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IMITATION AND THE CONDITIONED REFLEX

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IMPORTANCE OF IMITATION

One of the first things which strikes the observer of children and adults alike is what seems a universal tendency to do as others do, to imitate. Everywhere may be seen examples of action apparently done not because the individual has himself decided that such an action fits the particular situation but because such and such another individual is performing or has performed the same action. The sheep which turns aside in the road will, if the man or dog in charge is not alert, take with it half the flock before it can be turned back. The boy coming home from school who throws a stone at a cat will be joined by the rest of the boys who are passing. The lady who goes into a store, enquires anxiously what "is being worn" and, however her heart is set upon a garment of a particular kind, she will instantly reject it if it be "out of fashion." If the members of my "set" wear their trousers turned up, mine are turned up. If they wear them down, mine are turned down. If they eat asparagus with their fingers, I eat mine with my fingers; if with a fork, I do the same. If they rise when the Governor of the State begins a speech, I rise, even though I am ignorant of the custom. And, almost automatically, I sit when they sit. It is almost platitudinous to say that imitation plays a most profound part in our relations with our fellow men, and is responsible in a very large degree for the difference between the hermit and the member of a state. Other factors undoubtedly enter in, but it is certain that not a small part of the effect of our fellow men upon us is due to the fact that they serve as copies for our own actions. The philosophers have from earliest time recognized the im-

portance of such influence. From Plato down they have insisted upon the necessity for good copies, upon the force of good and bad example. And from time immemorial imitation has been used in education, consciously and unconsciously, and its importance stressed by those who concerned themselves with the rationale of instruction. A moment's thought will convince of the large part which it plays in school life. From arrival in the kindergarten the little boy begins to be with other children and to do as they do; he begins to find that there are certain things which he cannot do but which can be done by the teacher. Soon he tries to do as the teacher does. When the teacher writes a beautifully shaped A or a beautifully rounded a upon his paper, he watches with eager eyes to try and make one like it. When the teacher sings, he tries to sing like her. When she writes something on the blackboard and says "cow," the child says "cow." When she writes a figure and says "seven," the child says "seven." If she straightens up her back and says that "she wants to see the class sit up," the children look at her and each other and "sit up." When the teacher takes the class into the hall or road to teach them their drill, she must first go through the exercises. For no telling the children what to do will be as effective as telling them what she is going to do and doing it. Later when the class is learning manual work, the instructor must first take the tool and "pattern." In the French lesson the master must first say the French word. Often when the class does not seem able to perform any activity, the teacher will bring out the best pupil for a copy.¹ This is true not only of the teacher and of school subjects. Almost every action which the boy performs is completely modified by the way the other boys do it. His dress, his talk, even his walk are dictated by the precepts of good form. Imitation is of the other pupils at least as much as of the teacher. No detail is too large or too small, nothing too serious or too trivial. Our whole system of education, whether in the formal stage of school or in the more desultory stages of home and the street, is shot through and through with actions performed in reproduction of the actions of others. By its very universality and apparent simplicity this class of action has attracted the attention of the educator. But the simple answers given to what seemed a relatively simple problem do not satisfy the demands of modern thought, which sees in simplicity the sign to cry halt and investigate. There is here presented an analysis of the seemingly simple process of imitation and an attempt to show that it consists of highly complex integra-

¹ Cf. The Fugleman in the army.

tions of a peculiar type of conditioned reflex; incidentally certain previous theories will be criticized as may be necessary for the better explanation of the view proposed.

NATURE OF IMITATION

The fundamental thing about an imitative response is that it is similar to the stimulus which produced it. Putting this the other way round, the fundamental thing about a stimulus which produces an imitative response is that it is similar to the response which it evokes. I may imitate the sound of a locomotive more or less successfully, the gait of a man walking down the street, the action of a crowd taking off their hats. In each case the response I make is in some way similar to the stimulus. Take now a reflex of the so-called "chain" type,² where a stimulus A produces response B which acts as a stimulus to response C, which again acts as a stimulus to response D, etc. An example of this is, according to Sherrington, to be found in the act of deglutition and the crawling of the earthworm. Suppose, then, that of the chain B, C, D, . . . set on foot by the stimulus A, B and C are identical; then there results a stimulus A producing a reaction B which acts again as the stimulus for the same reaction B. Let us take an example. When a man feeds a printing press he goes through a complicated series of movements each of which when completed serves as the stimulus for the next movement. He would find it almost impossible to stop instantly at the middle of the process in putting in a sheet of paper, because, by force of habit, as we say, the one movement leads on to the next. Now when a complete unit of putting in one piece of paper and putting the hand back is finished, the man is in exactly the same position as he was before going through the process at all, and he automatically takes the next piece of paper and puts it into the machine. The activity is circular; when once completed it tends to be repeated. Now in this case there are a large number of extraneous stimuli; there is the stimulus of the noise of the machine, the sight, weight, and "feel," of the paper, etc., and all those are necessary for the movement. Further, between the action which serves as a stimulus and the repetition of action there is the whole series of movements constituting the unit. But suppose that our unit is very small so that the response acts as a direct stimulus for and identical response. Take the case of the child to whom increase of pressure on the hands acts as a stimulus to the movement of pushing away. Then when he

