

Beyond Behaviorism: On the Automaticity of Higher Mental Processes

John A. Bargh and Melissa J. Ferguson
New York University

The first 100 years of experimental psychology were dominated by 2 major schools of thought: behaviorism and cognitive science. Here the authors consider the common philosophical commitment to determinism by both schools, and how the radical behaviorists' thesis of the determined nature of higher mental processes is being pursued today in social cognition research on automaticity. In harmony with "dual process" models in contemporary cognitive science, which equate determined processes with those that are automatic and which require no intervening conscious choice or guidance, as opposed to "controlled" processes which do, the social cognition research on the automaticity of higher mental processes provides compelling evidence for the determinism of those processes. This research has revealed that social interaction, evaluation and judgment, and the operation of internal goal structures can all proceed without the intervention of conscious acts of will and guidance of the process.

The products of the crude, wholistic, and parallel "primary processes" are usually elaborated by the "secondary processes," which include deliberate manipulation of information by an active agent. An analogy to the "executive routines" of computer programs shows that an agent need not be a *homunculus*. However, it is clear that motivation enters at several points in these processes to determine their outcome. Thus, an integration of cognitive and dynamic psychology is necessary to the understanding of higher mental processes. (Ulric Neisser, 1967, p. 279)

One of the great intellectual debates of the 20th century within psychology and philosophy concerned the age-old question of free will—specifically, the extent to which it plays a role in the causation of complex, higher order mental processes in humans (see Campbell, 1967; Frankfurt, 1971; Ryle, 1949; Skinner, 1971; Strawson, 1962; R. Taylor, 1963). In what follows, we make reference to this debate to place the relatively recent social-cognitive research on the automaticity of higher mental processes in its historical context. In particular, the rather sudden paradigm shift in midcentury from behaviorism to cognitive science presents a point of departure from which we can review this research and consider its relevance for the debate over human volition.

In doing so, we seek to establish two main points. The first is that the social-cognitive approach to higher mental processes, like cognitive science in general, shares with behaviorism a basic deterministic stance toward psychological phenomena. By deter-

minism we mean, quite simply, the position that for every psychological effect (e.g., behavior, emotion, judgment, memory, perception), there exists a set of causes, or antecedent conditions, that uniquely lead to that effect—that is, "in the case of everything that exists, there are antecedent conditions, known or unknown, given which that thing could not be other than it is" (R. Taylor, 1963, p. 34). This fundamental similarity between behaviorism and cognitive science is often overlooked because the rise of cognitive science has often been conceptualized as a revolution in the Kuhnian sense (Kuhn, 1962; Lachman, Lachman, & Butterfield, 1979), and so it is perhaps unsurprising that the differences, rather than the similarities, between the two perspectives have been emphasized.

The defining distinction between the two schools, of course, is the behaviorist's refusal to consider mediating internal constructs and processes (e.g., perceptual interpretation and categorization, judgment and evaluation, memory, motivation and goal pursuit) in explanations of human behavior, whereas those same internal processes are the meat and potatoes of cognitive science (see Block, Flanagan, & Guzeldere, 1997; Herrnstein & Boring, 1965; Lachman et al., 1979). Yet, although this distinction between the two schools is certainly substantial and consequential, behaviorists and cognitive scientists do share certain basic assumptions about the nature of human volition and educe them from the same general philosophical foundation. That is, counter to the popular notion that cognitive science is a radical, encompassing departure from behaviorist theory, much cognitive and social-cognitive theorizing takes the same deterministic stance that served as a canonical conviction for behaviorists (see Amsel, 1989; Bargh, 1997, pp. 1–4; Barsalou, 1992; Zuriff, 1985, pp. 175–200).

Importantly, behaviorists and cognitive (and social-cognitive) scientists have accumulated evidence of determinism by their many demonstrations of mental and behavioral processes that can proceed without the intervention of conscious deliberation and choice. This distinction is at the heart of dual process models of the mind (see, e.g., Chaiken & Trope, 1999; Cohen, Dunbar, & McClelland, 1990; Posner & Snyder, 1975). Willfulness is assumed to

Preparation of this article was supported in part by National Institute of Mental Health Grant R01-MH60767.

We thank Peter Gollwitzer, Ran Hassin, and Joachim Vosgerau for discussions of the central issues, and Tanya Chartrand, Ap Dijksterhuis, Justin Halberda, Annette Lee-Chai, Katelyn McKenna, Alexander Todorov, and Dan Wegner for their helpful criticisms of an earlier version of this article.

Correspondence concerning this article should be addressed to either John A. Bargh or Melissa J. Ferguson, Department of Psychology, New York University, 6 Washington Place, Seventh Floor, New York, New York 10003.

reside in consciousness, and, therefore, a lack of conscious involvement in a process implies it was not willed (see reviews in Bargh, 1989, 1996). According to this standard perspective, then, the complexity and the abstract, protracted nature of the kinds of mental processes and social behavior that social-cognition research has recently discovered to operate and occur without conscious, aware guidance have bestowed an unprecedented legitimacy to the traditional conception of determinism.

In particular, the same higher mental processes that have traditionally served as quintessential examples of choice and free will—such as goal pursuit, judgment, and interpersonal behavior—have been shown recently to occur in the absence of conscious choice or guidance. It would seem, therefore, that the midcentury failure of behaviorism to demonstrate the determinism of complex higher order human behavior and mental processes occurred not because those processes were not determined but rather because behaviorists denied the existence of the necessary intraindividual, psychological explanatory mechanisms (e.g., perception, memory, conscious deliberation) mediating between the environment and those higher processes.

The second main point we seek to make goes well beyond the first, however, because it is our belief that the traditional conception of determinism in cognitive and social-cognitive science is inappropriately constrained by the equation of determination with the lack of conscious awareness, choice, and guidance of the process. For instance, according to this traditional conception, the fact that figural synthesis in vision (see, e.g., Neisser, 1967) can be accomplished without conscious decision making implies that the process is causally determined. This perspective necessarily allows for the possibility that consciously mediated acts might be freely willed (i.e., nondetermined). In other words, a person might have the ability to generate an uncaused choice about her or his behavior or other response to the environment (e.g., judgment, decision, selection of goal to pursue) if an act of conscious guidance underlies the behavior. An uncaused choice cannot be explained in causal terms beyond saying that the person decided (see Sappington, 1990).

As scientists studying human behavior and the higher mental processes, we reject the thesis of free will as an account of the processes that require conscious control (see also Prinz, 1997). Instead, we embrace the thesis that behavior and other responses are caused, including a person's choices regarding those responses; every deliberation, thought, feeling, motivation, and impulse, conscious or nonconscious, is (often multiply) caused. Some of these causes are available, often obviously, to awareness; others are unknowable to the individual. We consider the discovery and delineation of the causal mechanisms that underlie these processes and the quest for supplying mechanisms—not the degree to which the processes progress with or without awareness—as the critical and defining criteria of the deterministic stance (see Zuriff, 1985). We therefore adhere to a different version of determinism compared with contemporary theorizing in social-cognitive science, namely, a view that does not conflate the presence or absence of awareness with determinism or willfulness.

As such, although the growing social-cognitive evidence of the degree to which higher mental processes can proceed nonconsciously is consistent with the traditional determinist position, by showing that these processes do not require an intervening act of conscious will to occur, it should not be concluded from this that

those processes that require conscious or controlled processes (such as those involving temporary and flexible use of working memory; see E. E. Smith & Jonides, 1998) are any less determined. We suggest, rather, that those processes and behaviors that do entail an act of conscious choice, which the person is aware of making, are similarly amenable to an analysis of relevant causes beyond simply the person's decision itself.

We begin with a review of the shift from behaviorism to cognitive science as the dominant paradigm in psychology, with the dual objectives of highlighting the similarity between the two approaches in their assumption of deterministic explanations of behavior and detailing the reasons for the transition from one school to the other. The consideration of these reasons reveals that the failure of behaviorism in no way constituted the failure of determinism. We then present the case for the determinism of higher mental processes by reviewing the evidence showing that these processes, as well as complex forms of social behavior over time, can occur automatically, triggered by environmental events and without an intervening act of conscious will or subsequent conscious guidance. By placing our review of current research on automatic human behavior and higher mental processes firmly within its historical context, we hope to illuminate the roots of that research enterprise, as well as where it needs to go in the future. We then conclude by considering the potential for a deterministic account of the class of mental processes that contemporary psychological theories typically contrast with automatic processes, namely, conscious or controlled processes.

Reasons for the Transition From Behaviorism to Cognitive Science

Behaviorism was a protest movement against the mentalism of Wundt and Titchener (see Herrnstein & Boring, 1965, for a review), in particular, the subjectivity and unreliability of its introspectionist methodology (see, e.g., Mowrer, 1960, chapter 7). The components that the introspectionists proffered included (conscious) images, feelings, and sensations, and it was hoped that these elements could eventually be organized in a way similar to the then recently constructed atomic table in chemistry (Guzeldere, 1997). Researchers administered exhaustive training to participants who were then asked to identify and discriminate between various subjective sensations. However, differences between these participants as to their reported descriptions of phenomenal states were problematic because there was no obvious way to falsify either position; that is, it was impossible to corroborate the perspective of one participant by referring to the perspective of another (e.g., either the experimenter or another participant; see Searle, 1992; Shoemaker, 1997).

As a reaction to the subjectivity and unreliability of this methodology, behaviorism strove to provide a mechanistic account of human behavior, devoid of unscientific mediating variables such as conscious thought and phenomenal experience. The radical behaviorists such as Watson (1913) and Skinner (1938) ruled out cognitive, emotional, and motivational mediators of the stimulus-response (S-R) relation because such constructs could not be measured (at that time) independently by an outside, disinterested party.

Another reason for the exclusion of internal mechanisms from the behaviorists' explanatory scheme was that S-R psychology was

based on Thorndike's concept of habit. This, in turn, was based on the reflex arc of physiology, in which responses were said to be caused directly (reflexively) by external stimulation. For Thorndike, habits were modifiable reflexes, a "bond" or connection extending from some sense organ, *straight through* the organism . . . to the muscles involved in a particular pattern of movement" (Mowrer, 1960, p. 269, emphasis in original). Despite the fact that physiologists had already abandoned the concept of the simple reflex arc as an abstraction having no basis in actual functioning (Sherrington, 1906, p. 137, called it "a convenient, if not a probable, fiction"), the S-R unit became, and persisted as, the basic building block of all behavior. Thus, because S-R units were behavioral responses caused directly by their eliciting stimulus, there was no theoretical or explanatory place for any such mediating internal variable as perceptual interpretation or construal of the situation, motivations and current purposes of the individual, mood or emotional state, expectations, and so on.

As long as the S-R model was tested under very circumscribed and limited conditions—that is, to account for the simple bar-pressing behavior of rats and pigeons—it was successful. To extend the atomistic S-R unit beyond this narrow domain to the much more complex behavior of human beings, such as language and social interaction, behavioristic accounts had to rely on the S-R chain. In this view, complex human behavior was reducible to linear series of single S-R units. In the case of verbal behavior (Skinner, 1957), words were said to be emitted in the presence of their associated object because the individual's caretaking community (e.g., parents) has previously reinforced the use of that particular word in the presence of that object. Then, sentences are built up as reinforced chains in which the first word, emitted as a response, serves as the stimulus that elicits the next word, which has been previously reinforced as a response to the first, and so on, *ad infinitum*.

Human conversations were accounted for in the same manner, with the remarks of one partner serving as the stimulus for the other, who gives a conditioned response to it, which serves in turn as the stimulus for the first person, and so on (Skinner, 1957; see critique by Koestler, 1967, pp. 19–23). In fact, on the basis of the experiments with rats and pigeons, the chaining of S-R units was extrapolated as the primary law governing all human behavior (Skinner, 1953). The behaviorists asserted, in short, that the findings of the bar-pressing experiments could be safely generalized to complex or higher order human functioning.

