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ABSTRACT

This commemorative book contains 10 papers that provide a selective sample of behavioral and social science research accomplishments and trends over a 50-year period, and comparisons are made with research presented in the 1933 report, "Recent Social Trends in the United States" (The Ogburn Report). Four chapters in part 1, "Understanding Social Change", highlight advances in theories and methods devoted to social, organizational, and economic change. They include: (1) "The Ogburn Vision Fifty Years Later" (N. Smelser); (2) "Measuring Social Change" (A. Reiss, Jr.); (3) "Uncertainity, Diversity, and Organizational Change" (N. Hannan); and (4) "Macroeconomic Modeling and Forecasting" (L. Klein). Part 2, "Numbers and Decisionmaking", features the increasing use of quantitative concepts and data. It contains: (1) "Public Statistics and Democratic Politics" (K. Prewitt); (2) "Deterrence in Criminology and Social Policy" (H. Ross, G. LaFree); and (3) "Choices, Values, and Frames" (D. Kahneman, A. Tversky). Part 3, "Discovering the Mind at Work", explores the growth of the study of cognition and behavior in: (1) "Changing Views of Cognitive Competence in the Young" (R. Gelman, A. Brown); (2) "Some Developments in Research on Language Behavior" (M. Studdert-Kennedy); and (3) "Visual Perception of Real and Represented Objects and Events" (J. Hochberg). References are included. (JHP)

Behavioral and Social Science Fifty Years of Discovery

In Commemoration of the
Fiftieth Anniversary of the "Ogburn Report,"
Recent Social Trends in the United States

Neil J. Smelser and Dean R. Gerstein, Editors

Committee on Basic Research in
the Behavioral and Social Sciences

Commission on Behavioral and Social Sciences
and Education

National Research Council

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Preface

> The pioneer spirit is still vigorous within this nation. Science offers a largely unexplored hinterland for the pioneer who has the tools. . . . [Vannevar Bush, *Science, The Endless Frontier: A Report to the President*, July 1945]

The words of Vannevar Bush have not lost currency in the intervening four decades. But his 1945 report testifies to a further proposition: behind most scientific explorations stand committees on research, responsible for seeing that the tools of science are kept current, in adequate supply, and available to those who can use them most productively. These responsibilities call not only for short-term decisionmaking on a monthly or other periodic basis, but also for occasional sweeps of the horizon, to absorb the lessons of the past and plan thoughtfully for the future

The Committee on Basic Research in the Behavioral and Social Sciences was established in early 1980 at the request of the National Science Foundation and operates under the auspices of the National Research Council's Commission on Behavioral and Social Sciences and Education. The committee's first task—to assess the value, significance, and social utility of basic research in the behavioral and social sciences—was designed to respond to questions posed to the foundation, principally by its congressional overseers, on a fairly short-order basis. These inquiries required a systematic look at the nature and methods of research in these fields and specification of the criteria by which a national interest in support of basic research could be established. This first phase of committee work resulted in the publication of *Behavioral and Social Science Research: A National Resource* (National Academy Press, 1982).

Carrying out that initial task meant devoting a relatively small proportion of the committee's time to considering the longer-term trends of research advances in behavioral and social sciences, although these were reflected to some degree in the 1982 report. The present volume, fruit of the second

phase of committee activity, is largely devoted to assessing such trends. Symbolizing this interest, the papers in this volume were presented first at a commemorative public symposium held November 29–30, 1983, marking the fiftieth anniversary of the publication of *Recent Social Trends in the United States* (McGraw-Hill, 1933), the landmark report of the President's Research Committee on Social Trends. The research committee, appointed by Herbert Hoover in 1929 to investigate the overall condition of the nation, was comprised entirely of social scientists. Economist Wesley C. Mitchell was chair of the committee, and political scientist Charles E. Merriam was vice-chair. The dominant voice proved to be that of sociologist William F. Ogburn, the director of research. *Recent Social Trends*, with its 29 separately authored chapters, nearly 1,600 pages, and foreword by President Hoover, was soon labeled and has since been informally referred to as the Ogburn report.

This volume is inspired by the Ogburn report in several ways. The study of social trends has continued to be a major research area across many of the behavioral and social sciences. Four chapters in this volume highlight advances in theories and methods devoted to understanding social, organizational, and economic change since the Hoover era. A second theme is the increasing use of quantitative concepts and data in decisionmaking, explored in three chapters on the use of numbers in democratic political systems, criminal justice policy, and individual choice behavior. A final theme is the remarkable growth of the study of cognition and behavior, covered in chapters on child development, language, and visual perception. Each of the 10 thematic chapters is a vivid portrait of newly gained knowledge, taken from a particular perspective; as a whole, the volume is a selective sampling from the gallery of behavioral and social science accomplishments of the past 50 years.

The idea that our committee might take the Ogburn report as a reference point for this phase of its work was first suggested by Otto N. Larsen, senior associate for social and behavioral sciences at the National Science Foundation. It is a pleasure to acknowledge his role and that of the foundation generally in providing a continuing and substantial commitment of intellectual and material support to the committee; we particularly wish to acknowledge the contributions of Eloise E. Clark, formerly assistant director for biological, behavioral, and social sciences; James H. Blackman, formerly acting director of the Division of Social and Economic Science; and Richard T. Louttit, director of the Division of Behavioral and Neural Sciences.

We are indebted to the staff of the National Research Council for rendering many services during preparations for the symposium and this report. In particular, David A. Goslin, executive director of the Commission on

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Behavioral and Social Science Fifty Years of Discovery

Introduction

DEAN R. GERSTEIN

Herbert Hoover, in his preface to the report of the President's Research Committee on Social Trends (1933), explained that he had asked a "group of eminent scientists to examine into the feasibility of a national survey of social trends . . . to undertake the researches and make . . . a complete, impartial examination of the facts." Hoover noted that the committee's report on the findings compiled by their many experts "should serve to help all of us to see where social stresses are occurring and where major efforts should be undertaken to deal with them constructively."[1] The focus of this distinguished committee of social scientists (the term behavioral science had not yet gained currency) and the hundreds of consultants who contributed to the report was to document the state of the nation, especially in terms of changing institutions, and to make such recommendations as seemed appropriate for public policy or private action. The most notable aspect of the 1,600-page report was its unified view (President's Research Committee on Social Trends, 1933, pp. xii–xiii):

[1]The members of the committee were Wesley C. Mitchell, chair, Charles E. Merriam, vice-chair, Shelby M. Harrison, secretary-treasurer, Alice Hamilton, Howard W. Odum, and William F. Ogburn. The executive staff included Ogburn as director of research, Odum as assistant director of research, and Edward Eyre Hunt as executive secretary. Although President Hoover initiated and appointed the research committee, funding for its investigations was provided by the Rockefeller Foundation. Substantial services and personnel were provided by the Social Science Research Council and the Encyclopedia of the Social Sciences. The list of acknowledgments of other institutions and individuals assisting in the work ran to 12 pages. For accounts of the complex dynamics of the committee, see Karl (1969, 1974).

It may indeed be said that the primary value of the report is to be found in the effort to interrelate the disjointed factors and elements in the social life of America, in the attempt to view the situation as a whole . . . as a national union the parts of which too often are isolated, not only in scientific studies but in everyday affairs. . . . It is the express purpose of this review of findings to unite such problems as those of economics, government, religion, education, in a comprehensive study of social movements and tendencies, to direct attention to the importance of balance among the factors of change.

That attempt to bring the entire range of social science and what we now call behavioral science to bear on a comprehensive array of national issues in the United States was unprecedented and, in fact, remains unique.[2] It is difficult even to imagine a comparable effort being undertaken today. This is not for lack of individuals with the intellectual range and authority of Ogburn, whose unifying view the report largely reflects and with whom it is most often identified. Rather, the theoretical and philosophical presuppositions that could undergird a comprehensive mobilization of scientific knowledge in the interest of national planning and reform—presuppositions shared in important respects even by the one-time radical activist Ogburn and the conservative engineer Hoover—no longer hold sway. The sheer size of the research base and the scope of government action have broadened immensely, while the disciplines and government bureaus have fissioned into a multitude of specialties, whose skepticism about the value of any unified effort would be an enormous barrier even were there a will to try it.

This volume therefore does not try to develop and unify more recent research findings and make recommendations concerning national trends. Our aim is to spotlight a number of important changes within behavioral and social science research itself. Our procedure is not, strictly speaking, a historical one; the following chapters do not constitute formal histories of science, by which one means the careful tracking through time of events, ideas, institutions, and persons as these interact to produce continuities and changes from one scientific era to another. Rather, our intention is to select certain discoveries and advances that have occurred over the last half-

[2] A series of studies carried out by federal mandate in the mid- and late 1960s involved some tasks similar to those of the research committee, but no single study had nearly so broad a mandate. These efforts included the Advisory Committee on Government Programs in the Behavioral Sciences (1968); the Behavioral and Social Sciences Survey Committee (1969); and the Special Commission on the Social Sciences of the National Science Board (1969) There was also strong behavioral and social science representation during this period in the work of special-purpose national commissions on such subjects as pornography, law enforcement and criminal justice, and marijuana and drug abuse.

century and to show in what ways they clearly distinguish the present from the past.

The Ogburn report did not address itself primarily to the state of the art in fields whose practitioners were involved in its preparation. Yet it provides a unique window on certain major contours of thinking in certain fields at that time. The authors of the following chapters have drawn portraits of current research on major topics and contrasted these with earlier periods, particularly the era of Hoover's presidency. The subjects range from theories of large-scale social change to shifts in understanding the visual process; within this span fall such topics as economic modeling, ability testing, criminology, children's learning, and phonology. All these research fields were active a half-century ago, but in every case the science has changed markedly. The changes can be summarized as advances in methodology and advances in theory.

An increasingly extensive, precise array of methods is now used in behavioral and social science research. These methods of gathering, organizing, and querying data cut much closer than before to the core of individual and collective human behavior, enabling researchers and others who use the methods to look into ranges of phenomena not hitherto accessible to direct observation, analysis, or experiment. Examples of these methodological advances are numerous. Current, detailed, accurate employment/unemployment numbers simply did not exist at the time of the Ogburn report—the work force was counted only by the decennial census, and then only in terms of "usual occupations." The best estimates of the distribution of income in the United States available to Ogburn's research committee in 1930–1931 were based on special data collected by the National Bureau of Economic Research in 1918. Similarly, the Ogburn report's chapter on the changing opinions and attitudes of the public is based entirely on assessments of articles in leading magazines, books, and newspapers; the direct scaling and sample surveys of people's attitudes and opinions had not yet been invented. Indeed, methods for generating most of the frequently updated indicator series taken for granted by modern researchers, public officials, corporate decisionmakers, and evening news watchers did not begin to appear until the 1930s. Exact statistical and quasi-experimental research on penal deterrence, the preventive relationship between punishment and crime, did not begin until the 1960s. In the study of mind and behavior, the microelectrode, optical devices such as the Ames window, the sound spectrograph (invented at Bell Laboratories during World War II), and computers, including new mathematical software for efficient solution of large-scale statistical equations, radically changed the character of research undertakings.