² Herrick, *Principles of Neurology*, Chapter iv.

pushes on the wall, the harder he pushes, the more pressure there will be on his hands, and so he will push still harder until he has reached his physiological limits or until some other stimulus intervened. This is a pure example of what is known as "circular reaction," where the response acts as a stimulus for furthering similar activity. Such circular activity may be produced in different ways. There is the case of a crying baby. 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 ears. 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,³ 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.³ A similar phenomenon may be observed with animals. One restive dog will keep the whole dog population of the district barking. A crowing cock will start all other cocks crowing. Action of this type may be regarded as the elementary unit of imitation. It depends upon the fact that man and animals have senses by which they can perceive the reactions to stimuli from the same or other senses. It is a particular kind of conditioned reflex, where the response acts as a secondary stimulus. It comes from a psychological inbreeding, a kind of parthenogenesis of behavior.

There is another way in which imitation may come about, but by slightly different means. Suppose that a herd of cattle is feeding together and something occurs to startle them, perhaps the sound of a gun. They all manifest signs of fear and run in the opposite direction. Any individual, A, will, as he runs, see his fellows running, and this will always have occurred whatever the stimulus. Hence the sight of a running fellow will act as the conditioned stimulus for the activity of running. If now I drive a frightened animal into the field with the originally placid herd, it is very likely that the whole body will be stirred up to activity, especially at night when there are fewer conflicting stimuli. Thus Breed⁴ reports that pigeons placed in a cage where they could

³ V. Yerkes & Morgulis, *Psychological Bulletin*, 1909, pp. 257-273.

⁴ *Behavior Monographs*, No. 1.

see other pigeons eating, pecked the ground although no food was given them. The sight of other birds pecking had become a conditioned stimulus for pecking. Here the imitation is direct from other animals, and does not depend on the animal's own activity.

There are still other ways in which imitation may arise, but all depend upon the fundamental process of the conditioned reflex. For instance, the child lying in the cradle makes many combinations of muscular responses to various stimuli, such as kicking or gurgling.⁵ The whole organism may be thrown into an intense activity by a single strong stimulus. If then the mother gurgles at the same time, gurgling on some future occasion may cause kicking or a dozen other actions from the repertoire, and no one then says that the child is imitating. But if the mother happens to gurgle at the same time as the child is gurgling and making few other movements, and gurgles more frequently when the child gurgles, then after a time the gurgle from the mother will call forth the "imitative" gurgle from the child. Here the original secondary stimulus comes from without, and we have a kind of converse of type one. There may be other types, but all will be found to depend, as these do, upon the establishment of a conditioned reflex where the secondary stimulus is similar to the reaction. Imitative action may be defined as *action involving a conditioned reflex the secondary stimulus of which is similar to the reaction.*

IMITATION NOT AN INSTINCT

There is thus no reason to assume that the child has a special faculty or innate disposition to imitate. James talks of "the instinct of imitating gesture" and includes imitation in his list of "special human instincts" handed down by heredity. This is not the place for an examination of the general theory of instinct; but in imitation at least we have an activity which was originally classed as a hereditary reaction and which must now be classed as a learned reaction. In fact, we can see no essential difference between imitation and any other conditioned reflex activity, the only distinction being the minor one of the similarity between the secondary stimulus and the response. Apart from this, the imitative reflex may be treated exactly as any other. It may be woven into the fabric of our activities—integrated—or it may be left independent. I may form a whole complex of imitative actions as in the complicated play of older children, or I may leave

⁵ This example is due to Doctor Dearborn.

one reflex entirely unconnected with all the rest of my personality, entirely unintegrated, as when I cross my arms after another does so. Integration in general has been treated very fully in the literature; but as the integration of imitative actions is of particular interest, this will next be dealt with.

INTEGRATION OF IMITATIVE ACTIONS

Take a simple example of a childish imitation. "George. Age 1 year, 8 months. The other day there was a man at our house fixing the wall paper in one of the rooms. That evening George took a small camp chair and, pushing it to the wall, got up in it and rubbed the paper up and down. He did this two or three times."⁶ Or "Emma. Age 2 years, 4 months. Emma saw a girl out of doors throwing up a ball, running to catch it and laughing. For an hour or more after, Emma ran about the room, making believe to catch it, running about and laughing."⁷

These two examples show the general working of the mechanism described. The act once imitated serves as its own stimulus. The little boy went on with the whole cycle "two or three times." The little girl ran about "for an hour or more." Another little boy who had seen his mother wash the windows "would not stop till his mother told him to—at the end of an hour I think." Thorndike's cat is famous, which discovered it could climb on to a table, and did so until Thorndike grew "tired of the game." The general connection between imitation and repetition is very marked. In fact it is hard to say where one ends and the other begins, whether repetition is not "self-imitation" just as often as it is response to repeated stimuli. Here we have repetition of an action imitated from others; this may be either response to repeated stimuli or imitation of self, the primary and secondary stimuli being identical. In either case the examples show the way in which integration adds step by step to the system.

