THE PHYSIOLOGICAL BASIS OF LINGUISTIC DEVELOPMENT AND OF THE ONTOGENY OF MEANING.[1] PART I

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I. Infantile Crying and its Significance for the Adult. The Meaning of 'Significance'

The behaviour of the new-born human infant, during its waking hours, consists largely of reflex vocalizations and other random movements such as squirmings, writhings, and wrigglings. On account of its important rôle in the subsequent development of language, infantile crying, although it is regularly connected with other behaviour, has often been singled out for separate investigation. It is only by the artifice of abstraction that we can treat of sounds *as if* they existed separately from the other bodily manifestations concomitant with them. C. Bühler says, "The first and most striking observation to be noted in the first year is that crying *always occurs closely connected with movement.* We have, therefore, a unit of behaviour in which the crying is 'the dominant.'" [2]

The leading physiologists agree that the birth-cry of the human infant is a reflex response of the organism to various intraorganic and external stimuli. W. Preyer says, "The first cry is purely reflexive, like the croaking of the decapitated frog when the skin of his back is stroked. The cry is not heard by the newly-born himself and has not the least value as language. It is on a par with the squeaking of the pig just born, the bleating of the new born lamb, and the peeping of the chick that is breaking its shell." [3] And according to

[1] From the Department of Psychology of Princeton University.

[2] C. Bühler, The first year of life, 1930, 25. Italics in the original.

[3] W. Preyer, The mind of the child, Part II, 64–65. It must be pointed out that the auditory sensitivity of the new-born infant is still a subject of controversy among physiologists. Both Preyer and Stern, however, are in agreement with regard to the total deafness of many babies at birth. (See W. Stern, Psychology of early childhood, 1914, 74.)

W. N. Kellogg, "the reports of careful investigators indicate that the cry of the newly born orang-utan or chimpanzee is hardly distinguishable from that of the human infant." [4]

Charlotte Bühler remarks that "*All causes of crying in the first four months revert back directly to bodily hurts and needs.*" [5] And she specially mentions pain (*e.g.* colic, prick wounds, illness), strong and sudden stimuli (*e.g.* very bright light, sharp noises, sudden contacts, sudden changes of temperature), abrupt and sudden changes of posture, fatigue, hunger, etc. Margaret G. Blanton gives, as the principal causes, hunger, noxious stimuli, fatigue, and colic.[6]

Undoubtedly, crying implies no conscious meaning on the part of the infant during the earliest stages of infancy; but it has a meaning for adults, who understand it as a sign of the infant's distress. "A child's scream," says Jespersen, "is not uttered primarily as a means of conveying anything to others, and so far is not properly to be called speech. But if from the child's side a scream is not a way of telling anything, its elders may still read something into it and hurry to relieve the trouble." [7]

There is general agreement that along with the development of specific movements, there is a gradual differentiation of acoustic pattern in an infant's cries, according as they are evoked by this or that stimulus. M. G. Blanton writes: "The 'hunger cry' has generally a well marked rhythm, the first syllable of preliminary sound coming on the first part of the first beat, the second or accented syllable on the second part of the first beat, and a quick intake of breath as the third beat. This measure is most often repeated in groups of 5 or 6, each slightly more forceful than the preceding ones until the fourth or fifth, the last one being softer. Thus also will the groups be repeated. Each measure is also a trifle higher in pitch than the one preceding." [8] She describes as

[4] W. N. Kellogg, Humanizing the ape, PSYCHOL. REV., 1931, 38, 169.

[5] C. Bühler, The first year of life, 1930, 26.

[6] M. G. Blanton, The behaviour of the human infant during the first thirty days of life, PSYCHOL. REV., 1917, 24, 458–60.

[7] O. Jespersen, Language, its nature, development and origin, 1921.

[8] M. G. Blanton, *op. cit.*, 458–460.

follows the specific cry of colic: "Starting abruptly about 3 to 5 octaves above the adult female voice it slid through a modified chromatic scale to within the range of the middle octave. It was made with an accompanying rigidity of the abdominal walls and thus of necessity varied from the cry which included the activity of these muscles." [8]

D. R. Major observes that "The monotonous reflexive crying . . . soon gives way to cries which vary with the *kind* of discomfort the child is experiencing. . . . They [the cries] differ in pitch, duration, timbre." [9] C. Bühler also reports that cries develop specific configurations as the infant grows. Thus, in the first month "in addition to the monotone habitual crying" the new-born child "utters short cries of fright and single sounds of displeasure." [10] During the second month, she reports, the infantile crying ceases to be monotonous; "instead, it varies in intensity, rhythm and pauses." [10] During this period, according to her, different cries are associated with different bodily discomforts and needs. Thus, "The cry of hunger is continuous, loud, and strong and is interrupted suddenly by suckling movements, even if an objective stimulus does not come into direct contact with the lips." [11] The cry of pain, on the other hand, was observed to be "shrill, loud, and lasting, interrupted by whimpering and groaning, or it consists of short, single cries." [11] In the second month infantile crying is also accompanied with tears. She further reports that in the two-months-old child "habitual crying" may be distinguished from significant crying. The former is characterized by "uniformity, weakness, lack of variation in intensity, and interrupting pauses," and it continues "beyond an immediate need." [12] The accompanying bodily movements, she says, are not strong.

Still another observer, N. Bayley, reports in a recent study: "Fatigue crying was often accompanied by yawning, rubbing the eyes, or drooping." [13] Cry from colic pain,

[8] D. R. Major, First steps in mental growth, 1906, 284.

[10] C. Bühler, *op. cit.*, 35.

[11] C. Bühler, The first year of life, 1930, 36.

[12] *Ibid.*, 37.

[13] N. Bayley, Study of the crying of infants during mental and physical tests. *J. Genet. Psychol.*, 1932, 40, 315.

according to her, was judged by its continuity, recurrence, and relief when gas was expelled. Crying evoked by strangeness of place and persons "usually occurred when the child was first brought in, or when he was taken from his mother for some of the tests. It was also evidenced by clinging to the mother and turning away from the experimenter. Crying from this cause stopped when the child became accustomed to the place, and when held by, or allowed to remain close to, his mother." [18]

To sum up: (1) Infantile crying is only a part of the total infantile behaviour at any given moment.

(2) It is purely reflex in nature; and is due to purely physiological causes. No intention to communicate, on the part of the infant, is involved.

(3) The adult learns to read meaning into the cry of the infant by a process of inference. Inside the child there is only released nervous energy (internal stimulation): from the motor effects of this released energy the adult *infers* (from his previous experience) this or that about the processes going on in the child's internal organs. A state of contentment and comfort is inferred when the infant's muscles are relaxed, and its body is in an attitude of repose.

(4) In order to interpret the infantile cry accurately it must be taken in conjunction with the entire behaviour of the infant, together with such stimuli as may be playing on it at the moment.

