

Common Sense, Intuition, and Theory in Personality and Social Psychology

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Theoretical work in personality and social psychology benefits from a well-developed understanding of the prior empirical and theoretical work on a problem and from informed intuitions. Intuitions develop about a subject matter through years of study, investigation, and problem solving, just as chess masters develop a sophisticated set of cognitive structures that change the very appearance of the chess board. In part because the subject matter is so personal, students new to personality and social psychology arrive with many intuitions, prior beliefs, and naive theories about social processes and behavior based on unsystematic experiences and observations. These intuitions can hinder or foster theoretical progress. The role of mentors, critiques, and empirical tests in minimizing the deleterious effects of these entry biases is discussed. Refined scientific intuitions are also subject to error; however, so means of minimizing these errors are also discussed.

We often think, naively, that missing data are the primary impediments to intellectual progress—just find the right facts and all problems will dissipate. But barriers are often deeper and more abstract in thought. We must have access not only to the requisite information but also to the right metaphor. Revolutionary thinkers are not, primarily, gatherers of facts but rather weavers of new intellectual structures. (Gould, 1985, Essay 9)

Thomas Edison suggested that genius is 1 percent inspiration and 99 percent perspiration. Edison's observation applies to good theory in personality and social psychology, if for no other reason than constructing such intellectual structures can be demanding work. Theory in personality and social psychology derives from and contributes to the systematic collection of empirical evidence using a procedure that is repeatable by others, and it is this feature that distinguishes scientific theory from pseudoscience and religion. The towering theories in the field are further characterized by a clear and strong empirical basis and by new and unique predictions that can be tested empirically. These intellectual structures have broad scope: Each theoretical formulation accounts for a vast body of data and generativeness, and each produces new predictions, which lead to new discoveries. These theoretical structures produce predictions that follow demonstrably from a specific mechanism explicated in the theory as an internally consistent

set of propositions rather than from an author's expectations given the broad guidelines of a general perspective or heuristic formulation.

The mechanisms in good theories are specified in sufficiently abstract form in that they do not need to be revamped as cultural beliefs change. Theories typically are characterized by parsimony, a preference for the simplest assumption in the formulation of a theory or in the interpretation of data, but parsimony in the more integrative structures is not a front for atomistic thinking. Theories in personality and social psychology are further grounded on quantitative techniques for measuring verifiable empirical events (mensuration; e.g., psychometrics, descriptive statistics) and for guiding generalizations beyond the measured events (abstraction, induction; e.g., inferential statistics). The drive to specify theories in mathematical (computational) form is compelling to the extent that these formalisms provide a perspective on underlying mechanisms that generates new predictions, improves clarity and objectivity, or increases the specificity and precision (and, hence, the falsifiability) of theoretical predictions. As the theoretical structures in personality and social psychology grow to provide views of related domains, they acquire the property of consilience—the explanation of phenomena from different levels of organization that are connected and proved consistent with one another.

The observation, analysis, and specification required to transform an insight into a formal theory are sufficiently demanding work; this process, in and of itself, supports Edison's declaration. However, creative theoretical work in personality and social psychology

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benefits not only from a keen understanding of the prior empirical and theoretical work on a subject, but also from a genuine interest in and feel for or informed intuition about the subject matter. Just as chess masters develop a feel for the game as they match wits against worthy opponents and students of statistics develop a feel for the material as they work through innumerable problems and variations, a theoretician in the sciences develops a feel for the subject matter through years of thought, investigation, problem solving, debate, and mentoring. As Nisbett (1990) noted:

We know, of course, that learning how to do research is really like learning how to make movies. There are so many things to be learned that are quite invisible to the novice, some highly technical, some grand strategic, and some mundane-seeming but crucial. The only way to do this is by working shoulder to shoulder, trustingly, with someone who has already knows how to do it. (p. 1080)

In most fields of science, one enters with only a rudimentary understanding or feeling for the subject matter. Introductory courses in many of these scientific disciplines have associated laboratories to foster understanding of both theory construction in and the epistemological basis of the science. The reasoning is that it is not sufficient to memorize the laws and equations of chemistry or physics, for instance; to understand fully these sciences, one needs hands-on experience with classic and contemporary methods. Common-sense notions and folk theories about physics with which students might have begun are quickly dispelled as they learn that something as seemingly obvious and simple as gravity is not only responsible for a glass breaking on the floor when dropped but also for the earth's atmosphere, celestial orbits, and event horizons. Understanding the theoretical principles and mathematics of the obvious makes it possible to comprehend the incongruous in the context of human experience.