In parallel with but independent of these methodological advances, the-

ories in behavioral and social science have become far more attuned to the complexity, subtlety, and persistence of variable, subjective phenomena such as ideas, values, emotions, and images. The classical traditions of Western thought that dominated behavioral and social theory earlier in the century insisted either that subjective phenomena were immediate reflections of material reality, simply summarizing objective experience, or that subjective phenomena formed a separate and mysterious realm, inaccessible to measurement or rigorous analysis. In contrast, many current theories and empirical inquiries guided by them involve an increasingly detailed picture of the origins, character, and relations between people's internal representations, values, and attachments, and their behavior toward objects, institutions, and persons. The theoretical work of Keynes on macroeconomics, Chomsky on language generation, Simon on decisionmaking, and Deming on statistical quality control emphasizes the importance of human agency in effecting performances and outcomes.

These advances have not occurred without friction. In any field, new approaches are connected to earlier disputes and are always controversial. Theoretical arguments are seldom concluded by the progress of research; instead the debate shifts over time to different and more sophisticated grounds. Theories are more often improved than disproved.

The themes of increasing methodological precision and theoretical sophistication weave through each chapter of the report. The 10 chapters are ordered under 3 headings: Understanding Social Change, Numbers and Decisionmaking, and Discovering the Mind at Work. While any division is to some extent arbitrary, these headings are meant to emphasize some of the major lines of advance in the last half-century.

Social change was, of course, the main focus of the Ogburn report. Ogburn's own studies of technological innovation and its consequences were highly influential in their day and continue to underlie important segments of contemporary popular thought, although much of his perspective has since been modified by investigators seeking to understand social changes for which Ogburn's theories did not account.

The role of numbers in decisionmaking, particularly in the ever-changing landscape of American markets and political institutions, was a second overriding theme of the Ogburn report. This theme is taken up in this volume in several contexts: the role played by statistical agencies and information in democratic politics, the importance of probabilistic perceptions in mediating the deterrent effects of punishment on crime, and the distinctive calculi of values and probabilities that shape individual decisionmaking. In each instance, the authors are as much concerned with the way that long-term advances in knowledge interact with decisionmaking processes as they are with particular applications of knowledge to decisions.

The final section on the mind at work covers a range of discoveries in subjects that were not nearly as prominent 50 years ago and received little attention in the Ogburn report but have become centrally important in the behavioral sciences: individual development, conceptual and linguistic performance, and perception. The theoretical debates between behaviorist versus cognitive or information-processing approaches have been an important motor of progress in each of these areas.

UNDERSTANDING SOCIAL CHANGE

In the opening chapter, Neil J. Smelser compares assumptions of the Ogburn report about the relation between social science and society with present-day assumptions. Even as the methods of behavioral and social science research have become more sophisticated and precise between 1933 and 1983, its aspirations to social influence and power have become less grand. What resolves this seeming paradox is the shift from a social engineering view, which posited a direct link between learning facts and taking action, to a view that recognizes the necessarily "uncertain connection" between knowledge and policy (Lynn, 1978).

In the social engineering view, objective facts ultimately govern social action, whereas researchers now see factual knowledge as only one component in a complicated set of determining processes. Rather than taking facts as eternal truths residing in the world waiting to be observed, facts are now understood as compelling interpretive statements reached by comparing the results of more or less precise measurements undertaken within a theoretical scheme. While Ogburn thought the practice of social science was essentially a matter of patiently, methodically collecting enough statistical data to be certain of the situation, rather than jumping to conclusions based on irrational wishes or prejudices, researchers now see the continuing need to develop, test, and incrementally improve the precision and interrelation of research methods, measurements, and theoretical systems.

Ogburn and many of his colleagues held that once the facts were finally, clearly known, one would not have to worry independently about the will to act on them, since well-observed facts would not admit of conflicting interpretations and would convince people to abandon irrational prejudices or fantasies. After several decades of increasingly detailed work on the uses of scientific knowledge, this view is now known to be oversimple. Many factors intervene between the scientific pursuit of knowledge and the social pursuit of life, liberty, and happiness: competition for power between different social groups, conflict over values, and barriers imposed by the relative autonomy of different social spheres. Conflicts over policy derive from fundamental cultural values and differences in social position as well

as more evanescent ignorance or error. Collective action is seen as a problem of resource mobilization and leadership, hardly an automatic response to scientific evidence. In short, as the social and behavioral science research base has become much stronger, it is also much more clearly understood why policy and politics can never rest on scientific research alone.

In the next chapter, Albert J. Reiss, Jr., examines a reciprocal relationship that lay directly at the core of Ogburn's interests, the relationship between social science innovations and broader social changes. Ogburn was a pioneer in formulating the theory that the lead elements in social change are material or mechanical inventions such as the steam engine, radio, and elevator (without which there would be no skyscrapers), while cultural inventions are largely reactive, tending simply to permit social institutions to adjust to new material circumstances. Reiss notes that behavioral and social science research has led to many technical inventions that have affected and changed society. He cites the examples of human testing, sample surveys, quality control methods, and cohort analyses. While perhaps not as dramatic as the technological impact of the automobile or the transistor, these inventions have profoundly affected modern life.

Ogburn and most of his contemporaries thought that social science was an essentially neutral activity that evolved on its own; they did not know how thoroughly even such basic scientific matters as the measurement of population grew out of social needs and later were adapted to scientific ones. Social change can greatly affect the measures and concepts of social science, which are in turn increasingly important in shaping the understanding of and response to change. For example, the massive levels of joblessness experienced during the Great Depression substantially changed the way in which the work force was measured. Decennial surveys of workers' "usual occupation" were supplanted by monthly surveys of current employment status. In turn, these measures were vital to managing the wartime economy and subsequently to local, state, national, and corporate planning and analysis.

Reiss concludes that current studies of social change could be improved by attending more to organizational and other collective variables in contrast to the prevalent bias toward measures of individual behaviors, and by reorienting various aspects of the national statistical system. Such reorientation might not only provide better indications about domestic social trends but also aid in comparisons between the United States and other advanced industrial societies.

Carrying this last theme several steps further, Michael T. Hannan takes up questions of organizational change, delineating certain recent innovations in organizational research. His central concern is with issues of inertia versus change and homogeneity versus diversity: how populations of or-

ganizations respond to shifting or uncertain environments. In Ogburn's era and most of the years since, the dominant lines of organizational analysis have been based on the study of executive decisionmaking and its consequences. Theories of rational adaptation proposed that organizational leaders could see changes arising in the environment and make more or less sensible plans to adjust to them, presupposing that organizations comply with their leaders' intentions. Theories of random transformation proposed instead that organizational change is loosely coupled with environmental changes, because organizations are rife with internal politics, which makes compliance with leaders' intentions an uncertain matter, and because planning in uncertain environments is a highly precarious, often hit-or-miss business. Hannan outlines a new approach that treats populations of organizations in an evolutionary and ecological perspective. This type of research examines the scale and frequency of changes in socioeconomic conditions, how these changes affect the fortunes of generalist versus specialist organizations, which conditions force organizations to conform to a standard model, and which encourage diversity of forms. This approach takes the organizational species as the unit and asks how well different species survive specifiable changes in competitive or other environmental conditions.

Hannan points out that Ogburn considered social organizations highly inertial, resistant to change in their accustomed routines and motions. The Ogburnian prescription to overcome this inertia—application of pressure from above in the form of planning based on superior statistical systems—strikes present-day students of organization (in the United States, at least) as unlikely. Organizational inertia is too strong and experienced managers are too clever at finding ways to absorb such pressure without making fundamental changes. Hannan concludes that more research needs to be done on sources of organizational diversity and creation, since there is substantial reason to think that in uncertain environments, new or atypical organizations will be more successful in meeting the demands of the situation than older, standardized ones. Rather than searching for sources of transformation of organizations, analysis of change would be based on examining whole populations of organizations to determine their rates of birth and death and degree of heterogeneity. In this respect Hannan is at one with Reiss's prescription, that more studies should be conducted on organizations rather than on individuals.

Lawrence R. Klein reviews the growth of macroeconomic models and forecasts, which apply some of the most highly regarded and dramatic advances in social theory and measurement to near-term socioeconomic change. Klein traces the beginning of macroeconomic model-building from the 1930s. Macroeconomic models as we know them now, involving hundreds of aggregate equations and frequently updated series of economic indicators,

simply did not exist then. Analyses of the business cycle, apart from isolated pioneering attempts at modeling, were based on very general principles and on trends of isolated economic variables, rather than on attempts to relate these series to each other. Neither today's detailed statistics nor a usable theory was available to try to predict such things as the level of employment or interest rates. The relationship between these items and such extant series as commodity price indexes, and aggregate product measures such as gross national product, were not even guessed at.

The chapter on economic organization in the Ogburn report, by Edwin F. Gay and Leo Wolman, attempted to locate the causes of the Great Depression in a combination of cyclical and noncyclical factors: the extraordinary government debt that arose during World War I, which the federal government devoted much of the 1920s to retiring (actually reducing that indebtedness by about 40 percent); the shift in consumer purchasing patterns from perishables to durables, whose replacement could easily be postponed, making consumer markets far more volatile; excessive business investment in mergers, the creation of holding companies, and other financial combinations; poor banking practices, particularly the willingness to devote ever-increasing credit resources to loans on real estate and industrial securities (these, in turn, being subject to episodes of speculative frenzy) and to extension of consumer credit; an overall depression of agricultural prices; and an "unsound international commercial policy" based ultimately on the need of defeated Germany to finance enormous war reparations. What is missing from this perspective, for moderns used to hearing economic analysts tie up the stock market, foreign affairs, interest rates, and shifts in employment in a single paragraph, is any sense of how these items interact.

Keynes's general theory suggested in 1936 a relatively compact way to express in a small number of equations the relations between large aggregates such as the overall supply of money, the gross national product, total investment, the average interest rate, and overall employment. National and international economic indicator series, which became available in increasing numbers shortly before, during, and after World War II, provided increasingly informative statistics on which to fit these models. The strategy of macroeconomic model-building was perfected in principle after World War II, but it became clear that more accurate forecasts required more detailed systems of equations. These could be constructed in a preliminary way with the statistics then available, but there were severe computational limits, which were resolved only after high-speed computer capabilities (hardware) and appropriate new mathematical algorithms (software) combined after the mid-1960s to enable the rapid solution of hundred-equation and even several-thousand-equation models.