Determinism of Higher Order Processes: Behaviorism Tries and Fails

As many (even behavioristically inclined) critics pointed out, this is an entirely unsatisfactory and inadequate account of higher processes such as speech production and language behavior, not to mention human behavior (see, e.g., Brown, 1965; Chomsky, 1959; Koestler, 1967; Lashley, 1951; Mowrer, 1960). It cannot account for the human ability (if not propensity) to easily produce sentences never heard before; it cannot account for the child's quick mastery and use of grammatical rules that he or she has never been taught or otherwise learned (and which not even adults can report); and it fails to specify exactly what is the unit of language that is being reinforced—the meanings of separate phonemic sounds change depending on the context of the entire word, the meanings

of words depend on the context of the entire sentence, and so on (see Lashley, 1951).

The problems are not restricted to language. Among the most critical problems in applying S-R psychology to complex human behavior are ones related to the lack of specificity as to how stimulus and response are defined—are the Ss in S-R all of the outside events going on at a given point of time or only those to which the person responds? Is the R any part of the person's behavior at that moment or only those parts that are associated in lawful ways with the S? As Chomsky (1959, pp. 30–34) pointed out, by the broad definition, human behavior is hardly lawful at all, and by the narrow definition, the lawfulness is reduced to a tautology. Much of the problem had to do with the fact that people respond to different aspects of the same stimulus event and which aspect of the stimulus is associated with the response is not knowable (or specifiable *a priori* in the S-R theory) until one knows what the response was.¹

For example, consider a group of people in a museum viewing the same Utrillo painting of a Parisian street scene. One person may remark to her friend on the beautiful texture of the paint at the same time another person is saying to his wife, "Let's try that new French restaurant tonight." For the first person, the stimulus is the quality of the painting itself; for the second person, it is the specific content represented in the painting. In each case, it is only after one hears the two different responses that one can identify what Skinner (1957) called the controlling stimulus. The controlling stimulus is therefore defined (after the fact) in terms of its particular meaning for the individual, not in terms of its external or objective qualities—how it is construed and experienced by the individual, in other words, something left out of the S-R account. In Chomsky's (1959) analysis this was (ironically) a "mentalistic" account, with the stimulus no longer an external entity but "driven into the organism" (p. 34).

The publication of Skinner's *Verbal Behavior* (1957) was thus a watershed event in the history of 20th century psychology because (a) it was the first attempt to extend the S-R model to higher order processes in humans, and (b) it failed spectacularly. The behavioristic model of behavior—with its deliberate exclusion of internal, mediating processes—was revealed as wholly inadequate to predict and explain complex human phenomena such as language, memory, and behavior. Critics immediately noted the behaviorists' self-handicapping—that by forbidding itself any recourse (except the most primitive) to mediating mechanisms within the organism, behaviorism (especially radical behaviorism) could never possibly account for higher order human behavior (Mowrer, 1960, p. 264). As Chomsky (1959) concluded, "the magnitude of the failure of this attempt to account for verbal behavior serves as a kind of

¹ Note that this is not a problem for any account that includes a role for internal mediating mental processes. Social-cognition research, for example, easily handles individual differences in situational construal because the controlling stimulus is not external *per se* but a function of the person's perception or interpretation of the situation (i.e., the psychological situation; Higgins, 1996; Lewin, 1931; Mischel, 1973).

measure of the importance of the factors omitted from consideration" (p. 28).²

Cognitive Science and Determinism: Keeping the Baby and Throwing Out the Bath Water

With the shortcomings of behaviorist theory thus exposed, cognitive scientists began to investigate the very internal constructs previously banned from study. Considerable research effort to this end resulted in a massive amount of evidence demonstrating the explanatory value of internal and (as it turned out) nonconscious mechanisms (see, e.g., Barsalou, 1992). In the attempt to address the ways in which the mind worked in conjunction with the environment, cognitive science did not need to invoke concepts such as consciousness, intention, or free will. Thus, although cognitive scientists introduced, as necessary, some metaphysical constructs such as memory, they largely upheld the deterministic view of behavior through an almost exclusive focus on nonconscious, mechanistic processes. In this way, cognitive psychology continued to rely on the same determinist foundations that behaviorism had promoted; it simply incorporated metaphysical mental mechanisms such as memory and decision making into a deterministic account of mental processing.

Just 10 years following the publication of Skinner's (1957) *Verbal Behavior*, Ulric Neisser (1967) published his book, *Cognitive Psychology*, often referred to as the manifesto of the cognitive revolution. Neisser spent several early chapters developing the account of how the world meets the mind—first, the sensory registration of external stimuli, then, combinatorial processes of pattern recognition, and finally, segmentation of the physical world through processes of figural synthesis. These were all pre-attentive processes, according to Neisser, occurring automatically and immediately, with the individual unaware of anything but their final output—the trees and buildings and people that one experiences as the givens, the starting point, of one's thoughts and responses to the environment. In stark contrast to Skinner's position in *Verbal Behavior*, the process of figural synthesis was argued by Neisser to be the end and extent of the evidence for automaticity (pp. 100–101) in terms of internal cognitive activity put into motion wholly by the presence of environmental stimuli. Causation of higher mental processes was located in the mind itself, instead of outside in the environment, by means of what were termed executive processes. Remarkably, the dominant position in psychology had swung like a pendulum in just 10 years from being the environmental determinism of everything to the environmental determinism of hardly anything.

Still, Neisser (1967) fully realized the causal vacuum that had been left by the abandonment of environmental determinism and acknowledged the homuncular, or "little man in the head," nature of the interpolated causal agent of the executive in his discussion of "the problem of the executive" (pp. 292–296). For Neisser, as for the cognitive scientists who followed him (e.g., Baddeley, 1996; Barsalou, 1992), one important goal of cognitive science was to shrink the size of the black box of executive control processes by discovering ever more of its internal mechanisms.

The social-cognitive research on the automaticity of higher order processes reviewed next represents one attempt to shrink this black box. It has reopened the behaviorists' hypothesis that the higher order responses of the human being can be directly put in

motion by environmental stimuli. However, unlike the behaviorist approach, it makes full use of internal psychological processes as explanatory mechanisms in testing this hypothesis. Thus, whereas this contemporary research shares the behaviorists' goal of accounting for higher order processes without recourse to interpolated conscious choice and guidance, it is in no way a revival of the concepts of habit or of S-R psychology. It can be better considered as an attempt to bring the same emphasis on mechanism that has led to great strides in cognitive science and neuropsychology over the past 30 years to those areas of modern psychology that have, for the most part, proceeded in isolation from that general trend.

The social-cognitive research on automaticity focuses on processes that correspond to the traditional sense of determinism in much of psychology—processes that do not require conscious choice, intention, or intervention to become active and run to completion. As such, the considerable and pervasive role that automatic processes have been found to play in a wide variety of higher mental and behavioral processes constitutes strong evidence in support of the determinism of those processes. However, this is not to say that controlled or conscious processes are any less determined. Just as Neisser (1967) believed that the black box of executive control processes is nothing but a homunculus in the absence of mechanistic accounts of its functioning, we also argue, in the final section of this article, that conscious or executive control processes must themselves too somehow be controlled, or caused, and thus be just as determined as automatic processes.

Automaticity of Higher Mental Processes

Automatic Social Behavior by Means of Nonconscious Social Perception

One route between environment and human behavior that bypasses consciousness actually comprises two separate components, each of which has a long and well-documented research history: perception (i.e., internal activation of abstract semantic representations directly by the corresponding environmental objects and events) and behavior. Yet only recently have the two links of the chain become connected in theory, and combined, they do seem to indicate a causal effect of environmental events on behavior that proceeds outside of awareness. Moreover, these effects occur for simple, motoric responses (e.g., posture, mannerisms) and complex, social behavior (e.g., rudeness, intelligence) alike.

Automatic social perception. The first leg of the sequence is noncontroversial: that much if not most of perceptual activity is driven by the information in the environment, in interaction with the categories and concepts one has developed to represent that information (see, e.g., Bruner, 1957; Neisser, 1976; E. E. Smith & Medin, 1981). This effect extends beyond the automatic categorization of the physical objects and elements of the world (such as trees, buildings, and human beings) described by Neisser, to the meanings of social behavior. Much research has shown that social behaviors are encoded in trait-concept terms (e.g., honest, mean) spontaneously and without intention (see, e.g., Carlston & Skowronski, 1994; Uleman, Newman, & Moskowitz, 1996; Winter &

² From our vantage point 40 years later, it is clear that Chomsky's (1959) position carried the day, but this is not to say his arguments went unchallenged at the time (see, e.g., MacCorquodale, 1970).

Uleman, 1984). Other studies have shown the automatic capture of ambiguous social behavior by frequently used trait concepts (Bargh, Lombardi, & Higgins, 1988; Higgins, Bargh, & Lombardi, 1985; Higgins, King, & Mavin, 1982), resulting in individual differences in impressions formed of the identical person. Still other experiments have shown such automatic trait concepts to be capable of processing relevant social behavior even under severe memory load conditions (Bargh, 1982; Bargh & Thein, 1985) and to become active and influential when relevant stimuli are presented subliminally, outside of conscious awareness (Bargh, Bond, Lombardi, & Tota, 1986; Bargh & Pietromonaco, 1982).

That these trait constructs capture and interpret relevant social behavioral information without the perceiver's awareness or intention is indicated by the outcome of dozens of contextual priming studies in which the given trait construct is previously and unobtrusively activated in an unrelated context (as in a memory or language experiment by synonyms of the trait). These primed trait constructs then alter the interpretation of the behavior and hence the impression formed of the target person, compared with a nonprimed control condition, without the participants being aware of the influence (see reviews in Bargh, 1989, 1994; Higgins, 1989, 1996; Sedikides & Skowronski, 1991; Wyer & Srull, 1989). Moreover, preconscious effects on social perception have been found subsequently to extend to the activation of stereotypes, which are more complex, schematic organizations of several different concepts (see, e.g., Bargh, 1994, 1999; Brewer, 1988; Devine, 1989; Lepore & Brown, 1997).

In short, social behaviors in the external environment often if not usually access their corresponding mental representations in an immediate and direct manner, without conscious and effortful processes of categorization and interpretation being necessary.

The effects of nonconscious perception on behavior. To explain how these nonconscious perceptual processes might extend to the control of social behavior, we begin with considering how conscious mental contents directly affect behavior. There is a long history of theorizing about this link. For example, the physiologist William Carpenter (1888) argued that merely thinking about a given behavior is sufficient to create the tendency to engage in that behavior. William James (1890) popularized Carpenter's notion of *ideomotor action* in his classic chapter on the will. For James, "thinking was for doing" (see also Fiske, 1993), and so, thoughts about actions create impulses that, if not checked or controlled by "acts of express fiat," culminate in performance of that action. James, in fact, believed that most behaviors are caused by such impulses, by the free flow of the "stream of consciousness"—he believed it is relatively rare for a choice or decision to precede an act (James, 1890, pp. 520–524).

Yet, as described above, ideation about a specific type of behavior can also be induced nonconsciously, through automatic perceptual activity. Indeed, many theorists have argued for a strong, automatic connection between representations used to perceive a certain kind of behavior and those used to behave in that way oneself (see, e.g., Berkowitz, 1984; Lashley, 1951; Müsseler & Hommel, 1997; Prinz, 1987, 1990). Lashley (1951) and Prinz (1990) argued that the features relevant to understanding and categorizing someone else's behavior are highly semantically similar, if not identical, to the features one needs to produce to behave the same way. Thus, because of the semantic overlap, the percep-

tual and actional representations for the same kind of behavior should be strongly associated in memory.

Recent neurophysiological research supports the idea of a strong link between perceptual and motoric representations. Mirror neurons in nonhuman primates (e.g., the macaque monkey) that function to match the observation and the execution of motor actions have been discovered (Gallese, Fadiga, Fogassi, & Rizzolatti, 1996; Rizzolatti & Arbib, 1998). These neurons, located in the premotor cortex, fire both when the monkey reaches for and grasps an object and when the monkey watches the experimenter making the same actions. That the overlap occurs in the premotor and not the motor cortex is consistent with other neuropsychological research showing that behavioral representations, but not perceptual ones, are associated with regions of the motor cortex such as the basal ganglia and cerebellum (see, e.g., Gabrieli, 1998, p. 99; E. E. Smith & Jonides, 1998).