This method by which imitative units combine with themselves to form "higher units" of conduct is well illustrated in the following simple example. "Bertha. Age 1 year. Bertha's mother dips the comb in the wash basin when she combs Bertha's hair. If Bertha is given a comb she strikes the edge of the basin with it, but puts it in her mouth as often as to her head."⁸ Here we have originally the visual stimulus of a certain motion of the arm (mother's) when a comb is in the hand. The imitation seems to arise somewhat as

⁶ Child Observations, Russell, No. 42 (Heath's Pedagogical Library).

⁷ *Ibid.*, 121; see also 120 and 24.

⁸ Russell, *op. cit.*, 2.

follows: primary stimulus,⁹ say sight of a bright object, reaction movement of the arm, secondary stimulus sight of arm moving. S_2 , the sight of the arm moving will at first provoke the reaction of moving the arm again. This will soon become inhibited because the original primary stimulus will be absent, and thus the reaction will die out. Now comes the fresh stimulus of the comb, which at the same time substitutes "hand with a comb" for "moving hand" as the exciting stimulus, and inhibits¹⁰ the inhibition of the original reflex. There is now operative and uninhibited the reaction of moving the arm at the visual stimulus of a comb in the hand. When the child is given a comb she moves her arm. It is notable, however, that she "puts it to her mouth as often as to her head," i. e., the movements she makes are not new ones but those she has already performed. She had learned already by trial and error to strike something with an object in her hand, to bring the object to her head and to her mouth. When she had seen her hand moving it had been with these motions, and therefore by conditioned reflex it is these motions which she reproduces. She did not "learn" the peculiar motion of combing the hair by imitation. She did not "copy" her mother's movement but reacted with a movement already in her repertoire.

This comparatively simple imitative act is found then to consist of the following processes: (1) An imitative conditioned reflex is formed, (2) this is inhibited, (3) the inhibition is inhibited by a new stimulus and at the same time (4) a new conditioned reflex is formed, leaving (5) the imitative reflex the stimulus for which is motion of the hand holding a certain object. Such¹¹ imitative reflexes are very common.¹² Yet another step in the integration comes when the child on seeing the object puts it in his hand. E. g., "Roy. Age 2 years, 9 months. Roy went across the street where carpenters were

⁹ This explanation is of course only tentative and schematic. There are not enough experimental data to make anything else possible.

¹⁰ See Pavlov, J. P., *L'inhibition du Reflex Conditionnel*, *Journal de Psychologie*, Jan. and Fev., 1913.

¹¹ If this seems too complicated, and if the old "instinct of imitation" be preferred on the ground of simplicity, it should be remembered that to regard the psychological action as necessarily simple would be as great an error as so to consider the physiological action. A movement of the arm involves hundreds, perhaps thousands of nerve fibres, and hundreds of muscle fibres. The process is so complicated that all its details cannot possibly be grasped intellectually as a whole. The psychological explanation we have given is infinitely more simple than the known physiological facts. For its simplicity it may perhaps be assailed but not for its complexity.

¹² E. g., Russell, Nos. 182, 183, et. passim.

building a house. He saw a chisel used. When he came home, without stopping to have his coat taken off he got a case knife and toy mallet and used them as he seen the chisel used." Here we see the imitative units combining to form a higher unit, which is imitation of the *carpenter*. He had acquired the reflex of walking to a thing and grasping it in much the same way as above described of the child with the comb. This is tacked on to the object—stimulus reaction to the carpenter. When the boy reaches home he goes for the chisel and imitates the carpenter. Here is integration into a small imitative system. By conditioned reflexes such smaller systems may be combined into larger and yet larger wholes, the whole retaining a predominantly imitative flavor. Thus a daughter of the "idle rich" may play lady's maid, the combing motion making part of the whole imitative pattern each detail of which was originally formed in the manner described. Such integration is, of course, the way in which all mental life is built up, and the process is, as we have insisted, not peculiar to imitative reflexes. Its results range, in the case if imitation, from the simple action of the infant discussed to the complex games which often last weeks or months among older children.¹³ Further there is a gradual progress in integration. At first it is the object which is the starting point. A girls sees a brush under the table and begins to sweep with it like her mother. Here it is difficult to say whether the act is "reflex" or whether the mother is being imitated because the little girl wants to be "grown up." In such cases the observer usually says "she found a brush," "she found a pin," etc. Similarly, two young children asked for toothpicks after meals and used them "very intelligently." Here is a step further on towards a "conscious purpose." Still, however, the imitation seems to be connected with the object as much as with the person, i. e., it is half way between the fully motivated imitation of a policeman and the simple activity of crying when another child cries. In the former case, the child wants to be a policeman. He goes around the house looking for a hat like the policeman's hat, a whistle like the policeman's whistle, etc. It is indeed probably the sight of the policeman on his way home from school that determines his game, or perhaps the sight of a policeman in a book. Some stimulus there certainly is, but this is more directly connected with the *person* imitated than with an object. The progress is from an object as stimulus which implies a mere, uninte-

¹³ See Russell, No. 1,199 for a good example, where a model village was built and the activities connected with it lasted a whole term.

grated motion, to the fully integrated activity which centers about imitation of a living individual.

