Youngest Babies Help Solve Old Problem

Psychology

By Emily C. Davis

Psychologists are calling on the very youngest babies to help solve one of the old, unsolved riddles of life: Which is more important, heredity or environment.

The youngest babies, who have not had a chance to step out into the world, are sought because they are the best evidence of what heredity makes of a human being before environment takes a hand at changing him. After a while the same baby can be given more tests, and it will be possible to compare his achievements "before and after" and thus show what his environment is doing to him.

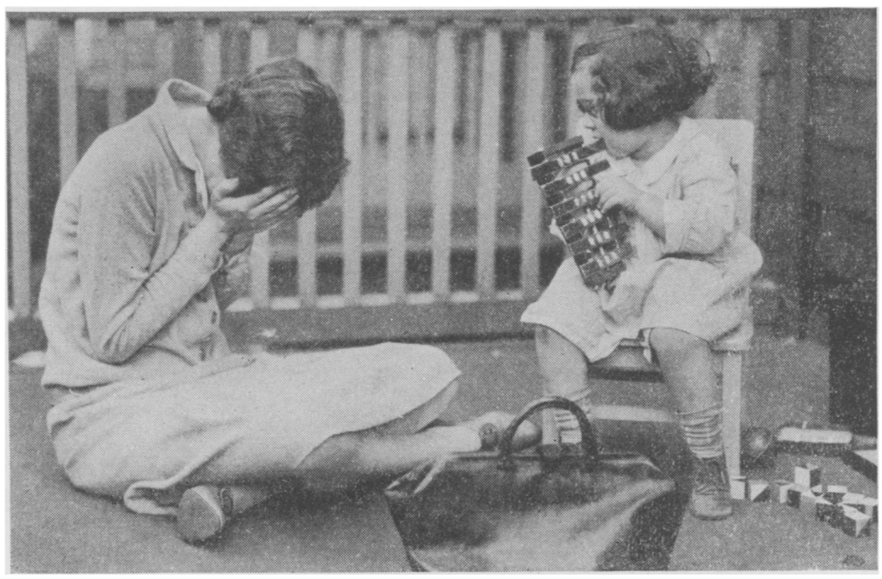
The idea sounds simple. But carrying out the plan is just beoming possible, because an infant's mental development is not easily observed and understood.

Only recently Dr. Mandel Sherman made experiments at the University of Chicago showing that when a baby cries it is just a matter of chance that an adult who comes into the room will read the baby's expression aright. A baby's facial signals when he is angry, frightened, or has a pin sticking into him are all, as the experiment showed, confusingly similar to the average onlooker.

Gradually, psychologists, led by the pioneer work of Dr. Arnold Gesell at Yale, have traced the development of intelligence back to its early stages when it is shown by grasping a rubber toy. Probing still farther back, to the very first month of life, they are less certain, but they believe that intelligence is displayed in such simple ways as paying attention to a voice or following a ball with interested eyes.

Not only do the youngest babies show their intelligence or lack of it, but they display personalities, and these personalities are being observed with scientific precision. In short, the youngest babies, that for thousands of years have been telling the world about themselves in a sign language that nobody tried to understand, are now being given the same intensive scientific attention as Fabre's beetles and Maeterlinck's bees. And the babies are proving as surprising as the bugs.

In one hospital crib lies young Edward, aged four days. His face is as pink as his blanket, and he is yelling fiercely. Bustling about gently is a nurse who might pick him up and provide a diversion in a monotonous afternoon. But she doesn't. So Edward protests promptly and strenuously against the unsatisfactory conditions in this strange world.



THE PSYCHOLOGIST may pretend she is hurt, in order to test the sympathetic nature of the child

In the next crib, a baby three days old, still known vaguely as Brother, accepts life in a much more pleasant manner. Brother is less lively than Edward, less responsive. The nurse, who is noting down facts about Edward's crying, says that at this moment Edward and Brother are displaying their personalities in rather characteristic fashion. Edward has started out in the world demanding attention steadily. Brother is quiet and stable.