Theoretical work in all scientific fields requires analysis as well as observation, creativity as well as effort. Good theory is more likely to come from a theoretician who has a feel for the subject matter and an intuitive understanding of the phenomenon in relation to theory and coherence. This visceral connection is not innate but acquired. For instance, when investigators struggle with the dual problems of operational and conceptual disconfirmation, they reflect (implicitly and explicitly) on the phenomenon they seek to understand and on the methods used to achieve this understanding. What might be regarded as a "disastrous" disconfirmation of prior expectations or hypotheses leaves in its wake the potential for a better feel (intuition) for and more nuanced understanding of the phenomenon. Insights into conceptual and operational problems do not respect the confines of office walls or

the context of formal problem solving either; they may dawn after rather than while working on the problem—while reading for pleasure, listening to Mozart, or relaxing with family. In this way, theoretical adversity in the life of the mind spawns opportunity and the potential for more cultured intuitions and insights.

To be clear, intuitions can foster or hinder theoretical progress in a scientific discipline. In personality and social psychology, the subject matter is so personal that many of the intuitions, prior beliefs, and naive theories people bring to the discipline are based on unsystematic experiences and observations. Our aim here is to encourage recognition of the power of intuitions in theory construction and hypothesis testing and to consider means by which naive intuitions might be evaluated and, as necessary, refined. Indirect as well as direct means are noted. I also consider the possibility that cultivated scientific intuitions can be misleading, and the value of mentoring as a reciprocal rather than rigid hierarchical process in scientific theories is discussed.

Entry Biases in Personality and Social Psychology

The historian of science, Boorstin (1983), observed that:

Nothing could be more obvious than that the earth is stable and unmoving, and that we are the center of the universe. Modern Western science takes its beginning from the denial of this commonsense axiom. ... Common sense, the foundation of everyday life, could no longer serve for the governance of the world. When "scientific" knowledge, the sophisticated product of complicated instruments and subtle calculations, provided unimpeachable truths, things were no longer as they seemed. (p. 294)

It is not the equipment but the lack of systematic analysis and the absence of disconfirmable thinking in common-sense reasoning that is most problematic in personality and social psychology. Common sense, the putative foundation of everyday life, can be a poor foundation for scientific theory about everyday life.

The subject matter of personality and social psychological theories, which ranges from classic questions about human nature to everyday life experiences and behaviors (Allport, 1968), is inherently fascinating to most people. This fascination is evident in overflowing introductory classrooms worldwide, in which students bring with them a lifetime of experience in observing and hypothesizing about human behavior. Daily life depends on the explicit use of personal hypotheses and theories about the way people behave and how people interact. These folk theories of social behavior are not without basis or effect: They include cultural truisms

and family lore as well as idiosyncratic hypotheses derived from a lifetime of unsystematic observations of daily interactions and supported through confirmatory hypothesis testing and behavioral confirmation processes (see also Funder, 1995). Most know that two heads are better than one just as they know that too many cooks spoil the broth. Quiz students the first class in Introductory Social Psychology and you will find it is axiomatic that opposites attract, just as it is that birds of a feather flock together. Some of these implicit theories are accurate, others are accurate only for some individuals or circumstances, and still others only appear correct because of human biases.

Because deep-seated prior beliefs and folk theories about personality and social behavior are grounded in years of observation and personal experience, students new to the field may have difficulty feeling that their theories of social behavior are any less valid or substantiated than are those they may learn while reading a textbook or hearing a lecture. Personal testimonials for many of these students continue to carry more weight than statistics evidence about a cherished social attitude or belief. Intuitions constructed from a lifetime of experience are not dismissed easily.