We come now to a point of importance. It is the question as to what, precisely, in an infant's movements, *constitutes* 'meaning.' The terms 'meaning,' 'significance,' and 'interpretation' need to be examined more closely. Why is it that a new-born infant's squirmings, writhings, and wrigglings, and even his early vocalizations, seem to be so lacking in significance? As we watch the movements of a very young baby we find ourselves saying that such mere writhing is pointless or aimless; the little limbs are flexing and unflexing at random; the organism is not doing anything in particular, not doing anything describable. Further observation of the infant, as those movements develop which we do

declare to be 'meaningful,' convinces us that 'aim' and 'point' come into the picture precisely when any of the baby's movements are aimed or pointed *at its environment.* The first change in the behaviour of the infant that gives us the impression that the infant's movements do have a 'meaning,' comes when we can see that they are directed towards (or away from) an outside object. If the child orients itself in *any* definite way towards a bright light, for instance, we instantly find the child's behaviour to be significant, meaningful. Nor can we easily resist inferring that the child is, to some extent at any rate, 'aware' of that light.

It is this fact of the orientation of organisms towards objects outside of themselves that leads us to find significance in 'tropistic' responses, at the lowest biological level. Inasmuch as the sunflower turns towards the sun, its reaction is significant. And the same principle holds in the case of the behaviour of more complex living organisms.

The question of the significance of an individual's behaviour, in short, reduces itself to the inquiry: How is the individual, infant or adult, orienting himself towards the objects around him? Or in other words, "What is the organism doing?" [14] This will involve, in E. B. Holt's words, "the study of his movements until we have found that object, situation, process (or perhaps merely that relation) of which his behaviour is a *constant function.*" [15]

Since the reaction of the organism to an objective situation must be something definite, we shall call it a *specific response.* It may be defined in the words of E. B. Holt as "a course of action which the living body executes or is prepared to execute with regard to some object or some fact of its environment." [16] Specific response is, therefore, to be sharply distinguished from various reflex movements which, however regular and fixed they may appear to be, do not have an intrinsic reference to anything located outside of the organism. To quote from Holt once more on this point:

[14] E. B. Holt, The Freudian wish, 1916, 168.

[15] *Ibid.*, 163.

[16] E. B. Holt, The Freudian wish, 56–57.

It is this objective reference of a process of release that is significant. The mere reflex does not refer to anything beyond itself: if it drives an organism in a certain direction, it is only as a rocket ignited at random shoots off in some direction, depending on how it happened to lie. But specific response is not merely in some random direction, it is *toward an object*, and if this object is moved, the responding organism changes its direction and still moves after it. And the objective reference is, that the organism is *moving with reference to some object or fact of the environment.* . . . In order to understand what the organism is doing, you will just *miss* the essential point if you look inside the organism. . . . It is the *pivotal outer object*, the object of specific response, which seems to me to have been overneglected.[17]

II. The Babbling Period, and the Mechanism of Reduplication

Observers agree that the random sounds first produced by an infant serve as the raw material for its later linguistic progress. Stern remarks that "even if the resulting 'echo-babble' is, at first, entirely incomprehensible, it yet enriches the learner's treasure with sounds, sound-combinations, rhythm, etc., the raw material then for future speech." [18] In fact, "phonetic experts tell us that the infant in his babbling covers the whole range of sounds utilized by Russian, Gaelic and Polynesian dialects." [19] K. C. Moore supports the main drift of this observation. She writes that "at the close of the fourth month my child had made well-nigh all the sounds that occur in the language." [20] According to C. H. Bean, during this period almost all the sounds of different languages may be heard in the babbling of the child. "The number of sounds that ultimately find a place in this self-imposed practice is astonishing. One cannot fail to hear all the vowels and consonants, diphthongs, aspirates, sub-vocals, nasals, German umlauts and tongue trills, French throaty trills and grunts, and even the Welsh *l*." [21] That many more

[17] *Ibid.*, 54–55.
[18] W. Stern, Psychology of early childhood, 1924, 141–142.
[19] F. Lorimer, Growth of reason, 1929, 33.
[20] K. C. Moore, The mental development of a child, *Psychol. Monog.*, 1896, 1, (No. 3), 115.
[21] C. H. Bean, *J. Genet. Psychol.*, 1932, 40, 198.

sounds are produced by the infant during this period than are later used, at least in its own language, is clear from the following remark of Preyer:

> According to my observations, I am compelled in spite of this disagreement to lay down the proposition as valid for all healthy children, that the greatly preponderating majority of the sounds the child makes use of after learning verbal language, and many other sounds besides these, are correctly formed by him within the first eight months, not intentionally, but just as much at random as any other utterance of sound not to be used later in speech, not appearing in any civilized language.[22]

Edward Conradi supports this observation:

> A great many sounds are produced during the babbling period which are not found in our language, some of them so complicated that we cannot produce them; among these are the so-called vomitive sounds and the cluck-like sounds, found among some primitive people but not in our own language.[23]

According to G. Stanley Hall, "It would be difficult even with Bell's phonic notation, or with a phonograph, to classify the first vocalizations of an infant." [24] A. Gesell states that "at the age of six months it requires diligent observation to record the wealth of vocalization which presents itself in the course of one day." [25]

Now, out of this astonishingly rich and varied repertoire of sounds, those which are used by the child's elders are reënforced, and become habitual; the others cease to be uttered. Preyer observes:

> The plasticity of the apparatus of speech in youth permits the production of a greater abundance of sounds and sound-combinations than is employed later, and not a single child has been observed who has, in accordance with the principle of the least effort (*principe du moindre effort*) applied by French authors to this province, advanced in regular sequence from the sounds articulated easily—*i.e.*

[22] W. Preyer, The mind of the child, Part II, 75–76.

[23] E. Conradi, Psychology and pathology of speech-development in the child, *Ped. Sem.*, 1904, 11, 328.

[24] G. S. Hall, Notes on the study of infants, *Ped. Sem.*, 1891, 1, 132.

[25] A. Gesell, Mental growth of the pre-school child, 1925, 213.

with less activity of will—to the physiologically difficult; rather does it hold good for all the children I have observed, and probably for all children that learn to speak, that many of the sounds uttered by them at the beginning, in the speechless season of infancy, without effort and then forgotten, have to be learned afresh at a later period, have to be painstakingly acquired by means of imitation.[26]

Almost as soon as sounds begin to be produced at all, they begin to be repeated, rather slowly and monotonously, one, two, three or more times. This *repetition*, or *reduplication*, may well be considered the first step in that process by which the mere vocalizations become organized into language. It is here that explanation of the development of language must begin. And it is here, precisely, that the ways part between most of the hitherto current efforts at explanation and that physiological description which alone seems to us to reveal the real causes that have brought languages into existence.

Some of the earliest reduplications observed are *a-a*, *ma-ma*, *da-da*, etc. Preyer holds that "These primitive syllables, *pa-pa*, *ma-ma*, *tata*, and *apa*, *ama*, *ata*, originate of themselves when in the expiration of breath the passage is stopped either by the lips (*p. m.*) or by the tongue (*d. t.*)." [27] But this can hardly be a sufficient explanation, since it is observed that the process often runs on to ten, twenty and even more repetitions, and further that it is far less in evidence in infants that are born deaf. There is clearly a definite mechanism that produces repetition. The phenomenon is so prominent during the months when the infant begins its vocalizations that this period of its life is called the 'babbling' period. And the tendency to reduplicate syllables (usually a consonant and vowel) is noticeable through the child's fifth year, at least, and to some extent through life.

