess in their language, they certainly use no numeral greater than three. When they wish to express four, they take to their fingers, which are to them as formidable instruments of calculation as a sliding-rule is to our English schoolboy. They puzzle very much after five, because no spare hand remains to grasp and secure the fingers that are required for 'units,'—yet they seldom lose oxen : the way in which they discover the loss of one, is not by the number of the herd being diminished, but by the absence of a face they know." [This tallies with what we have already said as to so-called numeration in animals and children.] "When bartering is going on, each sheep must be paid for separately. Thus suppose two sticks of tobacco to be the rate of exchange for one sheep, it would sorely puzzle a Damara to take two sheep and give him four sticks. I have done so and seen a man first put two of the sticks apart and take a sight over them at one of the sheep he was about to sell. Having satisfied himself that one was honestly paid for, and finding to his surprise that exactly two sticks remained in hand to settle the account for the other sheep, he would be afflicted with doubts ; the transaction seemed to come out too pat to be correct, and he would refer back to the first couple of sticks, and then his mind got hazy and confused, and wandered from one sheep to the other, and he broke off the transaction until two sticks were put into his hand and one sheep driven away, and then the other two sticks given him and the second sheep driven away." Galton relates many other similar facts which he had himself witnessed.

² And the barley-corn of English measure.—*Tr.*

ous. Again, there are survivals in certain current locutions, such as a day's journey. More than this; they have a human character, their standard and starting-point being, at least at the outset, certain parts of the body, or a determined sum of muscular movements. Little by little they lost their original significance, progressing through centuries towards our metrical system—the type of a scientific, deliberate, rationally abstract system, as far as possible liberated from anthropomorphism.

The reader will probably obtain a more definite idea of the nature of these lower forms by recapitulating the examples cited, than from any long dissertation. Is their intellectual level very superior to that of the generic image? This question is doubtful. At times the only distinction between them is the presence of the word: at the present stage it makes but a poor figure,—yet with all its modesty, it augurs a new world wherein it is to be of prime importance.