The inevitable idea comes up that it would be worth while knowing whether these brand-new human beings will stick to their first attitudes toward life, or whether they will be changed entirely. That is just what Dr. Thomas V. Moore, psychologist at the Catholic University of America, at Washington, D. C., would like to determine. Under his direction a list of personality traits for babies under two weeks old has been devised, and the personality records of Edward, Brother, and 118 other boys and girls of their own age are filed away.

At this point dots should indicate the passing of two years and the story is brought up to date. Thirty-five of the babies can still be located in the city. Two young psychologists are appointed by Dr. Moore to follow the babies to their homes and find out what environment had added to or substracted from the original personalities of these children.

Does the child who was good natured at birth now share his toys cheerfully? Does the child who became noted as a crying baby now have temper tantrums? The infant who could not learn to feed—does he now have trouble in feeding himself? And the baby who jumped in her sleep—does she still display nervousness? Again the children are given a chance to display their personalities, as in the hospital days, while the psychologist sits by and writes the record. The visiting psychologist carries with her a black bag, and if the two-year-old displays interest in the bag, he is told to open it. How he plays with the blocks, airplane and the other toys inside the bag is noted by the psychologist, and as she makes suggestions she observes whether the child is reasonable, obedient, orderly, destructive, sympathetic, shy, nervous.

Results of this investigation show that environment has changed the babies so that their first attitudes toward life are no longer outstanding. The once quiet baby is very likely to howl when the toys have to be put back in the black bag, so that they can be shown to other little children. The assertive baby may have learned to cooperate with the world instead of fighting it. (*Turn to next page*)

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Youngest Babies Help Solve Old Problem—*Continued*

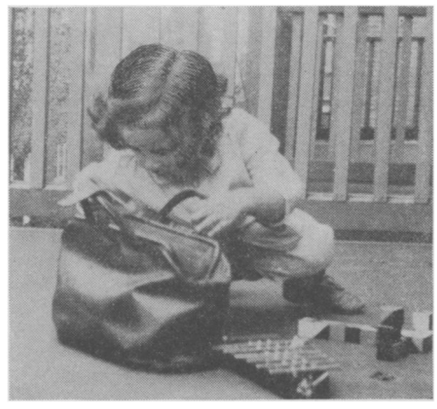
In fact, the only trait that carried over consistently from infancy to two years in these thirty-five children turned out to be good looks. The perfect infant, with nicely shaped head and well proportioned features, usually fulfilled its promise of being a pretty child. The infant that was scrawny and that looked beautiful only to its partial mother was not particularly attractive at two years. Good looks, of course, are a physical trait, very little affected by environment. All the character traits observed in the children at the two ages differed so that they offer a strong argument that a child's personality is shaped more by environment than by heredity.

This indicates that the complacent old excuses, such as "Jimmy inherits his temper from his father," are not valid to any great extent. It means that parents are responsible for the traits developed by their children in a broader way than the average parent now realizes.

A Princeton biologist recently declared that the infant at birth is already tuned to a fast or slow rhythm of living. It is also known that the baby's tiny body and brain have certain limits of possible development. But allowing for these limitations, the baby can be shaped to almost any mold that its family decrees. For while the newest baby is a personality, he is a much more pliable personality than parents generally realize. And he is much more pliable in the first year of life than he is ever going to be later.

Suppose he experiences neglect, and gets no amusement, in that first year of life? Suppose he is fussed over all day? Or suppose he gets what he wants by crying for it regularly? Any one can predict what that baby is going to be like under any of these conditions after two or three years, because everybody has seen children who displayed the results of such treatment. But specialists, and other people too, are beginning to look differently at such children now. The difference is that now it is realized that these personalities, good or bad, are not the inevitable development of the child's heritage, but have been formed quite largely by the wisdom or shortsightedness of the baby's home training.

While one set of psychologists has been showing that babies' characters change and develop amazingly in the first two years of life, another psychologist at Catholic University, Dr. Paul H. Furfey, has begun to investigate whether intelligence is also influenced more by environment than by heredity. It has been shown in the past that children from superior homes are likely to be more intelligent than children from poorer homes, Dr. Furfey points out. But whether these children are born with a superior inheritance of brains or whether they are brighter because of home advantages is still debatable.