Many explanations have been offered for the infant's repetition of his own sounds. So far as we have discovered, these explanations fall into three classes: the first would explain reduplication in terms of pleasure; the second, in

[26] W. Preyer, *op. cit.*, 76–77.

[27] W. Preyer, *op. cit.*, 86.

terms of heredity; and the third, in terms of instinct, the instinct of 'imitation.'

An explanation in terms of pleasure would deserve attention, if anyone had made clear how 'pleasure' can actuate the tiny nerves and muscles which we know to be the machinery that produces reduplication. No one has done this, and the 'explanation' does not explain.

We do not concede that an 'explanation' in terms of heredity (or of recapitulation) is even deserving of attention. For the question, 'How did language ever develop?' is not answered, or even met, by the reply 'It developed a *long time ago;* and is now inherited.'

And, lastly, if it is 'imitation' that constrains the infant to imitate his own vocal sounds, then it is 'imitation' which we propose to explain by means of the physiological mechanism called the 'reflex-circle.'

The principle of the reflex-circle was first formulated, we believe, by S. T. Bok.[28] E. B. Holt [29] has recently described how it works in the case of infantile babbling. We shall quote him at some length.

> The first results of the workings of Pavlov's law [of the conditioned reflex] are what Dr. S. T. Bok (1917) has called 'reflex-circles.' Let us consider *any* muscle *at a moment when* a nervous excitation, seeking some outlet of least resistance, purely fortuitously finds its way into the motor neurone of this muscle. The muscle contracts,—a random movement. But now something happens which is *not* random. Every muscle has sensory organs embedded within it, its proprioceptors, which are stimulated, probably by mechanical pressure, when the muscle contracts. And so the sensory cells of this muscle (of its tendons also and of the joint involved) are now stimulated and send an excitation along their afferent nerves to the central nervous system. But this excitation arrives only a second or two after the above-mentioned random

[28] S. T. Bok, The development of reflexes and reflex tracts, *Psychiatr. en Neurolog. Bladen*, 1917, 21, 281–303. Curiously enough, we find that a few writers, among whom are F. H. Allport and J. F. Dashiell, have made use of the principle of 'reflex-circles' *after* the appearance of Bok's article in 1917, without mentioning the original source. To the best of our knowledge Holt is the only writer who has acknowledged Bok's priority on this point.

[29] E. B. Holt, Animal drive, vol. I, 1931, 37–38.

impulse has found, or while it is still finding, outlet from the central nervous system into the muscle. Therefore by Pavlov's law (or equally by the law of neurobiotaxis) the incoming excitation will find outlet along the tract just used by the random impulses, that is, will go back to, and will further contract, the very muscle from which it came. Thus the afferent neurones from this muscle will begin to acquire, and after a few repetitions of this process will acquire, a synaptic connection with the motor nerve which goes out to this same muscle. A reflex-circle is established.

Now in the course of time what has happened to this (*any*) muscle, will happen to all the muscles: fortuitous impulses will sooner or later reach them all, and in all of them such a reflex-circle will then be established. The result is that in every muscle a contraction tends to reinforce and to perpetuate itself.

With regard to the application of this principle to the reiteration of infantile sounds, Holt writes:

It is well known that infants which are born deaf do not learn to speak, even though their vocal organs be absolutely normal (Preyer, 1889, pp. 42, 98). This is because a pre-requisite to the acquisition of speech is the establishment of reflex paths from the ears to the vocal organs, such that a sound received at the ears causes the vocal organs reflexly to reproduce that sound as closely as their anatomical structure permits. These indispensable reflexes are established inevitably if the infant's audition is normal. For, as is well known, its random murmuring, cooing, babbling, and other more strenuous vocalizations are, during certain of its early months, well-nigh incessant. It exercises *at random* its entire articulable gamut. Now each sound as it is produced stimulates the child's own auditory apparatus, if this is intact, and each such auditory excitation finds motor outlet in precisely that set of the vocal organs which has just made that very sound: and which will now make it again (a reflex-circle). Hence the infant's persistent reiteration of any sound which it has made (*cf.* Humphrey, 1921). So, little by little, if the child has normal hearing it becomes able to repeat also those same articulate sounds which *other persons* utter to it, and is well on the way to speaking. Of course, this principle is the basis of all onomatopoeia; and indeed Prof. J. M. Baldwin (1895, pp. 130–34) has called it the principle of 'simple imitation.' The reflex-circle in fact gives rise to a general law of iteration: A child will repeat any of its own random acts provided that this action (simultaneously)

stimulates, howsoever indirectly, any of its own sense-organs (and also of course, that no other reflex steps in to interrupt).[30]

Such, then, is the mechanism of the so-called imitative sounds. It is important to note that the circular activity involved in reduplicated vocalizations can be set in action by sounds other than those which the child himself makes. Thus a child in response to *ma*, uttered by the mother or the nurse, will say 'ma-ma-ma-ma,' etc. Prolonged crying—another case of reiterated sounds—may also be initiated either intra-organically or from without. The mechanism involved in this activity is exactly the same: the stimulus tends to reproduce or reinforce itself. G. Humphrey illustrates this case in the following words:

> Originally the stimulus was perhaps a pain, but as the child cries he hears himself crying. Then we have *S* producing *R*, and with it the auditory stimulus *S* 2, the sound of the baby's own cry in the baby's ear. Hence by the law of substitution of stimuli, *S* 2, the auditory stimulus, produces *R*, the reaction, and the more the baby cries the more he cries. Now it does not make any difference to the infant whether the auditory stimulus, once established, comes from himself or from another child. Whenever he hears the sound of crying he will cry, until the reflex has disappeared by 'lack of support' from the primary stimulus, that is, until he grows up and is not accustomed to hear himself crying. That is why the sound of a crying baby does not bring shrieks from a company of adults; the reflex has died out from lack of use.[31]

J. M. Baldwin appears to have been the first to use the expression 'circular-activity.' To quote him on this point:

> The reaction at which imitative suggestion aims is one which will *reproduce the stimulating impression*, and so tend to perpetuate itself. When a child strikes the combination required, he is never tired working it. H. found endless delight in putting the rubber on a pencil and off again, each act being a new stimulus to the eye. This is specially noticeable in children's early effort at speech. They react all wrong when they first attack a new word, but gradually get it moderately well, and then sound it over and over in

[30] E. B. Holt, Animal drive, vol. I, 1931, 39–40.

