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THE CONDITIONED REFLEX AND THE PSYCHIATRY
OF INFANCY

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I. SCIENTIFIC STATUS OF THE CONDITIONED REFLEX (C-R)

THE STUDY of the C-R has almost attained the dimensions of a subsience. According to a recent classified bibliography by G. H. Razran⁴⁵ the C-R literature to date totals about 1500 titles of which 42.6% are Russian; 29.8% English; 13.3% German; 11% French; and 3.3% in other languages. Roughly, about 60% of the experimental papers come from Russian and 25% from American laboratories. The German ratio of contributions from 1933 to 1935 dropped from 15% to 5%. Do we have in these interesting statistics a cultural index of national differences in scientific outlook? It would require an international commission rather than an individual to provide an adequate critique of all this literature.

When we reflect that many of these studies represent years of research by the most exacting methods, we may well ask what import the investigations have for the practical problems of child psychiatry. Analysis of the literature reveals that only a very small proportion of the studies address themselves to therapeutic applications. At the moment C-R concepts have had more significance for scientific theory and methodology than for psychiatry as a branch of clinical medicine.

Some would hold that the analysis of the C-R phenomena is as fundamental for psychology as Galileo's experiments with falling bodies were fundamental for physics. Others hold that the experimental constriction of C-R observation introduces such serious distortions of the normal state of the living organism that deductions are misleading if not invalid. Not without justification some of these critics say that the most illuminating results of C-R analysis consist in the explanations of its experimental limitations and inherent errors. Some experimenters, however, insist that the progressive effort to achieve laboratory control will itself lead to clarification; and that the C-R method offers a powerful tool for deriving the principles of all behavior, normal and abnormal.¹⁸

Pavlov's own career represents a tireless contest with the difficulties of his own experiments. He began under the spell of the scientific boldness of his teacher, Sechenov, who in his famous lecture on *The Reflexes of the Brain* in 1863 initiated a new chapter in science with words such as the following: "The child acquires consecutive reflexes in all spheres of the senses by means of absolutely involuntary learning. . . . All psychological acts without exception, if they are not complicated by elements of emotion are developed by means of reflexes. Hence all conscious movements, usually called voluntary inasmuch as they arise from these

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acts, are reflex in the strictest sense of the word."⁴⁷ From these dicta sprang that succession of studies (by this time they are probably already 2000 in number) which range from the *Withdrawal of the Tube-Worm from a Shadow* to the "Investigatory Reflex" of *Homo Sapiens*.

Historically the study of C-R phenomena cannot be detached from the broader fields of *associationism* and of *learning*. Associationism as a scientific tradition has come down from Aristotle and still has considerable vitality. The laws of association deal with the factors of contiguity, assimilation, frequency, primacy, intensity, duration, context, acquaintance, composition and individual differences.⁴⁸ To this list must be added the pervasive factors of age or maturity, a factor of peculiar importance in the period of infancy.

The psychology of learning presents a broader front than the experimental analysis of the C-R. The study of learning has become the most absorbing and characteristic pursuit of psychologists in America. Many American psychologists would be inclined to think of conditioning as a special example or form of learning rather than as the sole foundation of a learning theory.

Knight Dunlap, however, is a realistic critic of the C-R and is unable to see in the Pavlovian physiological scheme "any vestige of explanation of learning."⁴⁹ He would insist that Pavlov has not isolated natural primal reflexes and that under the conditions of experimentation these reflexes are abnormal in character. Dodge likewise finds that even a reflex so simple as the knee jerk undergoes alteration with conditioning. He has never been able to secure under rigid experimental conditions, a conditioned knee jerk which approached in identity its reflex prototype.⁸ Few psychologists would admit that C-R experimentation has actually isolated a unit of habit. Such severe strictures on the meaning of the C-R formula place serious limitations upon the introduction of conditioning techniques into the practice of infant psychiatry.

An adequate appraisal of the scientific status of C-R theory would have to include an examination of the principles of learning. There is no agreement as to these principles. Thorndike⁵⁰ has formulated important laws of learning which coincide in part with laws of association. Meumann's³⁸ classic experiments with nonsense syllables have been reviewed and altered to elucidate these laws and to search for C-R mechanisms. Numberless rats have been run through numberless mazes but their experimenters have not yet threaded the labyrinth of learning concepts.