Berkowitz (e.g., 1984, 1997) made the perception-behavior link the central mechanism behind media effects on behavior: Viewing a film containing violence and aggression cues or activates one's own tendencies to act in the same manner. Carver, Ganellen, Froming, and Chambers (1983) provided a test of the automaticity of this connection between social perception and social behavior, through use of a priming paradigm.³ Participants were unobtrusively exposed to words related to hostility on a first language test and then, in an ostensibly unrelated second experiment, were instructed to give shocks to a learner participant (actually a confederate who was not, in reality, shocked) whenever he or she made an error in a paired associates learning paradigm. As predicted, those for whom the construct of hostility had been previously activated gave longer shocks to the learner participant than did nonprimed participants.

Yet, because all participants in the Carver et al. (1983) study had been given explicit instructions to give shocks to the learner participant, there was conscious, purposive involvement in producing this effect. That it could also occur without any conscious involvement was tested in a similar priming study by Bargh, Chen, and Burrows (1996, Experiment 1). As in the Carver et al. study, participants first completed a scrambled-sentence test in what they thought was a first experiment. On this task, some participants were exposed to words related to rudeness, some to words related to politeness, and the remainder of participants were assigned to the control, no-priming condition. When they had completed the language test, all participants then (as they had been instructed) came out into the hallway to find the experimenter, to receive the

³ Priming of the social-cognition variety (as opposed to priming by means of prior presentation of single words in memory research; Roediger & McDermott, 1993) typically presents participants with words related to a certain trait concept (e.g., honesty, hostility) in a camouflaged manner, as in a scrambled-sentence test, where participants are to construct grammatically correct sentences (Srull & Wyer, 1979). Next, in an ostensibly unrelated experiment, the participants read about the (somewhat ambiguous) behaviors of a target person and report their impression of that person. The usual finding is that the prior exposure to the trait terms activates the related trait concept in memory, making it temporarily more accessible for a time, so that it is more likely to be used to capture or interpret the target behaviors. Subtle priming of the concept of honesty, for example, causes participants to see the target as more honest than do nonprimed participants.

second task of the study. At this point, however, the experimenter was engaged in a (staged) conversation with another person, and the two kept up this conversation until the participant interrupted (or until 10 min had passed). Results showed a startling effect of the priming on behavior in this situation: 63% of those in the rudeness priming condition interrupted at some point, 37% of those in the control condition did so, but only 17% of those in the polite priming condition interrupted.⁴

In a second experiment, Bargh, Chen, and Burrows (1996) extended the behavior priming effect from single trait concepts to stereotypes, as Devine (1989) had done in the domain of social perception. Participants completed a scrambled-sentence test with (for half of the participants) several words related to the stereotype of the elderly embedded in the test (e.g., wrinkle, grey, wise). However, none of the priming stimuli were related semantically to the focal quality of slowness or weakness, to ensure that any effects on the dependent variable (walking speed) was attributable to the stereotype activation and not the particular activation of that single concept. The participants believed the language test was the only experimental task, and so, when they had completed it, they left the experimental room and headed for the building elevator. As each walked away, how long it took him or her to reach the end of the hall was unobtrusively measured. As predicted, those in the elderly stereotype priming condition took significantly longer than did control participants.

The direct effect of automatic trait-concept and stereotype activation on one's own behavior has subsequently been demonstrated for a wide range of content and behavioral outcomes (Chen & Bargh, 1997; Dijksterhuis, Bargh, & Miedema, 2000; Dijksterhuis et al., 1998; Dijksterhuis & van Knippenberg, 1998; Macrae et al., 1998; Macrae & Johnston, 1998). For example, Dijksterhuis and van Knippenberg (1998) primed either the stereotype of university professors or that of soccer hooligans in a first experiment, and in the second, ostensibly unrelated experiment, participants answered questions from the game Trivial Pursuit. Professor-primed participants answered more of the items correctly than did hooligan-primed participants, living up to the stereotypes of those two groups as intelligent and stupid, respectively. In another study, Dijksterhuis et al. (2000) showed that priming some participants with elderly related stimuli in one experimental room resulted later in poorer incidental recall of the contents of that room, compared with the memory performance of nonprimed participants, a finding in line with the stereotype of the elderly as forgetful.

Behavior mimicry in naturally occurring interaction contexts. Research on behavioral mimicry within social interactions has a long tradition, going back at least to Adam Smith (1759/1966), who wrote that taking the perspective of the other person resulted in one's reflexive imitation of them. Darwin (1872/1965) also believed that imitation was a reflexive, empathic response to another. More recently, there has been a substantial amount of research demonstrating behavioral mimicry and coordination between interaction partners (see, e.g., Bavelas, Black, Lemery, & Mullett, 1986; Bernieri & Rosenthal, 1991; LaFrance, 1982). A consistent theme within these different research programs is that the mimicry between the partners is either in service of the strategic and conscious goal to establish rapport or friendship (i.e., an ingratiation goal) or because such a bond already exists (i.e., behavior matching between two friends).

It is unlikely that the effect requires the goal to establish or maintain an interpersonal bond. For one thing, direct effects of perception on behavior are found in many animals, such as in the quick and flawless coordination of movement in schools of fish, flocks of birds, and herds of antelope (Pitcher, 1983; Reynolds, 1987, 1993; see Dijksterhuis et al., 2000). Second, the recent behavior priming studies, reviewed above, showed effects on behavior in the absence of any such interpersonal motive or goal (in fact, in the absence of any other person). This leads to the prediction that such mimicry will also happen among strangers, between whom no bond already exists, and in the absence of any goal to establish such a bond.

Chartrand and Bargh (1999, Experiment 1) tested this prediction. Each participant interacted with two confederates (posing as fellow participants), one after the other. In each session, the two of them examined each of a series of photographs and gave their spontaneous associations and reactions to them. This task was designed so as to minimize eye contact and interaction between the participant and confederate to in turn keep to a minimum any motivation or goal to establish friendship or a relationship. One of the confederates touched her face often with her fingers while looking at the photographs, and the other shook her foot periodically from her cross-legged, seated position. The participant's behavior was videorecorded so that later ratings could be made of how much the participant engaged in face-rubbing and foot-shaking, respectively.

As predicted, the participant's behavior changed as a function of the behavior of the person he or she was currently with—more face-rubbing when with the face-rubbing confederate versus the foot-shaking confederate and more foot-shaking when interacting with the foot-shaking versus the face-rubbing confederate. When questioned later, participants showed no awareness of these behaviors of the confederates nor even of having engaged in these behaviors themselves.

In Experiment 2, the situation was reversed, with the confederate adopting the body posture and mannerisms of the participant. Compared with the condition in which confederates did not engage in such mimicry, participants liked the confederates significantly more and also thought that the interaction went more smoothly. By experimentally manipulating mimicry among strangers, Chartrand and Bargh (1999) were thus able to show that mimicry—an automatic and unintended behavior driven directly by interpersonal perception—causes the establishment of rapport and empathy between strangers, rather than the other way around.

Nonconscious activation and influence of situational norms. Recently, Hertel and Kerr (2000) used similar priming procedures to nonconsciously activate social norms. These were then found to

⁴ One might consider the lack of uniformity of behavior within each condition as somehow being evidence against the determinist position, arguing that if behavior is determined by the environmental stimulus (i.e., the primes), then it should occur 100% of the time. This argument, however, reflects a misunderstanding of the determinist position (as defined above)—to wit, any effect has an associated set of antecedent causes; in this and all studies discussed in this section, the experimental design never controls 100% of the inputs to the participant's response, only one (albeit powerful) such input. In psychological research, unlike (say) applied physics, it is impossible to have complete control over all relevant causal inputs.

guide behavior within an intergroup conflict situation, without the participants' conscious choice or awareness of such effects. Studies of the minimal group paradigm (Tajfel, Billig, Bundy, & Flament, 1971) have shown that merely dividing participants arbitrarily into groups results in in-group favoritism, such as the allocation of greater resources to members of one's in-group than to members of the other group. A standard explanation for this effect is in terms of motivational factors, for example, the higher valuation of one's own group to enhance one's own self esteem (Tajfel & Turner, 1986).

Hertel and Kerr (2000) proposed an alternative account in which behavior is guided by whatever social norms are activated and made accessible by the situation. In the intergroup situation, one possible norm is that of group loyalty (which would produce in-group favoritism), and another is that of equality of treatment (which would work to reduce such favoritism). The researchers primed either the concept of loyalty or of equality in a first verbal learning experiment in which participants were exposed to terms such as trustworthy, buddy, betrayal, and disloyal (in the loyalty-priming condition) or fair, impartial, prejudiced, and favoritism (in the equality-priming condition), interspersed with many other words. Next, in what was presented to them as an unrelated experiment, participants took part in the standard minimal group paradigm experiment.

As predicted, compared with participants primed with equality-related items, loyalty-primed participants showed greater in-group favoritism in resource allocation and also identified more strongly with their in-group. Furthermore, participants in the loyalty-primed condition had higher self-esteem the greater the in-group favoritism that they showed, whereas those in the equality-primed condition had lower self-esteem the more they showed in-group favoritism. This study shows that situations can automatically activate norms that then guide intergroup behavior without conscious involvement in the process.

Limits on perceptual determination of behavior. The effect on behavior of abstract semantic representations activated by perceptual activity is, of course, not obligatory (see Fodor, 1983). Macrae and Johnston (1998), for example, showed that when the primed behavior has costs or clear negative consequences, the effect is controlled or inhibited. Participants were primed with helpful-related stimuli and then, after leaving the experiment, were on an elevator with a confederate who dropped many pens. Helpful-primed participants were more likely than nonprimed participants to reach down and pick up the pens for the confederate except when, in another condition, the pens were leaking and very messy looking.

This finding is reminiscent of that of Langer, Blank, and Chanowitz (1978, Experiment 2) in which people in line for a copy machine were asked by a stranger if they would mind letting him use the machine before them. The number of copies he said he had to make was either small or large. When the number of copies to be made was small, the people in line acquiesced at the same rate, regardless of the quality of the reason given. When the number of copies to be made was large, the quality of the reason did matter. People reacted mindlessly to the actual content of the request as long as it did not interfere with their current goals, but when it did, the automatic effect of the activated request script (default or habitual tendency to acquiesce because usually there is a good reason for the request) on people's behavior was blocked in favor

of the goal (presumably, the people in line did have other things to do—currently active and operating goals—after they had made the copies).

The Macrae and Johnston (1998) study therefore illustrates the fact that perceptually activated semantic representations are not, of course, the only determinant of behavior; rather, behavior is multiply determined, and the environment can simultaneously put several, sometimes conflicting, behavioral and motivational impulses in motion. The dropped but leaking pens were relevant not only to a goal to be helpful but also to a presumably chronic goal of the individual to keep clean (see *Automatic Goal-Directed Behavior*, below), which would have guided the avoidant behavior. The messy pens were also associated with a clear, foreseeable cost (or disincentive), which, according to behaviorist learning principles, would inhibit the attempt to pick them up. Although there are clearly limits to the explanatory power of behaviorist S-R learning formulations, especially when it comes to behavior extended over time, this does not mean that the laws of reinforcement and punishment never apply to humans, especially in the case of single reflexive acts (see Rescorla & Solomon, 1967; Rescorla & Wagner, 1972).

Clearly, multiple nonconscious influences on behavior can occur in parallel, at the same time, yet a person can only do one thing at a time. It is thus an important agenda for future research to sort out how these alternatives are prioritized (see, e.g., Atkinson & Birch, 1970; Bargh, 1997; Lashley, 1951; Shallice, 1972) and how the various environmentally driven influences interact with one another (see below and Moskowitz, Wasel, Gollwitzer, & Schaal, 1999).