[31] G. Humphrey, Imitation and the conditioned reflex, *Ped. Sem.*, 1921, 28, 4.

endless monotony. The essential thing, then, is that *the stimulus starts a motor process which tends to reproduce the stimulus and, through it, the motor process again.* From the physiological side we have a circular activity—sensor, motor; sensor, motor: and from the psychological side we have a similar circle,—reality, image, movement; reality, image, movement, etc.[32]

Although Baldwin was early in discerning this principle, he did not have the full secret of the reflex-circle, and he unfortunately made use of the hedonic concept, *e.g.* 'delight,' which in addition to other defects involves the fallacy of enelicomorphism [33]—since this circular activity appears in early infancy. As Holt has said: "The ideas of reflex-circle and adient response have been used by Prof. J. M. Baldwin (1895, p. 133) but like Bain, Spencer, and most psychologists, he obscures the matter at once by hypotheses involving 'pleasure and pain.'" [34]

III. Origin and Growth of Meaning

Section 1. Meaning and Specific Response

The movements of any living animal are effected by energy which is stored in its (nerves and) muscles and released for action by either internal or external stimuli. There is a period in the development of the human fœtus when its movements, as described by Minkowski, are altogether "slow, unsymmetrical, arrhythmic, uncoördinated, diffuse and unformed." [35] This is because no definite functional connections have as yet been established in the fœtal central nervous system between the sensory and the motor nerves. By the

[32] J. M. Baldwin, Mental development in the child and the race, 1895, second edition, 132–133.

[33] We are indebted to Prof. Howard C. Warren for suggesting the term 'enelicomorphism,' (Gr. ἐνῆλικ- = mature), to denote the error which consists in interpreting infant behaviour after the analogy of adult experience. A view based on this fallacy may be, accordingly, designated as 'enelicomorphic.' This term seems to us rather more specific and less liable to ambiguity than either 'teleiomorphism' (E. Claparède, Experimental pedagogy, 1911, 92) or 'adultism' (M. Curti, Child psychology, 1930, 254).

[34] E. B. Holt, Animal drive, vol. I, 1931, 41 (foot-note).

[35] M. Minkowski, Sur les mouvements, les réflexes et les réactions musculaires du fœtus humain, etc., *Rev. Neur.*, 1921, 37, 1111.

time of birth a few such paths have been formed, the new-born infant shows some definite reflexes; but by far the larger part of its movements are still diffuse and uncoördinated.

At this time, as Stern has remarked, the infant gives no indication "of inborn ideas or of any real perception, i.e. seeing and noticing outside objects and occurrences as such, nor is there conscious will or endeavour. All that we are possibly justified in assuming is the presence of a dull, undefined foreshadowing of consciousness." . . .[36]

From birth on, the movements of the infant become more and more definite, and its random movements gradually subside, and fall into the background of the picture. The physiological aspect of this process has been described by Holt in Vol. I of his work called 'Animal Drive,' and we need not repeat the whole argument. The process is one of learning, which means histologically the growth of nerve dendrites according to C. U. Ariëns Kappers' law of neurobiotaxis and, from the point of view of behaviour, the steady conditioning of movements to stimuli as described by I. Pavlov. Considered broadly, the process is a progressive adaptation of the random movements of the organism to the obstacles which constitute its environment. It learns to go out 'adiently' (to use Holt's term) toward all ordinary stimuli, but to withdraw from stimuli which become over-strong. Thus it orients itself toward objects of the environment, navigates among them, explores them. It learns to take attitudes toward objects, to follow set courses of action with regard to them, and by exploring them to re-create their surface contours. All this is strictly physiological: a matter of movement, stimulation, and dendrite growth. The mechanism of imitation, described in the preceding section, illustrates the principles involved.

Now it seems to us that awareness of a stimulus is nothing else than this response that is made to it. Certainly the reaction of an organism is the principal if not the sole test of its awareness of any stimulus.[37] Indeed the response to a

[36] W. Stern, Psychology of early childhood, 1924, 75.

[37] *Cf.* W. Stern, *op. cit.*, 74–79.

stimulus is not merely the criterion of bare awareness, for over and above that the nature of the response reveals, in our opinion, what the stimulus has *meant* to the organism so responding. If, for instance, whenever a loud noise occurs near an infant, it quivers, puckers its lips, pauses in its breathing and then bursts into a loud wail, we can hardly resist concluding that the noise had some very vague 'meaning' for the infant; of the sort that we should call 'a disturbance,' perhaps a disagreeable disturbance. We should conclude this all the more confidently if a loud noise always elicited this same response. For what is it that ever assures us that another person has caught the meaning, even say, of a word if it is not that the particular word regularly elicits from the person a certain sort of response? If, on the other hand, a loud noise elicits from the infant sometimes laughter, sometimes a languid stirring of its limbs, sometimes screams, and sometimes no response at all, we are bound to conclude that the noise has no definite and settled meaning for it.

The position which we here adopt with respect to awareness and meaning is nothing new in psychology. The history of this view has been interestingly traced by Professor H. S. Langfeld;[38] and it is a long and impressive history although it has been systematically ignored by many academic psychologists. As Langfeld himself writes, "without response there would be no consciousness. No matter how many or how strong are the stimuli and the resulting afferent impulses, without the efferent impulses and specific response, either incipient or overt, an organism would have no awareness of a world; so far as that organism is concerned there would be no experience." [39] And again, "The meaning of an object is our attitude toward that object, our reaction to it." [40] Thus the infant's awareness of the meaning of a stimulus, and its motor response to the stimulus, are identical phenomena—two ways of describing the same process.

The same is true when the stimulus is a word. From the

[38] H. S. Langfeld, The historical development of response psychology, *Science*, 1933, 77, 243–250.

[39] *Ibid.*, 243.

[40] H. S. Langfeld, Concerning the image, PSYCHOL. REV., 1916, 23, 180.

infant's general reaction to the stimulus of mere noise to its more specifically differentiated reaction to a spoken word is only a further step involving essentially the same process of conditioning. Concerning primitive language B. Malinowski observes that, "A word *means* to a native the proper use of the thing for which it stands, exactly as an implement *means* something when it can be handled and means nothing when no active experience of it is at hand." [41] . . . "In all the child's experience, words *mean*, in so far as they act and not in so far as they make the child understand or apperceive." [42] Again, with Dr. Langfeld, "Words, in short, are conditioned responses to action, and only if we know this action, do we understand their meaning." [43]

When a mother assiduously ministers to her infant's needs, alleviates all irritations, etc., she produces in the infant a state of comfort, well-being and peace, which is not a condition of the child's sensory apparatus, but of his muscles—muscular relaxation, and calm. Now since it is the assiduous mother who effects this *motor pattern* in the infant, by removing sources of irritation and otherwise soothing him, she is regularly present and is seen and heard by the infant, *i.e.*, is as a visual and auditory *stimulus* a part of his total sensory pattern, at the moment when his motor pattern is this of relaxation and peace. Therefore, by Pavlov's law, the visual and auditory stimuli which reach the infant's eyes and ears from the mother, will produce in the infant a motor pattern of peace and well-being. By the same law *either* her visible aspect or her spoken 'Mamma' (with her peculiarities of intonation, etc.) will elicit in the infant the motor pattern of peace and well-being. Which is to say, that 'Mamma' as spoken by her 'means' to the child peace and well-being (a motor state).