Dunlap has advanced three alternate theories of learning which are delightfully inclusive by reason of their apparent contradictoriness. He designates them the Alpha, Beta and Gamma hypotheses respectively:

Alpha: "The occurrence of a response increases the probability that when the same stimulus pattern occurs the same total response will again recur."

Beta: "The occurrence of a response lessens the probability that on the recurrence of the same stimulus pattern the same response will recur."

Gamma: "The occurrence of a response in itself has no effect on the probability of the recurrence of the response."⁹

Dunlap seriously believes that all of these hypotheses may hold in different cases. We shall recur to the Beta hypothesis again because it involves the principle of negative practice which stands in interesting contrast to the C-R concept.

The Concept of Maturation

Another concept which must be reckoned with in the appraisal of C-R mechanisms has its roots in the physiology of development, and has received much confirmation from the studies of experimental embryology. In America this concept goes by the name of *maturation*. In spite of lack of precision, this term serviceably denotes the intrinsic organic factors which impart characteristic sequence and form to the ontogenesis of behavior. The operation of C-R mechanisms cannot be divorced from these underlying developmental mechanisms which determine not only somatic morphology but the morphology of behavior. Even if we should grant the validity of C-R "units," we should still have to recognize that the areas of conditionability change with age and maturity. The maturity of organisms determines the degrees and modes of susceptibility to environmental impressions.

Normative, naturalistic and experimental studies at the Yale Clinic of Child Development have demonstrated the importance of these maturity factors.^{14,15} We have used the cinema and the method of co-twin-control to bring them into evidence. A brief example will illustrate.¹³

Twins T and C, highly identical in physical and psychological characteristics, were placed before an experimental table. Simultaneously they were presented with a small pellet 7 mm. in diameter. At 38 weeks the twins addressed themselves to the pellet in an identical manner. The hands were placed in full pronation, the fingers were fully extended and spread apart in a fanlike manner. The thumb was extended almost at right angles. The photographic record of their attack upon the pellet in the motion picture shows an almost uncanny degree of identity in the details of postural attitude, hand attitude, approach and mechanism of grasp.

At 40 weeks there was a crude raking attack upon the pellet; at 42 weeks this raking approach was replaced by a poking with the tip of the index finger. These changes in prehensory pattern occurred contemporaneously in both children.

At a later age (93 weeks) the twins were seated back to back, each confronting an individual experimental table. The two examiners simultaneously dropped a 7-millimeter pellet into each of two bottles, simultaneously presented. Three trials were made with each child. The examiner, having dropped the pellet into the bottle, gave the bottle to the child. Both children watched this dropping of the pellet with the same transfixed attention. Both children on the first trial, and again on the second trial, seized the bottle, apparently heedless of the contained pellet; but both children on the third trial (without of course any influence of imitation) pursued the pellet by poking at it against the glass—indicating an identical capacity to profit by experience. In this instance we find that the corre-

spondence of behavior patternings asserts itself not only in spontaneous activities but extends into minute fields of specific adaptation and of learning.

In such remarkable correspondences of behavior in identical twins, we see a paradigm of important relationships between conditionability and maturity. These relationships suggest that constitutional individual differences must play a powerful rôle in the application of methods of conditioning and re-conditioning.

The concept of maturation emphasizes the unity of the organism and the priority of the total pattern of response. The unity of the organism is not conceived in mystical terms, but is identified with the functional and structural unity of the total reaction pattern. Specific patterns (learned and unlearned) differentiate out of this totality by a process of individuation and delimitation. Coghill, for example, asserts: "Conditioning of reaction, accordingly, is accompanied by restriction (narrowing) of the zone of adequate stimulation and concomitant restriction in the field of action. The primacy of structural basis for this is in the mechanism of the total pattern."⁶

Philosophically this view may be opposed to the C-R concept which, in its classic simplicity, emphasizes the primacy of the unitary reflexes. From a C-R standpoint the behavior of the individual is a complex concatenation of unconditioned and conditioned reflexes. The totality of behavior is accordingly secondary to the constituent units. The proponents of maturational theories stress the developmental physiology of the basic total pattern.