Personality and social psychologists appear to be cognizant of this problem even if we have not been explicit about it. We value the prize of a theory that makes nonobvious predictions, that illuminates flaws in social reasoning and interactions, that illustrates not only the inadequacy but the idiocy of common sense. Such work is unquestionably clever, but does the pursuit of the witty at the expense of the comprehensive put personality and social psychologists at risk of becoming the editorial cartoonists of the social sciences? In our focus on the foibles of social cognition and behavior, are we contributing to the perseverance of the misconceptions we seek to disprove? If the social heuristics, curiosities, and illusions revealed by carefully crafted experiments are not sufficiently contextualized, students, and perhaps we too, may fail to understand their place in everyday behavior.¹ Consider the hypothetical case in the field of perception—if the theories prized, pursued, and taught most in the field were perceptual illusions, would students really learn that the veracity of their everyday perceptions could no longer be taken for granted (a conclusion supported by a voluminous literature in perception), or would the students instead learn that illusions exist but their existence does not bear directly on their everyday experiences and common-sense notions of perception?

¹It is important to also keep in mind that the intrinsic interest, curiosity, and nonconformist beliefs of students are valuable properties for theorists in personality and social psychology. The task for the mentor and the student is to retain these properties while releasing the biased beliefs to which they contributed. I return to this issue later.

These questions hold despite the undeniable evidence that social behavior can be driven in dramatic fashion by people's naive theories of psychology. To know that folk theories can exert powerful influences on behavior, one need only reminisce about the futile attempts by college classmates to master the entire content of a course the night before the exam based on their belief that cramming for exams is effective. Indeed, one important class of theories in personality and social psychology is designed to accurately describe people's folk theories and to specify their effects on cognition, emotion, and behavior. There are potential limitations to theories of this ilk, of course. First, they may not have deep roots in that the content of these theories must change whenever people's relevant common-sense beliefs change. Second, people's common-sense beliefs about the causes of mental states or social behaviors do not, in and of themselves, constitute a comprehensive theory of social behavior. The naive theory that cramming for exams is an effective way to learn the materials in a course may account for certain study habits, but it does not substitute for a theory of effective study habits. Nisbett and Wilson's (1977) classic critique of theory and methods in personality and social psychology was made possible in part by selected failures in the field to distinguish between social psychological theories that model naive theories and social psychological theories that model underlying mechanisms. In mechanistic theories (including mechanistic theories of folk psychology; cf. Funder, 1995), the goal is to specify enduring principles of social behavior. Common-sense beliefs might serve as data, to be evaluated based on variations across theoretically specified conditions, but they are not theoretical statements about underlying mechanisms.

In sum, daily life depends on people's explicit use of hypotheses and theories regarding social behavior. Theoretical progress in personality and social psychology, compared to most sciences, may be especially difficult in part because each of us begins with intuitions formed through a lifetime of unsystematic observations and experiences rather than less well-established biases from which informed intuitions develop hand-in-glove with a mastery of a scientific field.

Means of Ameliorating the Effects of Entry Biases

Constructive Argumentation

We may not be able to do anything about the biased starting point in fields as personal as personality and social psychology. Indeed, in many respects students new to the field bring a great gift by arriving with misconceptions about social behavior because they remind us that an important task is to depict the antecedents, underly-

ing processing mechanisms, and consequences of just such beliefs and intuitions. We may wish also to consider possible means of mitigating these entry biases to better enable students and ourselves to view their folk theories and intuitions from multiple perspectives so that they foster rather than hinder theoretical progress. One such means of mitigating entry biases impressed on me early is to embrace interactions, arguments, and collaborations with constructively critical colleagues, especially those who share the belief that the aim of scientific theories is to construct intellectual structures that provide adequate predictions and useful frameworks for answering questions and solving problems in a given domain. There is a thin line between being constructively critical and squashing curiosity and creativity, a fact that would benefit theory in the field if mentor as well as student, reviewer as well as author, and grant panelist as well as applicant were to heed.

