INTERACTION OF THEORY AND METHOD IN SOCIAL SCIENCE

Peter T. Manicas
Interdisciplinary Studies, University of Hawai'i at Mānoa, USA

Keywords: Theory, method, research, philosophy of science, epistemology, interpretation, *verstehen* explanation, logic, quantitative methods, qualitative methods, experiment, history, comparative methods, value-free

Contents

Summary

Everybody recognizes that research in the social sciences requires both methods and theory, but it is not always clear how method and theory relate. Moreover, one needs to appreciate that there remains considerable controversy as regards many of the central issues. In what follows the effort is made to clarify both the relation (or relations) between theory and method and to at least address the central controversies. The article is organized around methods, divided into four main types: Quantitative, Experimental, Qualitative and Historical. As they are generally understood, each of these presupposes some strong assumptions about the philosophy of social science, what might be termed its "meta-theory." That is, each assumes a notion of the nature and tasks of a science, and in particular ideas about the nature and tasks of a social science. Thus, to merely hint at what is at issue, does science aim at establishing patterns or regularities—"laws" --in terms of which we gain the capacity to predict and control, or does it aim at providing an understanding of these patterns; and if the latter, in what does understanding consist? Related to this are differences in the conceptualization of "theory." Thus, is theory the effort to articulate relations of variables arranged deductively, the effort to represent causal mechanisms or perhaps, the effort to secure meaning? Complicating things further, there is the question of whether there are important differences in the domain of inquiry in the physical and social sciences which require important differences in both the aims of inquiry and the methods to be used? For example, is the fact that the social world is meaningful make a difference? And if so, how does this bear on methods? Similarly, is social science inherently historical and if so what difference does this make as regards methods and goals of research?

A sketch of each type of method is offered, making the effort to identify what is being

presupposed and then assess its strengths and limitations. It will be a main thesis of this account, that if properly understood, all the existing methods have an important place in research and that problems arise only when assumptions about science and the domain of inquiry in social science are not critically examined. Indeed, to see the issues, we need to have an understanding of the current situation in the philosophy of science. There has never been a time that research in the social sciences was not influenced by positions in general philosophy and more specifically on questions of the nature of the sciences. The current period is especially interesting since with the demise of the dominating theory of science in the 1970s, there has been a most fertile reconsideration of the central issues in theory and method.

1. Philosophies of Science

Toward the end of the nineteenth century, a host of philosopher/physicists were producing books and articles in what we would now call "the philosophy of science." These included G. R. Kirchoff, Wilhelm Ostwald, Ludwig Boltzmann, Hermann Helmholtz, his pupil, Heinrich Hertz, Ernst Mach, W. K. Clifford and his student, Karl Pearson, Henri Poincaré and Pierre Duhem. These men all spoke with enormous authority exactly because, by then, science was rapidly becoming an evident force in the daily lives of people. Moreover, all of these men have been called "positivists" in that they held, first, that scientific explanation must eschew appeal to what in principle is beyond experience, that to do so, as Kant had insisted, takes one into metaphysics, and second, following Berkeley and Hume, that "laws of nature," are but empirical invariances. The term “positivism” had been in use since August Comte’s coining of the term in the 1830s. In what follows, “positivism” includes “neo-positivism,” “logical empiricism” and sometimes “empiricism” --all distinguished from “post-positivism,” Worth mention, Comte, who also invented the term “sociology” made a strong argument that if the social sciences were to be sciences, they had to rid inquiry of “metaphysics” including the idea that causes were “productive powers.”

These ideas were well developed by the philosopher/physicists of the late 19th century. Thus, in his *Analytic Mechanics,* Kirchoff had said that we understand the effect of force, but do not understand what force is. It surely seems here that, as Ostwald and Mach argued, force is not some "mysterious power" but is nothing other than its "sensible effects." As Mach insisted, if force is not some “mysterious power,” then we must also abandon all those explanations which appeal to “mysterious powers.” For Mach, a theory is merely a set of concepts which provides an ‘economical” schema for experience. Mathematical functions are thus “abridged descriptions.” As Mach insisted, “knowing the value of the acceleration of gravity, and Galileo’s laws of descent, we possess simple and compendious directions for reproducing in thought all possible motions of a falling body. This compendious representation necessarily involves as a consequence the elimination of all superfluous assumptions which cannot be controlled by experience, and above all, all assumptions that are metaphysical in Kant’s sense.”