If, again, the mother by affectionate and playful actions excites reflexes already formed in the child, such as tilting exuberantly back and forth in his rocking-chair, then (by

[41] B. Malinowski, The problem of meaning in primitive languages, in C. K. Ogden and I. A. Richards, The meaning of meaning, 1923, 488.

[42] *Ibid.*, 487.

[43] H. S. Langfeld, Consciousness and motor response, PSYCHOL. REV., 1927, 34, 8.

Pavlov's law, as before) her face and spoken 'Mamma' will come to 'mean' for the child a happy excitement—rocking back and forth in his chair.

An infant's awareness of some meaning does not imply any very precise appreciation. And, as a rule, the earlier meanings of an infant are exceedingly vague. Just as there are many grades of specificity between the random and the co-ordinated movements of a child, so also there are different degrees of precision in its meanings. Any individual's meanings, during the course of his life, will range from a vague and shadowy awareness to fairly clear and precise cognition. In short, whenever there is a response on the part of the organism to a stimulus, there is always meaning. But not until the response becomes specific can there be precise meaning. The explanation of the absence of precise meaning for an infant is the same as the explanation of his lack of coördinated and specific movements.

Section 2. Objective and Subjective Aspects of Response; Re-Creation through Empathy

When an organism responds specifically, the process presents two distinguishable aspects. Firstly, the response points out or is aimed at some part of the environment (even if this is only a position in space); it further may follow objects moving in space, and in general trace or explore (and thus in a sense re-create) the contours and relations of objects and their movements. Let us call this the objective reference, or aspect, of the specific response. Secondly, it is an organism with its motile members that is executing the response, and this implies posture or attitude, and changing attitude, of the organism. Let us call this the 'subjective' aspect, or reference, of the response. Clearly these two aspects are actually indissoluble.

If now the act of perception is an act of responding specifically, it is clearly the objective reference (re-creation) of the response which is the perception of the object, of its contour and other properties, and of its motion if it is undergoing change; while at the same time the inseparable subjective

aspect of the response is an attitude of the organism toward the perceived object, a doing something to it or with it. It is true that one or the other aspect may seem greatly to preponderate in a given response. The 'subjective' aspect, at any rate, can never be wholly absent; some instances suggest that objective reference may be so reduced as to be practically absent. But the two aspects are indissolubly fused in the actual response, and can be distinguished only by a conceptual analysis. In all acts of vision the objective reference preponderates; yet the attitude called 'interest,' or something of the sort, is inevitably there. While the hand that reaches for an object or that wields a knife is an instance primarily of 'subjective' attitude, yet the position of the object seized or the position, shape, and texture of the object cut cannot fail to be rather specifically defined by the motion of the hand, or knife.

When the stimulus responded to is a word or sentence, it is the response of the hearer which creates the 'meaning.' Wherefore the meanings of words have to be learned, even as the multiplication-table is learned. It is obvious that what logicians call the denotation and connotation of words are both realized in the objective reference of the response, while the 'feeling tone' or emotional value of the word lies in the subjective aspect of the response.

All evaluation is, of course, within the subjective aspect. The pleasant and unpleasant experiences of the child are its subjective or attitudinal responses to various stimuli. The responses of the new-born baby seem to be predominantly attitudinal or subjective.

To sum up: the meaning of a stimulus, whether an object present and perceived, or a word or other symbol which stimulates us to create a signification and to take an attitude, comprises in general the following items:

1. Objective reference:
    a. Perceived (or conceived) location of the object (denotation)
    b. Perception (or conception) of the properties of the object, what it is, etc. (connotation)

2. Subjective reference, or aspect:

Attitudes of acceptance, rejection, or other personal intention toward the object: feeling, emotion, evaluation, use.

It is the objective reference or process of perception (and the therewith implied process of motor, 'conceptual,' re-creation) that next calls for consideration. We believe that this process is one with that phenomenon which psychologists have called 'empathy'; that is, that perception is a process of re-creation through empathy.

Empathy,[44] or *Einfühlung*, was first brought into special prominence by Theodor Lipps, as the essential process underlying 'æsthetic perception.' It has been further studied and discussed largely by students of aesthetics: by K. Groos, Vernon Lee, C. Anstruther-Thompson, H. S. Langfeld, and many others. Aesthetic perception, as Prof. Langfeld has shown, is not a 'mentalistic' state, but a motor or empathic response of the percipient to the object perceived. Empathic response is the process through which 'the *activities* of the perceiving subject' are merged 'with the qualities of the perceived object.' [45] In other words, the percipient *re-creates* the various contours, lines and configurations of the object of æsthetic perception. But whatever the type of perception, æsthetic or other, the process of perception is the same. Thus, as Prof. Langfeld says, with regard to the perception of movement: "The perception of a movement . . . is first identified in the object and not in one's self." [46]

The idea is not new. Erasmus Darwin, writing in the year 1794, showed that what we should now call empathic response is essentially involved in the perception of an object.[47] And Alexander Bain has throughout his psychology contended that our perception of an object, of its size, solidity, form, shape, and distance are really motor activities on the part of the

[44] The word 'empathy' was coined by the late Prof. Titchener as an English equivalent for Lipps' term *Einfühlung*.

[45] Vernon Lee, The beautiful, 1913, 63.

[46] H. S. Langfeld, The æsthetic attitude, 1920, 115–116.

[47] Erasmus Darwin, Zoonomia; or the laws of organic life, (Dublin edition) 1794, vol. 1, sect. XXII, 3, 254.

percipient. Concerning the perception of objects and their location in space, he writes: "By movements confined to the head and eyes we grasp objects lying directly across the view, or with all parts equally distant from the eye; by these movements, combined with altered adaptation to distance, we have figures of objects that retreat from the view, as in looking down a street." [48] Concerning the perception of size and weight, he writes:

By means of the movements of the eye, we acquire impressions of the *visual expanse or apparent magnitude.* This visual expanse of bodies is determined by the range or sweep of the eye in passing over their whole extent, or by the fraction of the field of view that they take in. We see a rainbow spanning one-third of the heavens; we see a cloud encircling the sky; we appreciate the dimensions of a picture on the wall as compared with other pictures beside it. The different degrees of movement and tension of the muscles that make the sweep are distinctly felt, and we set down one sweep as more or less than another. We also acquire by repetition standards of comparison for expanses in general, as we acquire standards of weight in the sensibility of the arms.[49]

With regard to the perception of solidity:

A cubical block, exemplifying all the three dimensions of *solidity*, presents nothing radically new. A new direction is given to the hand, and a new class of muscles are brought to contribute to the feeling. The movement must now be over the length, over the breadth, and over the thickness, and the resulting impression will be a complication of the three movements.[50]

On the perception of form or shape:

Form or shape is appreciated as easily as situation. It depends upon the course given to the movements in following the outline of a material body. Thus we acquire a movement corresponding to a straight line, to a ring, an oval, etc. This is purely muscular.[51]

On the perception of distance:

For what do we mean when we say that an object is four yards distant from where we stand? I imagine that among other things

[48] Alexander Bain, The senses and the intellect, 1855 edition, 244-245.
[49] *Ibid.*, 245.
[50] *Ibid.*, 190.
[51] *Ibid.*, 193.

we understand this, namely, that it would take a certain number of paces to come up to it, or to reduce the distance from four yards to two yards. The possibility of a certain amount of locomotion is implied in the very idea of distance. . . . In the case of objects within reach of the hand, the movements of the arm give the measure of distance; they supply the accompanying fact that makes distance something more than an unknown visible impression.[52]

On the perception of empty space:

By the swing of the arms alone we have a notion of empty *space*, which means to us nothing more than scope for movement, and consequently for extended matter.[53]

Thus the perception of an object is to be described as the re-creation of objective configurations by copying movements executed by our motile members, including the 'lines of regard' of our two eyes. The following passage from E. B. Holt brings out clearly the rôle of movement in the general perception of space.