Economists have used mathematical models to discard crude versions of a number of macroeconomic theories and to develop more sophisticated ones. But the models do not yet permit unambiguous choices between the more sophisticated versions of several competing theories about the basic workings of the macroeconomy. The typical macroeconomic model fits the observed data on which its specific numerical coefficients are estimated, but when the fitted model is then applied to generate predictions in other cases, it works much less precisely, being satisfactory in some instances but not others.

An obvious aim for users of macroeconomic models is to employ the models to control economies the way engineering controls keep physical systems on an even keel. This has proven very difficult. Looking to the future, Klein notes that, while pure statistical analysis of economic time series currently competes with macro models, it would be useful to find a way to combine them and to incorporate many more social, political, and demographic variables in economic analysis. This is the kind of unifying recommendation that Ogburn might have applauded. But today the emphasis is on the testing and refinement of theories as the primary use for such elaborate constructions of social data; applications such as planning would be thought appropriate only well down the road.

NUMBERS AND DECISIONMAKING

Kenneth Prewitt considers the growth and complex impact on American democratic politics of many of the public statistical systems discussed in the previous chapters. Noting the close linkage of these statistical systems to the research interests and products of behavioral and social science, Prewitt focuses on the role of statistical enterprises in such intensely practical problems as electoral accountability, political agenda-setting, and public resource allocation. Numbers or, more exactly, statistical systems that count various aspects of social action and provide numerical indicators of what is occurring in society play an essential role in at least three underpinnings of successfully democratic states: as vehicles for assessing the performance of government policies and programs; as ways of setting agendas by identifying or documenting particular interests; and as instruments for allocating government resources, for example, by statistical definitions of rights or entitlements, as in the allocation of federal funds according to "percentages of people living below the poverty line" in a congressional district. Prewitt indicates that social scientists who develop statistical methods and data-gathering surveys essentially for research purposes are also by virtue of this professional expertise the "keepers of the number system," responsible for seeing that the best kind of counting is done. He adds that this role entails

a responsibility to educate the public, including officials, about what the numbers mean—their strengths as well as their limits.

If we compare the concerns documented by Prewitt with the Ogburn report, and particularly the concluding chapter on government and society by Charles E. Merriam, we are struck at once by the new significance of number systems in mediating political accountability, representativeness, and framing of the political agenda. Merriam clearly notes these problems and suggests that scientific investigations of human behavior may have broad political significance in the future; he also stresses the enormity of the problems facing government then due to the economic transformations and crises of the period. Merriam did not, however, share Ogburn's enthusiasm for statistics as a possible solution to social conflict, a basis of coordination and planning that might harmonize diverse interests. Prewitt's chapter in important respects combines the legacies of Ogburn's and Merriam's conflicting views. Prewitt confirms Ogburn's sense of the potential power of number systems but couples it with Merriam's sense that the larger question is how these and other instruments of governance would be put to use in regulating new relations being formed among the government, the electorate, and large economic organizations.

Focusing on a quite specific issue of social policy, H. Laurence Ross and Gary D. LaFree review recent studies on the power and limits of induced change in formal criminal justice operations to deter street crime and drunk driving. They emphasize how the public perception versus the organizational actuality of criminal sanctions can effect the results of changes in the law. Before 1960, virtually no empirical, quantitative evidence existed on the effectiveness of increasing levels of deterrent threat as a method for reducing rates of street crimes or drunk driving. Criminology in the earlier period did not analyze the effects of punishment in its various real stages of implementation (e.g., rates of police patrolling, apprehension, conviction, sentencing, etc.) on the prevalence of crime. The chapter on crime and punishment in the Ogburn report, by Edwin H. Sutherland and C. E. Gehlke, presented statistics on the increased severity of the penalties permitted by law and the increased sizes of police forces. But their principal emphasis was to document that no "crime wave" was evident in the period 1900–1930, that rates of offending were fairly level except for the new crimes of automobile traffic offenses and liquor distribution. Questions of rehabilitation were the main ones identified for future research.

Ross and LaFree believe that the practicable research agenda on rehabilitation has largely been exhausted, with fairly negative results. They document a series of recent studies on deterring crime that led to the following results. Increasing the perceived certainty of apprehension for criminal behavior—by funding more police foot patrols or well-publicized

anti-drunk-driving patrol measures—does cut the rate of offending, although at least in the case of drunk driving the desired effect seems to be short-lived. There is serious question whether statutory provisions providing for increased severity of sentences for offenders can alone have any effect. Drawing their policy analysis to a close, Ross and LaFree conclude that manipulation of sanctions appears to be of little independent value, while increased police activity is expensive to achieve. They recommend exploration of alternatives that reduce the damage to victims of street crimes or drunk driving, e.g., measures such as victim compensation or more crashworthy vehicles and roads. Other alternatives, not discussed by Ross and LaFree, include neighborhood volunteer patrols and efforts to change public attitudes and policies on server behavior that can inhibit drink driving.

Ross and LaFree emphasize that individual perceptions of risk in practical situations can determine in part how policy intentions are translated into attitudes and behaviors. Daniel Kahneman and Amos Tversky investigate the ways in which individual decisions are influenced by persistent attitudes on risk-taking and the value of gains versus losses, as well as by variable ways to construct mental accounts of personal behavior, such as expenditure decisions. Kahneman and Tversky see a smooth relationship between the rationalist principles of decisionmaking formulated in the eighteenth century by Bernoulli and the prescriptive theories of rational choice propounded by von Neumann and Morgenstern in 1947. The notion that one could make decisions by rational, logical, robust quantitative analysis is an appropriate behavioral complement to Ogburn's emphasis on statistical systems and planning. Even Robert Lynd's iconoclastic chapter in the Ogburn report on consumer behavior seeks solutions to the ambiguities of market choice in the development of informational consumer advisory groups. But the conundrums that have come to dominate behavioral analysis of decisionmaking in recent years—the "prisoner's dilemma," Arrow's "impossibility theorem," behavioral experiments contradicting von Neumann and Morgenstern's principles—depart dramatically from prescriptive rationalist psychology.

Kahneman, Tversky, and others are developing an empirical understanding of individual choice behavior that involves measurable quantities such as dollars or numbers of deaths. These choices are conceived to have two levels. At one level, that of analyzing risky choices, individuals faced with a decision, seen for simplicity as a series of binary options, must make two kinds of subjective computations or estimates regarding the possible outcomes of the decision. One set of estimates concerns the probability that a given choice at present will lead to one or another future outcome; the other set of estimates concerns how desirable each outcome seems at present. The desirabilities of the possible outcomes weighted by their probabilities

of occurrence should govern the decision. But persons studied by Kahneman, Tversky, and other psychologists tend to have two kinds of systematic biases. First, they tend to overweight low-probability or high-probability outcomes and to underweight moderate probabilities. Second, they tend to be loss-averse: more negative about losing a certain amount of money than they are positive about gaining the same amount. The net result is that, when faced with making choices involving risk, people usually prefer to take a sure gain rather than to gamble for a greater gain (versus none). But with similar amounts at stake, they would rather pass up a sure loss in order to gamble on a greater loss (versus none).

One also has to consider a second level of decisionmaking called mental accounting. There is more than one way to frame a choice in terms of relative gains versus losses—this largely has to do with what one chooses to think of as the zero point. The way that a choice is presented, the frame built around the choice, may influence the decision. In other words, decision weights may not be robust. People do not necessarily make the same choice when faced with the same objective options framed in different ways, especially if the different frames take advantage of the biases that are built into people's ways of computing desirability and probability. For example: it is more attractive to frame property or medical insurance premiums as the cost of avoiding highly improbable but very large losses than to frame them as a sure loss taken in preference to gambling against a range of smaller to larger, mostly improbable losses. Sellers of insurance do better appealing to people's aversion to catastrophe than indicating how sums paid as premiums balance against the costs and probabilities of ordinary illnesses or accidents. The psychophysics of chance and value cause people to over value what they already have compared with what they would pay to obtain the same possessions or chances anew and to engage in anomalous spending behavior depending on how, in their own minds, they think about each expenditure: as a direct trade-off of one purchase for another; as the current cost of the item relative to a possibly higher or lower cost at another place or time; or as a net reduction in their overall assets.

DISCOVERING THE MIND AT WORK

The research covered by Kahneman and Tversky reveals an important analytical linchpin in theories on how individual choices are composed into social, political, and economic trends: the assumption of rationality as a characteristic of the sovereign consumer, autonomous citizen, or competent manager or worker. This assumption has turned into an increasingly complex field of study in itself. The final triplet of essays in this volume looks directly into the processes that constitute individual thought and complex

symbolic behavior, covering research on such tasks as calculation, visual interpretation, communication, and problem solving.

In contrast to the major significance of studies of perceptual and cognitive processes today, these research areas were little attended to in constructing the Ogburn report. It is instructive to read the chapter on education in the Ogburn report, by Charles H. Judd. Judd noted that schools were largely replacing earlier economic employment in industry or on the farm as a locus of children's activities outside the family. His report urged more scientific study of education—but nearly all the attention to research stressed the move to less formal teaching methods in lieu of recitation and rote and the use of psychological tests to assess the state of learning of the individual student. Other chapters on the family, youth, and childhood paid little attention to cognitive matters, concentrating instead on personality and child welfare.

Rochel Gelman and Ann L. Brown discuss the revisions in theory and method that have occurred in recent years in research on numerical, spatial, linguistic, and conceptual capabilities of children from infancy through school age, including the pedagogical processes by which in-school and out-of-school learning takes place—or bogs down. They place learning in the context of interaction between the growing child and the environment—initially the physical and family environment, later the school. Studies of infants and preschoolers show that innate cognitive faculties are far more sharply developed at early ages than is apparent from the limited physical capacities that infants have, and that "child's play" is more sophisticated in its use of cognitive skills than was thought. Recent studies indicate that infants have rudimentary computational abilities, appreciation of the multivalent character of objects, and a strong interest in learning about the world, and that preschoolers are "tireless explorers" and theorists who generally place high values on learning, planning, thinking, and construction of mental and physical competences.

Gelman and Brown look at a full range of cognitive matters, including the relations between quantitative reasoning, linguistic concepts, and visual perception. Advances in knowledge have resulted from a combination of methodological improvements (some using new technical devices), determination to study aspects of infant and child behavior with far more attention to detail than previously, and withdrawal from earlier theoretical presumptions that the infant's mind must be a blank slate. Modern theory proceeds from the idea that complex mental constructs do not arise from simple associative learning or prewiring in the brain, but rather from a series of active search-and-learn processes that evolve along with sets of subjective inferential principles.