The discussion of the integration of imitative activities makes yet clearer the point upon which insistence has been laid, namely that an imitative activity, except for the minor difference of similarity between the secondary stimulus and the response, is ordinary conditioned reflex activity. Imitative reflexes can be built up into systems just as any other. Just as in the rest of life, the imitative stimulus "recedes" with development, from the immediate presentation of the senses to what is called an ideal (the policeman in the case taken).¹⁴ Later the ideal itself "recedes" in the same way.¹⁵ But that is a matter for ethical psychology. We turn next to a few points in connection with imitative actions.

BEHAVIOR OF INTEGRATED IMITATIONS

Several interesting points come up on examination of the examples which Russell gives of integrated imitations. The systems are wholly arbitrary, depending on the previous experience of the child. For example, number 158 describes a boy who was a horse and would not eat candy. Number 160 describes another boy who was also a horse but will eat a cookie, but he must eat it "like a horse." Like every other form of reaction to experience, imitation is "selective" depending on the previous experience of the organism.

If the system includes some recalcitrant detail, which is contradicted or inhibited by an unavoidable fact, the whole may become inoperative, being temporarily inhibited. The boy who is playing horse stops playing, goes into the house, and gets his candy. At times when the new little "world" and previous experience occasionally brought up by the adults for this very purpose are so contradictory that they cannot exist together, there is a permanent inhibition of the entire system. This happened in the case of¹⁶ Clarence who "made believe" he was a horse so constantly that it became troublesome, and his parents thought he must be "broken of it." So they told him that if he was a horse he must stay in the stall with the horses. This did not suit him, so he said "he would be a kitty," when he was told he must catch mice. The logic of this appealed to him, and "since that time he has not played that he was a horse or a cat." This shows the solidarity of the unit "horse—integration." When there is a stimu-

¹⁴ Holt, E. B., *The Freudian Wish*.

¹⁵ There is always at the same time an immediate stimulus which is part of the nexus of stimuli forming the total stimulus or situation.

¹⁶ No. 226.

lus—his governess' reminder—that sets off a part of the system which is inhibited, so close is the bond that the whole mass is permanently inhibited en bloc. At other times we have seen this does not happen, but instead there may be "temporary inhibition," and at still other times there is a compromise, as when the little girl who played at being Mamma was blamed for spilling the milk which her mother had spilt. "I ain't" she¹⁷ protested, "the mamma that spilt the milk." Often, too, there is a symbolization of objects, as when e. g. a piece of paper serves as a scrubbing brush, a rampart of books a pig sty, a roll of cloth for a baby.

PSYCHOLOGICAL "DRIVES" AND IMITATION

It seems then that there are at first a number of imitative conditioned reflexes of one of the types described. Chance decides which ones shall be formed. The organism builds its early conditioned reflexes entirely at haphazard, and the reactions thus formed are connected with no other reactions. They are isolated. Soon however there develops an organization into systems—the policeman system, the cooking system, the father system, etc. The question now comes up, why are these systems formed? Is there any reason, e. g. why a child should want to imitate a policeman rather than a smaller child, a general rather than a private? That is, is there any reason for the integration into systems of one kind rather than another? Simultaneity does not seem to account for everything, as children are associated with their smaller brothers more than with e. g. the policeman, but in hardly any instance do we find imitation of a smaller child. Now there is ready to hand a theory which, if we could adopt it, would serve excellently in this connection. It is the "drive" theory, whereby all actions are due to a fundamental urge. Of these urges there are said to be two, the drive of sex and the drive of egocentrism, and they work not of themselves but by means of psychological mechanisms. According to this theory every action which "connected" with the drive of egocentrism in

¹⁷ This does not invalidate the contention that simultaneity repeated a sufficient number of times is all that is necessary for the formation of a conditioned reflex. Simultaneity is indeed the necessary and the sufficient principle for "association." But to this may be added other causes which may render the time necessary greater or less. What is subjectively known as "vividness" is obviously an example. This works by some quality of the nervous action aroused, perhaps by higher frequency of the nerve impulse, to adopt Forbes' theory. If this is so, the total number of nerve impulses necessary for the reflex may be constant, but they may be spread over a longer or shorter time.

the child would be "encouraged" and the energy from the drive would stamp the reflex deeper, while every reflex that tended against the drive would tend to be inhibited. Thus imitation of a policeman would be encouraged because this magnifies the self importance of the boy. Imitation of, say, a younger brother would tend to be inhibited. Integration would tend to grow up of a policeman system, integration of a "younger brother" "system" would tend to be inhibited, the component reflexes in the first case receiving energy from the "drive" in the second case being damped. The trouble is that if we examine this conception of drive it is found to be a very shadowy thing. For instance, Frink speaks of "The two great groups,—the source from which each process gets its primal push or drive." I.e., I save myself when I fall into water because I have a drive of self preservation. But if it is asked what is meant by a drive of self preservation, it appears that this means "I tend to preserve my life when it is endangered" so that when I fall into water it follows that "I tend to preserve my life because I tend to preserve my life when it is in danger."¹⁸ As a matter of fact, the so called drives are merely generalizations, just as the law of gravity is a generalization. It is absurd to say "I preserve my life because of an egocentric drive" as to say "the book falls because of the law of gravitation." In neither case does the energy for the motion have to be imported into the particular. It is there, fully accounted for, in the particular.

