

## Barbara Stoddard Burks: 1902-1943

Barbara Stoddard Burks was born in New York on December 22, 1902. She was educated at the University of California and Stanford. She was closely associated for years with Lewis M. Terman. With Terman and Kelley she learned to apply the newer biometrics to problems of nature and nurture. The result was a pioneer study—the first of a series of pioneer studies in genetics—dealing with the resemblance of parents to their foster children on the one hand and to their own children on the other, published in the *Yearbook of the National Society for the Study of Education*, 1928. She undertook to evaluate that share of the variance in Stanford-Binet intelligence which is attributable to home environment, and finding the contribution relatively slight became a staunch advocate of an essentially hereditarian approach.

By its very nature, intelligence is one of the most difficult characteristics to study genetically. Expression of intelligence, an end-product of the interplay of heredity and environment, represents an enormously complicated interaction. The report of Dr. Burks' study of foster children was the first adequately controlled and statistically sophisticated attempt to give a numerical value to the relative contributions of heredity and environment of the development of that part of intelligence measured by the intelligence quotient. Her conclusion was that "Close to seventy-five or eighty per cent of I.Q. variance is due to innate or heritable causes." In this first Stanford study, use was made of cross-correlations of resemblances of parents with own children and with foster children, and with an unrelated control group. In 1938 she applied Wright's method of path coefficients to the Stanford data and to the data from Dr. Alice Leahy's Minnesota Foster Study. This independent approach confirmed the earlier conclusions almost exactly: "We arrive at an estimated  $\frac{3}{4}$ ,  $\frac{1}{4}$  as the relative contributions of nature and nurture, with approximately even chances that the contribution of nurture is in truth between eighteen and thirty-three per cent."

Her work led naturally to the reputation which attaches to ingenious large scale original studies and to a series of friendly debates with Frank N. Freeman, who had almost at the same time conducted studies which appeared to assign to environmental factors a considerably larger weight in relation to intelligence-test variance. She never ceased to study and evaluate further materials, such as those of Skodak and the other Iowa University workers, upon this broad issue. Despite complications these later controversies remained in essentially the same form as when the problem was discussed earlier by Burks and Freeman.

For ten years she was one of the enthusiastic and devoted students who have one after another carried on the monumental *Genetic Studies of Genius*. In 1930 the third volume of the series, the *Promise of Youth*, was published by the Stanford University Press, with Dr. Burks as the principal author. This was a follow-up survey on the one-thousand gifted children whom Terman had found a score of years earlier in the California Schools.

In the early thirties Dr. Burks was a consulting psychologist in the Pasadena Schools. She was with the Institute of Child Welfare at Berkeley from 1933 to 1935. Here she became increasingly interested in the study of personality, collaborat-

ing with Mary Cover Jones in a monograph on *Personality Development in Childhood*.

When the Social Science Research Council appointed a committee in 1935 to make a systematic study of "competitive and cooperative habits," the committee designated Dr. Burks a collaborator whose special duty was to draw together all the research bearing on the personality factors which enter into competition and cooperation. The result was an exhaustive report placed in mimeographed form in the hands of interested scholars, indicating nature-nurture factors in these broad human dispositions.

She was in the same year awarded a fellowship of the General Education Board for study of child development and education in Europe. This led to several months residence in Geneva in intimate contact with the Piaget group, where she conducted researches on egocentrism in childhood. This led to a broadening in social-science perspective which became conspicuous in subsequent work.

Returning to America in 1936, Dr. Burks was appointed Research Associate of the Carnegie Institution of Washington at Cold Spring Harbor, New York. Her assignment there was to assay the value of the large collection of human pedigrees at the Genetics Record Office. For some 25 years records of a great many human characteristics, compiled in various ways, had been accumulated. These records were of doubtful value for genetic research. Many of the pedigree-charts had been filled out by individuals seeking information, individuals whose limited knowledge of medicine, of genetics, and of the rules of evidence tempered the validity of their material. In an ingenious series of experiments Dr. Burks showed that certain characteristics had been accurately enough reported to justify their use in research studies, while many other characteristics had been so inaccurately reported that valid conclusions could not be drawn from them. This survey brought to light a number of interesting genetic problems, some of which she analyzed and published. Several other studies are still in progress and, as it is hoped, will be published later.

This wealth of material contained a number of pedigrees showing inheritance of more than one clearly defined characteristic. This gave Dr. Burks an opportunity to attack a problem which had long fascinated her, that of genetic linkage. She saw the production of human-linkage maps as essential in advancing the study of psychological characteristics in man, through furnishing visible "markers" of chromosomes carrying genes important in the development of these characteristics. In association with Dr. Ruth Tolman (from 1931) she had sought to demonstrate an association of temperamental and physical traits in siblings showing unusual resemblance. The results were negative but the interest in the problem remained. In order to utilize in full the data available, Dr. Burks independently devised an ingenious method whereby autosomal (non-sex linked) linkage can be tested with sibling-pairs, involving only a single generation, and an estimate made of the crossover rate between linked genes. Among the pedigrees at Cold Spring Harbor were a number showing congenital tooth-deficiencies and hair-color. Beadle had suggested (1925) that these characteristics might be linked. With this new material, Dr. Burks demonstrated the existence of this linkage and published the first crossover rate between linked genes in man. A linkage between myopia and eye-color was also demonstrated. This marks an important advance in human genetics and one that will eventually put the genetic study of important pathological and psychological traits on a solid experimental base.

In 1938 Burks undertook the responsibility of providing a clearing house for the European scholars who had come to the United States as a result of political upheavals. For the next five years she served with vision and energy as chairman of the Committee on Displaced European Psychologists of the American Psychological Association. Through her devoted labors many were directly placed in American colleges and clinics, and others were given guidance while in the process of making their own cultural and vocational adjustment. Her interest in the problems of human welfare also led her in 1941 to undertake the editorship of the *Bulletin of the Society for the Psychological Study of Social Issues*. She added several new features to its regular coverage, and served with vigor on the Council of the Society.

For many years Dr. Burks had been an enthusiastic student of identical twins. Late in 1942 she published a report of six years' observations on a pair of twin girls separated in early infancy, the most detailed and broadly grounded analysis yet published of the factors which contribute to the differences in mental and temperamental development shown by separated twins. In April 1943 Dr. Burks was awarded a Guggenheim Fellowship to continue her studies on twins.

Becoming an Associate of the Department of Psychology at Columbia, she gave much of her time to the study of parent-child and parent-foster child resemblances in material furnished by the New York State Charities Aid Association. Work on this study is still in progress, and plans are being made for its publication.

She died May 25, 1943. To the basic genetic problem concerning the interaction of heredity and environment she brought a keen and sympathetic mind and a gift for tireless research and critical analysis of data. She sometimes insisted that she was not a mathematician; but she used the two-edged tool of numbers with the skill of a virtuoso. Genetics and psychology have suffered a grievous loss in a worker who had broken so much new ground that her contributions would have been an achievement for a much longer life. Her file of "unfinished business" contains many challenging projects, ripe for finishing, had there been time.

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