In his study of *The Psychology of Early Childhood*, Prof. Wm. Stern (1914) has entitled one section 'The Mastery of Space'. He there says (pp. 67–68), "The expression mastery of space signifies that not only the development of space-perceptions is to be discussed, but *the conquest of the spatial in cognition and in action at the same time.* The two are utterly inseparable; the structural unity of the sensory and motor comes out nowhere so clearly as in connection with space: there is no comprehension without intervention, no understanding without undertaking, no representation without a self-adjustment." Such a fact lends weight to the suggestion that the consciousness of space and action in space are the very same thing. In the terms of specific response that would mean that any specific response of the organism creates, i.e. *is*, the consciousness of that amount of space and of that position or configuration in space of which the response is a function: that is, which the response explicitly points to, defines, or re-creates (in the sense that a traced line 're-creates' the original over which it is traced).[54]

So far, we have described the process of the growth of

[52] *Ibid.*, 365.

[53] *Ibid.*, 192.

[54] E. B. Holt, Animal drive, vol. II. Quoted from the unpublished MS. by permission of the author.

meaning in the presence of the object. This process is at the perceptual level: it is perception. But the various stimuli that excite us are not always immediately present. An infant, for instance, reacts not only to the physically present mother or the nursing-bottle, but it also 'reacts to,' i.e. re-creates, these objects even when they are not in sight. But whether the stimulus is present or absent, our reaction to it involves the process of re-creation through empathic response. The difference is that in the case of the response to (re-creation of) an absent object, the original neuromuscular patterns must have been learned, so that they persist as "neurograms which, even when the original object is absent, will *re-create* its surface contour."[55] Erasmus Darwin described the re-creative process for ideas and thoughts (i.e. when the actual objects are not present), in the following words:

> It is hence, that we are very slow in acquiring our tangible ideas, and very slow in recollecting them; for if I now think of the tangible idea of a cube, that is, if I think of its figure, and of the solidity of every part of that figure, I must conceive myself as passing my fingers over it, and seem in some measure to feel the idea, as I formerly did the impression, at the ends of them, and am thus very slow in distinctly recollecting it.[56]

We saw at the end of the preceding section, how through the operation of Pavlov's law a tone or a word can serve as a substitute stimulus, a 'symbol,' for the physical object *mother;* so that in the absence of the mother it will touch off the same responses in the infant. The infant will thus re-create the familiar figure of its absent mother through the mediation of a symbol which stimulates its neurograms.

The response of the infant to the immediately present object is a perception. Its response to a symbol is a *meaning.* The process of re-creation has been sketched by E. B. Holt as follows:

> . . . the *meaning* of a word lies entirely in that which the word as a stimulus makes one *do*, even when such doing is performed at

[55] E. B. Holt, Animal drive, vol. 1, 1931, 216.

[56] Erasmus Darwin, *op. cit.*, vol. I, 110.

low tension and is invisible to one's neighbour; when, that is, it is only an inconspicuous play of muscle-tonus. This meaning will have objective validity, will be *cognition*, when and *in so far as* the movements in question are started, stopped, guided, and controlled by outer objects, that is, in mathematical parlance, when they are *functions* of outer objects. This much of the word-response is the word's objective meaning. The rest of the response which the word elicits is merely personal attitude (acceptance, rejection, liking, disliking, etc.), the personal element of the word's meaning. It is not surprising then that the objective or cognitive element of a word's meaning and the attitudinal or subjective element are so closely fused and so inseparable.

The meaning of a word, the response which it stimulates, as mental content and in detachment from the word or symbol itself, is what is called an 'idea' or 'concept.' And thus I believe that all concepts and ideas, in fact all mental contents, are actual motor responses; a part of the response, in each case, being a *re*-creation by motion of some configuration of objects in the environment—this the objective or cognitive part—and the rest of the response being merely a personal posture or attitude—this the subjective, emotional or affective element of the idea or concept.[57]

Section 3. Meaning of Gestures, Cries, and Tones

It is through the intervention of its elders that the general movements and postures of an infant gradually pass into symbolic gestures. A hungry infant, for instance, soon comes to react to the sight of the nursing-bottle by writhing, wriggling and directing its head and eyes towards it—general indications of food-adience. At the creeping stage an infant will creep towards its bottle. This is its direct response to the sight of the nursing-bottle. This response, however, has a 'significance' for the interested mother, inasmuch as she understands it to mean that the infant wants food The general behaviour of the child may thus be termed a *whole-body* language, since the attitude and activity of its whole body convey meaning to an onlooker.

But this whole-body language of the infant soon comes to be abbreviated, through the solicitous participation of the

[57] From an unpublished paper 'On the conceptual affinity of opposites.' Quoted by permission of author.

mother. As soon as the infant shows a nascent attitude of food-adience, the mother brings the bottle and thus cuts short the adient efforts of the infant. Whenever it stretches out its hand towards an object, the attentive mother is there to put the object in its hand. Such coöperation on the part of the mother, soon reduces the whole-body language of the infant to mere ('conventional') gesture, in which *only a part* and that the earliest part of an action is substituted for the entire action. The responses of the infant thus become merely symptomatic, i.e. symbolic.

Dr. F. N. Scott describes how the infant's original motion of clutching, through social coöperation, passes over 'into the socialized, symbolic attitude or gesture which is called pointing,' as follows:

> In its original form this gesture is the act of seizing or clutching. Its primary purpose is the acquisition of food. Such a movement also serves as a recognition-sign, disclosing to others the presence, and to some extent the identity, of the individual making it, and also revealing his hungry condition. If a supply of food were always present, the act would never rise above its primitive stage. As often as the individual felt the need of food he would reach out his hand and take it. But the source of food supply, especially in the case of the very young, is not always within reach. The hand goes out towards it in vain. The stomach remains empty, and the futile clutching movement is merely a sign of increasing hunger.
>
> If, now, when such a movement is made by the child, the mother places the food within its reach, the clutching takes on a new aspect. The movement was at first completed by the act of the child; it is now completed by the act of the mother, since a part of the movement which was formerly made by the child alone, is supplied by the mother's movement. This vicarious completion of the child's act has important consequences. . . . The effect of this is to abort or abbreviate the movement, for since part of it is to be performed by another, the whole movement need not be made. All that is necessary is a reaching toward the object; the mother will do the rest. Hence, in course of time, the grasping part of the movement will be abandoned. The clutch will be shortened into a mere thrust of the hand accompanied by an expectant look at the mother. The life-serving movement of clutching will have passed over into the gesture of pointing.[58]

[58] F. N. Scott, The genesis of speech, *Publ. Mod. Lang. Ass. Amer.*, 1908, 23, xxxiv–xxxvi.