We have gone into this point because the philosophy of "drives" is just beginning to make itself felt,¹⁹ and because it will doubtless be imported into educational theory. It is much more difficult to lay such an entity as a "drive" than to raise it. There is undoubtedly some kind of a system in the boy, built up largely on the "pleasure-unpleasure" principle, which leads him thus to imitate the man who seems to have unlimited power to do what gives the boy pleasure. Exactly how this operates, and just what connection the principle has with the formation of conditioned reflexes, we are not yet in a position to decide. This much is clear, that the conception of the "drive" but clouds the issue. The explanation of actions by its means is explanation in a circle, and it is even doubtful whether the two principles of egocentrism and sex are ultimate or whether they do not

¹⁸ Although I act in many different ways when I am in different kinds of danger this does not involve the existence of one common energizing "drive." The contention is that what has been made a psychological classification is really only a logical classification.

¹⁹ See Woodworth, *Dynamic Psychology*.

in turn depend upon the "pleasure-unpleasure" or some other more final principle.²⁰

CLASSIFICATIONS

A division of initiative is usually made into Reflex Imitation and Conscious or Voluntary Imitation. Sometimes further divisions are made, e. g. by Kirkpatrick, who makes five divisions, viz. Reflex Imitation, Spontaneous Imitation, Dramatic Imitation, Voluntary Imitation and Idealistic Imitation. This treatment has, it is clear, only a classificatory value. Reflex Imitation is obviously "spontaneous," Dramatic Imitation is clearly Voluntary and may be Idealistic. Such divisions correspond to milestones in the child's progress to adulthood rather than to any occult stages of a special instinct of imitation. The division into Reflex and Conscious or Voluntary imitation seems more fundamental. It is, in fact, a particular statement of the whole problem of the relation of reflex to fully conscious action. If the relation between an imitative activity such as blowing a whistle like a policeman and the whole imitative series of acting like a policeman is difficult to understand, it is no more difficult than the relation of the action of physical writing to the whole process of writing a book. In each case there is the great stimulus or situation, and the minor or sub-stimuli—the policeman and, say, the spoken and written words of friends or a scientific circle, prompting to write the book: ultimately there is the particular stimulus of the paper and the pen and the policeman's whistle. These are all cases where a relatively elementary action is subordinated in a larger hierarchy. As the act of writing is more or less unconscious, so may be the act of blowing the whistle. The act of putting the whistle in the mouth may have been acquired in a purely reflex way, as may have been the posture and the motions of the arms. Yet here we find them forming part of a larger and undoubtedly conscious system. It is not within our province here to discuss the whole question of consciousness and unconsciousness. We would point out, however, as has already been insisted, that imitation presents no peculiar problem. An imitative activity is one depending upon a conditioned reflex of which the secondary stimulus and the reaction are similar. When the whole question has been settled, of consciousness, its conditions and results, and its relation to what are known as "purely reflex" actions, then the special case of "reflex" and

²⁰As, e.g. by the "congruous-incongruous" theory.

"voluntary" imitation will be automatically cleared up. The problem is a general, not a specific one.

CRITICISM OF OTHER THEORIES

Cognate to the theory here maintained but presenting important differences are the theories of Dewey and Baldwin. According to Dewey, "What is here called imitation is a misleading name for partaking with others in the use of things which leads to consequences of common interest."²¹ Dewey maintains that people have the same interests "they act with the same controlling ideas, beliefs and intentions, given similar circumstances. Looked at from without, they might be said to be engaged in "'imitating' one another." "A considerable portion of what is called imitation is simply the fact that persons, being alike in structure, respond in the same way to like stimuli." This case has already been discussed. It seems to represent only half the truth. The other half is that when men have become accustomed to being with their companions who are doing the same thing as they,—responding to the same stimuli—then if they later see their companions responding to that stimulus they are also apt to make the response even though the stimulus be not operative in their own case. The examples we gave were, in the animal world, the pigeons, who seeing their companions pecking at food, went through pecking motions though there was no food in their own cage, and in the case of human beings, the man who rises just because the rest of the crowd rises, without knowing why they are rising. It does not seem true that all imitation is explainable as the pursuit of common interests, for there do seem actions which are imitative pure and simple, and which have nothing to do with common pursuits. The play of the boy imitating the policeman is an example. It does not seem possible to go all the way in this philosophy of means and ends. Later in speaking of the men who are "doing much the same sort of thing in much the same sort of way" Dewey says "but imitation throws no light on why they so act" and again "objective likeness of acts and the mental satisfaction found in being in conformity with others are baptized with the name imitation." It is surely pertinent to ask this same question of Dewey's own explanations. "Why have they a mental satisfaction in being in conformity with others?" This "mental satisfaction" is slipped into the account of imitation, and it seems perilously near the old "instinct," with the emotional accompaniment of its exercise.