A major problem for schools is to retain the natural curiosity and theory-

building capabilities of the child and turn these to the mastery of more explicit. formal bodies of knowledge through appropriate teaching strategies. Many of the standard pedagogical practices in modern classrooms—asking questions to which the teacher already knows the answer, insisting on appropriate "turn-bidding" behavior, teaching facts through nonnarrative rote and without contexts for use beyond quizzes designed to measure individual performance—differ substantially from teaching sequences the child may have experienced prior to and outside school, such as apprenticeship, free play, story or song learning, and role exchange. Gelman and Brown point out that to broaden in-school teaching methods, the character of out-of-school learning situations should be recognized and better exploited, possibly decreasing the number of children who become failure-oriented (liable to develop defensive behavior and "dumb" self-concepts that weigh heavily against success in school) rather than mastery-oriented (able to be constructively self-critical and to learn from rather than be afraid of making mistakes in the course of mastering new material).

Michael Studdert-Kennedy analyzes current understanding of the manner in which humans encode and decode words, phrases, and meaningful communications from the highly complex and variable tones of speech and motions of sign languages, and he reviews the evidence that linguistic competence, the ability to make these reversible codifications between ideas and expressions, is a distinct "module" in the brain. He describes the emergence of a new kind of research on language centering around the theoretical revolution introduced in the 1950s by Noam Chomsky. The principal result of that revolution has been to look for the faculty of language deeper within the human mind than had occurred under the behavioristic interpretation of language as something impressed on the mind as though on a blank slate, or within the descriptive tradition, dominant at the time of the Ogburn report, which was devoted to characterizing the major language groups, their evolution, and the seemingly endless variety of dialects.

The current two-level notion of language sees it as a merged product of a phonological lexicon, or cross-registry of syllabic sounds and their root meanings, and a syntactic generator, which produces as well as decodes grammatical sentences. Both levels involve repeated sampling of a finite set of rules and devices to produce an infinity of possible utterances (meaningful sound sequences). The failures in applied linguistic research after World War II to produce machines that could translate texts automatically from one language to another, read to the blind, or convert speech into written text, were highly instructive in progress toward current conceptions of language. Studdert-Kennedy reveals how the sound spectrograph permitted discovery of the complex aural interlayering of syllables in actual speech, and how studies of aphasias led researchers to the idea that language

of earlier ideas and researches, yet the breakthrough was at once a scientific and a practical achievement that went well beyond its original intentions.

Because they are embedded in social and technological change, subject to the unpredictable incidence of scientific ingenuity and driven by the competition of differing theoretical ideas, the achievements of behavioral and social science research are not rigidly predictable as to when they will occur, how they will appear, or what they might lead to. The chapters of this volume show that much has been learned in 50 years and that benefits have flowed from this new knowledge. There is in this knowledge a counsel of patience and challenge: the study of behavior and social life may be slowed or quickened, but it cannot, as Ogburn believed it could, be guided down orderly avenues of social equilibration or reform. One can expect the overall sphere of knowledge to expand; the area within it, of subjects well understood, to increase. But the expanding perimeter of subjects only partially understood is ever volatile with new kinds of data, new twists on older controversies, new ideas to be reckoned with. And beyond the realm of the known and the disputed lie far larger territories, unexplored and barely imagined.

Behavioral and social science remains an endless frontier.

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Understanding Social Change

The Ogburn Vision Fifty Years Later

NEIL J. SMELSER

The occasion for the symposium on which this volume is based was to note trends in knowledge in the behavioral and social sciences since the publication in 1933 of *Recent Social Trends in the United States*. That massive book was the report of a special committee of social scientists commissioned in 1929 by President Herbert Hoover to conduct a survey on the subject. It was a monumental undertaking, the last in a series of efforts of the Hoover administration to augment the knowledge base for social policy. My assignment is to try to capture the main vision of the report and to indicate the ways in which that vision has changed in the half-century since its publication.

President Hoover's own account of the reasons for deciding to launch the commission is terse. He spoke of the requests of "a number of interested agencies" (Myers, 1934:193), and he said that "the country [in 1929] was in need of more action in the social field." He added, however, that "our first need was a competent survey of the facts in the social field." Then, upon its completion he described it as "the first thorough statement of social facts ever presented as a guide to public policy," adding, however, that "the loss of the election prevented me, as President, from offering a program of practical action based upon the facts" (Hoover, 1952:312).

Hoover's account reveals his engineering view of social life: first the facts, then application based upon the facts. Later I will show how closely this mentality corresponded to that of the Ogburn committee itself.

READING THE OGBURN COMMITTEE REPORT TODAY

As indicated, my main task is to interpret the broad vision of the Ogburn committee report[1] and the subsequent vicissitudes of that vision. I should like to begin, however, by reporting a few reflections that occurred to me while plowing through the 39 chapters and 1,568 pages of the report.

First, some things apparently never change. In a chapter on "Recreation and Leisure Time Activities," J. F. Steiner (President's Research Committee on Social Trends, 1933:931) assured the reader that

> football can hardly be regarded as a passing fad which will soon give way to something else. The huge investments in stadia, which must be paid off in future years, make almost inevitable the continual approval of the game by college administrative authorities. Its capacity to generate gate receipts and its value as an advertising medium are assets that cannot be ignored.

In his chapter on "Education," Charles H. Judd quoted with approval Henry Pritchett's condemnation of the consequences of competition in sports (p. 377):

> Every college or university longs for a winning team. . . . The coach is on the alert to bring the most promising athletes . . . to his college team. A system of recruiting and subsidizing has grown up. . . . The system is demoralizing and corrupt . . . the strict organization and the tendency to commercialize the sport have taken the joy out of the game.

Second, and in like spirit, there were many other statements that also might have been written today, even though we know how much things have changed in 50 years. In one of the chapters, entitled "The Activities of Women Outside the Home," S. P. Breckinridge concluded that "women's role in the American community has undergone redefinition during the past thirty years" (p. 709). She mentioned industrial advances, the rise of specialized services, and the decreased size of the family as having eliminated many of women's household activities. As a result, she noted that "large numbers of women through necessity or choice are seeking a new place in the economic system." Moreover,

> the shift is not being made without revolutionary changes in attitudes with regard to women's responsibilities under the changed surroundings of their lives. Their new position . . . is giving women a share in the entire life of the community.

Third, and with the aid of historical hindsight, the reader cannot fail to

[1] The report was identified with the name of Ogburn even at the time of its publication (Duffus, 1933).

notice some obviously slighted topics. The committee acknowledged that the Great Depression of the time "is not explained," though apprehensive mention of its ravages appears from time to time. A generous interpretation of this is that the Great Depression struck only a few months before the committee was formed, and that the committee was as confused as the rest of the nation by the tragedy. Also, many ideas (Keynes's theory of unemployment) and measuring techniques (national economic accounts), helpful in understanding depressions, were not yet invented. In addition, however, the Depression was the largest political issue of the day, and Ogburn was insistent on presenting facts neutrally and avoiding politically sensitive issues, whether by temperament or out of deference to the President.[2]

The same reason might account for the virtual absence of materials on race and ethnic relations—though one chapter dealt with racial conditions—which seems surprising in light of the presence on the committee of Howard Odum, the day's leading sociologist of the South. It is inconceivable that such a report could be written today without major attention devoted to racial and ethnic issues. In addition to the possibility that race and other controversial areas were soft-pedaled, it should be remembered that race relations were then still largely regional rather than national, that the political mobilization of blacks was in its infancy, and that neither politicians nor social scientists had begun seriously to challenge the racist foundations of American social life—all of which would contribute to the low visibility of racial problems.

THE OGBURN VISION OF SOCIAL PROCESS

One reviewer of *Recent Social Trends* remarked that "the Committee findings are so unified and eloquent as to give the impression of single authorship" (Mallery, 1933:211). That authorship was largely Ogburn's. It is remarkable to observe the degree to which he dominated the committee report. Its main statement echoes his perspectives and theories published earlier and later, and the chapters by others frequently echo those perspectives and theories. It is generally fair, therefore, to treat the report as manifesting the Ogburn vision of the social sciences.

How best to characterize this vision? It is a view that begins with the identification of social anomalies and problems that arise through irregular

[2]On this subject, and on Ogburn's conflicts with fellow committee members Wesley Mitchell and Charles Merriam on the question of the independence of the committee from presidential involvement, see Harold Orlans (1982) and Barry D. Karl (1969, 1974). Among the chapter authors, Robert Lynd broke most conspicuously from Ogburn by insisting on stressing normative and political issues.

social change and ends with the informed amelioration of the anomalies and the consequent improvement of society.

It is possible to produce a graphic representation of what I have extracted as the main ingredients of that vision:

Social change (discontinuity and lags)	→Social problems	→Documentation by objective facts	→Social invention	→Application by policy change	→Social amelioration

Each ingredient leads to the next, and thus constitutes a more or less articulate theory of change. In the remainder of my remarks I intend to take up each ingredient (as well as the transitions between the ingredients) and present a capsule statement of the committee's view, then indicate how that view has altered over the decades, mainly as the result of ongoing social science research and theory development.

SOCIAL CHANGE

One of Ogburn's most notable contributions as a social scientist is the notion of "cultural lag," which enjoyed great influence in the social sciences for a long period and is still important in the literature on social change (Ogburn, 1922). The kernel of this theory finds expression early in the report itself (p. xiii):

> Not all parts of our organization are changing at the same speed or at the same time. Some are rapidly moving forward while others are lagging. These unequal rates of change in economic life, in government, in education, in science, and religion, make zones of danger and points of tension.

More particularly, Ogburn saw changes in technology as well as economic and governmental organization leading the way of change in modern times, with the family and church having declined in social significance.

The image of society evoked by this notion is what sociologists call "the functionalist view," namely, that the different parts of social organization stand in systematic—whether harmonious or disharmonious—relationship to one another, and that changes in one call for changes in another. This view of society, in various forms, dominated a number of the social sciences for several decades and still represents a major theoretical position. Subsequent research and theory development, however, have demonstrated it to be both overdrawn and incomplete. Comparative research on the relationships between economy and family, for example, have demonstrated that even in the face of very rapid industrialization, some traditional family forms, far from being "zones of danger and points of tension," persist and

even facilitate economic development through recruitment and other mechanisms. The Japanese family is the classic case in point. The implication of this kind of research is that the notion of "fit" among the various parts of society is weaker than the functionalist view would imply, and that many more diverse combinations of structures are possible. A second line of criticism and reformulation runs as follows: It is not so much the "fit" or "misfit" between different structures that account for pressures for persistence and change as it is the power positions of groups or classes with vested interests and the outcomes of political struggles among these groups. This second line of development is seen as exposing and correcting for the political naiveté, if not conservatism, of the functionalist position.

SOCIAL PROBLEMS

According to the Ogburn vision, social problems emerge as manifestations of objective social situations—i.e., discontinuities and lags. For example, the automobile, a material advance, generated an outward drift of the population into suburban areas; the consequent problem was that the central districts were "left to the weaker economic elements and sometimes to criminal groups with resultant unsatisfactory social conditions" (President's Research Committee on Social Trends, 1933:xlii). In another example, the committee attributed increasing divorce rates to the fact that the family had fewer economic and other functions, which weakened personal ties among its members.