At just this time, another debate broke out in Germany. The so-called “*Methodenstreit,*” or “war of methods,” posed positivist philosophy of science against an argument that the human sciences (*Geisteswissenschaften)* rested on entirely different foundations than the physical sciences (*Naturewissenschaften).* The search for general laws may be appropriate for physical phenomena, but since persons were conscious, historical beings, for the human sciences, explanation required *verstehen* (understanding). This was possible in the *Geisteswissenschaften* because as Hegel had argued, life ‘objectifies’ itself in the institutions of the family, civil society, law, art, religion and philosophy.

For positivists, this surely smacked of metaphysics. Max Weber joined the argument, but as in happened, while he firmly rejected positivism as appropriate for a human/historical science, except for his work and a few others, the idea that *verstehen* was not inconsistent with causal explanation failed to take root. Indeed, in the 1920s “logical empiricism” was born in Vienna. It combined the deductive logic of Russell and Whitehead’s *Principia Mathematica* (1910-1913) and the promise of a comparable inductive logic, with the empiricism of the turn of the century philosopher/physicists. By mid-century, then, it had become the dominating and definitive philosophy of science, thoroughly taken-for-granted by nearly everybody, social scientists as well as philosophers.

Things began to change in the 1950s. While the story cannot be told here, we can notice that by 1970 all the fundamental features of positivist philosophy of science were in tatters. Critical here was the early work of philosophers, W.V. Quine and Rom Harré, and the historian of science, Thomas Kuhn. It is now fair to say that while there remain important points of difference between them, the dominating current of philosophies of science are “post-positivist.” We can best make clear both the differences between positivism and post-positivism, and the differences within post-positivism by examining, concretely, method and theory in the human sciences.

2. Quantitative Methods

It is hardly an historical accident that quantitative methods are very often taken to be the paradigm for social science research. From the beginnings of modern science, mathematics has been an important tool and the capacity to measure and formulate relations between quantifiable entities is an important achievement. Perhaps from Durkheim on, so-called “hard science methods” have been legitimated by positivist philosophies of science. Given this posture, quantitative methods are not only taken to be the best example of social science, providing the criteria for its standing as “science,” but for some, the only methods.

We will conceive this type of method broadly, to include all statistical methods including, for example, survey research, and various versions of factor analysis (including regression and path analysis). We may begin with the obvious: Ordinary life is filled with statistical information, from who is in first place in soccer standings, the cancer rates for smokers, to the number of Hawaiians in Hawai’i. Just as many ordinary conversations make use of statistical information, most research projects will employ statistical data of some sort. Much of this serves to have an abstracted description of vital “social facts” and much of it serves as evidence which either confirms or falsifies critical assumptions and hypotheses. Of course, there are problems in the effort to use numbers to represent features of the world, some always noticed, some not.

2.1 Descriptive Statistics

The biggest problem with what are usually termed “descriptive statistics” (“descriptive” since they merely summarize in numerical form some attribute, a batting average, smokers, Hawaiians) is in the “categories” which are employed in assembling the data. “League-leader” constitutes no problem since we can agree that it measures the number of wins against losses of teams in the league. Hawaiians is a different matter: In the 1990 Census, the number of Hawaiians by “race” was 138,732, by “ancestry” it was 156,812 and by the more complicated measure of the State Health Survey, Hawaiians numbered 205,078.

In one of its many confusing uses, since it makes commitments regarding a “conceptual scheme (or framework for inquiry), employing categories is rightly thought of as “theory.” In this sense, everyday experience is “theory-laden” since it would be unintelligible without the countless concepts which mark off and relate “kinds:” apples and fruits, criminals and doctors, red things and edible things—one could go on endlessly. Embedded in ordinary language, kinds are inevitably social and historical constructions. We learn to use these, generally with success, even though for most of them, we have only a “typical” case and there will be an irremediable fuzziness about them. Indeed, we generally cannot provide a clear definition of a term or concept: We know a bird when we see one--and put aside pterodactyls. More important, the fact that kind-concepts are social and historical products is highly pertinent to research in that one may well encounter “conceptual maps” which are different that the one assumed by the researcher, either of another culture, another tradition of inquiry, or simply a different study by a different researcher. Since these conceptual maps parse the world differently, they constitute different “realities.” *This problem bears on all research, qualitative as well as quantitative*. We need to avoid the tendency to assume, uncritically, that *our* categories are “given” and sacrosanct. Consider, for example, that racial categories in fact make no biological sense. On all the evidence there are no biological grounds for grouping people into distinct races. In other terms, there is no non-arbitrary statistically significant difference between populations which we would like to call "races" and neighboring populations. Indeed, "each population is a microcosm that recapitulates the entire human macrocosm even if the precise genetic composition vary slightly… "