²¹ J. Dewey, *Democracy and Education*, p. 41.

The instinct Dewey himself admits indeed later, but his whole point here is that it is not operative when men in society are seen to act in similar ways. He has really, however, introduced it into the context under a different guise.

It is interesting to note that he goes on to state that "imitation of ends as distinct from imitation of means will help to reach ends, is a superficial and transitory affair which leaves little effect on disposition." The case of the child is cited who "imitates" someone throwing a ball to him. Here there is the "common end" of keeping the game going, and the child simply "imitates the means of doing, not the thing or end to be done." Here again, why should the child adopt the common end of keeping a ball going? That has yet to be shown, and it is also to be shown that imitation plays no part in that choice of the end. The whole account is disappointing. It seems to rely, unusually for its author, upon half analyzed conceptions and unproved assertions, and assumes the "instinct" of imitation, which we have been forced to reject, while it denies imitation in cases where it undoubtedly exists.

According to Baldwin,²² imitation is "an ordinary sensorimotor reaction which finds its differentia in the single fact that it imitates. . . . It is what I have called a 'circular activity' on the bodily side." The most general statement of the nature of a "circular activity" is to be found on page 262 op. cit. "Thus a circular activity is found in operation; life processes issuing in increased movements, by which in turn the stimulations to the life processes are kept in action." Again on page 133 we find "The essential thing in imitation . . . is that the stimulus starts a motor process which tends to reproduce the stimulus and through it the motor processes again. From the physiological side we have a circular activity."

The question for Baldwin is this: granted such a circular activity, what is its origin? He rightly points out the extreme importance of repetition in the development of the organism, and asks the question "Where did imitation enter in the scheme of evolution?" "Either the neurological analogue of imitation was present from the first, and in conscious imitation becomes explicit as mental accommodation, or it has come in somewhere in the biological series." His conclusion is that it was present from the first, and that it is, in fact, the great means of adaptation with the outside world. The organism acts so as to reproduce favorable conditions, and such action is at the basis of memory, reason and all

²² "Mental Development in the Child and the Race."

higher processes. How this seems to put the cart before the horse. A controversy arose, indeed, around Baldwin's use of the term "imitation" to cover this "circular activity," and the critics seem to have been in many points just. But aside from this, to assume that because the lowest organism react in such a way that they "re-establish the state favorable to the reaction," therefore such reaction is the inherent characteristic that makes for survival does not seem justified. For although repetition is of importance in organic evolution, yet it has not been shown that it is the only thing of importance. Baldwin has shown indeed, how the organism goes on living, but he has not shown how it develops. Any theory which postulates imitation as the fundamental principle of organic evolution is open to the same objection. In fact, as we shall later point out and as has already been hinted, the organism cannot acquire a new activity by imitation. The original organic action cannot possibly have been imitative in the psychological sense, and it is difficult to see how it can have been "circular" in Baldwin's sense. Imitative activity and "circular" activity is a special form of activity—depending on nervous property, irritability in general. Baldwin has not shown that they are the form by which survival comes. But a general category that is to be the father of all organic action must be dynamic. It must allow of progress, of evolution. By the sheer weight of his own hypothesis Baldwin has forever precluded the possibility of a new and original movement or action. But the fact remains that evolution demands such new and original action. As a consequence, Baldwin's theory must on general grounds be rejected.

When the argument is examined in detail, internal defects appear. For instance, the stimulus is treated as though it were something apart from the organism or its action—as though it were something to which the organism could *do* something. For example it "reproduces or maintains stimulations which are beneficial." It "goes out to find its stimulus." Now psychologically considered, the stimulus is inseparable from the response. The organism cannot stand aside and contemplate a stimulus, it can only react to it. Any contemplation must be by way of memory, and it is this fact that seems to constitute a danger in the purely introspectionist method. It is interesting to note a similar statement in a member of the behaviorist school.²⁸ "He becomes adjusted only when he reacts in such a way as to bring about the disappearance of

²⁸ J. B. Watson, *Psychology*, p. 271. Note fin.: Compare also Kempf's general thesis in "The Automatic Functions and the Personality."

the particular organic stimulus which is acting at the moment." Here an exactly contradictory result is produced by the same process of regarding the stimulus as in some way separate from the organism. Baldwin makes the relation one of reproduction, Watson one of avoidance or "disappearance." To return to Baldwin, it is of course not maintained that the organism does not often act in such a way that a similar stimulus is present after the action, or in such a way, as Watson points out, that the stimulus of pain actually disappears. The point is that each assume a purpose where on their own showing they are only entitled to assume a response. That Baldwin is not justified in his statement about circular activity is amply proved by later researches showing that organisms simply respond, and often, if the environment be manipulated, to their own destruction.

