important relation between the CS and UCS is predictive rather than simple contiguity, and the CS leads the dog to expect the UCS, not to emit a response similar to the UCS. But they also provided direct evidence supporting the Pavlovian concept of inhibition. Rescorla's work is fundamental in the influential Rescorla–Wagner model (Rescorla & Wagner, 1972), which explains conditioning in basically cognitive terms.

Crucial experiments, at least in design, have played an important and continuing role in the development of several areas in psychology. One such area is the perception of space and objects in space, centering around the nativist-empiricist issues. The conflicting scientific explanations of such perception—Ewald Hering's theory of innate point-to-point representation of objects in space and Hermann von Helmholtz's association theory—led to a number of crucial experiments, including those of Helmholtz on adaptation to wearing of prisms which displace objects in space. Although such experiments seem conclusive, more recent research leads to questions about the original interpretation of the results. Further, other research on both nonhumans and humans suggests that aspects of depth perception are innate. Examples of such research include Edward L. Thorndike's research (1899) on dark-reared chicks, and Richard D. Walk and Eleanor Gibson's studies (1961) using the visual cliff. Detailed reviews of the area are in Hochberg (1966, 1971). Although none of the experiments resolved the initial issue, they have helped to clarify the area in crucial ways, and have largely transformed the original issues (Hochberg, 1966).

INFLUENCE OF EXPERIMENTS ON THEORETICAL CHANGES

Although the role of research, especially of individual experiments, is a matter of debate among philosophers of science (see Lakatos & Musgrave, 1970, and Harding, 1976, for a variety of views), research has had considerable impact on theories in psychology. The examples given in the preceding section make clear that individual experiments have led to important modification of some theories and virtual abandonment of others. In that sense, certain experiments have been crucial.

On the other hand, although Tolman's research may have been one factor, a variety of both experimental findings and theoretical papers underlies the "paradigm shift" in much of psychology from S-R to cognitive models. In this sense, Kuhn's approach (1970/1962) to the role of research in scientific revolutions has considerable merit. Further, individual experiments have been crucial relatively, and not absolutely as in the original Baconian sense.

EMPIRICAL RESEARCH METHODS
EXPERIMENTAL DESIGNS
EXPERIMENTAL METHODS
HYPOTHESIS TESTING
MEDIEVAL THINKING
MILL'S CANONS
OBJECTIVE PSYCHOLOGY
PHILOSOPHY OF SCIENCE
RESEARCH METHODOLOGY
SYSTEMS THEORY
THEORETICAL PSYCHOLOGY

R. T. BROWN
C. R. REYNOLDS

CULTURAL BIAS IN TESTS

Various social class and racial groups show considerable mean differences in scores on a variety of standardized tests of mental ability widely used in schools, college admissions, the armed forces, and personnel selection in hiring. This is especially true of tests of "general ability," "intelligence" or I.Q., and scholastic aptitude. One popular explanation for the observed social class and racial differences on such tests is the *cultural bias hypothesis*, which holds that (1) the typical experiences involving the acquisition of knowledge and skills are different for various subpopulations, and (2) the item contents of the tests are selected much more from the typical experiential background of certain groups (e.g., the white middle class) than from that of other groups (e.g., the poor and racial minorities), thereby favoring certain groups with higher average scores and disfavoring other groups with lower average scores on the test. Psychometrically, the problem is how to determine objectively whether the cultural bias hypothesis is or is not a valid explanation of the observed mean difference between any two specific subpopulations on any specific test. The question cannot be answered in general terms; it is an empirical question referring to a specific subpopulation (e.g., whites and blacks in the present-day United States) and a specific test (e.g., the Scholastic Aptitude Test).