The kind-concepts of ordinary experience are often the point of departure of the categories used in quantitative research. In the effort to ensure clarity and agreement about these, empiricist oriented researchers insist on the need for “operational definitions.” Here one specifies exact criteria for applying the concept, the “operations” which need to be performed to see whether the term applies. Thus, for example, we may count someone as Hawaiian only if they can produce a genealogy which goes back to pre-Western contact. This certainly clarifies the concept but raises the question of whether it arbitrarily restricts the meaning and thus fails to catch the “reality” intended. (Formally, is the concept “construct valid”?) In our Hawaiian case, the researchers employed *different* criteria for determining who counted as Hawaiian. Since *who* is Hawaiian is precisely what is at issue and there is no theory-neutral conception of this, there will be room for disagreement. We need to be as clear as we can in our use of concepts, but we need also to avoid the trap of supposing that operationalizing a term gives us a theory-neutral category. The idea that there is some rock-bottom empirical "data" ("the given") which is theory-neutral is a fundamental feature of empiricist (positivist) theory of science. It is now generally agreed, however, that this a false ideal, and that science can proceed without assuming that there is a theory-neutral, God's eye view of the world. We say more about this subsequently.

2.2 Inferential Statistics

So-called "inferential statistics" refers to the use of statistics to make inferences concerning some unknown aspect of a group or set. We then have further complications regarding the general problem of induction—inferring probabilities from our premises--in particular, judging whether what was true of the sample, is true of all. We cannot here get into the many problems of sampling, except to notice that one can never be sure that the sample is truly representative of the population from which it was derived; hence one must be cautious regarding the conclusions drawn. There are, it might be mentioned, several competing theories about proper sampling techniques.

Things get even more complicated when we turn to quantitative work which seeks to identify patterns and regularities. This is often taken to be a major goal of science. The concept of a "variable" is critical. Simply defined, a variable identifies an item that varies, perhaps numerically between 0 and 1. "The language of quantitative social research is a language of variables and relationships among variables". Typically, one offers an "hypothesis" which is a conjectured "law-like" statement. The hypothesis links an "independent variable" (or variables) to a "dependent variable." Again, "the cause variable, or the one that identifies forces or conditions that act on something else, is the *independent variable*. The variable that is the effect or is the result of the outcome or another variable is the *dependent variable."*

This sort of analysis makes perfectly good sense only if we assume a positivist theory of science in which explanation proceeds by subsumption under laws and in which causality is conceived as per David Hume as constant conjunction. On this view of the matter, C is the cause of E means *only* that "If C, then E." Similarly, one explains E by showing that C has occurred and that "If C, then E." Termed the "covering law" model of explanation (or Deductive-Nomological: DN Model), it is the second defining feature of positivist theory of science. (The first is the assumption regarding "data" as theory-neutral.) On this view, a fully ramified theory is thought of as a deductive system in which premises, the explanatory principles or "laws" entail what is to be explained.

2.3 Causality and Multiple Regression

We can see the problems with this conception of explanation by considering a central technique of quantitative methods: multiple regression. Consider the following:

1. A (some "variable," e.g., IQ) correlates with B (some other variable, e.g., income)
2. A "predicts" B
3. A "explains the variance" in B
4. A "explains" B
5. A "causes" B

We can handle 4. and 5. together. We can say 4., “A explains B” only if we can say, “A causes B.” But first, as everyone admits, correlations do not establish causes. Causes *produce* outcomes, so science may well begin by identifying regularities in the world. But a scientific explanation does not aim establishing “law-like” correlations, no matter how probable. Rather, it comes with identifying the causal mechanisms which *explain* empirically available patterns. We know that, generally at least, salt dissolves when put in water. But there is something about salt *and* water, such that when salt is put in water, it tends to dissolve-- and not (say) to explode or turn the water to gin! Indeed, the covering law model obscures the critical role of theory and model building in real science. Thus, the Bohr model of the atom generates the periodic table which “summarizes the properties of the elements—the variation in their physical properties, such as the number and type of bonds they form to other atoms.” With an understanding of this mechanism, we understand, for example, why iron oxidizes and copper conducts electricity.