Further when Baldwin says "the stimulus starts a motor process which tends to reproduce the stimulus" he does not say how it comes about that the final state of the organism after action serves as stimulus. He only takes it for granted that there is this "circular action" which means no more than that "there are cases where we may be said to imitate ourselves." Life is full of such self-perpetuating activities; in reacting to the stimulus formed by the completion of the first reaction it is sometimes immaterial whether that reaction occurs in ourselves or in others. . . .²⁴ But this is putting imitation up as a peculiar process, and so far from simplifying the problem complicates it by assuming that we can imitate ourselves too. "We imitate others because we imitate ourselves." Why we imitate is not explained; the process is still left an irreducible surd. It does not clear up the general situation at all to put it in terms of stimulus and response, because then we have to invent a particular kind of stimulus, viz. an imitative stimulus. Moreover his illustration of the circular reaction in the lower forms of life which lack a nervous structure is really no parallel with imitation as usually conceived-conscious imitation as he calls it. The example he gives²⁵ where the protoplasmic mass reacts to the oxygen around it continually by internal motion which presents new material for oxidation shows the working of an external inorganic stimulus upon the organism. An equilibrium is maintained, but that is in no sense imitation. The organism is so modified that it is ready for further stimulation; but the stimulus is not reproduced. The reaction in the terminology of this paper is not

²⁴ This possibility of self imitation is, of course, maintained in the account given in this paper.

²⁵ Pp. 271-272.

similar to the stimulus. The term "reproduce the stimulus" seems to have been used in two different senses, and is the cause of the undoubted confusion of thought. When one reacts in such a way that the action itself is similar to the stimulus, one may be said to reproduce the stimulus. When one acts in such a way that the result of the action is that the stimulus is kept up one reproduces the stimulus in an entirely different sense. No analogy is possible between the two, and no argument is valid which proceeds from the assumption that the two processes are essentially the same.

The theory of Baldwin created considerable stir when it was first given out, and was, indeed, the centre of an inter-continental controversy. It presents, moreover, sufficient apparent likeness to the theory here maintained to be dangerous. It is for these reasons, as stated already, that a detailed criticism has been given. The criticism, however, has been of positive value in that it has laid bare an important implication of the conditioned reflex theory.

AN IMPORTANT IMPLICATION

If imitation is built up from imitative units²⁶ each of which involves a conditioned reflex of the kind we have described where the secondary stimulus and the reaction are similar, then the imitative action is not new. The essence of action due to conditioned reflexes is repetition, for such action is due to substitution of one stimulus for another because both have occurred simultaneously before. The formation of the conditioned reflex lies in the substitution, and substitution implies the pre-existence of that with which the substitution is effected. A dog cannot learn to secrete saliva at a green light unless he already secretes at some other stimulus. The same applies to imitation. X hears a piano recital and his fingers begin to make the motions through which the pianist is playing. An observant onlooker remarks that X is a pianist, and it would further be safe to guess that he had played that particular piece. His hearing the notes has occurred with certain muscular motions, and had subsequently served as a conditioned stimulus for those motions. But they would not do so unless he had played the piano; it is certain that even a musical man with no knowledge say of the violin would not make the correct finger movements when he heard a violin solo. Thus Mr. X has learnt nothing new; he has only repeated a series of co-ordinated movements which he had already gone

²⁶ Cf. Watson, *Behavior*, chapter VIII, which adopts the unit theory and maintains that imitation is a combination of already acquired activities, but does not explain the nature of the unit.

through at least once. It is the same with all imitation. No new activity is acquired. A number of old activities may be synthesised into a new chain by a new stimulus or rather a combination of new stimuli, but those activities are old. E. g., to take an illustration already used, suppose a boy imitates a policeman by standing in the road with a whistle and "controlling" the traffic. Here he has already learned to blow a whistle and to move his arms about in a certain way. What is new about his imitation is the combining of these activities and the standing in a certain attitude on a board in a certain place, and this is due to the combined stimulus of the attitude, the board, the whistle and the motions of the policeman.

Take another example: If a boy is learning to operate a machine the instructor will perhaps show him how. Then the boy will repeat the instructor's motions as far as he can. The instructor will say, perhaps, "You do that like a farmer" when the pupil is awkward. He is psychologically truer than he knows. The boy, if he has been brought up on an old fashioned farm will have certain ready made motions not involving any delicate co-ordination. These he will import into his action at the machine, although the instructor whom he was trying to copy did not use at all the same movements and perhaps not even the same muscles.

Still another example: An adult learning to dance is told not to try to walk. The motion is quite different. Yet every adult who learns to dance begins with the motions of walking even when he or she has been watching and trying to imitate a good dancer. The rhythm and muscular action of walking are imported ready made into the imitation of the other person.