II. STUDIES OF INFANT BEHAVIOR BY THE C-R METHOD

The first investigations of conditioned reflexes in young children were made by Krasnogorsky in 1907, using the motor reflex of opening the mouth to food. In a short summary before the International Medical Congress in 1913 he reported the establishment of conditioned responses in all normal children beyond the age of one year in from 2 to 10 trials.

Ivanov-Smolensky used similar methods on children, both normal and abnormal. Marinesco and co-workers have since 1930 published under titles such as the following: "Hystérie et Reflexes Conditionnels," "Nouvelles contributions à l'étude des reflexes conditionnels dans l'hystérie," "Stuttering and Conditioned Reflexes," and "Conditioned Reflex: Application to Clinical Problems, Especially Neuroses and Psychoses."

Denisova and Figurin have conditioned infants to natural stimuli occurring within 21 to 27 days after birth; reporting that conditioning was effected in from 48 to 350 presentations of the stimulus for 15 seconds previous to and 30 seconds after feeding began. The age at first appearance of the C-R varied from 33 to 77 days. They also investigated differential conditioning in infants from 4 to 7½ months of age.

In America comparatively little work has been done on the C-R in infants. The first study was carried out by Mateer,³⁷ in 1918. A bandage applied to the child's eyes was made the conditioning stimulus, this being associated with the

feeding of chocolate. In 1917 Watson⁵³ conditioned an 11 months old infant so that he feared formerly neutral objects. The loud clang of an iron bar was brought into association with a hitherto tolerated rabbit. Subsequently the infant feared the harmless rabbit. This conditionability of emotional response was made a tenet of Behaviorism.

Ray and Wallace attempted to condition fetal kicking, using one subject. Wallace obtained negative results,⁴⁹ while Ray's results were equivocal since the neutrality of the vibrator, used as the conditioned stimulus, was not clearly established.⁴⁴ Aldrich conducted an experiment for the purpose of determining whether or not a 3 months old infant was deaf. The ringing of a small dinner bell was accompanied by scratching with a pin on the sole of the foot.¹

In a recent study from the Iowa Child Welfare Research Station, Wenger⁵⁵ reports an investigation of the conditioned response in infants. He finds that it is possible with perseverance to establish some form of conditioned response in some newborn infants, using standard methods (lid response conditioned to tactual vibration of the foot; withdrawal and respiratory responses conditioned to auditory stimulation). "Conditioning in the neonate is unstable and not easily obtained. These factors make it difficult if not impossible to investigate systematically many of the characteristics of conditioned responses in neonates. . . . The data contribute to the theory that internal inhibition is not a phenomenon of conditioning but an artifact resulting from an experimental environment controlled to the point of monotony."⁵⁵

III. C-R INTERPRETATIONS OF PSYCHOPATHOLOGY

While working on differential conditioned reflexes, Krasnogorsky observed that his subjects tended to become irritable and hard to handle when differentiations became too difficult for them. He observed that the nicer the differentiation demanded, the more the normal balance between irritation and inhibition was disturbed. Also in forming delayed reactions he discovered that as soon as the conditions became too difficult for a subject, the balance failed and an intensive inhibition developed which increased to the degree of sleep. The disturbance of the balance was still more apparent in experimentation with abnormal children.²⁹

Ivanov-Smolensky²⁰ explains the observations of Krasnogorsky on the basis of additional observations of neuroses experimentally produced in dogs.

1. Neurotic conduct is the expression of disturbed equilibrium between cortical stimulative and inhibitive processes: either cerebral stimulation or inhibition predominates.

2. The "psychic trauma" which is generally supposed to be the cause of the development of the neuroses from a physiological point of view is a task which is difficult for the balancing of the stimulative and inhibitive cortical processes (differentiation or integration) which task is offered to the given nervous system by the biosocial medium . . . In the cortex a conflict of the stimulative and inhibitive processes takes place which produces an abrupt disturbance of the intracerebral balance and a wide spread irradiation of the stimulation or inhibition (stimulative or inhibitive neurosis).

3. The "dislodged complex" corresponds to the originating in the cortex of an inhibitive place which is the result of an unsuccessful bio-adaptation.

4. The cause of a neurosis is the incongruity between the complicated nature of the surrounding world and the ontogenetic want of adaptability of the given cerebral hemispheres; thus that cause is the weakness of the reflex-producing, i.e., balancing capability which keeps the equilibrium of the individual and the external world by means of cortical excitation and inhibition.