I had the good fortune of entering graduate school with Richard Petty, whose prior experiences, beliefs, and intuitions were very different from my own. By the end of our first week in graduate school at Ohio State University, we were arguing intensely about almost everything. To survive on our paltry graduate stipends, we rented a dilapidated house, painted it, wired it for electricity, and covered one entire wall with blackboard paint so that we could work through the arguments that were already in progress. The long hours of argumentation we spent at that blackboard wall drove home several points that shaped dramatically my thinking about theory in our field.

First, social behaviors are complex and thus have multiple antecedents within and across levels of organization. As such, comprehensive social psychological theory requires the specification of the various antecedents and causal mechanisms producing some outcome variable (e.g., attitude, attribution, aggression), the moderator variables that govern the conditions under which each of these mechanisms operate, and the unique consequences resulting from each of the mechanisms. These properties were explicit goals in the construction of the Elaboration Likelihood Model (cf. Petty & Cacioppo, 1986).

Second, the identification of complex antecedents and mechanisms across levels of organization often requires deep expertise in multiple disciplines. Comprehensive accounts of social behavior, therefore, are likely to require collaborative, integrated programs of scientific research that extend beyond the traditional borders of the field of personality and social psychology—a point to which I return when considering scope and consilience as properties of social psychological theories. Expertise of this kind is like the manufacture of good wine—it takes time, attention, and a nurturing environment.

Third, given the nascent form of contemporary personality and social psychological theory, one can gen-

erate an interesting story about almost any pattern of data. Accordingly, the capacity to tell a good story is poor measure of the story's worth. Stories in science—even if only proximal truths—should be nonfiction, so it is important to be sure of the facts before spending a great deal of time crafting the intellectual structure that explains a putative pattern of data.

The Relentless Interrogation of Data to Identify Possible Alternative Theoretical Structures

The intuitions with which I arrived in graduate school were so different than Petty's, and our arguments were so disrespectful of either of our naive theories of social behavior, that I begrudgingly surrendered my original reliance on cherished beliefs in favor of theoretical analysis and empirical evidence—an approach that, conveniently enough, was being taught as a part of our graduate training. We came to view empirical disconfirmations of experimental hypotheses not as assaults on a personal belief system but as opportunities to envision systems underlying social behavior previously not imagined possible. Early evidence contrary to the notion that people's idiosyncratic cognitive responses to the message arguments are the most important determinant of attitude change led to a better specification of the various routes to persuasion, moderator variables, and individual differences (e.g., need for cognition) that underlie attitude change and persuasion.

These experiences may suggest a second possible means of transforming entry biases to more informed intuitions: the merciless interrogation of the causes and meaning of empirical results whether they confirm or disconfirm an expectation or theoretical prediction. Although one should value parsimony, it is useful to also consider the possibility that the multivariate mechanisms underlying social behavior are almost certainly more complex than any hypothesis or model might suppose, and then simplify from this starting point. Regardless of the experimental result, I now try to consider what remains hidden from view—due to the limitations of our dependent measures or experimental design, the selection of sample or stimulus materials, or any prior conceptions that may blind us to the obvious. This does not always come easily, of course. When my skepticism is not only shared but amplified by colleagues in the process of peer review, I am reminded of Underwood's (1957) notes:

The rejection of my own manuscripts has a sordid aftermath: (a) One day of depression; (b) one day of utter contempt for the editor and his accomplices; (c) one day of decrying the conspiracy against letting Truth be published; (d) one day of fretful ideas about changing my profession; (e) one day of re-evaluating the manuscript in view of the editor's comments fol-

lowed by the conclusion that I was lucky it wasn't accepted. (p. 87)

With time spent studying, investigating, and working through problems, the manner in which one thinks about social processes and the intuitions and feel for social phenomena are inconspicuously altered.