In the ensuing decades social scientists have become more sophisticated in their understanding of what constitutes a social problem. We now see that social problems emerge as a complex process of interaction between "objective" social conditions, the criteria people bring to bear in evaluating those conditions, and the success or failure of efforts of interest groups to push their particular criteria forward. Consider another example from the report. In their chapter on "The Population of the Nation," Thompson and Whelpton brought up the topic of the quality of the population. They argued that the differential birthrate among the social classes had resulted in "some deterioration in the biological soundness of the national stock" (a social problem). Their position on this matter was simply that "as soon as any agreement can be reached about the method by which 'undesirables' can be selected from the population, they should be prevented from propagating" (President's Research Committee on Social Trends, 1933:56). We would now regard this view as hopelessly naive. The quality of the population is not some kind of objectively given problem. It is a problem for some (eugenicists) and not a problem for others (the right-to-life movement) because the ideological priorities of the two groups—in the name of which

problems are identified—are different if not contradictory. Whether the quality of population gets officially identified as a social problem calling for action depends on the outcome of a political struggle among these and other interested groups in society.

Social problems, then, can be defined by the presence of "objective facts" only if there is consensus about the meaning and significance of those facts. The Ogburn committee, in regarding social problems as the objectively determinable result of objectively observable lags and discontinuities, was, in effect, imposing a kind of imagined consensus on society. That kind of consensus rarely exists. We now know that social problems are not matters of objective fact but matters of an uncertain, disputed set of both facts and principles. Recognizing this, we can appreciate why such a large proportion of the debates about social problems are debates *not* about the existence of facts but about symbols, about the legitimacy of the competing sets of criteria by which a factual situation will or will not qualify as a genuine social problem.

DOCUMENTATION BY OBJECTIVE FACTS

In his introduction to *Recent Social Trends*, Herbert Hoover spoke of his desire "to have a complete, impartial examination of the facts" in the report. In a way this phrase encapsulates the mentality of the social sciences in the early twentieth century—the acme of positive science, which regarded empirical facts as objective things, waiting to be observed, recorded, and quantified. This mentality manifested itself in a variety of different ways. To name a few:

- the pioneering efforts to develop measures in psychology and education, including the work of Thurstone on measurement of attitudes and Terman on the measurement of intelligence.
- the reaction of the institutional economists (among them Veblen and Commons) against what they regarded as the abstract, disembodied theory of classical economics; as part of this polemic they insisted on the empirical study of economic life in concrete institutions.
- in anthropology the reaction of the diffusionists (especially Boas) against classical evolutionary theory, and their insistence on detailed, empirical studies of the movement of cultural items and artifacts from culture to culture.
- Ogburn's own dismissal of classical evolutionary theory as speculative and wrong,[3] and his insistence that the study of evolution must rest on the

[3]Ogburn wrote that the theory of "the inevitable series of stages in the development of social institutions has not only not been proven but has been disproven" (Ogburn, 1922:57).

"actual facts of early evolution" (Ogburn, 1922:66). Ogburn (1929) celebrated the rise of scientific social science in his presidential address to the American Sociological Society in 1929, stressing its emphasis on objective measurement, verification and truth, and its separation from methods in other areas such as ethics, religion, education, and propaganda.

Not everybody found comfort in this position. Pitirim Sorokin, sociologist at Harvard, in a savage review of *Recent Social Trends* in 1933, bemoaned what he called "holy and immaculate quantification":

> In the future some thoughtful investigator will probably write a very illuminating study about these "quantitative obsessions" of a great many social scientists, psychologists, and educators of the first third of the twentieth century, tell how such a belief became a vogue, how social investigators tried to "measure" everything; how thousands of papers and research bulletins were filled with tables, figures and coefficients; and how thousands of persons never intended for scientific investigation found in measurement and computation a substitute for real thought. . . .[4]

Be that as it may, Ogburn's preference for stressing objective facts, apart from opinions and value judgments, held sway in the report itself. The chapters and monographs, the committee said, "present records, not opinions; such substantial stuff as may serve as a basis for social action, rather than recommendations as to the form which action should take" (President's Research Committee on Social Trends, 1933:xciv). The contributors, moreover, were "bound strictly by the limitations of scientific methods," and if they occasionally strayed beyond these limitations the reader could see clearly when they were giving their own opinions (p. xcv).[5]

Even at the time, this "factual-statistical" representation of the world was regarded by others besides Sorokin as wanting. Adolph Berle, a member of Franklin D. Roosevelt's brain trust, commented that the report "has the barrenness of . . . statistical measurement . . . the desire for objectivity has been carried entirely too far." And Charles Beard, the historian, remarked that "the results [of this report] . . . reflect the coming crisis in the empirical method to which American social science has long been in bondage" (Orlans, 1982:9). And in the decades since the acme of Ogburnian positivism we have come to view the world of empirical facts not so much

[4]Throughout his review Sorokin assaulted the Ogburn committee report for its multiplication of meaningless quantitative tables and citations. In a rejoinder Ogburn countered with the assertion that "only one-tenth of the space is taken up with tables," a statement that constitutes a kind of ironic confirmation of Sorokin's plaint.

[5]Ogburn wrote a short methodological "note" on the necessity to separate facts and opinions sharply from one another, but this was not published as part of *Recent Social Trends*, probably because not all of the members of the committee subscribed to his position (Bulmer, 1983).

as a realm of observable and measurable things but rather more as the purposeful creation of human agents and investigators. This realization, moreover, has resulted from developments both at the level of theory and of empirical research. At the theoretical level, early critics of positivism, such as Talcott Parsons (1937), argued that facts could not be viewed apart from the conceptual framework by which they are evoked. In his influential work on the history of science, Thomas Kuhn (1970) argued that both scientific facts and scientific knowledge are relative to the kinds of paradigms invented and employed by scientists. And more recently critics like Jürgen Habermas have hammered away at exposing the ideological and political foundations of "objective science." The cumulative effect of these kinds of intellectual development has been to effectively erode the positivist dream of the early twentieth century.

At the level of social research our assessment of "facts" has also become more sophisticated. The dominant approach, of course, is still that the behavioral and social sciences are *empirical* sciences above all, and we have improved our measurement techniques and data bases enormously. But social scientists no longer conceive, as a Durkheim or an Ogburn might have done, of the crime rate as a "social fact" to be observed. We know, on the basis of empirical research, that a "crime rate" is a vastly different phenomenon, depending on whether the investigator consults police records, observes police in action, asks people whether they have ever been victims of crimes, or whether they have ever committed crimes. We know also that every one of these measures is defective in different ways.

We know that there is no such "thing" as public opinion, which can be measured scientifically by randomly sampling a portion of the population and interviewing them on a given set of issues. Research has shown that results of such surveys vary significantly depending on how the questions are asked, what kinds of people do the asking (whites or blacks, men or women, investigators dressed in suits or investigators dressed in dirty jeans), and how people distort their responses on sensitive issues (such as how much they smoke, drink, or use drugs) (Cannell and Kahn, 1968). We have also come to acknowledge that certain ideological assumptions or biases are built into some of the measures we use. For example, the fact that, in the sample survey, we give equal weight to all respondents in analyzing data reflects a kind of "democratic" assumption that each person's voice counts as much as another's—an unrealistic assumption given what we know about actual patterns of participation, influence, and power, even in democratic societies; it is the (perhaps unwitting) translation of the electoral principle of a democracy into a "one-person, one-response" assumption.

Interestingly, these kinds of acknowledgments make simultaneously for both greater humility and greater sophistication on the part of social in-

vestigators. We are cognizant of the many sources of measurement error that are generated in the creation and study of social data and in its assessment by investigators (Turner et al., 1984). By the same token, however, investigators are now equipped systematically to take measurement errors into account when representing and statistically manipulating data, by using techniques that would not come to mind within a simple positivistic perspective.

SOCIAL INVENTION

According to the Ogburn vision (President's Research Committee on Social Trends, 1933:lxxi) the massive accumulation and description of social facts can reveal the broad range of social problems generated in a society undergoing rapid and irregular social change. These problems, moreover, "can be solved only by further scientific discoveries and practical inventions."

The imagery of a scientific invention—as well as its application—pervades the Ogburn vision of social reform and the amelioration of social problems. In the chapter on "The Influence of Invention and Discovery," Ogburn and S. C. Gilfillan wrote that "there are social inventions as well as mechanical ones, effective in social change" (p. 162). They gave as examples the city manager plan, group insurance, installment selling, the passport, and universal suffrage.

The committee (1933:lxxiv) envisioned the need for a massive effort in the field of social invention:

> If one considers the enormous mass of detailed work required to achieve the recent decline in American death rates, or to make aviation possible, or to increase per capita production in farming, one realizes that the job of solving the social problems here outlined is a job for cumulative thinking by many minds over years to come. Discovery and invention are themselves social processes made up of countless individual achievements.

Read today, this link between knowledge about social problems and social invention appears somewhat mechanical and politically naive. First, little attention is given to the exact mechanism that provides the transition between the accumulation of knowledge and social invention. In his presidential address to the American Sociological Society in 1929, Ogburn (1929:5--6) outlined a simple model. Science, he said, is an accumulation of thousands of verified "bits and pieces of new knowledge." He envisioned that this would occur through careful, patient, and methodical work, much of which could and would be carried out by "dull and uninteresting persons." Once in a while, "one of these little pieces of new knowledge

becomes of very great significance, and it is then called a great discovery or a great invention." Ogburn predicted that when the social sciences became truly cumulative, all social scientists would be statisticians, and social theory "will have no place in a scientific sociology, for it is not built upon sufficient data."

This account of what constitutes a scientific discovery does not square with our more contemporary understanding. We appreciate that the "very great significance" of an empirical finding derives from the fact that it demands a substantial change in the way we formulate our general understanding of the world—in short, in the way we formulate theory. Typically a "discovery" is the verification of findings that cannot be accommodated by an accepted scientific framework. Or, alternatively, a "discovery" involves a reformulation at a theoretical level, such that heretofore unrelated empirical findings can be related to one another and explained within a new framework or by a new principle. Put another way, scientific discovery always involves a *relation* between empirical findings and theoretical formulation, not an accumulation of empirical findings (Kuhn, 1970).[6]

Furthermore, with respect to "social inventions" a different set of processes needs to be invoked. Consider the social invention of universal suffrage—one of Ogburn's examples. It *is* an invention in the sense that it is a contrivance designed to facilitate the operation of the democratic process. But the role of knowledge in the crystallization of such an invention is a limited one. Much of the "knowledge" involved has not been scientific in the sense of having been proven or verified; it has been more in the nature of lore associated with democratic philosophies, which takes the form of assumptions about the workings of political influence and power. Furthermore, the dynamics of the invention were not the dynamics of assembling knowledge so much as the historical struggles of different kinds of classes and groups for access to the political systems of democracies.