5. The treatment of a neurosis must tend not only to remove the cortical inhibition spots (dislodged complexes) but also to train the reflexogenous and balancing function of the cortex of the cerebral hemispheres.

Krasnogorsky explains neurotic behavior in similar terms. For example he believes that many tics and similar nervous disorders are merely conditioned reflexes and therefore susceptible to a conditioned reflex treatment.

Experimental neuroses have also been produced by Liddell² in his studies of the conditioned motor reflexes of sheep. He transformed a docile, well-balanced animal to a stubborn, highly nervous animal, who became unmanageable for further experimentation and did not resume normal, quiet deportment in the laboratory until over a year later. Liddell found that positive conditioning led to no neurotic results but, when restraint was piled upon restraint and increasingly fine differentiations were demanded, negative conditioning strained the nervous system to the breaking point.

The striking verisimilitudes of experimentally produced neuroses have led to extensive inferences in the interpretations of psychoneurotic behavior. Pavlov even used the C-R formula to explain complicated psychoses.

C. MacFie Campbell protests that such explanation is not yet warranted. He says:⁴ "There are many factors to be taken into consideration in regard to catatonia and schizophrenia and neurasthenia which make the application of the conditioned reflex formulation at present premature and inadequate. . . .

"To bring extremely elaborate bodies of doctrine into association is very stimulating, but my great difficulty is in knowing whether we may not be dealing largely with analogy which, of course, has value as it may stimulate us and make our thought a little less narrow than it has been."

Meyerson likewise says:¹⁰ "When one studies the Pavlovian work factually, that is, independent of hypotheses, a simple reflex is modified by all kinds of environmental conditioning. No elaborate conduct is built up and it is elaborate conduct that we are interested in. In other words, Pavlov has shown us how a simple reflex act may be brought into play by all kinds of artificial stimuli, but he really shows us nothing else."

IV. THE C-R AND PSYCHOANALYSIS

Theoretical interpretations of psychopathological phenomena lead to an intriguing question: What are the relationships between C-R theory and psychoanalysis. Some writers have yielded to this intrigue and have attempted to erect a bridge from one system of thought to the other. Hull holds that it is possible to cast the C-R approach to certain psychoanalytic phenomena into the form of

mathematical equations, which may ultimately realize a mathematical theory of psychoanalysis.

A few ingenious exegetes have adduced deep correspondences between the conditioned reflex and psychoanalytic mechanisms. These writers not only assume that neurotic behavior is caused by conflict between stimulating and inhibiting tendencies, but they identify the various psychoanalytic concepts as coinciding with different phases of the conditioned response. Cathectic association is likened to the conditioned response; repression (in its various forms) to external and internal inhibition; sublimation to differentiation. Adjustment to external reality is ascribed to the conditioning and differentiation processes of Pavlov; and the activating influence of the wish is derived from motor activities directed to the inhibition of the reality value of the wish. In fact, Kubie states that the analyst at work is "actually presenting a spoken version of a classic experiment on the conditioned reflex."³⁴

Such an identification of C-R and psychoanalysis easily reduces to neologisms and tautology. Meyerson has properly pointed out that the fundamental Pavlovian work and the fundamental Freudian approaches are located at diametrically opposite poles. Pavlov has shown us how a simple reflex act can be brought into play by all kinds of artificial stimuli. Freud, on the other hand, shows how reflex conduct is conditioned into very elaborate behavior by an underlying unitary force of libido. In Meyerson's opinion, there is no reason for harmonizing the approach of Freud and that of Pavlov at the present time.⁴⁰

Adolph Meyer also suggests that we are dealing with facts which should be cultivated side by side, and that one set of facts should not be substituted for another too quickly. "Let them be stimulations, each set of facts in its own way, and let us enjoy the convergence which can be observed."³⁹

V. UTILIZATION OF C-R TECHNIQUES IN INFANT PSYCHIATRY

In all the voluminous literature there are very few studies which deal concretely and convincingly with the application of C-R techniques in the actual solution of problems of child behavior. In a simple but suggestive investigation, Aldrich demonstrated that the diagnosis of deafness could be made at the age of three months by the method of the C-R. Krasnogorsky and Mateer suggest that the differential C-R methods provide procedures for discriminative diagnosis of various types of defectives and psychasthenics. In actual practice, however, such tests are conspicuously absent.