Second, there are always many causes of any outcome. It order to make a fire, we need in addition to some combustible material, a source of heat and oxygen. Absent any of these, no fire. So which is more important? We get a fire only if the right combination is present. (It takes a good deal more heat to ignite a vinyl fabric than it does to ignite cotton.) If we pick out a source of heat as “the cause,” that is because we assume the presence of oxygen and the combustible material. We forget about the oxygen and say that the spark “caused” the fire. (Weber called this "adequate causation," the difference in the existing state which brought about the effect.) This is both convenient and unsurprising. But the fact remains: all the factors are important: you will not get a fire if any are absent. Consider then Sarah’s ability to score big on the SAT. What is “the cause”? Which of the “factors” (causes) will be more important? Sarah may be “bright,” but she also was well-motivated, got some terrific education—and she felt good on the day of the test.

Versus the covering law model, on the realist understanding of causality, explanation and prediction are not symmetrical. That is, where we have a statistically significant correlation, we can predict even if we could not explain. Smoking and cancer is good example. There is some causal mechanism at work in cancer production, likely several, and smoking is related to this in ways that we do not yet understand. Some people surely do smoke all their lives and never get cancer. And some people who never smoke do. But we know that the probability of getting cancer significantly increases if you smoke: A “predicts” B. More generally, it is an error to hold that the social sciences fail because they fail in their predictive capacities. The physicist understands the principles of motion but cannot predict the resting place of a failing leaf or of the resting places of the pieces of a boulder shattering as it rolls down a mountain-side. Indeed, it is hard to underestimate the damage done to social science by having false assumptions about what the physical sciences can do.

2.4 Explaining the Variance

It is usually supposed that regression and other related techniques, by enabling us to “explain the variance,” solve the problem of complex causality. What is intended can be briefly summarized. Assume that there are a number of “factors” which taken together presumably “determine” some outcome. The idea then is find out how significant each factor is in “producing” this outcome. The language of “producing an outcome” or “determining an outcome” is causal language. But indeed, such language is entirely inappropriate. We need to go a little deeper to see what is at issue here.

Assume first a standard regression equation, a set of dependable, meaningful independent variables (a, b…) with a linear relation to the dependent variable (Y).

$$Y = a + b_1 + b_2 + b_1 b_2 + e \qquad (1)$$

“Y,” the “dependent variable,” presumably is “determined” by the independent variables, “$a + b_1 \ldots$” The problem is then one of variable selection. (It might be mentioned here that while multiple regression treats all independent variables as prior to the dependent variable, path analysis can offer far more sophisticated models in which time enters, showing, for example, that some factor or factors have but indirect “effect” on some other variable. But the problems to be considered in what follows remain.)

The goal of the analysis is a “good fit.” If we do our work well, what we end up is “a useful statistical description defensible against plausible alternative interpretations.” It is critical to emphasize that the very best result is a statistical description, a point nearly always missed. At best, the result is a highly simplified picture, a statistical snapshot, of a fantastically complicated concrete social situation. For example, as an abstract ratio, the crime rate represents a picture of crime in the real world. It leaves much out—obviously. On the other hand, "A picture of a friend is useless if it covers a football field and exhibits every pore. What one looks for instead is an interpretable amount of information, with the detailed workings omitted.” As regards the crime rate, the "detailed workings" include, of course, the specific structured actions of *everyone* in society: both criminals and non-criminals. While it would be agreed that a crime rate is such a snapshot taken from a very long distance, the same is true of all other statistical results, including the results of regressions.

A useful description—a good fit— is not so easy to come by. One test of this is the “coefficient of correlation,” R^2. It is usually said that R^2 gives “the percentage of variance explained” in the dependent variable by the regression. But, this is an expression that, “for most social scientists, is of doubtful meaning but great rhetorical value.” The rhetorical values lies in the supposition that first, a large R^2 guarantees “ good fit” and second, in the more radical confusion, that the number represents the causal importance of the factor in the regression.