All this shows (1) how a whole-body activity of the infant is abbreviated into a gesture, and (2) why even the vestigial gesture has a meaning *for the mother* (and often for her alone).

Now this cutting down of the infant's original adient efforts toward food, to mere gesture, provides the infant also with a 'meaning' connected with his gesture. The mother by solicitously proffering the bottle on seeing his incipient striving for food (his 'gesture'), produces in the child the following sequence of reflexes; and these, after sufficient repetition of the meal-time experience, become connected as a chain reflex:[59] internal hunger stimuli (appetite)—gestures of food-adience; [the mother sees and steps in] mother as visual stimulus and nursing-bottle as visual, tactile and olfactory stimuli—motor exploration (perception) of mother and bottle, and motor appropriation of the bottle and its contents.

For the first few times, the advent of the mother with the bottles is a necessary link in the sequence of reflexes. But as in all learning of chain-reflexes, after some repetitions the proprioceptive afferent impulses returning to the central nervous system from one movement have become canalized into the motor paths of the next following movement, and are sufficient of themselves to produce the movement. From this moment on, the mother herself is not an actually necessary link in the chain. On the contrary, if the mother does not see the infant's gesture and bring the bottle, the infant's next movements will be *as before*, to re-create its mother and to grasp and carry to its lips the (not-present) bottle. And precisely this it is which we have all often seen, and said: "The baby is definitely *looking for* his mother; he *wants* her to bring the bottle." Such is the physiological mechanism of 'expectation' and 'purposive' action in general. This 'expectant' re-creation of its absent mother and grasping reach for the absent bottle are the gesture's *meaning* in the experience of the infant. They mean, translated into words: I want mother bring bottle.

[59] 'Agglutinated' is the term used by Alexander Bain, The senses and the intellect, 1855 edition, 322–328. William James used the term 'concatenated': *cf.* W. James, Principles of psychology, vol. I, 115.

While the present writer was studying this physiological aspect of expectation, a friend chanced to have the following experience with a dog. Walking down the street, Mr. A saw on a lawn a large dog that he had never previously seen. The dog was looking toward A, and A in passing smiled and made a friendly gesture to the dog. With a slight wag of his tail the dog turned about, ran to the back of the lawn and returned, still running, and carrying in his mouth a rubber ball, which he dropped squarely in front of A's feet. A stopped, and the dog looked up at A 'expectantly,' wagging his tail. A threw the ball, and the dog bounded off to fetch it back; and the game was on. On his second return, and thereafter, the dog dropped the ball into A's hand.

It is a game which a dog is at all times ready and eager (motor-set) to play. The master's part and the dog's part alternate, the dog's turn beginning when the master throws the ball and ending when the dog returns the ball to his master's hand. But if the master does not throw it again, the dog's next turn cannot be carried out, and is reduced to 'expectation.' When from the lawn the dog saw A walking past, all the *stimuli* were present which were needed to set the dog to playing the game. With alacrity he played his turn; and laid the ball at the feet of an utter stranger. This act was a 'gesture,' and as typical an instance of 'meaningful gesture' as could well be conceived. It can scarcely be denied that the dog made the gesture with 'a definite purpose in his mind.' Nor can it reasonably be denied that the physiological mechanism of the performance was a well established chain reflex.

The dog dropping the ball at A's feet is completely analogous to an infant waking up in its crib, hungry, and crying 'in order to' summon its mother with the nursing-bottle.

The child's understanding of the behaviour of others does not begin with its appreciation of words; it begins with an appreciation of its elders' actions and gestures. As Colonel Mallery writes:

> It [the child] learns words only as they are taught, and learns them through the medium of signs which are not expressly taught.

Long after familiarity with speech, it consults the gestures and facial expressions of its parents and nurses as if seeking thus to translate or explain their words.[60]

And Stern observes:

Gesture has its value too, in those speaking to children, as a help to the understanding of many words, for the meaning of many gestures is at once apparent to the child; when these are the constant accompaniments of certain words, at last the words alone are sufficient to convey the meaning. If at the words, "Well, come then," a child learns to get up and struggle along to his mother, it is because these words have been accompanied by the highly suggestive gesture of outstretched arms.[61]

That a few words, or any other prominent stimulus, out of the many simultaneous stimuli present in a total situation should elicit from the child (practically) the same response as does the whole situation, merely illustrates that 'part-for-the-whole association' which is a fundamental property of the conditioned response principle. The phenomenon bears witness to the underlying physiological mechanism. A word does this neither more nor less than does any other significant stimulus or gesture which the organism has previously encountered. In quite the same way, Wolf, the favourite dog of Rip Van Winkle, who had learned by frequent painful experiences to remember Dame Van Winkle's thrashings, found meaning and significance in the mere sight of her threatening attitude; for, in the words of Washington Irving, "at the least flourish of a broomstick or ladle, he would fly to the door with yelping precipitation." [62]

That the significant use of the gesture has preceded speech also in the linguistic development of the human race, is obvious from its copious, and in some instances its exclusive, use among primitive peoples. Prof. G. F. Stout reports that "It is well established that the Bubis of the island of Fernando

[60] G. Mallery, Sign language among North American Indians, in First Annual Rep. Bur. Ethn. Smithsonian Instit., 1881, vol. I, 276.

[61] W. Stern, Psychology of early childhood, 1924, 145.

[62] W. Irving, The sketch book, in The works of Washington Irving, 1856, vol. II, 47.

Po cannot understand each other in the dark. Miss Kingsley in her 'Travels in West Africa' tells us that among the Fans it is common to propose to go to the fire in order to see what people are saying." [63] Even where speech appears to be more or less developed, in a primitive society, gestures are still employed to convey the more precise meaning of the speaker. Lord Monboddo writes: "the savages in North America do at this day supply the defect of their language by a great deal of action and gesticulation." [64]

The process of abbreviation of the whole-body activity into the symbolic gesture is also obvious in the case of primitive man. Ethnologists report that the movements of the entire body, involved in the communications of the primitive man, are generally replaced by the movements of the hands. Thus James Mooney observes, concerning the American Indians:

> The signs are made almost entirely with the hands, either one or both. . . . Thus the sign for man is made by throwing out the hand, back outward, with index finger extended upward. . . . Woman is indicated by sweeping downward movement of the hand at the side of the head, with fingers extended toward the hair to denote long flowing hair or the combing of flowing locks.[65]

The use of hands is again illustrated in his account of the gestures denoting more abstract concepts:

> Thus, *fatigue* is shown by downward and outward sweep of the two hands is front of the body, index finger extended, giving a gesture-picture of utter collapse. *Bad* is indicated by a motion of throwing away.[66]

As vocal language (tonal or verbal) develops, the gesture-language recedes into the background. But not even at the highest levels of vocal communication, do gestures ever entirely disappear. They persist in a more or less vestigial form. For even when a speaker makes no conspicuous gestures, slight movements are always to be detected: movements of the

[63] G. F. Stout, A manual of psychology, 1899, 475.