A certain resilience also develops, if for no other reason than one becomes more confident that there will be a Day 5 in Underwood's (1957) scenario. And the resilience of the theoretician can be as important as the quality of the theory. As Nisbett (1990) reminded us in his wonderful "Anticreativity Letters," the Garcia effect in classical conditioning, which established that organisms are differentially prepared to learn certain associations, was "kept from publication by editors and reviewers for years on the grounds of rank implausibility of the phenomenon, not to mention multiple artifactual explanations for the experiments" (p. 1081).² The take-home message is that scientific theories and articles are public goods, though the merit of innovative ideas is not always recognized initially by editors or reviewers. One should try to learn something from peer review, for instance, about the nature of supporting evidence needed to address the skepticism or apathy of the intended audience, the alternative interpretations that might need to be addressed, the form of the presentation it will take to communicate clearly, and so forth; but whether an idea is worth pursuing is a judgment that rests with the investigators, who can only hope that their intuitions are adequately informed.

Consilience and Scope as Properties of Social Psychological Theories

A third possible means of mitigating the effects of entry biases on theory, if not refining the entry biases themselves, is to seek to develop theories that include the properties of consilience and scope—consilience by progressively extending, for instance, social psychological theories to other social and biological levels of analysis to insure convergence of data and explanation, and scope by formulating theoretical principles in sufficiently abstract form through the specification of sets of antecedents, elementary component processes, moderator variables, and sets of consequences to

achieve generality (Cacioppo, Semin, & Berntson, 2003).

Always the beneficiary of amazing colleagues and students, I fortuitously met and came to know Gary Berntson when I returned to Ohio State University in 1989. Over a series of early-morning coffees, we discovered we shared a conviction regarding the importance of multilevel integrative analyses of complex social behavior, and we began collaborative research working across levels of analysis from the cellular milieu to the social context. We quickly developed a deep mutual intellectual respect and friendship, which drove perspectives from different levels equally with none subservient to another. Reductionism, as Berntson would say, is not substitutionism. Reductionism, or the breaking apart of nature into its natural constituents, provides a powerful lens through which to view social phenomena, and as such it has the potential to enhance rather than diminish theoretical understandings of the macrophenomena (cf. Cacioppo, Berntson, et al., in press). It provides points of entry into complex systems; the reason for such an entry is not simply to describe the parts but to develop a better understanding of the complex system. As Wilson (1998) observed:

Complexity is what interests scientists in the end, not simplicity. Reductionism is the way to understand it ... but dissection and analysis are not all that scientists do. Also crucial are synthesis and integration, tempered by philosophical reflection on significance and value. (p. 54)

Knowledge of which brain structures or systems are involved in social cognition, for instance, especially when used in combination with an understanding of the roles or functions of these systems and structures, fosters the construction of crucial tests among social psychological hypotheses and leads to new hypotheses and understandings of the structure and function of specific social processes, representations, and constructs. Addictive and compulsive behavior no longer falls under the purview of the field. Prejudice was traditionally conceived as a negative attitude based on a faulty and inflexible generalization (Allport, 1954). Evidence based on animal and human studies of brain structures are converging on and offering refinements to social psychological theory showing that (a) prejudice has both a component that can be characterized as an automatic associative response to a social category and a parallel component that can be characterized as a contextually sensitive and controlled response to the individual and social category, (b) these parallel components can operate synergistically or antagonistically, and (c) the emotional content of social prejudices is more delimited than initially thought (Cacioppo & Berntson, 2001; Phelps et al., 2000). New and unanticipated properties can also emerge when one examines

²Like Garcia's (i.e., Garcia & Koelling, 1966) articles on classical conditioning, Nisbett's "Anticreativity Letters" have become essential reading for students in the field. Also like Garcia and Koelling's articles on conditioning, Nisbett's (1990) "Anticreativity Letters" were a departure from the normal fare, and his article was also judged unsuitable for publication by reviewers. The manuscript was ultimately published not as an article but as a letter in the *American Psychologist* (Nisbett, May 7, 2003, personal communication), thereby illustrating with its own sordid history the preference in peer review for the unoriginal, the importance of a theoretician's resilience, and the fact that innovations in the long run typically win out.

the whole as well as the parts—discoveries that in turn can advance theories about the constituent parts as well as the whole (e.g., Cacioppo et al., 2002).