PERSONALITY AT TWO AND A HALF. Marcia is interested in the funny bag of the visiting psychologist

If babies from rich and poor homes could be given intelligent tests as soon as they arrive in the world, before they begin to be influenced by home conditions at all, this point could be soon settled. But babies under one month of age do not show signs of intelligence so clearly as they reveal personality. Apparently a baby's emotional equipment is active and its brain is ready to register impressions some time before the higher brain centers, where such impressions are interpreted, are in full function. One month is about the youngest age at which a baby's mentality shows significant signs that psychologists can read. Still, at one month a baby has not been mentally affected to any great extent by differences in its surroundings.

Using a new test for the mental development of babies, Dr. Furfey tested 277 infants at one month of age, born at a large city hospital. When the babies' mental attainments were compared with the social and economic status of their homes it was found that the babies from the best homes did not have superior alertness to the babies from the poorer homes. Yet older children from good homes do average higher in mental tests. In other words, Dr. Furfey explains, it appears that mental development, like personality, is something that parents and homes can either build up or retard.

The mental test for babies used in this heredity versus environment investigation is something new in the measurement of the earliest signs of intelligence. Observing babies under one year of age, it is difficult to gauge exactly what stage of mental development is back of a child's spoon-throwing activities or his antagonism for his father's new hat. But a set of standards for measuring what the average baby should do and know at certain ages has been devised by two young psychologists working with Dr. Furfey. The scale, which is for babies from one month old to one year, is called the Linfert-Hierholzer Scale, after the two young women who made it, Miss H. E. Linfert and Miss Helen M. Hierholzer.

The differences in mental ability between a baby one month old and a baby twelve months old appear to be relatively as great as the difference between a primary school child and a university graduate, according to these two baby specialists. Which indicates that a baby must put in a busy first year, for all he looks so detached and sleeps so much of the time.

If a number of babies one month of age are shown a bright pink celluloid ring, almost two-thirds of them will display interest and curl their fingers about it when the ring is placed at their finger tips. No month-old babies have ever tried to put the ring into their mouths, the psychologists have found. At two months, about two youngsters in 100 will try to taste the ring. At four months of age, 30 per cent. of the run of babies have discovered that putting things in their mouths is a pleasing amusement.

At one month of age, just half of the babies object to the taste of salt when a spoon with a tiny bit of salt is placed to their lips. By two months, 74 per cent. of babies are aroused to annoyance by this experiment. Ninety-eight per cent. of the four-month-old babies cry at the taste of salt.

Some babies are really as remarkable as their families think, because babies do vary astonishingly on these mental tests. A nine-month-old baby that tries to build with blocks is doing something that only about 2 per cent. of the babies in this country would think of doing at his age. A nine months' old baby that doesn't try to get a spoon that falls on the floor is less alert than most of his contemporaries, for 92 per cent. of the nine-month-old babies (*Turn to next page*)

Babies—*Continued*

would go promptly after the spoon, and what is more, almost 50 per cent. of babies at even six months pass this test of mental development.

Evidence that environment counts for more than heredity is hopeful evidence, Dr. Furfey believes. Heredity is largely a matter of chance in this world, and attempts to improve racial stocks necessarily make slow progress. But a child's environment may be improved immediately and directly through the education of its parents and through general education of the public.

It is only about one generation ago that parents began to be introduced to brand-new ideas about spinach, tomato juice, cod liver oil, sunlight and other vital aids to a baby's physical well-being. The facts about a baby's mental and emotional development are being discovered more slowly and with more uncertainty. But Dr. Furfey believes that when the scientific investigations can be organized for public use and put into understandable terms, mothers are ready to apply new knowledge on the mental well-being of babies.