[64] Lord Monboddo (James Burnet), Of the origin and progress of language, vol. I, second edition, Edinburgh, 1774.

[65] J. Mooney, Sign language, Bureau Amer. Ethn., Bull. no. 30, 567.

[66] J. Mooney, Sign language, *ibid.*, Bull. no. 30, 568.

eyes and eye-brows, and of the general facial musculature. In many persons, indeed, the facial musculature exhibits a continuous 'play of emotion,' as it is called. Thus Colonel Mallery writes:

Even among the gesture-hating English, when they are aroused from torpidity of manner, the hands are involuntarily clapped in approbation, rubbed with delight, wrung in distress, raised in astonishment, and waved in triumph. The fingers are snapped for contempt, the forefinger is vibrated to reprove or threaten, and the fist shaken in defiance. The brow is contracted with displeasure, and the eyes winked to show connivance. The shoulders are shrugged to express disbelief or repugnance, the eyebrows elevated with surprise, the lips bitten in vexation and thrust out in sullenness or displeasure, while a higher degree of anger is shown by a stamp of the foot.[67]

This persisting accompaniment of gesture is so considerable that Diderot, for instance, deemed that even in the most mature use of (spoken) language, gesture and intonation together continue to express actually more of a speaker's meaning than do his vocabulary and diction, however accomplished these latter may be. And this opinion coloured Diderot's views on the art of acting. F. Luitz says in his introductory Notice to Diderot's 'Le Paradoxe sur le Comédien': [68]

What a large place he [Diderot] wishes to see accorded to pantomime in a dramatic work. He feels that there is too much speaking and too little acting, in the tragedies. . . . For the actor should move us rather by his actions and by his tone of voice, than by his words.

Long before an infant can understand words, it makes considerable advance in the language of tones. Thus M. M. Nice reports that though her daughter's vocabulary, at two years, consisted of five words, yet the child was able to communicate 'to a large extent by tones of voice and gestures.' [69] And this is true of most children. Of the wild boy

[67] G. Mallery, *op. cit.*, 279–280.

[68] In the Bibliotheca Romanica, (Heitz, Strasbourg) No's 179–182, 7.

[69] M. M. Nice, A child who would not talk, *Ped. Sem.*, 1925, 32, 107.

of Aveyron, Itard writes:

Victor owes to it [the sense of hearing] the fact that he can distinguish words of one syllable, and above all, when presented with different intonations of the language, can recognize with considerable accuracy those which are the expressions of reproach, anger, sadness, contempt and sympathy.[70]

The process of conditioned response is in evidence here. Thus Major writes:

The caressing sounds get their meanings perhaps from being frequently associated with gentle and tender handling, and harsh sounds come to have a certain response because associated with rough, or indifferently gentle handling, and not because in either case the distinction is untaught and instinctive. . . . If a child were accustomed to hearing soft words and being beaten at the same time, such words would soon come to arouse fear and trembling. If, on the other hand, gentle and caressing treatment were associated in the experience of the child with harsh sounds, the latter would soon come to be soothing and quieting.[71]

The same is eminently true of animals. Charles Darwin recorded that:

Monkeys soon learn to distinguish, not only the tones of voice of their masters, but the expression of their faces, as is asserted by a careful observer. Dogs well know the difference between caressing and threatening gestures or tones; and they seem to recognize a compassionate tone. . . . This limited amount of knowledge has probably been gained, both by monkeys and dogs, through their associating harsh or kind treatment with our actions; and the knowledge certainly is not instinctive. Children, no doubt, would soon learn the movements of expression in their elders in the same manner as animals learn those of man.[72]

Herbert Spencer believed that intonation is a part of what we have called the 'subjective' aspect of meaning.

All speech is compounded of two elements, the words and the tones in which they are uttered—the signs of ideas and the signs of

[70] J. M. Itard, The wild boy of Aveyron, 1932, 60.

[71] D. R. Major, First steps in mental growth, 1906, 286.

[72] C. Darwin, The expression of the emotions in man and animals, 1872, 358.

feelings. While certain articulations express the thought, certain modulations express the more or less of pain or pleasure which the thought gives. Using the word *cadence* in an unusually extended sense, as comprehending all variations of voice, we may say that *cadence is the commentary of the emotions upon the propositions of the intellect.* This duality of spoken language, though not formally recognized, is recognized in practice by every one; and every one knows that very often more weight attaches to the tone than to the words. Daily experience supplies cases in which the same sentence of disapproval will be understood as meaning little or meaning much, according to the vocal inflections which accompany it; and daily experience supplies still more striking cases in which words and tones are in direct contradiction—the first expressing consent, while the last express reluctance; and the last being believed rather than the first.[73]

Romanes held similar views, declaring "that words are never understood unless tones are likewise so, and that understanding of words may be assisted by understanding of the tones in which they are uttered." Further, "while the understanding of certain tones of the human voice extends at least through the entire vertebrated series, and occurs in infants only a few weeks old; the understanding of words without the assistance of tones appears to occur only in a few of the higher mammalia, and first dawns in the growing child during the second year." [74]

Finally, in at least some primitive languages and even in so highly developed a language as the Chinese, intonation is a recognized means for conveying meaning. Using "*accent* in the antient sense of the word, to signify a musical modulation of the voice, by which it is made higher or lower with respect to gravity or acuteness," Lord Monboddo writes, "I believe all the antient and original languages, without exception, have a great deal of accent or tone in them." [75] He continues:

> The Chinese language . . . is full of tones, insomuch that sometimes the same monosyllable signifies nine or ten different

[73] H. Spencer, Essays scientific, political, and speculative, vol. II, 1899. The origin and function of music, 421–422.

[74] G. J. Romanes, Mental evolution in man, 1893, 124.

[75] Lord Monboddo (James Burnet), Of the origin and progress of language, vol. I, second edition, Edinburgh, 1774, 470.

things, according to its different accents. The Indians too in North America . . . have tones by which they make the same word signify different things; and particularly one of those nations, the Hurons, according to the account given us of their language by Gabriel Sagard, . . . supply the defects of their language, particularly the want of tenses, persons, numbers, and genders, by accents only. . . . The Jesuit Sebastian Rasles, who was missionary in Canada in 1723, says the same thing of the Huron language; for he tells us, that the same word has different significations according as it is differently accented.[76]

[76] *Ibid.*, 471–472.

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