More generally, social inventions appear to be the invocation of established or imputed knowledge *in relation to* some desirable social goal or social value. Consider the historical "invention" of desegregated education by the United States Supreme Court in *Brown v. Board of Education* in 1954. In that decision, justices cited a wide variety of social-science findings to the effect that separate facilities engender feelings of inferiority in blacks.

[6]For an earlier statement of the relations between empirical findings and theory in the social sciences, see Robert K. Merton's two essays, "The Bearing of Sociological Theory on Empirical Research" and "The Bearing of Empirical Research on Sociological Theory" (Merton, 1968:139–171).

But as Judge David Bazelon (Eisenberg, 1969:374) argued, reliance on these findings might have misstated the true basis for the case:

> In 1896 the court had approved the "separate but equal" doctrine. While the country might then have lacked the sophisticated studies available in 1954, any honest person would have conceded at the time of *Plessy v. Ferguson* that segregation undoubtedly would have made Negroes feel inferior. The assumption of inferiority was the rationale for the practice; no black man could help but perceive that separate train cars and separate schools kept him in his place.
>
> Since we already knew what Kenneth Clark and others told us, the public could justly ask of the Supreme Court in 1954, why the law had changed. The answer, of course, was that our values had changed. *Plessy v. Ferguson* was discarded not because social scientists told us that segregation contributed to feelings of inferiority, but because by 1954 enough people in this country believed what they did not in 1896—that to thus insult and emasculate black people was wrong, and intolerable, and therefore, a denial of the equal protection of the law to blacks.

In the area of social inventions, as in other areas, the committee's insistence on the neutrality of scientific knowledge and on its separation from matters of opinion involved a cost. In this case the cost was to miss a great part of the intricate interplay between knowledge—whether imputed or established—and the political and cultural dynamics of society.

APPLICATION BY POLICY CHANGE

Toward the end of its main report, the committee (p. lxxiii) noted with approval the "increasing penetration of social technology into public welfare work, public health, education, social work and the courts." In addition, it called for the formation of groups through the Social Science Research Council to bring technical advice to decisionmakers, and perhaps the formation of a national advisory council to focus on "the basic social problems of the nation."

We have seen, in the discussion immediately preceding, that to invoke the imagery of technology in the formation of social policies is both limiting and misleading. The same can be said when that imagery is carried over to the implementation of social policies. Two observations are in order on this score.

The first has to do with the adequacy of knowledge in the name of which policies are implemented. The putative knowledge cited in the *Brown v. Board of Education* case was that integrated school facilities would lead to a decrease in feelings of inferiority on the part of blacks. Scores of studies on the self-esteem of black children in diverse settings tell us that so many contingencies affect self-esteem—class, neighborhood, the behavior of individual teachers, the fortunes of the movement to improve conditions for

blacks in the larger society, to name a few—that it is impossible to posit a single, direct link between type of schooling and the self-esteem of its pupils (Smelser and Smelser, 1981). Speaking more generally, most scientific knowledge of all sorts is organized in the form of contingent predictions, that is, connections between variables (such as government deficit-spending and rate of inflation, or type of educational arrangements and self-esteem), with other things held constant. This is the way knowledge is generated—by holding various factors constant, whether by experimental or statistical manipulation, in order to establish precise causal linkages. But in the ongoing flow of social life, other things are not constant, and precise prediction of consequences is impossible because of the interaction among multiple forces.

A second complexity arises through the fact that any kind of policy, when implemented, is likely to generate a variety of unanticipated side effects, not all of which are predictable or likely to be beneficial. Consider only one example, that of attempting to ameliorate the incidence of suicide in society. One feasible policy would be to attack intensively the social conditions of certain high-risk groups, such as the elderly, with the aim of reducing feelings of isolation, desertion, and despair. In implementing this kind of policy, a community might embark on a program of establishing senior citizen clubs as social centers, and making individual agencies, such as suicide prevention centers, more available to them. Integrating the elderly into more meaningful social communities might decrease the incidence of suicide. But in addition, it might facilitate the formation of more definite political groups among the elderly, which are traditionally antipathetic to educational programs that call for the passing of school bonds, as well as to community health programs such as the fluoridation of drinking water—to programs, that is, that represent the implementation of *other* social goals, usually considered also worthy by the planners sponsoring the suicide-prevention efforts. Knowledge of the diversity of consequences of different programs may in fact result in more intelligent setting of priorities in planning. In any event, it provides a different and better model for planning than that of the direct application of bits of knowledge toward the solution of specific problems.

SOCIAL AMELIORATION

The last link in the chain of social process is the ultimate impact of knowledge on society's welfare. As indicated earlier, the committee (pp. xlii–xliii) was apprehensive about the trend toward higher divorce rates in American society; "our culture may be conducive to further increases in divorce unless programs are instituted to counteract this tendency." The

problem arising for society is "how . . . to make marriage and the family meet more adequately the personality needs and aspirations of men and women and children." And in pointing the way to dealing with such a problem, the committee once again turned to the importance of knowledge: "the study of marriage and divorce may not only aid in stabilizing the family but may also help us on the road to happiness."

My comments up to this point should indicate how many unstated, unacknowledged, *and* contingent steps there are between the objective study of a social state of affairs and its improvement. But it should also be pointed out that "happiness" or improvement as a consequence of purposive planning and programs is itself a contingent matter. Just as the Ogburnian vision of what constitutes a social problem rests on the committee's imagined consensus on values, so does its notion of amelioration. In areas where widespread consensus on values obtains in society—for example, the health of the population—programs like mass immunization are likely to be uncontroversial and widely regarded as ameliorative. When, however, such consensus is lacking, one group's amelioration is another group's deterioration. Even the Ogburn committee's invocation of the value of "family stability" as a consensual matter could be and has been challenged by those committed to communal and other arrangements believed to be superior to the traditional family. When consensus is lacking, moreover, debate comes to focus not only on the consequences of programs but on the relative legitimacy of the competing cultural values by which we judge those consequences. In this respect, the assessment of consequences is as deeply embedded in the political and cultural dynamics of a society as is the identification of social problems.

A CONCLUDING NOTE

We end with a kind of paradox. Even though the Ogburn report seeks legitimacy mainly from the framework of positive science, its vision of the social process is characterized by a number of items of faith: faith in the capacity of objective knowledge to identify social problems, faith in the capacity of cumulative knowledge to result in social inventions, and faith in the capacity of those inventions to solve the social problems. That particular set of faiths permitted the committee to be simultaneously naive and pretentious—at least as judged by our contemporary understanding—about the role of the behavioral and social sciences in social policy. The same set of faiths permitted the committee to define social and behavioral scientists as simultaneously disembodied from the political process and essential ingredients to that process. Such are the paradoxical consequences of the positivist-utilitarian view of the relations between science and society.

Today I believe we would acknowledge the tremendous importance and utility of the social sciences in the social and political life of the nation. In its first report (Adams et al., 1982), the Committee on Basic Research in the Behavioral and Social Sciences acknowledged this and pointed to three areas in particular: technical contributions in the information-generating process, such as sample surveys and standardized testing; changes in the way we do things, such as administer therapy, predict economic trends, and run organizations; and changes in the way we think about things such as poverty, race, social justice, and equity in society. Yet the present committee, mindful of the kinds of complexities and contingencies that have been touched upon in this discussion, regarded these not as utilitarian applications of bits of scientific knowledge, but rather as arising from and intertwined with the social purposes and cultural aspirations of the nation as a whole. As a result of change in our thinking about the relations between science and society, I believe we have become, paradoxically, both more sophisticated in our research design and measures and less pretentious in our aspirations than we were 50 years ago.

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Measuring Social Change

ALBERT J. REISS, JR.

INTRODUCTION

Surely among the most influential models of social change was that developed by William Fielding Ogburn (1922b). Ogburn described a process of invention followed by cultural change, followed by social disorganization, and finally social adjustment (Ogburn & Nimkoff, 1940:877). Ogburn concluded that public policies and interventions meant to guide modern social change would depend heavily upon the development of a unified national statistical system to collect and process information about social trends (Ogburn, 1929:958). Although Ogburn's vision of a unified statistical system has not been realized, he may well have regarded this as but a lag in adjustment to which all inventions give rise.

This essay does not attempt to assess systematically Ogburn's (1922b) theory of social change, his contributions to our understanding of social trends (1928–1935, 1942), or the development of statistical systems (Ogburn, 1919; President's Research Committee on Social Trends, 1933). But it draws heavily upon that vital heritage. Three major questions are addressed: (1) How do inventions, especially those of the behavioral and social sciences, affect social changes and adaptations? (2) How do social changes affect measurement? And, (3) How do contemporary behavioral and social science models, concepts, and methods affect our understanding of society and how it changes?

SOCIAL INVENTIONS

In Ogburn's view, inventions, particularly mechanical ones, are the source of all cultural growth and evolution. Inventions also cause disruptions in

related parts of culture and in social organization, necessitating adaptations and adjustments. But these adjustments take time, and Ogburn therefore called them cultural lags, noting that "Over the long course of social evolution, measured in thousands of years, cultural lags are invisible. At any particular moment, however, they may be numerous and acute" (Ogburn in Duncan, 1964:30).

Although Ogburn emphasized that social inventions can cause social change (1934:162), his theory and his own work gave priority to mechanical inventions (1922b:76–77; Ogburn & Nimkoff, 1940:809–810).[1] This benign neglect of social inventions is coupled with Ogburn's firm conviction that the behavioral and social sciences can shorten cultural lags. Nowhere did he summarize this belief better than in his chapter on invention in *Recent Social Trends* (President's Research Committee on Social Trends, 1933:166):

> Society will hardly decide to discourage science and invention, for these have added knowledge and have brought material welfare. And as to the difficulties and problems they create, the solution would seem to lie not so much in discouraging natural science as in encouraging social science. The problem of the better adaptation of society to its large and changing material culture and the problem of lessening the delay in this adjustment are cardinal problems for social science.

Ogburn concluded an essay on trends in social science with these observations (1934:262):

> The greatest obstacles to the development of science in the social field are complexity of the factors and the distorting influence of bias. These are formidable, but certainly the trends of the present century are most encouraging, and we may look forward, because of social science, to a greater control by man of his social environment.

The relatively lesser emphasis that Ogburn placed on the role of social as compared with material technology persists to this day. Even social and behavioral scientists tend to overlook their role in processes of social change. In fact, it is quite plausible that social inventions, especially those of the behavioral and social sciences, are a major cause of change, as well as key elements in society's adaptation to change. The selective perception that limits recognition of the role of behavioral and social science inventions may indeed count as a cultural lag.

[1] Ogburn's interest in social inventions, their effects, and lags in adapting to them preceded the writing and publication of his classic study, *Social Change* (1922b). His doctoral dissertation (1912) was on child-labor legislation. While teaching at Reed College in Oregon, he became interested in the initiative and referendum as methods of direct legislation (1914, 1915). Still later, he was interested in the consequences of women's suffrage (Ogburn & Goltra, 1919). As Duncan concludes, however, this early interest in social inventions arose, in part, from political sympathies with social problems and reforms.