What happens when families and homes allow young personalities to get askew is shown in the work of one of Dr. Furfey's student psychologists in an experiment at the Washington Child Research Center. This young psychologist, Miss R. F. O'Grady, is investigating the fantasy conversations that some children carry on half aloud as they fall asleep. By use of a telephonic apparatus, the psychologist listens in on the children's half-dreamy, rambling remarks and records them in a note book. Children who have this habit of talking themselves to sleep are generally problem children, whose everyday lives are not satisfactory and happy. The child compensates for an inadequate day by picturing himself as the center of an attractive situation.

One little girl studied by Miss O'Grady spends several hours at night before she drops off to sleep going over a story in which she is sick or injured and is the center of an anxious group of doctors, nurses, relatives and friends.

"A bad cut clear up to my ear," the little four-year-old murmurs. "I can't move; the bandages are so tight. The doctor is sewing it up a little bit. The doctor is smelly." And so on, with much detail of courage on her part and admiration and excitement all around her. (*Turn to next page*)

Einstein Extends Theory to Electricity

Physics

The new theory of Albert Einstein, which will soon be published by the Prussian Academy of Sciences, is said to be as exclusively mathematical as was his original theory of relativity and therefore will be comprehensible only to leading experts. But from what little has been given out in Berlin, the nature of the paper may be inferred.

According to the relativity theory the gravitational effect of a body exercised by its mass is confined to the gravitational field which surrounds it and within which space the body is consecutively affected. Space, consequently, is no absolute independent entity, but exists only in relation to the influencing body. The motion of bodies is not determined by any general force of gravitation drawing them together, but by the properties of gravitational fields, from which their motions can be determined.

Similarly every electrically charged body is surrounded by an electrical field, the charges and properties of which determine the electrodynamics of the body. These could be derived from the known characteristics of the electrical field.

The older theories used to derive the laws of electrodynamics from hypothetical motions of the smallest particles of mass, thus regarding electrodynamics as a special part of mechanics. Modern physics tried to solve the difficulty by the reverse process; that is, by reducing mechanical changes to electrodynamical causes, regarding the motions of material masses as electrical processes. From this point of view mechanics became a special part of electrodynamics in general.

By the application of the mathematical laws of the gravitational field as developed by the relativity theory, Einstein is said to have settled the above question by applying them to the electrodynamic field, thus uniting both fields under identical laws.

According to this advance information, Einstein (*Turn to next page*)

Minute Current Reveals Stars' Heat

Astronomy

How an infinitesimal electric current, which would have to be amplified twenty billion times to make it a single ampere, is used to study the temperatures of the stars and planets was described recently by Dr. Seth B. Nicholson at the Carnegie Institution of Washington. Dr. Nicholson is an astronomer at the Institution's Mt. Wilson Observatory.

"The greatest success in measuring the heat received from the stars has been obtained with the thermocouple," he said. "A thermocouple consists of a junction of two elements which, when heated, generates an electric current, that can be measured with a galvanometer. The weight of a complete thermocouple with receivers one-half millimeter in diameter, including the connecting wires, is about one-thousandth that of a drop of water.

"A star, of the same color as the sun, which is just bright enough to be easily seen without a telescope, radiates on the whole United States about the same amount of heat as is radiated by the sun on one square yard. When the heat from such a star which falls on the 100-inch mirror of the Hooker telescope at Mount Milson, the area of which is six square yards, is focused on the receiver of a thermocouple, the temperature of the receiver is increased about one-half-millionth of a degree Fahrenheit, and a current of electricity is made to flow through the galvanometer. The current thus generated is about one-twenty-billionth of an ampere. The currents produced in this way are proportional to the amount of heat received by the thermocouple, so that the deflection of the galvanometer when a star is focused on the thermocouple is a measure of the heat received from that star.

"The heat from many stars has been measured in this way, and of those measured more heat reaches the thermocouple from the red star Betelgeuse, in the constellation of Orion, than from any other. Much of the heat from stars and from the sun is absorbed by the earth's atmosphere. This absorption is especially large in the blue and violet light and when allowance is made for this loss we find that more heat reaches the earth from the blue star Sirius than from any other star."