Evaluations, Emotions, and Judgment

Many studies have demonstrated that people automatically evaluate as either good or bad most if not all stimuli (objects and events, social and nonsocial alike) on encountering them (see, e.g., Bargh, Chaiken, Govender, & Pratto, 1992; Bargh, Chaiken, Raymond, & Hymes, 1996; Fazio, Sanbonmatsu, Powell, & Kardes, 1986; Glaser & Banaji, 1999). This classification of the stimulus as either good or bad occurs within a fraction of a second after its presentation (250 ms or less) and does not depend on the individual having the intention to evaluate or the awareness that he or she is doing so (see, e.g., Bargh, Chaiken, et al., 1996). Research on evaluative priming has suggested that people tend to automatically evaluate visually presented words (see, e.g., Bargh et al., 1992; Bargh, Chaiken, et al., 1996; Fazio et al., 1986; Glaser & Banaji, 1999), faces (see, e.g., Baldwin, Carrell, & Lopez, 1990; Murphy & Zajonc, 1993; Niedenthal, 1990; Niedenthal & Cantor, 1986), pictures (Giner-Sorolla, Garcia, & Bargh, 1999), and odors (Hermans, Baeyens, & Eelen, 1998).

Typically, these studies have used the sequential priming paradigm (see, e.g., Neely, 1977) in which prime stimuli are presented, on each trial, very briefly prior to presentation of the target stimulus, to which the participant responds. The duration of the prime is too brief for a conscious, strategic response based on the prime to be prepared for the target (as in an expectancy about the nature of the target), and so, any effect of the prime on response latency to the target indicates an automatic spreading-activation effect (Neely, 1977, 1991). Several different tasks have been used—to evaluate the target as good or bad, to respond whether the

target is a word or not (lexical decision), or merely to pronounce or name the target as quickly as possible. Regardless of which task is used to detect the effect, when the prime and the target are of the same valence (both good or both bad), target responses are facilitated, compared with when prime and target do not match on valence. Importantly, in these studies, there is no other semantic relation between the prime–target pairs other than matched versus mismatched valence. Thus, the only way in which the prime can affect responding to the target is if the prime itself is classified as good or bad immediately and unintentionally, with the consequence that, for a short time, all other similarly valenced concepts in memory are more accessible (see below and Ferguson & Bargh, 2000).

Because of the ubiquity of this effect, more recent research has probed its downstream consequences for emotion, judgment, and motivation. Chartrand and Bargh (2000) have shown that the automatic evaluation is a contributing, and nonconscious, influence on one's mood. In this set of studies, participants were subliminally presented with a series of attitude objects that were either all positive or all negative. Participants' subsequent mood was a function of the valence of the subliminally presented attitude objects. Those who had been presented with positive stimuli were subsequently in a significantly better mood than those who had been presented with negative stimuli. This research demonstrates that the automatic appraisal of stimuli accrues over time into an effect on one's general mood state; given that the process and effect is entirely nonconscious, it would seem that automatic evaluation processes serve as a kind of signal as to the overall quality of one's environment. In general, people are motivated to change or alter their environment when in negative moods and to leave well enough alone when in positive moods (see Mowrer, 1960; Schwarz, 1990).

Other experiments have examined the consequences of automatic evaluative processes for social judgment (Ferguson & Bargh, 2000). In one study, participants were asked to complete word-fragments that could be completed with either a positive or negative word. For instance, the fragment "GREE_" could be completed as "GREEN" or "GREED." Each fragment was preceded, very briefly, by either a positive or negative attitude object. Participants tended to complete the fragments with a word that matched in valence with the preceding prime. Another study investigated whether this effect of automatic evaluation on response generation would also occur with homonyms that could be defined in either a positive or negative way (e.g., "MEAN"). Again, participants tended to define each homonym in line with the evaluative connotation of the preceding prime. In both these studies, there was no other semantic relation between prime and target other than valence.

These first two studies demonstrated that automatic evaluation influenced the ways in which participants interpreted stimuli that could be disambiguated in either a positive or negative way. Presumably, the only way such an effect could occur is through the temporary activation by the prime of all similarly valenced concepts in memory. A third study (Ferguson & Bargh, 2000) explored whether automatic evaluation would influence an inference about a social behavior that could be interpreted as either positive or negative. For example, the behavior "Molly never takes no for an answer" could be characterized as either stubborn or persistent (see Newman & Uleman, 1990). Participants were asked to read

various ambiguous behavior descriptions, and while doing so they tended to spontaneously infer a trait that was evaluatively consistent with the attitude object that preceded the behavior. Thus, one's initial automatic evaluation(s) of a person—which could be based on race or gender (for example), as well as haircut or clothes—even though fleeting, can have powerful, long-lasting consequences for future interactions with that person, given that it can cause the interpretation of that person's behavior to be slanted in either a positive or a negative direction. These interpretations can remain in memory for a long time, and they serve as the basis for more consciously formed judgments and decisions about the person (see, e.g., Higgins, 1996).

Automatic evaluations have also been linked to motivational orientations toward the object. Solarz (1960) showed that people were faster to pull a lever toward them when responding to positively valenced object names, compared with responses to negative items, and were faster to push the lever away when responding to negative compared with positive items. Thus, there is a relation between immediate evaluation and muscular readinesses to approach or to avoid the object. The participants in Solarz's experiment were explicitly evaluating the stimuli when making their lever responses, however, and so, there was a potential causal role of the conscious and deliberate goal to evaluate in this effect. Chen and Bargh (1999) replicated the Solarz finding in a task in which there was no goal to evaluate anything at all, just to react to each stimulus as quickly as possible. When the reaction was made by pushing the lever, participants were faster to respond to the negative than the positive attitude objects, and when it was made by pulling the lever, the reverse was true. The unintended and nonconscious evaluation of a stimulus object or event immediately prepares the appropriate muscular tendency to either approach or avoid that stimulus.

Automatic Goal-Directed Behavior

As Neisser (1967) foresaw, any account of higher order processes in humans must take into account the intervening role of the person's motivations and goals with regard to his or her current environment. In this section, we build the argument that such motivations and goals can be put into motion directly by the environmental situation, without necessity of conscious choice or reasoning processes, and can then operate to guide behavior and other higher mental processes in complex interaction with the environment (see also Bargh, 1990; Bargh & Chartrand, 1999).

Feedback is essential. At about the same time that it was becoming clear that discrete S-R units are not capable of accounting for complex human behavior, critics such as Mowrer (1960, chapter 7), Miller, Galanter, and Pribram (1960) and Koestler (1967, chapter 3) saw the necessity of feedback from the environment for the activated response to be guided to conclusion. Developments in information theory and engineering—most notably Wiener's (1948) concept of cybernetics, in which mechanisms govern their own behavior on the basis of environmental information fed back to them—led to the creation of automatic control systems (Aizerman, 1963; deRoy, 1966; Nagel, 1952). An automatic control process is defined as that "by which any quantity in a machine, mechanism, or other technical equipment is maintained or altered according to given conditions *without the direct participation of man*" (Aizerman, 1963, p. 1; our emphasis).

The existence of systems that can self-regulate in an entirely mechanistic way—without human intervention and choice making—means that, in principle, autonomous mental circuits can also operate, once activated, in a complex goal-directed interaction with the environment extended over time. Thus, both Mowrer (1960, p. 267) and Koestler (1967, chapter 3) endorsed an approach to determined higher order behavior in terms of autonomous units or circuits activated by the environment that then operate and guide lower level processes in the goal hierarchy. (See Carver & Scheier, 1981, 1998, for a contemporary cybernetic approach to human goal-pursuit.) Wiener (1948, p. 14) gave an example of such an autonomous unit operating on feedback information in the domain of motor behavior: A person intends to pick up a pencil and manages to do so without further decision making or guidance of the lower level processes such as deciding which muscles to move. Indeed, it is highly improbable that a person could, through conscious willing, contract the appropriate muscles in their proper order so as to pick up the pencil. Nonetheless, visual and then tactile feedback from the environment remain essential throughout the act.

For internal goal structures to guide behavior toward the goal for extended periods of time, therefore, they must, through informational feedback, be able to interact with the environment. Thus, to escape the problems inherent in S-R chains, as enumerated above, and to attain a mechanistic account of goal-directed behavior over time, internal goal structures (a) must be capable of autonomous operation and (b) must have access to incoming information about the changing environment. The existence and sophistication of automatic control mechanisms in engineering (see, e.g., Michael Mozer's self-programming and autonomous house; Mozer, 1998; Mozer et al., 1995) demonstrate that it is possible, in principle, for such control systems to exist. That they do exist and operate in humans, as sophisticated autonomous mental processes that learn and adapt to experience on their own, is supported by the success of connectionist or neural-network approaches to vision and problem solving (see, e.g., Cohen et al., 1990; McClelland & Rumelhart, 1986; E. R. Smith, 1996; Wiles & Humphreys, 1993).

The purposive nature of behavior. It is not only the feedback element of these hypothetical control structures that is critical, it is also their goal-directed nature. Any proposed mechanism for environmental control of higher order phenomena must take into account the fact that human behavior is purposive—as acknowledged long ago by the neobehaviorists (e.g., Hull, 1931; Tolman, 1932), as well as by Neisser (1967). As the epigraph that opened this article clearly shows, Neisser saw from the outset of cognitive psychology that any attempt to explain higher order processes must take into account how the individual's motivations and goals modify the effect of the external environment.

In fact, the hypothesis that environmental events are capable of activating internal goal structures (Bargh, 1990) was first put forth in response to the growing literature on the goal-dependence of many (if not most) social information-processing tasks (see reviews in Bargh, 1989; Srull & Wyer, 1986). How information is processed, stored, and later remembered about another person or about a social situation or event is not a straight function of the information itself but an interaction between it and the current purposes of the perceiver. When interacting with another person (or group of people) one is not always trying to form impressions of them, to present oneself to them favorably, or to remember what

is being said—one can be trying to get their help in solving a problem (i.e., fixing a computer), trying to relax and just have a good time, or seeking information about their position or feelings toward the current political or world crisis. What people attend to, how people interpret it, what people remember, and so on from these exchanges is dramatically different depending on what particular goals they have at the time (see the discussion of this point by Wicklund & Steins, 1996).

Consequently, the automatic effects of the environment on the mind hit a brick wall (as Neisser foresaw) after the initial preconscious analysis of the environment that produces the informational units that the individual then uses, or not, depending on his or her current purposes. What happens after this initial segmentation of the environment depends on the current goal and is not solely a function of the informational input. Under the prevailing assumption that goals were put in place through conscious choice and decision processes, it seemed, at the time, that the limits of the extent of environmentally driven, automatic processes had been reached: They could determine the shape of inputs but not outputs in the form of memory storage, judgments, evaluations, and behavior (Bargh, 1989).

One possible route remained for higher order processes to occur completely without conscious involvement, and thus automatically. That would be if the environment itself could activate the person's goal within the situation, as part of the preconscious analysis of that situation, and if this goal then operated in the same manner (without the individual knowing it) as when put into play consciously. This became the so-called auto-motive model of environmentally driven, goal-directed behavior (Bargh, 1990).

That goals could proceed, once activated, without awareness had already been well established, in the long history of research on skill acquisition (see reviews in Bargh, 1996; Wegner & Bargh, 1998). That research showed that once put into motion by explicit instructions (as in psychology experiments) or the individual's own intention to pursue the goal (as in life outside the laboratory), well-practiced information-processing and behavioral goals could operate autonomously, needing no conscious intervention to run to completion (see Anderson, 1983; Newell & Rosenbloom, 1981; Shiffrin & Schneider, 1977; E. R. Smith & Lerner, 1986). The notion that mental operations recede from conscious awareness and necessity of control with frequent and consistent use has been a staple principle of psychology since Jastrow's (1906) pioneering book on the subconscious. Modern research on skill acquisition has affirmed that intentional processes (e.g., driving a car, reading, playing a violin, making a social judgment) become fast and effortless with practice. The hallmark of these automatic skills is that once they are put into operation by a conscious intention, they then operate autonomously in complex interaction with environmental events—once they are in operation, conscious choices and guidance to completion are no longer necessary.