After Watson's famous experiment (in which he produced a conditioned emotional response of fear by associating the clang of an iron bar with the presentation of a toy rabbit), it was at first believed that we had in this experiment the key for unravelling behavior disorders. One reviewer (in 1930) ventured prophecy.

If Dr. Watson is anywhere right . . . the practice of psychiatry . . . in two decades will have to become nothing else than the pursuit of the art of "unconditioning." . . . He expects to see unconditioning done as reliably and perhaps as spectacularly as condition-

ing. . . . In the behaviorist's hands mental hygiene would consist mainly of prevention of situations in which unfavorable conditioning might be produced and of accomplishing . . . favorable pre-conditioning; while psychiatry would reduce itself mainly to following the child and rapidly unconditioning where the undesirable habit had unfortunately been produced.⁴²

In spite of this Utopian outlook, the method of the C-R has been systematically used to a very slight degree. Mrs. Jones, one of Watson's co-workers, was able to uncondition the fear of the toy rabbit which Watson had produced in one of his subjects. She used commonsense procedures calculated to substitute a pleasurable association with the formerly fearful object, namely the harmless white rabbit. She associated food and mealtime with the toy rabbit until finally the child would eat willingly with the rabbit in his lap. The experiment was successful, but Jones concluded nevertheless that "a child's unlearned emotional reactions cannot be regarded as reflexes to specific and uniform stimuli, but rather they involve, in the course of individual growth, a continuous differentiation of the effective stimulus patterns."²³

Zeuer undertook experiments to determine whether or not C-R techniques actually throw light on life situations such as are encountered in psychotherapy. His results were largely negative.⁵⁷ Similar conclusions were reached by Humphrey.¹⁹

Bregman, working at Columbia, reports utter failure in attempting to modify the emotional attitudes of infants by the conditioned response technique. She used wooden forms for her neutral stimuli, associating with one set the sound of an electric bell which regularly produced fear reactions; and with the other set, music, which produced responses of pleasure. When the bell and music were no longer presented, there was no differentiation between stimuli which were supposed to evoke pleasure responses and those which should evoke fear responses. Bregman concludes, "The findings call into serious question the rôle of conditioning as the process primarily responsible for the emotional modifications which take place in infancy."³

Gauger, also working at Columbia, likewise reports failure in attempting to apply C-R techniques to children. He concludes, "Teaching a child to like something is as successful when the stimulus is given alone as when it is accompanied by a satisfying stimulus. The effects of positive conditioning were not distinguishably different from those of negative adaptation."¹²

It may be argued that these negative results are due to faulty technique. But if failures occur under experimental conditions, it is evident that the techniques are scarcely ripe for ordinary application by the practicing psychiatrist.

In the practical clinical situations of psychotherapy, we deal more frequently with complicated personality problems which require re-education or which must be approached from the broader standpoint of re-learning. In its classic simplicity the C-R is fragile and variable even under optimum experimental conditions. It probably would at present prove a fragile instrument in dealing with psychotic and neurotic children.

For purposes of contrast we may refer here to the *method of negative practice* which seems to stand in such paradoxical contradiction to the C-R concept. This method has already been referred to in relation to the Beta hypothesis of learning, which holds that the occurrence of a response lessens the probability that on the recurrence of the same stimulus pattern the same response will recur. Knight Dunlap⁹ has put this hypothesis to practical application in the breaking of specific bad habits including stammering, tics, masturbation, thumb sucking and even homosexuality.