Before listing some of the valid methods for testing the cultural bias hypothesis, the three most common but wholly fallacious criteria of test bias should be discussed at the outset. The *egalitarian fallacy* is the scientifically unwarranted assumption that all subpopulations are equal in whatever ability or trait the test purports to measure, and that therefore any mean differences between groups indicates that the test is biased. The *culture-loaded fallacy* is the belief that because the item content of a test involves culturally specific knowledge or skills, it is necessarily biased against any particular group that scores lower than some other groups. The *standardization fallacy* is the notion that because a test was standardized for a particular population, it is necessarily biased against members of any other population. None of these arguments, alone or in combination, is a valid test of the hypothesis that any particular test is biased for any particular groups.

The psychometric definition of bias is based on the statistical concept of bias: A measurement is biased if it systematically underestimates or overestimates the true value. A test is biased if an obtained score systematically underestimates or overestimates the true value of the trait it purports to measure in one group as compared with some other groups. More generally, a test is biased with respect to two (or more) groups if the scores for members of one group have a different meaning than they have for members of the other group. That is, the test functions differently for the two groups, and the same interpretation of a given score is not justified for persons from the different groups. Objective statistical tests of bias, therefore, consist of a search for important psychometric features of a particular test that behave differently in the two or more subpopulations in question. The psychometric features of primary importance are those most relevant to the intended use of the test; predictive validity for a particular criterion, construct validity, reliability, and factor structure. Statistically significant differences between groups in any of these psychometric features, or differences large enough to be of consequence for the practical uses of the test scores, are indications of bias. These indicators may be classified as *external* (i.e., they rely on the correlation of the test scores with other variables that are independent of the test) and *internal* (i.e., they rely on internal psychometric characteristics of the test itself). Bias may also result from *situational* factors: the race, sex, dialect, or attitude of the examiner, unequal exposure to previous similar tests, time pressure and anxiety in the test situation, and the like.

External criteria of bias include group differences in the validity coefficient for predicting a certain criterion; in the intercept and slope of the regression of criterion measures on test scores; in the standard error of estimate of the predicted criterion measures; and in the correlation of test scores with other variables, such as chronological age and various kinship correlations (twins, siblings, etc.), which may be theoretically important for the test's construct validity.

Internal criteria of bias include group differences in the reliability of the test; in the pattern of item intercorrelations; in the rank order of item difficulty (i.e., a groups-by-items interaction); in the item characteristic curves; in the test's factor structure and the relative magnitude of items' or subtests' loadings on each factor; and in the relative frequencies of choice of the several distractors (incorrect response alternatives) in multiple-choice items.

Most empirical studies of test bias based on these objective psychometric criteria have addressed the question of bias in the test scores of American blacks, who on average generally score about one standard deviation below the means of the white and Asian populations on most widely used standard tests of cognitive ability and scholastic aptitude. The vast majority of published studies have not supported the culture bias hypothesis with respect to most standard tests; differential validity coefficients for blacks and whites, for example, are a practically nonexistent phenomenon in college and job selection tests (Arvey, 1979; Jensen, 1980; Reynolds & Brown, 1983). The preponderance of present evidence indicates that most current standardized tests of mental ability yield unbiased measures for all native-born English-speaking segments of American society today, regardless of their sex or their racial and social-class background. The observed mean differences in test scores among various groups are generally not an artifact of the tests themselves, but are attributable to factors that are causally independent of the tests.

BILINGUALISM
CONTAMINATION
CULTURE FAIR TESTS
DISTRIBUTIVE JUSTICE
EQUITY THEORY
NATIONAL CHARACTER
PSYCHOMETRICS
RACE BIAS IN TESTING
RACIAL DIFFERENCES
SOCIAL CLASS

A. R. JENSEN

CULTURAL DETERMINISM

Cultural determinism refers to the belief that the culture controls an individual's destiny. Ruth Benedict in *Patterns of culture* asserted that children become a part of their culture with its perceived possibilities and impossibilities directing the course of their lives. This deterministic view of human development makes clear that, although individuals think they make a personal choice about a house, an article of clothing, or even food, actually their choice is determined by the culture: all that person does, eats, and feels is culturally determined. This powerful influence of culture has attained a maximum effect by the time a child is five, so that the child sees no other way of behaving except that which is taught by the culture. Responses have become so firmly fixed that they last throughout the life span.