Automatic linkage of plans to goals. Aarts and Dijksterhuis (2000) have examined whether plans of action become automatically associated with the goal that they are intended to carry out. Their experiments tested the idea that habits are not behaviors linked directly to the environment, as in S-R psychology, but are instead behaviors automatically linked to their higher order goal. Thus, when the goal is activated, the habitual plan for carrying out that goal is automatically activated as well (without need of conscious planning or selection).

University students who either habitually used a bicycle to travel from home to the university or instead relied on a different mode of travel (e.g., public transportation, walking) served as participants. In an initial language experiment (the priming task), some participants were (and others were not) exposed to sentences having to do with traveling to some location (e.g., the shopping mall). In this way, the goal to travel was unobtrusively activated or primed for half of the participants and not for the other half. Next, participants performed a reaction time task in which they decided whether each of a series of target words referred to a kind of action or not (i.e., actional verbs). Habitual bicycle users were faster than the other participants to respond that "cycling" was an action, but only when the goal of traveling had been previously primed, as in the first experiment. From this and related experiments, Aarts and Dijksterhuis (2000) concluded that habitual behaviors are automatically linked not to relevant environmental events per se but rather to the mental representations of the goal pursuits they serve.

Environmentally triggered goal pursuit. The fact that well-practiced goal pursuits operate autonomously, once in operation, to effortlessly guide behavior based on ongoing goal-relevant events in the environment does not in and of itself demonstrate preconscious goal activation and pursuit, of course, because explicit instructions or conscious choice are needed to put the goal into operation. However, if environmental features eventually become automatically associated with the top level or trigger of the goal structure—the same internal representation that is presumably activated by conscious will—then the role of conscious choice is removed entirely.

Theoretically, this is possible if one assumes that goal representations behave by the same rules as do other mental representations and develop automatic associations to other representations that are frequently and consistently active at the same time (i.e., Hebb's, 1949, principle of contiguous activation; see Shiffrin & Dumais, 1981; Shiffrin & Schneider, 1977). Thus, if a person consistently chooses to pursue the same goal within a given situation, over time that goal structure becomes strongly paired with the internal representation of that situation (i.e., the situational features). Eventually, the goal structure itself becomes active on the perception of the features of that situation. This is a form of unintentional skill acquisition—just as with desired skills (driving, basketball, reading), in which a person wants to automate the components of the skill to better perform it, goal pursuits can become automated through the same practice of that goal through frequently and consistently pursuing it in that situation (see Bargh & Chartrand, 1999).

Thus, the auto-motive model assumes that external events can trigger goals directly, without an explicit conscious choice, and that they then operate without the person knowing of it. We now turn to experimental tests of that assumption.

Priming of information-processing goals. The initial tests of the model used the same priming techniques as in the earlier work on automatic social perception (see reviews in Bargh, 1994; Higgins, 1989) and the more recent work on the perception-behavior link, as described above. Applying the same methodology to the issue of goal activation, Chartrand and Bargh (1996, Experiment 1) presented participants with words related to an information-processing goal in a first language task, as described above. The stimuli were related to either the goal of memorization (e.g., retain,

remember, hold) or the goal of impression formation (e.g., evaluate, judge, assess).

This experiment was a conceptual replication of a classic study in social cognition in which participants were explicitly instructed by the experimenter either to memorize the behaviors of a target person or to form an impression of him (Hamilton, Katz, & Leirer, 1980). All participants were asked to recall as many of the 16 target behaviors as possible after their presentation. In this previous study, participants given the explicit instructions to form an impression actually remembered more of the behaviors than did the participants with the explicit goal of memorizing the material. Moreover, the impression-goal condition showed evidence of better organization of the material in memory (as assessed by clustering indices).

In the Chartrand and Bargh (1996) study, however, participants received only the same, "vanilla" instructions to read each behavior "because we will ask you questions about them later." No participant was explicitly told to memorize or form an impression. Nevertheless, the same results were obtained on both the free recall and the memory organization indexes as in the original Hamilton et al. (1980) study—participants with the primed, nonconscious impression goal remembered more of the behaviors and organized them to a greater extent in memory around the target individual's different personality traits than did those with the primed memorization goal. When participants were questioned during debriefing, there were no differences between the two priming conditions as to what they said they had been trying to do while reading the behaviors—nearly all said they had just read the behaviors as presented, with no other purpose in mind.

In a second experiment, Chartrand and Bargh (1996) replicated another standard paradigm in social-cognition research and showed that the same effects were obtained when the goal of impression formation was subliminally primed (through parafoveal and masked brief presentations of goal-related stimuli such as judge, assess, and personality) but no explicit task instructions to form an impression were given, as when, in the earlier studies, participants were explicitly told to form an impression of the target person.

Automatic activation of motivational orientations. It is not only specific, concrete goals such as to memorize or evaluate that become active nonconsciously and operate automatically. Séguin and Pelletier (2000) have demonstrated that relatively abstract motivational orientations can also operate automatically. Deci and Ryan (1985, 1991) and others have shown that activities engaged in to satisfy (consciously held) intrinsic or self-determined motives are enjoyed for their own sake and the person feels absorbed and a sense of flow in the task. Activities that satisfy extrinsic or instrumental motives, on the other hand, are not engaged for their own sake, but for external reasons such as punishment or reward, and are not enjoyed for their own sake.

Séguin and Pelletier (2000) primed participants in a first task, using the scrambled-sentence test method, either with words related to intrinsic motivation (e.g., challenge, spontaneous, mastering), extrinsic motivation (e.g., restricted, forced, expected), or neither in a control condition. Participants then worked on several crossword puzzles in what they believed to be an unrelated second experimental task. In two such experiments, Séguin and Pelletier found that, compared with the control condition, those who worked on the puzzles with a nonconsciously operating intrinsic

motivation enjoyed the task more, felt they worked on it through their free choice, and found significantly more words on the puzzle; those in the primed extrinsic motivation condition, on the other hand, enjoyed the task less, found it less interesting, found fewer words, and felt less that they worked on the task because of their own choice. In other words, the nonconsciously operating intrinsic or extrinsic motivation produced the same outcomes as the many studies of the conscious operation of these motivations.

In summary, the same information-processing outcomes were obtained when processing goals were activated nonconsciously, through external means, as in earlier studies in which the goals were given to participants explicitly. These results support two basic premises of the auto-motive model: (a) that goal structures can be activated directly by relevant environmental stimuli and (b) that goals, once activated, produce the same outcomes whether they are put in motion by a consciously made choice or through external stimuli (Bargh & Chartrand, 1999).

Automatic operation of behavioral goals. Thus far, the research shows that information-processing goals can become active and operate independently of conscious control—we now turn to the question of whether behavioral goals can as well. Bargh and Gollwitzer (1994; Bargh, Gollwitzer, & Lee-Chai, 1999) have conducted several studies in which the goal of achievement was first primed, after which participants' task performance was assessed in an ostensibly unrelated experiment. In one experiment, participants first worked individually on a word-search task in which, for half of the participants, achievement-related words were embedded, along with other words, in a matrix of letters. In the control condition, no words related to achievement were presented. After the priming task, participants were instructed to find as many words as possible on five similar word-search puzzles, each of which contained hidden words related to a certain category (e.g., bugs, furniture). Those participants previously primed with achievement-related stimuli were found to significantly outperform the nonprimed participants on these puzzles.

It is important to ensure that this achievement-priming manipulation is having its effect on behavior through the activation and operation of a motivational state of goal pursuit because alternative accounts of this finding are possible. One plausible alternative explanation is that participants in the achievement-primed condition were induced to perceive or construe the experimental situation that followed differently from the control participants—namely, as being an achievement situation. As noted above, there is a substantial literature showing such effects of highly similar conceptual priming manipulations on social perception. On the basis of this different interpretation or construal of the situation, then (see Lewin, 1931; Mischel, 1973, on the importance of the psychological situation as opposed to the objective situation in behavioral choices), it is possible that the achievement-primed participants had formed a conscious goal and strategy to work harder on the word-search puzzles that followed.

We therefore sought to demonstrate that the nonconscious achievement effect is truly a motivational and not a perceptual one. Motivational states of goal pursuit have unique properties, as described in a variety of theories (see, e.g., Atkinson & Birch, 1970; Bandura, 1986; Gollwitzer, 1990; Lewin, 1951). One such quality in particular is highly useful in demonstrating a dissociation between motivational and perceptual priming effects—the fact that activated goals increase, rather than decrease, in strength over

time, until the goal is attained (Atkinson & Birch, 1970). Perceptual priming efforts, like all cognitive activation effects, decay or decrease in strength over time, as several social-perceptual priming studies have demonstrated (see, e.g., Higgins et al., 1985). Because the expected effects of goal priming and perceptual priming go in opposite directions as a function of the time (post priming delay) variable, it is possible to conduct a clear test of dissociation between the two processes (Dunn & Kirsner, 1988).

In this experiment (Bargh et al., 1999, Experiment 2), half of the participants had the goal of achievement primed in the first word-search task, and the other half did not. In what they thought was a separate experiment, some of the participants next performed a word-construction task using Scrabble letter tiles in which they were to find as many words as possible that could be formed using those letters. The other participants were given a family-tree filler task for 5 min and then the word-construction task. This was the behavioral task condition. In another condition, participants either immediately or after a 5-min delay read about a person who behaved in an ambiguously achieving way (i.e., studying hard right before the test) and then gave their rating of how achievement oriented the target person was. This was the perceptual task condition.

Comparison of the priming effects over time between the behavioral and the perceptual task conditions revealed, as predicted, a clear dissociation. On the perceptual task, a significant priming effect was observed at no delay, with achievement-primed participants rating the target person as being more achieving than did nonprimed participants, but this effect had disappeared after 5 min. On the behavioral task, on the other hand, although a significant priming effect was observed at no delay, with achievement-primed participants outperforming the control participants on the word-construction task (an average of three words more), this effect was significantly greater after 5 min (an average of eight words more). Thus, a motivational state was induced by the priming separate from the perceptual and judgmental effects of the priming.

Two other studies (Bargh et al., 1999, Experiments 3 and 4) tested whether primed goal operation exhibits other classic qualities of motivational states, such as persisting on a task in the face of obstacles and resuming an interrupted task so as to reach the goal of completing it (Gollwitzer & Moskowitz, 1996; Lewin 1926; Ovsiankina, 1928). In the first study, the achievement goal was primed for some participants and not others by means of the language-test procedure. Next, in an ostensibly unrelated second experiment, they were given 3 min to find as many words in a set of Scrabble letter tiles as they could. The experimenter left the room and, unbeknownst to the participants, monitored the room by a hidden videocamera. After the 3 min were up, the experimenter instructed the participants to stop working by way of an intercom. She then recorded who did stop working on the task and who continued to work after the stop signal had been given (usually looking at the door surreptitiously throughout). A full 55% of those in the achievement-primed condition, compared with just 21% in the control condition, continued to try to get as many words as possible despite the obstacle of having been told to stop working.

In the other study, participants were again primed with achievement-related material or not and in a second experiment were told that they would work on two tasks. Pretesting had shown that the second of the two tasks—rating a series of cartoons as to how funny they were—was clearly the intrinsically more enjoy-

able task. All participants began to work on the first task, finding words in letter matrices as before. In the midst of this task, there was a staged power failure, and when electric power was restored, the experimenter announced that there was no longer enough time to complete both tasks and that participants could choose which one to do. In the control condition, only 36% chose to return to the interrupted verbal task, but 66% of those in the achievement-primed condition did so to reach that task goal. Thus, in these experiments, the achievement-primed participants consistently showed classic properties of being in a motivational state, despite not having consciously chosen or guided their behavior towards this goal.

Brain processes underlying automatic goal operation. Another basic tenet of the auto-motive idea is that not only do externally activated goals produce the same outcomes as when the same goal is consciously intended but also they do so in the same way. To test the operation-identity hypothesis, Gardner, Bargh, Shellman, and Bessenoff (1999) primed the evaluation goal through the language-test procedure for some participants and not for others. Then, in an ostensibly unrelated second task, all participants engaged in an experiment on the brain processes involved in audition and listened to a series of words while their brain potentials were continuously recorded. Next, they were presented with another series of words and this time were explicitly told to evaluate each one. After a 10-min distractor task, the entire procedure was repeated but with a primed and then explicit goal to form mental images of each stimulus. The order of the evaluation versus the imagery phases of the experiment was counterbalanced.