Dunlap illustrates his method by citing the case of the typist who persists in transposing *t-h-e* into *h-t-e*. Such errors are ordinarily eliminated with difficulty. He found, however, that even a small amount of practice in typing the word *in the wrong way* eliminated the error. Accordingly, in certain cases of stammering, he advises as follows: "What we are to do, therefore, is to teach the patient to stammer voluntarily, as nearly as possible in the way in which he now stammers involuntarily. Then we must cause him to practice stammering in this way, under the conditions of thought and desire appropriate to the destruction of the habit which we are using as the basis for the practice. This is simple in theory. In application it is difficult, requiring an expert psychologist for its direction; but *it seems to be effective!*"⁹

VI. CONCLUSIONS AND CAUTIONS

From this survey it is evident that the theoretical aspects of C-R investigation far outweigh technical application. There is a justification for this state of affairs. The human organism is so highly integrated that it is refractory to analytical simplification. Nevertheless, under scientific urge the quest for simplification will continue. The very difficulties of the quest will inevitably yield further data which will elucidate the complex integrity of the individual organism. In this sense C-R research, even when limited to animals, will indirectly influence the concepts and principles of infant psychiatry.

But the clinical applications must remain for some time limited in scope. Deductions from the white rat must be carried over to the human sphere with due reservations. The enigmas of human infancy demand respect both on theoretical and on practical grounds. Because of their clean cut simplicity it will be tempting to push C-R techniques into the earliest life periods. The very primitiveness and formativeness of infant behavior invites experimental approach. But here a word of caution may be in order. It has been found that the younger the infant the more difficult it is to establish a stable conditioned reflex. In early infancy from 100 to 300 paired stimulations are required to establish a conditioned response; whereas, at the age of one year, two or three stimulations may suffice. Can we be certain that the infantile nervous system in the first stages of sensory nascency is hospitable to persistent stimulation?

There is an erroneous belief that the results of conditioning are temporary and evanescent. Recent experimental evidence reported by Wendt⁵⁴ shows that

a conditioned response (the fore-leg flexion to tone and light stimuli in a dog) may be retained for a period as long as $2\frac{1}{2}$ years. It is suggested that the retention was due to the fact that the dog had no opportunity to develop conflicting response systems. Such an interpretation indicates that it may be important to avoid highly artificial conditioning experiments on the human infant, because the very artificiality may result in abnormal perpetuation. An extremely artificial response in the nature of things cannot be readily replaced by responses which are natural and normal to the organism. Disuse does not necessarily lead to fading.

The maturational concept suggests that the scope of natural and wholesome conditionability is always determined by the maturity of the organism. The infant's immaturity must be considered in qualitative as well as quantitative terms, and we run a certain risk when we introduce untimely artificial stimuli repeated with artificial frequency while the infant is in the formative phases of his sensorimotor organization. The neonate is not even protected by the apperceptive trends of the 6 months old infant, and stimuli which are apparently innocuous may be nocuous to him by reason of the untilled nature of his susceptibility.

It would be ironical if the experimental analysis of the conditioned responses of the young infant resulted in the production of abnormal behavior rather than in an understanding of the therapeutic value of the methods of the C-R.

There are, of course, factors of safety. The maturational mechanisms themselves operate to make the infant immune to adverse stimulation. His biological unreadiness safeguards him from influences utterly foreign to his receptivity. But there must be marginal areas of receptivity where there is danger of encroaching upon his immaturity. He then testifies to his resistance by crying, by increase of tonic immobility, by deepened sleep, by fretfulness, by respiratory gasps, and other forms of infantile non-conformance. Let us be duly thankful that there are limits to his conditionability!

BIBLIOGRAPHY

1. ALDRICH, C. A. *A New Test for Hearing in the Newborn: The Conditioned Reflex*. Amer. J. Dis. Child. 1928, 35: 36-37.
2. ANDERSON, O. D. AND LIDDELL, H. S. *Observations on Experimental Neuroses in Sheep*. Arch. Neurol. and Psychiat. Aug. 1935, 34: 330-354.
3. BREGMAN, E. C. *An Attempt to Modify the Emotional Attitudes of Infants by the Conditioned Response Technique*. J. Genet. Psychol. 1934, 45: 169-198.
4. CAMPBELL, C. MACFIE. See Ref. 10.
5. CHURA, ALOJZ J. *Über die Beziehungen der Bedingungs-reflexe zu der Entstehung der kindlichen Neuropathie*. Med. Klin. 1932, 28: 192-193.
6. COGHILL, G. E. *The Structural Basis of the Integration of Behavior*. Proc. Nat. Acad. Sci. 1930, 16: 637-643.
7. DENISOVA, M. P. AND FIGURIN, N. L. *The Problem of the First Associated Food Reflexes in Infants*. Voprosy Geneticheskoy Reflexologii i Pedologii Mladenchestva 1929, 1: 81-88.
8. DODGE. See Ref. 46.
9. DUNLAP, KNIGHT. *Habits, Their Making and Unmaking*. Liveright, Inc. New York, 1932. Pp. x+326.