Entry biases tend to dissolve into richer intuitions when interdisciplinary collaborations seek not simply to describe a phenomenon from one level of analysis in terms of another or to aggregate measures from multiple levels of analysis, but to weave an intellectual structure that accounts for the observed data across levels of analysis and place these data in a broader theoretical context within each parent discipline. As Wilson (1998) suggested, the “explanations of different phenomena most likely to survive are those that can be connected and proved consistent with one another” (p. 53).

The principle of parsimony, a valuable companion of consilience and scope, has been used in social psychology to justify models based on simple, serial, linear processing stages; untested assumptions that social outcomes have single causes; and the omission of potentially relevant data at other levels of analysis. Cognitive dissonance and self-perception theory, for instance, were thought to be empirically indistinguishable in part because evidence from physiological analyses was regarded as irrelevant. An attitude was once theorized to be instantiated as a single mental representation that resulted from the sequential processes of attention, comprehension, yielding, and retention and that influenced behavior almost regardless of the situation (see review by McGuire, 1968). The accumulation of contrary empirical evidence contributed to an epistemological crisis in social psychology (e.g., Elms, 1975; Gergen, 1973; Schlenker, 1974).³ Parsimony is desirable, *ceteris paribus*; but as long as a formulation is falsifiable, scope and generativeness should trump parsimony, or else parsimony may serve as an anticreativity principle in social psychological theory.

The theoretical attributes of scope and consilience have led to very different theoretical formulations in personality and social psychology today. In attitude theory, for instance, theory in social psychology now casts an attitude toward a stimulus as possibly having multiple representations (e.g., Wilson, Lindsey, & Schooler, 2000), attitude stimuli may be subjected to parallel (e.g., implicit, explicit) as well as serial sets of information-processing operations (e.g., Greenwald, McGhee, & Schwartz, 1998), evaluative processes may have negatively accelerating rather than simple linear activation functions (Cacioppo & Berntson, 1994), attitudes and preferences appear to be subject to

ascending as well as descending neural influences (Berntson, Boysen, & Cacioppo, 1993; Boysen, Berntson, Hannan, & Cacioppo, 1996), and moderator variables are thought to govern which set of processes influence attitude expressions in specific circumstances (e.g., Petty & Cacioppo, 1986).

The History and Philosophy of Science

Exposure to if not formal training in the history and philosophy of science can be not only a pleasant addition to training in social psychology but a vital part of the development of a theoretician. A final possible exercise to foster the refinement of entry biases, therefore, is to study (or at least read for leisure) the history and philosophy of science—materials that by their abstract nature can help shed light on some of the implicit assumptions, biases, or boundary conditions that characterize one’s scientific endeavors (e.g., Boyd, Gasper, & Trout, 1997; Eddington, 1939; Platt, 1964). It is not that one will find something immediately relevant to understanding the specific social phenomenon in which one is most interested (though it is a possibility), but that pondering the history and philosophy of science in light of one’s own theoretical thinking and research can challenge assumptions formed implicitly about manipulations, measures, participant samples, and the nature of the relations and influences among theoretical constructs. Boorstin (1983), in his treatise on the history of science, did not make a distinction between folk theories and mechanistic theories, but his perspective on contemporary scientific theories draws this distinction in personality and social psychology into focus.

In an analysis of the factors that might account for the differential rates of progress in various scientific fields, Platt (1964) noted that:

We praise the “lifetime of study,” but in dozens of cases, in every field, what was needed was not a lifetime but rather a few short months or weeks of analytical inductive inference. . . . We speak piously of taking measurements and making small studies that will “add another brick to the temple of science.” Most such bricks just lie around the brickyard. (p. 351)

Considering such a passage cannot help but give one pause for reflection on one’s theory, intuitions, and program of research. Indeed, periodically reconsidering one’s intuitions, assumptions, and theoretical structures may be essential, for although the emphasis thus far has been on transforming entry biases to informed scientific intuitions, the informed intuitions of a seasoned theoretician—like the formal theories themselves—also have the potential to lead one astray.