When people are explicitly evaluating stimuli, there is a significant increase in activation of the basal right hemisphere at around 500 to 600 ms after stimulus presentation (see Cacioppo, Crites, & Gardner, 1996). This right shift of activation does not occur with other processing goals, such as forming a mental image. Gardner et al. (1999) obtained this right shift in the evaluation task and its absence in the imagery task for participants explicitly engaged in those tasks. Most importantly, the identical results were obtained in the priming conditions as well. When the evaluation goal had been activated without the participant's knowledge and while he or she was intending only to listen to the stimuli, the same right-shift in basal right hemisphere activation was observed. No such pattern occurred in the imagery goal priming condition. These findings provide strong support for the assumption that activated goal structures operate in the same way when put in motion by external events as by internal acts of intention and will.

Consequences of goal pursuit. Another standard outcome of explicit, conscious goal pursuit is the self-assessment that occurs following the attempt. Efforts to reach a goal can succeed, but they can also come up short or fail completely. With conscious, explicit goal pursuit, it has long been recognized that there is a postactional component in which one reflects on one's performance and evaluates oneself accordingly. There are consequences of this evaluation stage for one's mood and beliefs about one's ability and self-efficacy (see Bandura, 1997; Gollwitzer, 1990; Heckhausen, 1991). Again, the hypothesis was that nonconscious goal pursuit should produce these self-evaluative consequences as well. That is, a person should be in a better mood following success and a worse mood following failure following pursuit of a goal that he or she is not aware of pursuing. Moreover, in line with self-efficacy theory (Bandura, 1977, 1990), the individual's subsequent perfor-

mance on a task in the same domain should be affected by whether he or she had just succeeded or failed to attain the nonconscious goal.

These predictions were tested in several experiments (Chartrand, 1999) in which the goal to achieve was unobtrusively primed for some participants and not for others, using the language-task procedure as before; words related to achievement (e.g., strive, mastery, attain) were scattered throughout the task. Participants then worked on an anagram task they were told was merely a filler task before the next experiment; the anagrams were either very easy or very difficult to complete in what participants were told was the average amount of time. This constituted the success versus failure manipulation—although no explicit performance feedback was ever given. Finally, in what they believed to be an unrelated second experiment, participants completed mood scales. As predicted, the moods of the achievement-primed participants were affected by the success/failure manipulation (happier following the easy anagram task than following the difficult one) but not the moods of the control condition participants.

In another experiment, instead of completing mood scales following the priming and task difficulty manipulations, participants were given a portion of the Graduate Record Examination (GRE) Verbal test. This was a test in the same ability domain (verbal) as the one (anagrams) on which they had just succeeded or failed. According to self-efficacy theory, success or failure in attaining the goal to achieve on the previous verbal task should affect the self-efficacy beliefs of participants in the achievement-goal priming conditions (but not those of the control condition participants), and this should be observable in their subsequent performance in the same domain (Bandura, 1986, 1990). Again, as predicted, the Verbal GRE performance of participants in the nonconscious achievement goal condition was better if they had previously completed the easy anagrams and worse if they had previously completed the difficult anagrams; performance by control participants was unaffected by the prior difficulty of the anagram task.

In summary, the research on automatic or nonconscious goal operation shows it to produce the same outcomes as conscious goal pursuit—in varied domains such as information processing, memory storage, social behavior, and task performance—with the same mediating brain processes operating as well, and even to the final phase of goal pursuit in which self-evaluation occurs and self-efficacy in those domains is adjusted accordingly.

Situational activation of goals. In these goal-priming studies, the external goal activation is achieved through presentation of synonyms of that goal. These words presumably activate the semantic representation of the goal, which is assumed to be strongly associated with the actional or motivational components of the goal structure. Although these studies do demonstrate that goal pursuits can be instigated by external means, by directly activating the goal concept, the priming manipulations bypass or sidestep an important theoretical component of the model: that situations and environments are capable of activating the goal structure. What is left out of the experiments just described is a test of that first link between situations and goals.

Other studies have provided evidence in support of that link, however. Spencer, Fein, Wolfe, Fong, and Dunn (1998) examined the effect of a threat to one's self-esteem on stereotype activation. Specifically, they replicated an earlier finding by Gilbert and Hixon (1991) that showed unintentional activation of a minority

group stereotype in one condition (i.e., the presence of an Asian American experimenter on a videotape increased the subsequent likelihood of word-stem completions consistent with the stereotype of Asian Americans) but the elimination of this implicit stereotype effect for other participants who had also a second, attention-demanding task to complete at the same time the videotape was being shown. In other words, a load on available attention or processing resources seemed to knock out the stereotype activation. Spencer et al. showed, in several experiments, that if the participant had just suffered a blow to his or her self-esteem (being told his or her performance on a bogus ability test was below average), that person showed the implicit stereotyping effect in a replication of the Gilbert and Hixon experiment even under the conditions previously found to eliminate that effect.

It is clear that threatened self-esteem causes people to engage in stereotyping where otherwise they do not (see also Tajfel & Turner, 1986), but when one goes beyond that descriptive conclusion of the Spencer et al. (1998) findings, the mechanism by which low self-esteem produces such efficient stereotyping (not affected by the memory load) is somewhat mysterious. In our view, however, the present notion of automatic goal operation provides a plausible mechanism. We assume that a common plan or method of restoring threatened self-esteem is to compare downward (see, e.g., Wood, 1989) or to denigrate others. Indeed, this has long been argued to be a prime function that stereotypes serve (see Brewer & Brown, 1998). Thus, the goal of restoring one's self-esteem (itself a subgoal of basic self-esteem needs; see Baumeister, 1998; S. E. Taylor, 1989; Tesser, Martin, & Cornell, 1996) is frequently and consistently pursued through the plan of denigrating others, and using negative stereotypes is a standard tactic of such denigration. Here, then, is an important and ecologically valid case of a situational event—a blow to one's self-esteem—that automatically puts in motion the goal of denigrating others, causing stereotypes to automatically become active. As discussed above, one hallmark of a well-practiced automatic procedure is its efficiency or lack of dependence on attentional resources (see, e.g., Shiffrin & Schneider, 1977), which helps to explain how stereotyping could occur under the memory load conditions previously shown to prevent it.

Another recent study on automatic stereotyping has shown that chronic, long-term goals to treat others with fairness are activated automatically by the situational feature of the presence of a minority group member (Moskowitz et al., 1999). Whether participants had a chronic goal to be egalitarian and fair was first assessed through an incompleteness paradigm, which assessed whether fairness to others was a valued aspect of the participant's identity. Following that assessment, all participants took part in an ostensibly unrelated experiment in which stimuli related to gender stereotypes were presented under conditions in which it was not possible to control the activation of the stereotype through strategic, effortful processes (see Blair & Banaji, 1996). Participants with the chronic egalitarian goal showed no signs of stereotype activation in this experiment, whereas the other participants did. Thus, those with the egalitarian goal were able to automatically prevent the use of the activated stereotype in the face of stereotype-consistent cues in the environment. This and two other experiments demonstrated that the chronic, automatic goal to be fair becomes activated automatically in the presence of minority-group-related stimuli, to then inhibit the application of the stereotype to group members.

The nonconscious effect of power on goal pursuit. An important situational feature likely to be associated with a person's goals is power within that situation (Bargh, Raymond, Pryor, & Strack, 1995; Deprét & Fiske, 1993). Power can be defined as one's ability to attain one's important needs and goals (Cartwright, 1959; Russell, 1938). If an individual repeatedly uses situational power to attain his or her own goals, then power within a situation should come to automatically activate those goals, which should then operate on their own.

That there is an association between power and sex in men who sexually aggress or harass is well established (see, e.g., Lisak & Roth, 1988; Pryor & Stoller, 1994). Malamuth (1989) has developed a personality measure—the Attractiveness of Sexual Aggression (ASA) scale—that distinguishes these men from others. Consequently, Bargh et al. (1995) hypothesized that men identified by the ASA as having tendencies toward sexual aggression would have their goal of sexuality automatically activated by situational power. This hypothesis was tested in two experiments.

The first experiment used the sequential priming task (Neely, 1977, 1991) to demonstrate an automatic association between the concepts of power and sex for high-ASA but not low-ASA participants. On each trial, a target word to be pronounced as quickly as possible by the participant was preceded by a subliminally presented prime word. Power-related primes facilitated responding to the sex-related primes for the high-ASA participants, which could only happen if the activation of the concept of power automatically also activated the concept of sex—no such effect occurred for the low-ASA participants.

In the second experiment, the behavioral consequences of this automatic link between power and sex were examined. Participants either high or low on the ASA took part in an experimental session along with a female confederate posing as another participant. First, half of the participants had the concept of power primed through the language-test procedure, with the remaining participants exposed only to neutral stimuli. Next, the participant and confederate worked separately on a visual illusion task that involved no interaction between them. Finally, they were shown into separate rooms and told that the experiment had actually had to do with incidental impression formation, the kinds of impressions people form of others with whom they interact only minimally. The participant then completed a rating of the confederate, including the critical items of how attractive he found her and whether he would like to get to know her better. For participants low in the tendency to sexually aggress, the power priming manipulation made no difference in their ratings of the confederate's attractiveness or in their desire to know her better. However, high-ASA participants primed with power-related stimuli, as predicted, found the confederate significantly more attractive and had a greater desire to know her better, compared with high-ASA participants in the no-priming condition.

In all of these studies, the goal in question was activated not by verbal synonyms of itself but by semantically unrelated environmental stimuli. We can conclude that environmental events can and do activate goals that have been pursued habitually in that situation in the past. The automatic motivation evidence is especially crucial for the present argument concerning the determinism of all higher order processes, even executive control processes, in humans because it shows that automatic processes can interact in a flexible manner with ongoing environmental events (i.e., auto-

matic processes are not merely habitualized, S-R responses to the environment), dealing with incoming information over time differentially depending on which goal structure is nonconsciously operating. We return to this point below.

What Controls "Controlled" Processes?

This accumulating evidence about the range of social behaviors, motivations and goals, and evaluations and emotions that occur without conscious involvement and so, according to the traditional understanding, in a determined manner, indicates that behaviorism did not fail because of its supposed limitations concerning its mechanistic underpinnings. Rather, it failed because it denied the inclusion of internal mediating variables in such a deterministic framework.⁵ In sum, the existence of research on automatic human behavior, in conjunction with research in cognitive science, demonstrates that the deterministic philosophy that was developed and embraced by behaviorism nearly a hundred years ago is still guiding psychological research and theory today.

The Conflating of Automaticity and Determinism

Despite the seeming popularity of presumptions of determinism, the field of psychology in general outside of cognitive science and social cognition has not wholeheartedly embraced determinism. Many have associated the failure of behaviorist models to explain higher order human behavior with the failure of mechanistic accounts in general (see, e.g., Bandura, 1986). Instead, complex behavior is asserted to be mediated by the person's active construal of the meaning of that environment, by the person's current intents and purposes, and by the exercise of conscious choices and decisions based on these construals and purposes (see, e.g., Bandura, 1986; 1990; Locke & Latham, 1990; Mischel, Cantor, & Feldman, 1996; Zimbardo, 1969).

The marked (and rather sudden, historically speaking) increase in the range of documented internal processes and complex interpersonal and goal-directed behaviors that occur automatically has, quite possibly, led to the following misunderstanding: that the degree to which a person negotiates her or his environment automatically represents the corresponding degree to which that person's behavior is determined. Yet it is not the case that the one is determined and the other is, somehow, not determined. The real difference between automatic and controlled processes is not that one form is caused and the other not caused but that psychologists have at present, through research, discovered the mechanisms for the one form and not yet for the other. This is why the range and scope of automatic effects has so dramatically increased in the past 20 years and can only increase with additional research (see Bargh, 1997; Wegner & Bargh, 1998). To assume that phenomena and effects for which the mechanism is today unknown will never have their underlying mechanisms discovered is to make the same kind of mistake the behaviorists did in assuming there would be no scientific way to study internal psychological processes (see Footnote 3).