10. FRENCH, THOMAS. *Interrelations Between Psychoanalysis and the Experimental Work of Pavlov*. Amer. J. Psychiat. May 1933, 1165-1203.
- *11. GACKELL, L. *An Investigation of Conditioned Inhibition in Hysterical Children*. Arch. Psychol. 1935, 148: 52.
12. GAUGER. See Ref. 23.
13. GESELL, ARNOLD. *The Developmental Psychology of Twins*. Handbook of Child Psychology. Ed. Carl Murchison. Worcester, Mass.: Clark Univ. Press, 1931. Pp. 158-203.
14. ———, ET AL. *An Atlas of Infant Behavior: A systematic delineation of the forms and early growth of human behavior patterns, illustrated by 3,200 action photographs*. In two volumes. New Haven: Yale Univ. Press. 1934. Pp. 922.
15. ——— AND THOMPSON, HELEN AND AMATRUDA, C. S. *Infant Behavior: Its Genesis and Growth*. New York: McGraw-Hill, 1934. Pp. 343.
- *16. HAMBURGER, F. *Über Psychotherapie ein Kindesalter*. Wien Klin. Wchschr. 1913, 64: 1313-1320.
17. HAMBURGER, F. *Über den Mechanismus psychogener Erkrankung bei Kindern*. Wien. Klin. Wchschr. 1912, 25: 1773-1777.
18. HULL, CLARK L. *Learning: II. The factor of the conditioned reflex*. Handbook of General Experimental Psychology. Worcester, Mass.: Clark Univ. Press. 1934. Pp. 382-455.
19. HUMPHREY, GEORGE. *Is the C-R the Unit of Habit?* J. Abnorm. and Soc. Psychol. 1925, 20: 10-16.
20. IVANOV-SMOLENSKY, A. G. *Neurotic Behavior and Teaching of Conditioned Reflexes*. Amer. J. Psychiat. 1927, 7: 483-488.
21. JONES, H. E. *The Retention of Conditioned Emotional Responses in Infancy*. J. Gen. Psychol. 1930, 37: 485-498.
22. JONES, M. C. *The Elimination of Children's Fears*. J. Exper. Psychol. 1924, 7: 382-390.
23. ———. *The Conditioning of Children's Emotions*. Handbook of Child Psychology. Ed. Carl Murchison. Clark Univ. Press. 1931. Pp. 71-92; also 1933, pp. 271-302.
24. ———. *A Laboratory Study of Fear. The Case of Peter*. Ped. Sem. 1924, 31: 308-315.
25. KHOZAK, L. I. *Characteristics of the C-R Functions of Difficult Children*. Psychol. Abst. 1934, 8: 73, 697.
26. KOTLIAREVSKY, S. I. AND IVANOV-SMOLENSKY, A. G. *The Method of Investigating the Higher Nervous Activity of Normal and Abnormal Children*. Psychol. Abst. 1935, 9: 446, 3949.
27. KRASNOGORSKY, N. I. *Über die Grundmechanismus der Arbeit der Grosshirnrinde bei Kinder*. Jarhb. Kinderheilk. 1913, 78: 374-396.
28. ———. *On the Fundamental Mechanisms of the Cerebral Cortex in Children*. Trans. 17th Internat. Cong. Med., London, 1931, Sect. X, Part II, 199-200.
- *29. ———. *The Conditioned Reflexes and Children's Neuroses*. Amer. J. Dis. Child. 1925, 30: 754-768.
30. ———. *Psychology and Psychopathology in Childhood as a Branch of Pediatric Investigation*. Acta Paed. 1930, XI: 482-502.
- *31. ———. *Bedingte und unbedingte reflexe im Kindesalter und ihre Bedeutung für die Klinik*. Ergebn. d. inner. Med. und Kinderkn. 1931, 39: 613-730.
32. ———. *The Physiology of Cerebral Activity in Childhood as a New Subject of Pediatric Investigation*. Amer. J. Dis. Child. 1933, 46: 473-494.
- *33. ———. *Die neue Behandlung der Enuresis nocturna*. Monatsch. f. Kinderhk. 1933, 57: 252-254.
34. KUBIE, L. S. *Relation of the Conditioned Reflex to Psychoanalytic Technique*. Arch. Neurol. et Psychiat. 1934, 32: 1137.