This is not to say, however, that human beings are acculturated without difficulty. Frustrations and negative feelings often occur in children as they face cultural rules and expectations. Their resentment and hostility all too often accompany the process. In recent years resentment is seen in the conflict with and condemnation of the "establishment." Children strive for autonomy and expression of impulses, but such striving brings conflict with the cultural agents. The most important of these agents, of course, are the parents, especially the mother. Most children growing up in a family where cohesion and stability exist come to accept cultural rules as advocated by the parents. This acceptance is furthered by affectional bonds between parents and child. Through interdependence for emotional satisfaction, children conform to the teaching and wishes of the parents. In the acculturation process, children internalize cultural mandates so that the culturally valued ways of behaving become a part of personality.

The significance of the culture in determining behavior is seen in the concept of "social clocks": Not only is culturally determined behavior a reality in our lives, but the expected and approved behavior must become a part of the individual by certain times. Bernice Neugarten and Gunhild O. Hagestad (1976) present this concept. Thus, the age span is divided into periods of time through which we progress according to a timetable created by the culture in which we live; the life course must be run at certain speeds based on a predetermined schedule. In the time periods of childhood, adulthood, and old age, rewards and opportunities are given or withheld by the culture depending upon age and whether or not one's movement is in synchrony with the social clocks provided by the culture.

Again, all is not smooth. Problems develop because the clocks are not always clearly seen. If mistakes are made and individuals speed up or slow down out of synchrony, the culture provides punishment. Individuals who do not conform face stress and conflict.

Cultural determinism, accordingly, means that in reality we have little choice about our life course, as Theron Alexander emphasized in "The life course issues." Cultural determinism leaves little opportunity for individual freedom or experimentation with other than culturally approved solutions to problems. Nor are individual differences based on genetic variation allowed free expression.

Conflict with cultural rules is particularly common in adolescents. The culture insists on conformity and age expectations, but adolescents are told sometimes they are not yet old enough for certain privileges, and at other times that they are too old. Misunderstandings result.

While giving credence to the power of cultural determinants of behavior, a considerable number of workers see the course of development as determined by biological factors as well as those existing in the culture. Jean Piaget, for example, in *The origins of intelligence,* took the position that stages of development are based on maturational factors. Seeing physical influences as factors of importance in determining behavior, therefore, in addition to culture, appeals to many.

ACCULTURATION
AFFILIATION NEED
ETHNOCENTRISM
NATIONAL CHARACTER

T. ALEXANDER

CULTURAL DIFFERENCES

Cultures, ways of believing and acting, vary over the world. Because of cultures' considerable influence, social scientists have been interested in their effect on human personality and behavior. Cultures differ not only in ways of making a living, but in the possessions of people and in their ways of thinking. Both material and thinking involve the use of cultural symbols, that is, the teachings of a social group that provide a basis for seeing and interpreting the world. Thus these systems for interpretation affect people to the extent that their thinking or understanding of the world is passed on to succeeding generations, so that the culture is continued.

Anthropologists and social psychologists have pointed out the benefits from studying simple societies in order to compare them with complex cultures such as that of the United States. By observing behavioral differences, they can gain ideas about which behavior varies with culture and which is relatively innate and occurs in all cultures. Sometimes the results are astonishing and have considerable effect on social scientists' thinking about human behavior and development.

The classic example of such a change in view is one that resulted from Margaret Mead's work with Samoan culture reported in *From the South Seas* (1939). Early in this century G. Stanley Hall—especially in evidence in his two-volume work *Adolescence*—explained that adolescence is a stage created by physiological processes undergoing change based on programs within the genes. According to him, since the "storm and stress" result from changing physiological processes, the behavior was universal and found in all cultures. To investigate this idea, Mead went to Samoa to live among the people there. She found that in Samoa, parents' child rearing was quite different from that of the American culture. The parents of