Thus, one reason why there may be such strong skepticism about the automaticity of higher mental processes and complex social behavior (see especially Bandura, 1986; Mischel et al., 1996) is this (false, in our view) equation of automaticity with determinism. For the same reasons, proponents of automaticity

might sometimes be viewed as asserting the ultimate insignificance of consciousness as a causal factor, or set of causal factors, in human behavior. For example, much of the debate over the concept of automaticity in social cognition and behavior has consisted of arguments concerning the relevance and necessity of consciousness versus nonconsciousness as proposed internal mechanisms in the causal chains of behavior (for an edited collection, see Wyer, 1997).

Although some may conflate the notion of automaticity with determinism, it is our position that a deterministic interpretation of human behavior should not be confined to behavior that proceeds without consciously aware choice and guidance. Whereas automatic behavior can be easily understood as exemplifying a deterministic account of behavior (it is commonly defined as unwilled, unintentional, unaware; see Bargh, 1994), the existence of a role played by consciousness or controlled processes in a phenomenon does not preclude a deterministic account of it. After all, the very point of research and theory on judgment and decision making is the discovery of the causal mechanisms (i.e., determinants) of conscious choice and reasoning processes themselves (see, e.g., Baron, 1994; Hogarth, 1980; Holland, Holyoak, Nisbett, & Thagard, 1986; Nisbett & Ross, 1980; Plous, 1993). To take another example, Cohen et al. (1990, p. 332) described controlled processes in the Stroop effect as voluntary at the same time as they provided a neural-network model of it (i.e., a mechanism for it). Accordingly, if one assumes that human behavior and higher mental processes should be analyzed within a mechanistic framework, the question is not whether nonconsciousness or consciousness is more important in accounting for human behavior but the particular ways in which each of them is causally relevant.

To not include conscious processes such as choice and flexible processing of information in the net of causal factors responsible for some actions is tantamount to adopting a dualist perspective. In other words, to say that consciousness is not causally relevant but rather is just a by-product of nonconscious processes is consistent with the position that consciousness is an epiphenomenon. This argument is dualist because it implies that conscious processes are somehow excluded from the deterministic web that encompasses everything else (see Prinz, 1997). Conscious processes (as Descartes, 1614/1931, contended) would have to be of a qualitatively different sort to not follow the physical, and thus deterministic, laws that nonconscious processes follow. Although many philosophers have in fact suggested a qualitative distinction between consciousness and nonconsciousness (see, e.g., Chalmers, 1996; Jackson, 1986; Searle, 1997), such a standpoint, in our view, does not lend itself to the scientific study of consciousness. Surely, those who study consciousness from a scientific perspective must assume that it is lawful and follows the same laws that govern everything else in the physical world. (If this were not the case, by

⁵ Historically, this was not always the case. Originally, behaviorism did not deny the existence of internal processes (Watson, 1913), only their suitability as topics for scientific study because they were not observable and independently verifiable. Only later did this exclusion from study develop into the axiom that the internal processes themselves did not exist or at least played no causal, mediating role (see Koestler, 1967, chapter 1). The critical mistake was to assume that because there was no scientific means to study the internal phenomena at the time, none would or could eventually be developed.

what presumptions are scientists who study consciousness or conscious processes abiding?) Although philosophers are under no such duress in terms of necessary presuppositions, scientists would seem to be.

"Control Processes" Must Themselves Be Controlled

It seems undeniable that conscious processes are themselves causal agents within the same deterministic framework as nonconscious processes. Conscious and nonconscious processes presumably act in concert with one another, and with stimuli outside of our bodies, according to physical laws. Any mental circuit or system that guides behavior extended over time (as opposed to single, one-off reflex responses) must have access to information in the environment to do so. That an individual is currently consciously aware of this information at the same time does not mean that the process is any less determined. If one takes any of the perception-behavior studies described above, one finds that the effect required information of which the person was consciously aware and could report on—such as walking down the hallway more slowly after priming with elderly-related stimuli or helping to pick up pens in the elevator.

Yet the automatic goal operation experiments provide more telling and, in hindsight, rather obvious evidence that even controlled mental processes are themselves controlled and determined. Goals—such as to form an impression of someone, or memorize information, or achieve the best score possible on a task, or treat others fairly—are executive processes that operate on information held in working memory and “do things with it” (see Baddeley, 1996). This is the functional essence of a goal structure (Miller et al., 1960). Therefore, if these goals are nonconsciously activated and operating without the person’s knowledge but still producing the same outcomes and using the same brain structures as when the goal is being consciously pursued, this means that the executive processes and working memory operations are themselves being controlled by the automatically operating goal.

For example, in the Chartrand and Bargh (1996) studies in which information-processing goals were covertly primed, the nonconscious goal of impression formation operated on the behavioral information about the target person and integrated it into a coherent impression, resulting in superior thematic organization of the information in memory. To do so required the participation of brain regions that operate on information in working memory, forming associative links between items and encoding the information in memory—brain regions (such as Broca’s area and the right-hemisphere premotor cortex for holding information temporarily in working memory and the anterior cingulate and dorsolateral prefrontal cortex for executive processes that operate on that information) that are the seat of executive processes (Bunge, Klingberg, Jacobsen, & Gabrieli, 2000; Cohen et al., 1997; E. E. Smith & Jonides, 1998, 1999). The distinction between automatic and controlled processes, with the latter usually associated with frontal lobe functioning (see, e.g., Damasio, 1994; Jacoby, Kelley, & McEree, 1999; E. E. Smith & Jonides, 1999), breaks down entirely because these controlled processes are themselves being controlled by determined, automatically operating goal structures. In short, the experimental findings reviewed above could only have been obtained if the flexible organs of the brain that constitute working memory and action planning and guidance partici-

pated themselves as autonomous subordinate units under the control of the automatically operating processes.

Related to this point is the fact that even in studies of executive processes or working memory in which participants work on a novel (to them) task such as 2-back (Cohen et al., 1997) or Stroop (see, e.g., Cohen et al., 1990), the experimental situation requires the participants to delegate to the experimenter control over what they do. These may be novel goals and demonstrate the flexibility with which the cognitive machinery (in particular, the frontal cortex) can be programmed to process information, yet the control here is still external, in the form of the experimental instructions. In the classic Libet (1985) experiments in which the impulse to move one’s finger is shown to come prior to the person’s feeling of willing that motion, the impetus or intention to move the finger is directly traceable to the experimental instructions to move it. Thinking about working memory tasks or apparently paradoxical results such as Libet’s in this way removes much of the mystery from them. In the Libet study, the impulse to move the finger did not come before the participant’s intention to move it; it followed the instruction from the external controlling agent—the experimenter to whom the participant had previously delegated control over what he or she did in the experimental session.⁶

There are parallels here to other situations in which one’s goal structures are externally controlled, where one’s will is being controlled from outside—such as in hypnosis (see, e.g., Hilgard, 1965) and (much more commonly) in hierarchically structured groups and organizations in which one is subordinate to an authority figure (see especially Haney, Banks, & Zimbardo, 1973; and Milgram, 1963, for the power of this external control). Most notably, perhaps, people make use of this fact of external direction in a strategic way when they form concrete intentions and plans to perform an action at a future time and place. Gollwitzer’s (e.g., 1993, 1999; Gollwitzer & Brandstätter, 1997) extensive research on implementation intentions—defined, tellingly, as “delegation of control to the environment” (Gollwitzer, 1993, p. 174)—showed that novel and nonhabitual behaviors are enacted automatically and nonconsciously on the later occurrence of the designated environmental event. Thus, here is again a case in which flexible mental processes—those needed to perform nonchronic, nonhabitual, nonpracticed behaviors—are being determined and controlled at the later point in time by the external environment. In other words, the control processes of working memory that are typically contrasted with nonconscious or automatic processes are in these cases themselves being controlled.

In short, although the currently pervasive distinction in cognitive science between automatic and controlled mental processes makes it perhaps difficult to conceive of automatic control, we note that the term has been common in engineering for nearly 50 years (Nagel, 1952) and means the same thing there that we mean by it here: autonomous systems interacting with environmental information over time to attain a goal, without any need of intervention from outside that closed system to do so. It is not necessary to invoke the idea of free will or a nondetermined version of consciousness as a causal explanatory mechanism in accounting for higher mental processes in humans.

⁶ We thank Ap Dijksterhuis for this insight.

Belief Versus Reality of Intentional Control

One very common reason for resistance to the deterministic stance, even among many cognitive and social-cognitive researchers, is the subjective feeling of will that one experiences in one's own life. Yet this subjective feeling is misleading as evidence on the issue of free will. For instance, consider the case of one of Dr. Penfield's famous brain surgery patients, whose right hand (for example) would move "by itself" when the appropriate motor area of the cortex was electrically stimulated. The patient was not able to prevent this movement even when warned in advance that it would occur and was trying to stop it by holding his right with his left hand. Penfield (1958; see also Penfield & Perot, 1963) reported that conscious, aware patients do not feel that they have willed their own muscular responses that are produced when a motor area of the cortex is electrically stimulated. Instead, they invariably believe that the movement has occurred independently of, and sometimes even in spite of, their own volition or will.

Compare this phenomenon with what happens in the perception-behavior research already described (see *Automatic Social Behavior by Means of Nonconscious Social Perception*, above). If the internal representation activated by the external prime event was exactly the motor component of the action, then the action should occur immediately and without fail—the situation would be identical to that of Dr. Penfield's patient. Yet, in the perception-behavior studies, none of the participants had the Penfield experience of behavior that was not under their own control, that ran counter to their conscious intentions. They all experienced it in the same way that they experienced their own behavior, despite the fact that it was not under their control. The same holds for the participants in the automatic goal operation studies reviewed above.

It is intriguing that although the goal study participants did not have the conscious experience of intending or choosing the goal that they followed, neither did they feel that their behavior was involuntary. In other words, the participants in the perception-behavior and goal-priming studies experienced their own behavior as volitional without actually having had the volition—thus, the feeling of volition does not require the existence of an act of will and so cannot be taken as evidence for the existence of volitional acts. A highly similar phenomenon occurs in hypnotized subjects. They enact a posthypnotic suggestion (i.e., "when you awake you will immediately crawl around on your hands and knees") and then, when asked what they are doing, almost immediately generate a rationale ("I think I lost an earring down here"; Gazzaniga, 1985; Hilgard, 1965).

This phenomenon also is reported in recent experiments by Wegner and Wheatley (1999). In their paradigm, participants moved a cursor around a computer screen, using a mouse; the screen contained pictures of various objects (e.g., hat, clown, apple). The cursor was jointly under the control of another participant, actually a confederate, who caused the cursor to move to predetermined objects at certain times. If the name of the object that the cursor moved to was presented to the participant over headphones (in the midst of a steady stream of words) just before the cursor landed on that object, the participant believed that he or she intended to move the cursor there; if the name of the object had not been presented prior to the event, the participant did not believe he or she caused the movement. The feeling of will in this

study was induced versus not induced through externally activating (or not) the idea of the object prior to the cursor's movement to it—in neither case did the participant actually cause the cursor to move to the object.

There is also recent evidence that belief in a substantial role for free will or conscious choice in one's life varies by culture. Iyengar and Lepper (1999, p. 350) reported a study comparing the beliefs of Japanese versus American students regarding how many choices they had made during the course of a given day—the American students reported themselves as having made 50% more such choices than did the Japanese students and also reported these choices as being significantly more important to them. These students were also asked to list those situations in which they would wish not to have a choice at all. Approximately 30% of the Americans, but none of the Japanese, reported wanting to have choices all of the time, and more than half of the American students said they could not imagine a time when they would prefer not to have a choice. Belief in the role and extent of free will as a causal factor in one's life is therefore not a universal and may be at least somewhat a function of the values (e.g., for individualism) of one's culture—the implication being that the feeling of volition is not necessarily based on its true causal status.