* Starred references are those which bear directly on the application of C-R techniques to problems of infant psychopathology.

35. MARINESCO, G., AND KREINDLER, A. *Des reflexes conditionnels. I. L'organization des reflexes conditionnels chez l'enfant.* J. de Psychol. 1933, 30: 856-866.
36. ———. *Conditioned Reflex; Application to Clinical Problems. Especially Neuroses and Psychoses.* J. de Psychol. Norm. et Path. 1934, 31: 722-791.
37. MATEER, FLORENCE. *Child Behavior, a Critical and Experimental Study of Young Children by the Method of Conditioned Reflexes.* Boston: Badger, 1918. Pp. 239.
38. MEUMANN, E. AND EBERT, E. *Ueber einige Grundfragen der Psychologie der Uebungsphänomene im Bereiche des Gedachtnisses.* Arch. f. Ges. Psychologie 4: 1-232.
39. MEYER, ADOLPH. See Ref. 10.
40. MEYERSON, A. See Ref. 10.
41. MORO, E. *Bedingte Reflexe bei Kindern und ihre klinische Bedeutung.* Therap. Gegenw. 1912, 53: 151-156.
42. PARTRIDGE, G. E. Review of Watson's *Behaviorism*, 1930. Amer. J. Psychiat. 1932, July, 12 (1): 188.
43. PEN, R. M. *Concerning the Formation of Effective and Inhibitive Habits by Imitation.* Psych. Abst. 1935, 9: 129, 1150.
44. RAY, W. S. *A Preliminary Report on a Study of Fetal Conditioning.* Child Develop. 1932, 3: 175-177.
45. RAZRAN, G. H. S. *Conditioning: a Classified Bibliography.* Long Island University. To be published in the Psychological Review.
46. ROBINSON, E. S. *Association Theory Today.* New York: The Century Co., 1932. Pp. 8+132.
47. SECHENOV, I. *Selected Works.* State Pub. House for Biological and Medical Literature, Moscow-Leningrad, 1935. Pp. xxxvi+489.
- *48. SEHAM, M. *The "Conditioned Reflex" in Relation to Functional Disorders in Children.* Amer. J. Dis. Child. 1932, 43: 163-186.
49. SONTAG, L. W. AND WALLACE, R. F. *Study of Fetal Activity: Preliminary Report of the Fels Fund.* Amer. J. Dis. Child. 1934, 48: 1050-1057.
50. THORNDIKE, EDWARD L. *The Psychology of Learning.* New York: Columbia University Press, 1913. Pp. xi+452.
51. TRAUGOTT, N. N. *The Dynamic Irradiation and Concentration of Internal Inhibition in the Cortex of the Large Hemispheres of the Child.* (Trud. Lab. Fiziol. Institut. Gertzena, 2, 177-199). Psychol. Abst. 1934, 8: 273, 2406.
- *52. ———. *The Effect of Difficult Extraction of Food Procuring Conditioned Reflexes Upon the General and Speech Behavior of Children.* INa. Put. Izuch. Neurodin. Reb., 316-403). Psychol. Abst. 1935, 9: 131, 1167.
53. WATSON, J. B. *Conditioned Emotional Reactions.* J. Exper. Psychol. 1920, 3: 1-14.
54. WENDT, G. R. *Two and One-half Year Retention of a Conditioned Response.* Jour. Gener. Psychol. 1937, 17: 178-180.
55. WENGER, M. A., ET AL. *Studies in Infant Behavior.* Iowa City: University of Iowa Press, 1936. Pp. 207.
- *56. WOLWICK, A. B. *Materials to the Study of Conditioned Reflex Activity in Children with Weak Excitatory and Inhibitory Processes.* (Medico Biol. ZH 1, 110-119.) Arch. Psychol. 1933, 147: 37-38.
57. ZEUER, K. *The Significance for the Problem of Learning of C-R Experiments with Adults.* Psychol. Bull. 1934, 31: 715.