Underlying the major themes for this first section is a speculation that the relative contributions of the respective sciences and technologies to social change are altering substantially. Modern societies have come to depend heavily on the behavioral and social sciences and their technologies and cannot run without them. As material technology replaces labor, nonmaterial technology may come to dominate social change, if it has not already done so.

Major Social Inventions and Their Consequences

Ogburn was fascinated by the effect of what he distinguished as major technological inventions such as the ship, the airplane, the internal combustion engine, and the elevator. He also devised lists of significant social inventions (1934:162), such as the minimum wage law, the juvenile court, Esperanto, installment selling, and group insurance. Yet he apparently never attempted to differentiate between social and behavioral inventions with potentially major versus those with more limited or minor effects. Some social and behavioral science inventions, nonetheless, have had such significant and widespread impact that one cannot imagine modern democratic societies operating without them. Two such inventions, noted in the first report of the Committee on Basic Research in the Behavioral and Social Sciences (Adams et al., 1982) are singled out here: human testing and sample surveys.

Human Testing Ogburn (1950) generally attributed invention to three fundamental causes: mental ability, social demand, and the accumulation of cultural elements from which inventions are fashioned. To pinpoint the origins of a particular invention is not a simple task, given the multiplicity of able minds, the variation in the sources of demand, and the different patterns that elements of the cultural base may take.

The invention of human testing is usually attributed to a nineteenth-century scientific interest in the study of individual differences. The history of tests of distinctly mental abilities is better documented than other major forms of human testing (Wigdor & Garner, 1982). Tests of mental abilities derived from psychologists' attempts to understand differences in intelligence among individuals. Galton (1869) first devised a series of sensory discrimination tests to shed light on individual differences, followed by Cattell (1890) and others who developed batteries to test sensory and motor abilities. But it was a demand within the French Ministry of Education, to distinguish subnormal from normal children in Paris schools, that led Binet, in collaboration with Simon (1905), to introduce the concept of mental age and scales to measure it.

Ogburn often noted that inventions diffuse more readily where there is a demand for them; the Binet-Simon scale diffused quickly. The test was translated into English by Goddard in the United States in 1908, into Italian by Ferrari in 1908, and into German by Bobetrag in 1912 (Klineberg, 1933:323). Translation was followed by revision, such as the Stanford-Binet test published by Terman and his collaborators in 1916 (Klineberg, 1933:324).

Although testing has been important to the conduct of research and was a product of psychological laboratories, its development and invention have been highly responsive to social demands arising outside the laboratory, initially by the public schools to sort children and somewhat later by the U.S. Army to screen World War I draftees. Testing is now at least as consequential for the major operating organizations in industrial societies as for the conduct of research. The testing industry is integral to four major organizational tasks: (1) *selection* of persons as employees or clients; (2) *classification* of employees or clients according to organizational tasks; (3) *assessment* of human performance within organizations; and (4) *assessment of the "human output"* of organizations.

Ogburn distingushed primary from derivative effects of invention. Since societies and their organizations do not systematically collect and process information about such effects, even less so for social than mechanical inventions, it is far easier to identify qualitatively than to document the quantitative impact of the invention of human testing. The primary effects are clearly on employment and the management of organizations. Testing occupations generate substantial employment in the U.S. Civil Service, the Armed Forces, public and private school systems, and in large private industrial firms, most of which employ testing extensively in at least one of the four organizational tasks mentioned above, as well as in the development, production, and marketing of tests themselves.

Public controversy and litigation may surround the use of testing in organizational management. Because many organizations base selection and promotion on testing, test information can be influential in legal proceedings. The testing industry has been challenged to produce different kinds of tests as a consequence of such litigation. The courts have played a substantial role, for example, in structuring tests for selecting and promoting women and minorities in police and fire departments.

Derivative effects of behavioral and social inventions include the spur they often provide to mechanical inventions. The first high-speed printer (essential for modern computers) was developed for a scoring machine by the educational tester Lindquist. In the highly competitive educational achievement testing industry, the rapid scoring and delivery of test results to schools was critical to market shares. As this example illustrates, social

invention and mechanical invention are seldom independent of one another. The design of modern control systems necessarily involves both human performance measures and technological components. The displacement of humans by computerized robots is also a replacement of some human skills by other human skills. The machine's displacement of manual or mechanical labor moves the labor force toward the cognitive skills that are most distinctively human.

It seems no exaggeration to estimate that the average person in an industrial society encounters the products of the testing industry virtually every year for the first two decades of life and in many cases for much of his or her career. Even where not subject to standardized tests, occupational life is controlled by elementary concepts of ability and achievement developed in testing. Increasingly, testing concepts enter the debate over major issues in society, such as the recent controversy over merit pay for teachers—especially whether merit can be based on testing teacher performance.

Aside from the considerable effect on every other sector of society, the invention of testing precipitated many new inventions in statistics and other behavioral and social sciences. These inventions have significantly affected the conduct of research, and the results of that research have in turn affected society. The early testing of intelligence and mental abilities led to Spearman's attention to the reliability of measures and his positing of the G factor in intelligence (Spearman, 1904); this development gave rise to factor analysis, especially with Holzinger's (1930, 1931) development of the bifactor method (through a study with K. Pearson and collaboration with Spearman, 1925). A variety of statistical factoring methods were soon invented as the concept of intelligence changed with empirical testing, including multiple-factor methods (Thurstone, 1931, 1935) and principle component methods (Kelley, 1928, 1935; and Hotelling, 1933). As factor analysis was extended to other human traits and characteristics, e.g., human emotions (Burt, 1915, 1939), attitudes, and opinions, awareness of its limitations led to statistical inventions for discerning latent structures (Guttman, 1950; Lazarsfeld, 1950, 1954, 1967; Rasch, 1968, 1980) and statistical interactions (Goodman, 1970).[2] These analytical innovations have shaped theory and hypothesis testing in behavioral and social sciences and,

[2]The history of social science inventions should become an important part of any sociology of knowledge as well as being integral to the study of social change. The ways that demand shapes intellectual agendas is not well understood. Consider the fact that Lazarsfeld undertook his work on latent structure analysis and Guttman on scale analysis in connection with research for the Research Branch of the Information and Education Division of the U.S. War Department in World War II.

as Holzinger noted in 1941, have had major applications in physics, medicine, and business forecasting (1941:5).

Sample Surveys Modern sample surveys rest on early inventions. The principles of random selection, objective probability, and stratified random sampling are well over a thousand years old (Duncan, 1984:iv). Survey modes of data collection also have been around for a considerable time. But the coalescence and systematization of these inventions into the modern stratified probability survey of a population are a product of modern behavioral and social science, coming mostly within the last 50 years.

As in the case of testing, there is a dearth of data to assess the effects of this invention, particularly its role in social change. Yet, we can plausibly argue that, except for institutional data collected as a by-product of organizational routines, the sample survey has become the major mode for linking action to intelligence in modern democratic societies. Even news organizations do not any longer claim to speak for the aggregate except in a metaphorical sense; but the opinion poll is accepted as doing so.

It is difficult to trace all of the ways that the sample survey has come to dominate organizational and individual decisions and operations. A few examples are offered simply to illustrate how pervasive it has become and how instrumental it is in changing behavior.

Perhaps nowhere has the invention of sample surveys altered the pattern of activity as much as in American electoral politics. Despite an abundance of skepticism about candidate and opinion polls, no candidate runs for major political office without a private polling operation. Media coverage of elections compares candidates in terms of their poll status; legislative and executive action is responsive to poll information; and political issue and candidate polls are a substantial American industry.

A second major area where surveys dominate is in providing intelligence for government decisionmaking. Much of the information for operating the government comes from sample surveys. The IRS, for example, has used sample surveys in its Audit Control Programs since 1948, and as an established part of its Taxpayer Compliance Measurement Program (TCMP) since 1962 (Long, 1980:55). These surveys of tax returns and filing compliance in the general population have become a principal means for the IRS to set its enforcement strategy. Major short-term policy indicators on unemployment and the cost of living are based wholly or in part upon sample surveys. The Survey Division of the Bureau of the Census has become one of its largest, quite apart from many other divisions within the bureau also operating sample surveys or collecting information through them. The Current Population Survey annually reaches about 1 in 1,000

households. No organization of any size remains unsurveyed by some government organization (though not always by sample surveys).

A third major area for sample surveys is marketing. Market research may be the dominant sector in sample surveying, surpassing the resources allocated to surveys by governments—though data for precise comparisons are lacking.

There are several kinds of market research. Sample surveys affect product development and sales strategies. They locate territories or populations for marketing a particular good or service. Surveys estimate the demand for new products or satisfaction with existing ones. The mass media, which rely on sample surveys for news, rely even more heavily on them for market information. No industry is more sensitive to the sample survey than television, in which ratings of network programs determine advertising revenues and the fate of writers, producers, and stars.

As a fourth major consequence, the sample survey has become the major means of developing social indicators in postindustrial society. Sample survey information is aggregated into indicators in two different, albeit related, ways. Surveys are used cross-sectionally—at a point in time—to evaluate relative performances or outputs, as in the Nielsen ratings of television programs, or to compare electoral candidate strengths. Social indicators are also used to forecast, monitor, control, or respond to the course of change over time. For example, the monthly Current Population Survey estimates unemployment, residential tenure, and vacancy rates; the semiannual National Crime Survey examines victimization rates; the Annual Housing Survey reports characteristics of housing units; and the National Health Survey examines illness, use of health care services, and health-related expenditures.

Sample surveys are also important in applied social science research, especially by nonacademic organizations. Not only has evaluation research become a substantial private industry, but major organizations such as the Armed Forces have developed a considerable in-house capability for sample surveys; it has been said that the most surveyed population in the world is the Armed Forces of the United States; certainly the American soldier in World War II served the most surveyed military in history (Stouffer et al., 1950).

Finally, the sample survey is one of the major methodological foundations of the modern behavioral and social sciences. Despite widespread use in government and by profit and nonprofit organizations, major innovations and inventions in sample surveying continue to stem mainly from the academic social science community. Exceptions occur, primarily in the development of efficient means of surveying, such as computer-assisted telephone interviewing (CATI); yet even when such innovations occur outside the

academic community, assessment of their utility and continuing innovation generally moves within it.

This brief review of the pervasive effects of two major behavioral and social science inventions—human testing and sample surveys—illustrates their major impact on patterns of life in modern societies and draws attention to the possibility that the relatively lower scientific prestige of the behavioral and social sciences rests in part on their not studying the social impact of their inventions.