It is thus true from another angle that we imitate ourselves, not other people; no entirely new activity can be acquired by imitation; at the best a new combination of activities may be gained; further, if an activity forming part of what is imitated has already been combined with another activity or series of activities, the whole series is liable to be imported into the imitator's "copy." The same conclusions are reached by the animal experimenters: Miss E. B. Smith ²⁷ says that there is no evidence to prove that an animal acquires a new activity by imitation. Monkeys, pigeons, chickens and other creatures have been experimented with. Chickens even showed no difference in accuracy and force of pecking if they were kept apart or allowed to "copy" older birds. Miss Smith comes to the conclusion that the old idea that animals learnt by imitation of their elders has little in its favor. Similarly Thorndike: "Nothing in my experience with these animals (monkeys)

²⁷ So also, Watson, loc. cit.

then favors the hypothesis that they have learned to do things from seeing others do them."²⁸ This principle is of great importance in pedagogy. Whenever manual skill is taught the method of imitation is used at least to some extent, whether this be by pictures or directly. If then among the motions A B C D E F there is a motion C which has previously been used by the child in the series C D¹E¹, then the result of the imitation will not be A B C D E F but A B C D¹E¹F¹. Further, if the series C D¹E¹ becomes associated with A B, then a new conditioned reflex is formed which will have to be unlearned before any progress can be made. The child will have "imitated" herself. How then can he save this unlearning process and thus economize his time? By isolating the process C D E from the rest of the series, building it up from its components C & D & F; in short by drill away from the immediate object. Take the case of handwriting. A child who comes to school has already formed many habits of finger movements such as those used in throwing balls, closing doors, etc. If he now be given a pencil and told to make a letter after having been "shown how" he will import some of his stock in trade of motions into his handwriting. Thus "bad habits" will start and even if they are noticed immediately by the teacher time has been wasted. The stimulus of the sight of the teacher making the motion teaches the boy indeed what to look for when he observes the motion of his own hand and may thus act as a check. But it is not the imitation as such that teaches to write, except when it serves merely to unite previously acquired movements. If one of these latter is part of a series of movements, imitation will be of little use.²⁹ Careful analysis of the child's movement will then be necessary, and proper drill should be given for each individual case. The same thing is seen in teaching the piano. Dexterity may be acquired by exercise of certain movements away from their context, and even away from the piano, more easily than by letting the child simply imitate the teacher playing at the piano, as is often done under bad instruction.

An interesting corollary is that the older the pupil, the greater the need for drill, and the less willing is the pupil to undertake it. This constitutes an argument for the early beginning of such subjects as oral languages and music. Time

²⁸ Animal Intelligence, p. 213.

²⁹ The phrase "acquiring of new activities" is, of course, vague. In the last resort, such things as handwriting drill must be taught by watching others, but when the movements have been simplified there should be no danger of faulty imitation. Movements in combination may well be learned thus with the proper precautions.

is actually saved by giving the rudiments as early as possible in childhood. Where a subject or a movement appears to have been taught by imitation, it follows that a more rational method of instruction is the careful and scientific analysis of the activity into the component parts. The pupil is helped to go through these isolated movements and then, by imitation, he may learn to combine them. That is the scientific method of instruction in cases where imitation plays a part. It is followed in the teaching of handwriting and, still more strikingly, in the teaching of language by the phonetic system.³⁰ With increasing knowledge and technique of analysis it will perhaps come to be used for teaching all activity involving bodily motions. It will succeed because it will supplant the crudity of unanalyzed synthesis.

SUMMARY AND SUGGESTIONS FOR INVESTIGATION

This chapter, which began with an account of the ubiquity of imitation in every day life and in education, now ends with a qualification of the first statement. Imitation, it has been seen, is not an instinctive or an innate, but a learned reaction, consisting of activity based upon conditioned reflexes where the secondary stimulus and the reaction are identical. This secondary stimulus may originate either in the same or in another organism, so that imitation may technically be either of self or others. Thus no new activity is learned by imitation, but only new combinations of activities already acquired, the action imitated serving to integrate a new series, the elements of which are already part of the organism's stock in trade. Accordingly the statement that a child learns so much from imitation is only true if by learning is understood "synthesis of previously performed reactions." He is helped, indeed, to write by watching his teacher, but he does not learn the writing movements. He is helped to perform the evolutions of physical drill by observing an instructor, but he does not learn the movements that make up these evolutions. The help that is given him by the copy is rather in the acquisition of a new combination. Now the exact effect upon educational practice of this revision of the theory of imitation has yet to be worked out. Indication has already been made of its bearing on the theory of drill. But a far wider field is opened up. There is necessary a rigor-

³⁰ It is said that without this system it is practically impossible for an adult to learn to speak a foreign language without an "accent," i. e., the adult imports the rhythms, etc., of his mother tongue when he learns directly by imitation. Cf. also the methods of instruction used by the exponents of motion analysis.

ous examination into every case where imitation enters into learning, whether the imitated person be another child or the teacher. In every case it should be ascertained whether the imitation is premature, that is, whether it presupposes elements and sub-integrations which are not already in the pupil's repertoire. It may possibly be that it is a positive physical disadvantage for younger children to see too much of older ones. On the other hand it may turn out that the difference between children of school age is not sufficient to do any harm, or that the harm is more than offset by the healthy emulation of older by younger children. It may be that we do not give the proper place to explanation before giving a copy to be imitated, e. g. in handwriting. It may be that we give too much explanation and too little chance to copy individual motions. Our teaching of handwriting could perhaps be greatly improved by taking the analyses of handwriting motions already made and building up a scheme of instruction which will give the proper place to imitation as a synthesis. All these and similar questions can only be answered by experiment. They cannot, any more than any other question in any applied science, be settled a priori by theory. Psychology cannot show how to teach. It can only point the way to research in the class room and out of it.