Though the planets shine with reflected sunlight and are far cooler than the stars, the thermocouple can be used to measure (*Turn to Page* 52)

Einstein—*Continued*

has succeeded in devising mathematical formulas which bring under a single set of laws the phenomena of electricity and magnetism with those of gravitation. If so, it will be a great triumph of mathematical genius, for hitherto no scientist has been able to demonstrate such a relationship, although many have attempted to solve this perplexing problem.

The laws of the motion of bodies in the two fields are much alike in form. For instance, Newton's law of gravitation states that two bodies attract one another with a force proportional to their mass and inversely proportional to the square of the distance between them. Two bodies charged with opposite electricities behave in the same way; that is, they attract one another with a force proportional to their charge and inversely proportional to the square of the distance between them.

But there is this important difference between the two cases. It is possible to interpose a screen between two electrified or magnetized bodies that will cut off the force while nothing will interfere with the effect of gravitation. Every radio fan realizes the effect of interposing sheets of metal or grids. But the pull of the sun on the earth acts through 93,000,000 miles of empty space and would act the same if this space were filled with iron or anything else.

Because gravitation acts the same between all bodies regardless of their composition or what is between them, Einstein did away with the idea of a hypothetical pulling "force" of gravitation and simply said that bodies came together because of the peculiar state of the space between them due to their presence and distance. His brief paper of 1915 generalized his theory of relativity of 1905 to include gravitation as well as mechanics and now it appears he has in another five-page paper extended the general theory to cover electricity and magnetism.

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Experiments in cooking at New York State College of Home Economics show that best results with green vegetables are obtained by dropping the vegetables into boiling water and cooking them in a open kettle for the shortest possible time.

WASP STUDIES AFIELD

By PHIL and NELLIE RAU

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This volume of more than 400 pages, with 69 illustrations, is a distinct contribution to entomological knowledge, and is also a "nature book" of delightfully readable quality. Mr. and Mrs. Rau have watched the wasps at work and at play, and report their observations with a pretty combination of scientific accuracy and the sympathetic imagination without which science cannot attain its full possibilities of fruitfulness.

A special feature of this text, besides its study of species not hitherto fully reported and the description of an interesting series of experiments, is the concluding chapter on heredity, place memory, and instinct.

"Under the magic of their pens the wasps become more notable than most men, and skepticism as to the actual intelligence of these marvelous creatures is almost impossible. No lover of nature can afford to omit reading 'Wasp Studies Afield'." — Cleveland Plain Dealer.

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Frogs Learn Geometry

Zoology

Frogs are not so dumb as they look. They can learn a simple proposition in geometry, as that a square is not a triangle. And they will remember their lesson for a little while, at least if they are paid for it.

A European experimenter, S. Biedermann, has reported the results of tests on the learning capacity of frogs. He set square and triangular blocks in pairs before his squat pupils. One block would have a delectable insect attached to it, the other would have nothing. After a sufficient number of repetitions the frog would learn that one shape was associated with the idea of food, the other with the idea of remaining empty; and when both blocks were presented without the accustomed bait the frog would hop expectantly to the one that had hitherto served as his dinner-table.

A number of different species of frogs and toads were thus "educated." Tree frogs proved to be the most apt pupils.

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Japan's land area is about that of the State of Montana.

Babies—*Continued*

Another evening the story is that she is quarantined for sickness. Lindbergh comes to see her and brings her medicine. Lindbergh's mother also comes at her request and says, "Haven't you got well yet? My! My!"

This four-year-old with an ingrowing idea comes from a wealthy home where governesses take scrupulous care of her. But she gets no taste of excitement or danger in her routine existence. So she has found a way for herself to put adventure into her quiet life—the only method at her command, the dream stories. Constant harping on the same morbid idea obviously is bad for the child, but the mother of the four-year-old who suddenly discovers such a habit firmly established is very much at sea as to what to do.

The psychologist did not tell her that if she had taken as much care of the baby's personality development as she has taken of physical welfare, this dream life would probably not have become so important to the little girl's life. There is no use bewailing spilt milk. But such cases point their warning unmistakably for other mothers to see. The warning, as Dr. Furfey sums it up, is that the younger the baby, the more easily it may be changed—for better or worse.

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