Neither supposition can be sustained. As one prominent writers says, R^2 “is best regarded as characterizing the geometric shape of the regression points and nothing more.” It is easy to see why it is nothing more than this. The central problem is that the independent variables are not subject to experimental manipulation. In the natural sciences, one tests theories about causality with an experiment. The experiment seeks to “control” the conditions to see if the hypothesized cause actually produces the outcome which the theory predicted. This is not possible in the social sciences. “Regression,” which presumes to “control” variables, mathematically, is often thought to be an adequate substitute for experiment.

There are several lines of argument that it is not. One regards the problem that “variances are a function of the sample, not the underlying relationship.” That is, the linear model (eq. 1) is a local analysis whose result depends upon the actual distributions of the variables in the population sampled. Thus, “in some samples, they vary widely, producing large variance; in other cases, the observations are more tightly grouped and there is little dispersion.” (One needs some further understanding of statistical analysis to fully grasp this criticism.) For this reason, then, “they cannot have any real connection to the 'strength' of the relationship as social scientists ordinarily use the term, i.e., as a measure of how much effect a given change in the independent variable has on the dependent variable...”

Second, there is the problem of assuming that the measured variables “add up” to 1.0, the problem of “additivity” and independence. Consider this example:

If the regression describes, say, domestic violence in countries as a function of violence in prior years plus economic conditions, can one say which variable is more important in causing violence? For most purposes the answer is no. The units of one variable are violence per amount of prior violence; the units of the other are violence per amount of economic dislocation. One can say only that apples differ from oranges. As theoretical forces abstracted from any historical circumstances, they have no common measure.

Equation 1 makes us believe that the variables are both additive and independent (with b_1b_2 taking into account the interaction effects of the variables.) But this is never the case. Nor can it be said that "path analysis" solves this problem. Path analysis an extension of regression which makes the same assumptions as does regression, but where "a regression is done for each variable in the model as a dependent on others which the model indicates are causes, direct and indirect. "Path coefficients," then, are "used to assess the relative importance of various direct and indirect causal paths to the dependent variable. As above, "good fit" presumes to indicate (Humean) causality.

The best sort of example to illustrate the general principle is to see the confusion in the mostly meaningless discussions of the relative effects of heredity and the environment. Consider a parallel (idealized) biological study, a study that requires a controlled experiment.

Take a genotype replicated by inbreeding or cloning. This minimizes genotypic individuality. Place them in a various carefully controlled environments. It is then possible to establish rough tables of correspondence between phenotype on the one hand and genotype-environment combinations on the other. The results, called the “norm of reaction,” are never predictable in advance. They are not predictable since genetic and environmental factors are not additive (and hence cannot be represented by linear equations.) They are causes in transaction in exactly the sense that genes cause different phenotypical outcomes in different transactional environments.

If such norms could be experimentally established for persons in their development, then across the range of controlled environments and (cloned?) genotypes, one could relate the variances in outcomes with the changes in the independent variables. This would still not provide the proportion of causation since causation does not suddenly become additive. But one could talk sensibly about their relative “importance.” One could “explain the variance” sensibly. More dramatically, as Achen says, we conduct an experiment in which we put some children in middle-class homes and the others in closets. There surely will be differences in cognitive ability, personality, etc. Almost certainly, most of the differences in these realized capacities will be “explained” by environment. Conversely, put them all (per impossible) in the same environment, most of the variation surely will be “explained” by heredity. The foregoing explains, of course, the importance of (identical) twin studies — and their limitations.

2.5 The Role of Quantitative Methods

But all this is not to say that quantitative methods have a minor place, or more outrageously, that have no place in social science. First, as noted above, they are enormously useful in providing descriptions of facets of society. We need to have numbers of all sorts of things, demographic, economic, political, and sociological. These provide descriptions of what needs to be explained, for example, a change in the crime rate. And they provide valuable evidence for conclusions about social reality. For example, we need to know the number of middle-class youth who escape conviction for possession of drugs before we can conclude that drug use is mainly restricted to poor blacks.