Approximately 1,800 years ago, Galen organized the best work of the Greek medical schools and out-

³This misunderstanding continues in contemporary theory in social psychology. In work on emotions, some continue to argue that theory and data from the neurosciences are irrelevant because emotions deal with feelings, which by definition are subjective and personal. To put this in context, imagine how specious it would be to argue that theory and data from the neurosciences were irrelevant and could not advance our understanding of pain because it is a subjective and personal phenomenon.

lined an integrative theory of physiology and medicine. His notions about medicine persisted for approximately 1,500 years despite the availability for several centuries of measures and procedures for disconfirming his theory. Theoretical progress in the field awaited the development of new ways of thinking about medical data and theory testing, not measures or data per se (Brazier, 1959). The scientific method as we know it did not exist during this time, and one might dismiss the longevity of Galen's formulations to the absence of a philosophy, practice, or procedure that could be counted on to refine scientific intuitions. However, their existence does not guarantee accuracy, as is readily apparent when one considers the extremes one sometimes finds in competing theories. Indeed, the history and philosophy of science provide ample evidence that science can be humbling to even the most accomplished theoretician.

Various scientists and philosophers have observed that barriers to theoretical progress go beyond difficulties in securing the requisite information: A theoretician must also create the appropriate intellectual structures. Writing about the philosophy of the physical sciences, Sir Arthur Eddington (1939) forewarned that scientific instruments are shaped subtly by a scientist's implicit theories of the phenomena to be investigated and that once deployed, the scientific instruments shape data and theory in ways that are biased to confirm the investigator's original intuitions. Eddington's forewarning, like the surprising longevity of Galen's theory, serves as a reminder not to reify theories or be smug about one's scientific prowess or intuitions.

In this context, the curiosity and nonconformist beliefs of students and young investigators can be as important for even the most seasoned investigator to consider as anything a mentor might offer in return. Mentoring as a reciprocal rather than rigid hierarchical process—which admittedly takes longer than issuing work orders following the blueprints from grant proposals—can play an important role in correcting sophisticated as well as naive assumptions and intuitions. Unfortunately, graduate training in personality and social psychology often focuses on what is at the cutting edge of a small part of the field because developments are unfolding rapidly and the demands of the academic job market place an emphasis on contributing to the literature early and often. As a result, promising theorists may not be given encouragement to question the very basis of contemporary methods and theories or the opportunity to develop a meaningful appreciation for the origins of the unfolding scientific advances in the field, much less the origins and advances in related scientific fields. This practice may contribute to empirical and theoretical work in a field that is derivative, insular, and nongeneralizable—features that, perhaps not by chance, have been said to characterize various epochs in social psychology (e.g., McGuire, 1973; see also

Nisbett, 1990). Following Platt's (1964) logic, providing (or taking) the time to understand the common origins of major lines of thought in a given field and, over time, in related fields, can yield rich associations, connections, and structures involving what otherwise might have seemed to be unrelated data. Theory in the field is ultimately the beneficiary.

Conclusion

In social psychological theories, constructs such as attitudes, cognitive representations, interpersonal relationships, and social norms are no less palpable than are the theoretical constructs of gravity, quarks, event horizons, and black holes. In personality and social psychological theories, we worry about our theories not explaining much of the phenomena we seek to understand. Such obstacles have not stopped theory in cosmology, where dark matter and dark energy—unobservable entities inferred to exist as a way of accounting for the variance otherwise not explained by cosmological theories—represent more than 95 percent of the stuff of which the universe is thought to be comprised. In personality and social psychology, as in physics, theoretical constructs represent nonobservable elements within a complex intellectual structure that specifies how observable stimuli in specifiable conditions are transformed to produce one or more measurable outcomes. Social behavior generally is complex in its determinants and in the component processes. Identifying the specific nature, timing, and integration of the component processes underlying social behavior; the antecedents and moderators of different component processes; and the unique consequences for social behavior resulting from different component processes are essential tasks for theorists. Theorists in personality and social psychology, like theorists in quantum mechanics, have incomplete information regarding the initial starting position and the trajectories of the individuals they study, which together contribute to the stochastic nature of the phenomena under investigation and the small effect sizes measurements reveal.