Were there systematic investigations of such inventions and their effects, we might discover that in postindustrial society behavioral and social science inventions are more consequential for social change than material inventions. Ogburn developed his theory of cultural evolution by focusing on the material inventions and advances in physical science and mathematics that contributed to the Industrial Revolution. That view scanted the great social inventions of earlier societies, such as bureaucratic administration and empires (Eisenstadt, 1963) and antedated most of modern behavioral and social science.[3] The role of economics in setting government policies and in the social control of economies has grown considerably since the work in *Recent Social Trends*. Although a president had sought the advice of academic social science in the "President's Research Committee on Social Trends," the committee seemed not to have imagined the significant role that behavioral and social science inventions would come to play in corporate organizational life and government in America.

Ogburn believed that the cultural base of social invention accumulated less rapidly in modern times than that of mechanical invention (Ogburn & Nimkoff, 1940:792).[4] This slower growth, in turn, slows the rate of new social invention. Yet there appears to be greater accumulation in the behavioral and social sciences than Ogburn expected. Rapid expansion of the knowledge base has been especially evident in cognitive psychology and linguistics.

A final word may be in order here on the reluctance to examine the impact of behavioral and social science inventions on society and especially on social change. Lags in adaptation due to such inventions may be intrin-

[3]Ogburn observes en passant: "The fact that technology is at present so powerful a cause of cultural lags, and consequent social disorganization, does not deny that other variables such as social inventions or population changes are creating lags also . . . the lag of social changes behind technological progress is simply a special case of the general phenomenon of unequal rates of change of the correlated parts of culture" (Ogburn & Nimkoff, 1940:893).

[4]The matter is empirical. It is not clear that the cultural base of social inventions cumulates any less rapidly in the modern world. Boulding (1978) argues that the homogenization of societies throughout the world may lead to less diversity in the cultural base and thus in the long run threaten the survival of culture.

sically shorter than for material inventions. But also, the dominant social theories have conceptualized societies as relatively stable structures, with an emphasis on the ways that such stable structures are maintained.[5] Models of social structural change seem less well developed, less often tested, and more focused on radical or revolutionary change than on ordered but accelerated change.[6] The literature on organizations, for example, emphasizes the resistance that organizations display to deliberately contrived interventions. This strategy of theory construction and testing downplays the important ways that inventions occur and are diffused in society—most often other than by deliberate intervention—and promotes the false premise that invention and intervention are ordinarily successful in producing change, except where organizational resistance is powerful enough. The contrary seems to be the case. Most experiments and inventions fail, or succeed in producing entirely unintended effects. We may learn more about how to produce intended effects through social invention by looking to the unintended consequences of purposive social action (Merton, 1936).

Reduction of Cultural Lags

Although Ogburn subordinated the role of behavioral and social science inventions in causing cultural change,[7] he assigned to these sciences a special role in facilitating the *adaptation* of society to changing material culture (1934:166). Ogburn believed that the failure of institutions to adapt to advancing technology produced nearly all social maladjustment and disorgani-

[5]Ogburn (1957b:8–9) concluded that the study of social trends carries two major messages: "The first general message that knowledge of social trends brings to us is that there is much stability in society, even though there be a period of great and rapid social change. . . . The second lesson we learn from a knowledge of social trends is that there is a sort of inevitability about social trends. . . . It is difficult to buck a social trend. It may be slowed up a bit, but generally a social trend continues its course. . . . Success is more likely to come to those who work for and with a social trend than to those who work against it."

[6]Antipathy toward military institutions, for example, may account for a general neglect of how organizations may change quite rapidly and as a consequence of social inventions. In the history of race relations in the United States, for example, little attention is given to how the U.S. military organizations became egalitarian and at an accelerated rate compared with any other sector of American society (and that religious organizations are among the most recalcitrant to change and racially segregated at the local level).

[7]In Part VII, "Social Change," of *Sociology*, Ogburn recognized that assigning a priority to mechanical invention is partly a function of the precision with which an invention can be dated. He also recognized the problem of an infinite regress of causation that complicates assignment of priority in social change. He concluded with a mechanical analogy: "When all the interconnected parts of a culture are in motion, and each part exerts a force on some other part, the origin of the motion cannot be located" (Ogburn & Nimkoff, 1940:866–867).

zation (Ogburn & Nimkoff, 1940:890). In a 1957 addendum to the theory of cultural lags, Ogburn (1957a:172) reasoned that lags accumulated more rapidly in modern society because of the volume and accelerated rate of technological change. Although acknowledging that lags might be reduced by retarding the development of the natural sciences or following Stamp's (1937) suggestion for a moratorium on mechanical invention, he did not take these suggestions seriously, believing that such courses of action required too high a degree of planning and control (Ogburn & Nimkoff, 1940:890). Although the accumulation of lags was thus inevitable, it could still be reduced. For example, wars and revolutions reduce accumulated lags in a society (Ogburn, 1957a:172). Another less radical way to reduce lags is through the technology of the behavioral and social sciences (President's Research Committee on Social Trends, 1933:166). But just how to achieve this Ogburn failed to make clear.

The answer would have to lie in the production of knowledge-based innovation and invention designed to increase adaptation to cultural changes or to reduce the effects of their accumulation.

Below I will illustrate two different ways in which social science—both basic and applied—can function in restructuring societies in consequence of changes in culture.

Statistics and Quality Control The invention and diffusion of statistical quality control illustrates how social inventions can cope with the cultural dislocations caused by material and nonmaterial inventions. The coalescence of mechanical inventions into the modern mass production assembly-line factory produced the problem of assuring uniformity and high precision. Departures from strict production standards have consequences ranging from mechanical failure to increased transaction costs; these can be very significant in competitive markets or under other conditions where the tolerance for failure is small.

Statistical quality control is the statistical surveillance of repetitive processes. It is used primarily for two purposes: *process control* to evaluate future performance and *acceptance inspection* to evaluate past performance (Wallis & Roberts, 1956:495). In either type of control, samples are drawn to make decisions about a population. For process control, the population is an infinite number of expected results from repetitions of the same process; for acceptance inspection, it is the quality of a finite set of existing items.

The basic invention of statistical quality control was developed in the 1920s by an industrial statesman, Shewhart,[8] who invented the statistical quality control chart (1925. 1926a, 1926b, 1927, 1930, 1931). Its wide-

[8]Shewhart dates the invention of the statistical quality control chart as 1924 (1939.4).

spread dissemination came in the 1940s and resulted from the demands of the War Production Board, which deemed quality production of military goods essential to winning the Second World War, especially in light of the high quality of the German industrial complex (Wallis & Roberts, 1956:495, 512). Wald's method of sequential analysis (1945), although developed initially for use in scientific research, proved so useful for acceptance inspection that an estimated 6,000 U.S. plants used it within two years of its development in 1943 (Wallis & Roberts, 1956:518).

Other organizational innovation accompanied this rapid diffusion. Intensive training courses in quality control were developed at Stanford University and given in most major industrial centers during the war. Among the many consequences of diffusion was the founding of the American Society for Quality Control, made up largely of applied statisticians working in industrial applications.[9]

Ogburn concluded from his studies that the acceptance of inventions and their integration into cultures other than the one of origin depended upon the similarity of the cultures involved (Ogburn & Nimkoff, 1940:829). He was also disinclined to assign causal roles to individuals either in invention or diffusion (Ogburn, 1926). For Ogburn, the existence of independent invention demonstrated that the cultural base predominates over individual ability or uniqueness.

Ogburn's view may be correct in the long run, but in the short-run case of quality control, there were key individual disseminators. One of these was W. Edwards Deming, a government statistician originally in the Department of Agriculture and later at the Bureau of the Census and on independent government assignment. The introduction and rapid diffusion of statistical quality control in Japan seems largely due to the efforts of Deming. Since 1951, the Union of Japanese Scientists and Engineers has recognized his importance to Japanese industry by creating a major award, the Deming Prize, for contributions to statistical quality control in industry (American Statistical Association, 1983:1).[10] Some believe that the competitive margin of Japanese over U.S. products is attributable to a higher integration of statistical quality control in Japanese industry.

[9]Although statistical quality control was initially developed and applied in industry, the invention has wide applications since it is applicable to any kind of repetitive process, e.g., communicable diseases, medical experiments with human subjects, and accounting processes.

[10]There is no Deming Prize in the U.S., although he was honored in 1983 by the American Statistical Association for his contributions to "statistical quality control at home and abroad" with the Samuel S. Wilks Medal Award. Deming also has been decorated for his work in the name of the Emperor of Japan with the Second Order Medal of the Sacred Treasure. Nearing age 83, the peripatetic Deming was absent from the award ceremony, unable to fit it into his schedule without a few months' notice! (American Statistical Association, 1983:1).

Cohort Analysis A second example of how behavioral and social sciences permit adaptation to social change is the use of cohort analysis. A cohort is an aggregate of individuals of similar age who are exposed to or experience certain events during the same period of time. Cohort analysis is a quantitative description and analysis of occurrences from the time a cohort is exposed to these events (Ryder, 1968:546).

The continued entry of new cohorts provides a continuing opportunity to modify society. Cohorts consequently are central to the study of social change. But there also may be effects associated with age or aging per se, and changes brought about by external influences or events that affect all people alive at the time. These three sources of change in a population are referred to as cohort, age, and period effects.

A cohort analysis, as Ryder (1968:550) points out, differs from a longitudinal or panel analysis in that the latter examine changes in the individual members of a population or sample over time, while cohort analysis examines the changing characteristics of an aggregate through time: it is macro- rather than microlongitudinal.

The value of a cohort analysis to our understanding of social change can be illustrated by the studies of changing attitudes toward racial integration in the United States (Taylor et al., 1978:48). Opinion polls between the 1950s and 1980 showed considerable shift in white attitudes favoring racial integration. Underlying that shift, however, were different cohort trends. Although all age groups showed some shift with aging, this factor accounted for only about 10 percent of the total attitude change. Almost half of all change was due to the succession of cohorts in the population, with older, less favorable cohorts being replaced by new, more favorable ones. Almost half of the change in favorableness by 1980 is due simply to those younger cohorts comprising an ever greater portion of the population. By simple extrapolation we would forecast that within a matter of decades the vast majority of the population will favor racial integration. This type of cohort analysis shows that lag reductions often occur through the mechanism of population replacement.[11]

[11] But cohort analysis does not substitute for theoretical models of what causes particular changes. In the example, we still need to explain why the younger cohorts are most favorable. Is it due, for example, to indoctrination, to greater contact with unlike persons in environments such as schools, to involvement in social movements that support certain racial attitudes, or to some combination of these and other explanatory variables? While cohort analysis can aid us in understanding changes at the population level, it does not provide a substantive theoretical explanation of how such changes occur at the macrolevel of individual members of that population or at the microinstitutional and organizational level of changes. The failure to develop explanatory micro- and macromodels of social change severely limits our understanding of it. For a more extended discussion and set of examples of uses of cohort analysis, see Reiss (1982b).