Second, these methods give us capacities to generalize, including generalizations discoverable only through the use of regression and similar methods. "Quantitative and statistical techniques may be used to reveal patterns… that are obscured by the range of influence operating on them…Likewise, statistical techniques can be sometimes be used to extract revealing patterns in data even when the precise parameters of the various influences are not known prior to analysis". For example, how do we explain ethnic or income differences in voting behavior, etc. As above, identifying such patterns does not give us causality, but "the existence of such a pattern suggests that there may be structural influence at work, a claim that can be investigated further to examine its plausibility.” That is, the description calls for theories about the mechanism or mechanisms involved in the pattern. One can say more generally that science often begins with a reliable generalization: Iron rusts, apples are nutritious. But science allows us to understand these in terms of causal mechanisms.

-
-
-

Bibliography

Achen, Christopher (1982) *Interpreting and Using Regression*. Beverly Hills: Sage. [A valuable assessment of regression.]

Babbi, Earl (2004) *The Practice of Social Research*, 10th Edition (Belmont Ca.: Thomson Wadworth.) [A standard textbook in research methods. Still, very much positivist in his fundamental assumptions.]

Bhaskar, Roy (1979) *The Possibility of Naturalism*. Atlantic Highlands: Humanities Press. [An extended defense of realist philosophy of social science. Sometimes hard going.]

Bourdieu, Pierre and Wacquant, Loïc, J. D. (1992) *An Invitation to Reflexive Sociology*. Chicago: University of Chicago Press. [Perhaps the best single source of the important ideas of Bourdieu regarding theory and method.]

Denzin, Norman and Lincoln, Yvonne S. (eds.) (1994) Handbook of Qualitative Research Thousand Oaks: Sage. [An important compendium of varieties and problems of qualitative research.]

Foucault, Michel (1984), *The Foucault Reader*, ed. Paul Rabinow. New York: Pantheon. [Perhaps the most accessible source of Foucault's important views.]

Gadamer, Hans Georg (2005) *Truth and Method* (New York: Continuum International Publishing Group; 2nd Revised edition. [The most recent influence on hermeneutics as a mode of inquiry.]

Geertz, Clifford (1973) *Interpretation of Cultures*. New York: Basic Books [Fundamental for qualitative methods.]

Giddens, Anthony (1984) *The Constitution of Society*. Berkeley: University of California Press. [Giddens' definitive work. Valuable.]

Kuhn, Thomas (1962), *The Structure of Scientific Revolutions*. Chicago: University of Chicago Press. [Indispensable for post-positivism.]

Manicas, Peter T. (2006) *A Realist Philosophy of Science: Explanation and Understanding* . Cambridge: Cambridge University Press. [An effort to develop the critical consequence for theory and method from a realist point of view.]

Pickering, Andrew (ed.) (1992) *Science as Practice and Culture*. Chicago: University of Chicago Press.[The best collection of essays on the current state of the sociology of science. Important.

Rabinow, Paul and Sullivan William, M. (eds., *Interpretative Social Science: A Second Look*. Berkeley: University of California Press. [All the leading writers and a most useful introduction by the editors.]

Sayer, Andrew (1992) *Method in Social Science*. London: Routledge.[An excellent realist account of theory and method.]

Turner, Jonathan H. (1987) "Analytical Theorizing," in Giddens, Anthony and Turner, Jonathan (eds). *Social Theory Today*. Oxford: Polity Press. [The best short account of current neo-positivism in social theory.]

Biographical Sketch

Peter T. Manicas - born in Binghamton, New York in 1934, Peter Manicas was reared in Batavia, New York and received his BA from Syracuse University in 1955. After service in the USAF, he received his MA and PhD from the University of Buffalo, 1963. He was on the faculty of Ohio Wesleyan University and C.W. Post College until moving to Queens College where he took an early retirement and began, in 1988, what became a new career at the University of Hawai'i. Prior to that, he had served on the Graduate Faculty of the New School for Social Research and was a Visiting Senior Fellow at Linacre College, Oxford.

He has taught courses in philosophy, American Studies, political science and sociology and served on dissertation committees in history, economics, education and psychology in addition to the foregoing areas. This experience propelled his research interests in the history and philosophy of the social sciences, American pragmatism, Marxism, and political and social theory.

Peter has won several teaching awards and has served or is now serving on a number of scholarly journals, including *European Journal of Social and Political Thought*, *Information, Management and Information Technologies*, *Theoretical Psychology*, and *Social Process in Hawai'i*. He is currently Associate editor of the *Journal for the Theory of Social Behavior*.