The position of scientific realists in the philosophy of science holds that scientific theories go beyond data to posit the existence of nonobservable entities—such as black holes and mental representations—that actually exist (Thagard, 2002). In this view, the theory of Newtonian (classic) physics could be discarded because quantum mechanics provides a more accurate description of reality. The contrasting view in the philosophy of science is represented by scientific empiricists who contend that the aim of scientific theories is not to discover absolute truths about reality but rather to produce intellectual structures that provide adequate predictions of what is observed and useful frameworks for answering questions and solving prob-

lems in a given domain (Thagard, 2002; van Fraassen, 2002). According to this philosophy, the theory of Newtonian mechanics represents an important theoretical structure because it continues to provide the simplest explanation for gross physical phenomena.

Each investigator must choose, but the perspective represented here clearly favors the notion that theory represents convenient intellectual structures for predicting or describing in more abstract terms observable data, not necessarily actual structures in the world. Given the self-correcting nature of science over the (very) long run, theories may approach actual structures in the world, but there are no means available for differentiating between a scientific theory that describes actual structures and one that simply provides an exceptionally good description of known and imaginable facts at a given point in history. Recall that Galen's theory of medicine was thought to be an absolute truth for about 1,500 years in part because it would have been irreverent to think otherwise. It therefore may be prudent to adopt the philosophical perspective of scientific empiricism, which views theories in social psychology as convenient abstractions and intellectual structures for describing, predicting, and controlling observable data bearing on social problems or behavior (i.e., as proximal rather than absolute truths), if for no other reason than it may make it easier to not take one's theoretical positions so seriously that creativity or insight is hindered.

Students may bring entry biases from a lifetime of instrumental ways of thinking about social behavior, but they also bring a fresh perspective and an open-mindedness that should never be lost, for these are features that lead one to re-examine rather than mindlessly defend one's intuitions, assumptions, and theoretical structures. This, in turn, can foster theoretical progress. How might one develop or retain these properties? Each individual is unique, but perhaps one should both take theory in the field very seriously and not take theory in the field very seriously, each in turn. If the goal of theory construction is to produce an intellectual structure that provides adequate predictions of what is observable and a useful framework for answering questions and solving problems in the given domain, then the process of theory construction should be imaginative and playful within the constraints provided by logic and evidence. The creative processes of theory construction and refinement are more likely when a prepared mind meets an empirical anomaly. Burying oneself in social psychological journals to the exclusion of a rich and happy life is to ignore new hypotheses that can come from observing and interacting with friends and family, enjoying literature and culture, and benefiting from a normal social life (Nisbett, 1990).

Disappointment over an experimental outcome can be followed by the thrill of curiosity and the discovery of the possible if into the breach of the unknown steps

informed intuition. Whether or not one realizes it, intuition serves as a guide in a variety of decisions one must make in any scientific theory and program of research. Along with the likelihood that an experimental hypothesis provides a good fit to nature revealed through empirical inquiry is the joint probability that all those propositions on which it is based are also good fits to nature; uninformed intuitions (or a defensive posture towards one's own theory and data) can provide a fast track to a frustrating program of research.

There are other predictable impediments to theoretical progress on practical problems of course. For instance, theoretical work in settings in which experimental control is absent or incomplete means that disconfirming evidence can often be attributed to other causes besides deficits in the theory. Given the power of confirmatory biases, confidence in the accuracy of a scientific theory is unlikely to be quick to erode (Greenwald, Pratkanis, Leippe, & Baumgardner, 1986). Perhaps some of the means for mitigating entry biases and for articulating and re-examining "cultivated" scientific intuitions might also lessen the effect of other inherent information-processing errors in human cognition. And perhaps rather than theories and paradigms serving like mighty waves that arise and roll across the sphere only to crash, wither, and be replaced by another generation, formalisms and paradigms will grow across generations as relationships between mentor and student and older and younger investigators become more a mutual partnership rather than a learned hierarchy, and the complementary strengths in naive and scientific intuitions have a chance to subtly minimize the inherent problems in each.

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