From all of this evidence, as well as research of the "illusion of control" (see, e.g., Langer, 1975), one can conclude that people normally and naturally experience their own behavior as intentional and volitional even when that is not the case. It is clear from this that one's subjective experience of volition is a poor and inaccurate guide to its true causal status.

What Does a Determinist Outlook Mean for the Scientific Study of Consciousness?

Our position is that psychologists studying higher mental processes should continue the scientific study of conscious processes but at the same time give appropriate attention to the deterministic philosophy that must underlie such analysis. Many cognitive psychologists have begun this endeavor; for example, Crick and Koch (1997a) have begun to analyze consciousness in terms of the various effects of phenomenal images on the (nonconscious) workings of the visual system (see also Baars, 1997; Churchland, 1997; Cohen & Schooler, 1997; Crick & Koch, 1997b; Goldman, 1997). In other words, researchers are trying to grasp and understand consciousness in a way that lends itself to scientific treatment. We view this development as exciting and fruitful. Although understanding the degree to which and the ways in which people negotiate their environments without awareness of the perceptual or goal system that is guiding them is an important and compelling issue, so too is understanding the degree to which and the ways in which people consciously and flexibly interface with their social and nonsocial environments.

Conclusions

The recent social-cognitive work on the automaticity of higher mental processes, such as those underlying social interaction, affect and evaluation, motivation and goal-setting, and social judgment, is a continuation of two major trends of 20th century psychology—namely, the behaviorist's focus on external, environmental causal forces and the cognitive psychologist's focus on the

psychological mechanisms mediating between the environment and those responses. This research has found much of an individual's complex psychological and behavioral functioning to occur without conscious choice or guidance—that is, automatically. Traditionally, in many fields of psychology, the automaticity of a psychological phenomenon has been taken as evidence that it is environmentally determined (albeit in interaction with those mediating internal processes). We have argued further, however, that it is an error to conclude that those processes that do require the intervention and guidance of conscious or executive control processes—such as those that involve the flexible and strategic operation of working memory—are any less determined, because such processes are also caused. Therefore, the task of future cognitive and social-cognitive research should be, as Baddeley (1996) and others have recently argued, the discovery and delineation of the mechanisms by which such executive processes operate.

References

- Aarts, H., & Dijksterhuis, A. (2000). Habits as knowledge structures: Automaticity in goal-directed behavior. *Journal of Personality and Social Psychology, 78*, 53–63.
- Aizerman, M. A. (1963). *Theory of automatic control*. New York: Pergamon Press.
- Amsel, A. (1989). *Behaviorism, neobehaviorism, and cognitivism in learning theory: Historical and contemporary perspectives*. Hillsdale, NJ: Erlbaum.
- Anderson, J. R. (1983). *The architecture of cognition*. Cambridge, MA: Harvard University Press.
- Atkinson, J. W., & Birch, D. (1970). *A dynamic theory of action*. New York: Wiley.
- Baars, B. (1997). Contrastive phenomenology: A thoroughly empirical approach to consciousness. In N. Block, O. Flanagan, & G. Guzeldere (Eds.), *The nature of consciousness: Philosophical debates* (pp. 187–202). Cambridge, MA: MIT Press.
- Baddeley, A. (1996). Exploring the central executive. *Quarterly Journal of Experimental Psychology, 49*, 5–28.
- Baldwin, M. W., Carrell, S. E., & Lopez, D. F. (1990). Priming relationship schemas: My advisor and the Pope are watching me from the back of my mind. *Journal of Experimental Social Psychology, 26*, 435–454.
- Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. *Psychological Review, 84*, 191–215.
- Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory*. Englewood Cliffs, NJ: Prentice Hall.
- Bandura, A. (1990). Self-regulation of motivation through anticipatory and self-reactive mechanisms. In R. A. Dienstbier (Ed.), *Nebraska Symposium on Motivation: Vol. 38. Perspectives on motivation* (pp. 69–164). Lincoln: University of Nebraska Press.
- Bandura, A. (1997). *Self-efficacy*. New York: Freeman.
- Bargh, J. A. (1982). Attention and automaticity in the processing of self-relevant information. *Journal of Personality and Social Psychology, 43*, 425–436.
- Bargh, J. A. (1989). Conditional automaticity: Varieties of automatic influence in social perception and cognition. In J. S. Uleman & J. A. Bargh (Eds.), *Unintended thought* (pp. 3–51). New York: Guilford Press.
- Bargh, J. A. (1990). Auto-motives: Preconscious determinants of social interaction. In E. T. Higgins & R. M. Sorrentino (Eds.), *Handbook of motivation and cognition* (Vol. 2, pp. 93–130). New York: Guilford Press.
- Bargh, J. A. (1994). The four horsemen of automaticity: Awareness, efficiency, intention, and control in social cognition. In R. S. Wyer, Jr., & T. K. Srull (Eds.), *Handbook of social cognition* (2nd ed., pp. 1–40). Hillsdale, NJ: Erlbaum.
- Bargh, J. A. (1996). Automaticity in social psychology. In E. T. Higgins & A. W. Kruglanski (Eds.), *Social psychology: Handbook of basic principles* (pp. 169–183). New York: Guilford Press.
- Bargh, J. A. (1997). The automaticity of everyday life. In R. S. Wyer, Jr. (Ed.), *The automaticity of everyday life: Advances in social cognition* (Vol. 10, pp. 1–61). Mahwah, NJ: Erlbaum.
- Bargh, J. A. (1999). The cognitive monster. In S. Chaiken & Y. Trope (Eds.), *Dual process theories in social psychology* (pp. 361–382). New York: Guilford Press.
- Bargh, J. A., Bond, R. N., Lombardi, W. J., & Tota, M. E. (1986). The additive nature of chronic and temporary sources of construct accessibility. *Journal of Personality and Social Psychology, 50*, 869–878.
- Bargh, J. A., Chaiken, S., Govender, R., & Pratto, F. (1992). The generality of the automatic attitude activation effect. *Journal of Personality and Social Psychology, 62*, 893–912.
- Bargh, J. A., Chaiken S., Raymond, P., & Hymes, C. (1996). The automatic evaluation effect: Unconditionally automatic attitude activation with a pronunciation task. *Journal of Experimental Social Psychology, 32*, 185–210.
- Bargh, J. A., & Chartrand, T. L. (1999). The unbearable automaticity of being. *American Psychologist, 54*, 462–479.
- Bargh, J. A., Chen, M., & Burrows, L. (1996). Automaticity of social behavior: Direct effects of trait construct and stereotype activation on action. *Journal of Personality and Social Psychology, 71*, 230–244.
- Bargh, J. A., & Gollwitzer, P. M. (1994). Environmental control of goal-directed action: Automatic and strategic contingencies between situations and behavior. In W. Spaulding (Ed.), *Nebraska Symposium on Motivation: Vol. 41* (pp. 71–124). Lincoln: University of Nebraska Press.
- Bargh, J. A., Gollwitzer, P. M., & Lee-Chai, A. (1999). *Bypassing the will: Automatic and controlled self-regulation*. Manuscript submitted for publication, New York University.
- Bargh, J. A., Lombardi, W., & Higgins, E. T. (1988). Automaticity of chronically accessible constructs in Person \times Situation effects on person perception: It's just a matter of time. *Journal of Personality and Social Psychology, 55*, 599–605.
- Bargh, J. A., & Pietromonaco, P. (1982). Automatic information processing and social perception: The influence of trait information presented outside of conscious awareness on impression formation. *Journal of Personality and Social Psychology, 43*, 437–449.
- Bargh, J. A., Raymond, P., Pryor, J., & Strack, F. (1995). Attractiveness of the underling: An automatic power \rightarrow sex association and its consequences for sexual harassment and aggression. *Journal of Personality and Social Psychology, 68*, 768–781.
- Bargh, J. A., & Thein, R. D. (1985). Individual construct accessibility, person memory, and the recall-judgment link: The case of information overload. *Journal of Personality and Social Psychology, 46*, 1129–1146.
- Baron, J. (1994). *Thinking and deciding*. New York: Cambridge University Press.
- Barsalou, L. W. (1992). *Cognitive psychology: An overview for cognitive scientists*. Hillsdale, NJ: Erlbaum.
- Baumeister, R. F. (1998). The self. In D. T. Gilbert, S. T. Fiske, & G. Lindzey (Eds.), *Handbook of social psychology* (4th ed., Vol. 1, pp. 680–740). New York: McGraw-Hill.
- Bavelas, J. B., Black, A., Lemery, C. R., & Mullett, J. (1986). "I show how you feel": Motor mimicry as a communicative act. *Journal of Personality and Social Psychology, 50*, 322–329.
- Berkowitz, L. (1984). Some effects of thoughts on anti- and prosocial influences of media events: A cognitive-neoassociation analysis. *Psychological Bulletin, 95*, 410–427.
- Berkowitz, L. (1997). Some thoughts extending Bargh's argument. In R. S. Wyer (Ed.), *Advances in social cognition* (Vol. 10, pp. 83–94). Mahwah, NJ: Erlbaum.
- Bernieri, F. J., & Rosenthal, R. (1991). Interpersonal coordination: Behav-

- ior matching and interactional synchrony. In R. S. Feldman & B. Rimé (Eds.), *Fundamentals of nonverbal behavior* (pp. 401–432). Cambridge, England: Cambridge University Press.
- Blair, I. V., & Banaji, M. R. (1996). Automatic and controlled processes in stereotype priming. *Journal of Personality and Social Psychology, 70*, 1142–1163.
- Block, N., Flanagan, O., & Guzeldere, G. (Eds.). (1997). *The nature of consciousness: Philosophical debates*. Cambridge, MA: MIT Press.
- Brewer, M. B. (1988). A dual process model of impression formation. In T. K. Srull & R. S. Wyer, Jr. (Eds.), *Advances in social cognition* (Vol. 1, pp. 1–36). Hillsdale, NJ: Erlbaum.
- Brewer, M. B., & Brown, R. J. (1998). Intergroup relations. In D. T. Gilbert, S. T. Fiske, & G. Lindzey (Eds.), *Handbook of social psychology* (4th ed., Vol. 2, pp. 554–594). New York: McGraw-Hill.
- Brown, R. (1965). *Social psychology*. New York: Free Press.
- Bruner, J. S. (1957). On perceptual readiness. *Psychological Review, 64*, 123–152.
- Bunge, S., Klingberg, T., Jacobsen, R., & Gabrieli, J. B. E. (2000). A resource model of the neural basis of working memory. *Proceedings of the National Academy of Sciences, 97*, 3573–3578.
- Cacioppo, J. T., Crites, S. L., Jr., & Gardner, W. L. (1996). Attitudes to the right: Evaluative processing is associated with lateralized late positive event-related brain potentials. *Personality and Social Psychology Bulletin, 22*, 1205–1219.
- Campbell, C. A. (1967). *On selfhood and godhood*. London: Allen & Unwin.
- Carlston D. E., & Skowronski, J. J. (1994). Savings in the relearning of trait information as evidence for spontaneous inference generation. *Journal of Personality and Social Psychology, 66*, 840–856.
- Carpenter, W. B. (1888). *Principles of mental physiology*. New York: Appleton.
- Cartwright, D. (1959). A field theoretical conception of power. In D. Cartwright (Ed.), *Studies in social power* (pp. 183–220). Ann Arbor, MI: Institute for Social Research.
- Carver, C. S., Ganellen, R. J., Froming, W. J., & Chambers, W. (1983). Modeling: An analysis in terms of category accessibility. *Journal of Experimental Social Psychology, 19*, 403–421.
- Carver, C. S., & Scheier, M. F. (1981). *Attention and self-regulation*. New York: Springer.
- Carver, C. S., & Scheier, M. F. (1998). *On the self-regulation of behavior*. New York: Cambridge University Press.
- Chaiken, S., & Trope, Y. (Eds.). (1999). *Dual process theories in social psychology*. New York: Guilford Press.
- Chalmers, D. J. (1996). *The conscious mind: In search of a fundamental theory*. New York: Oxford University Press.
- Chartrand, T. L. (1999). *The self-evaluative consequences of nonconscious goal pursuit*. Unpublished doctoral dissertation, New York University.
- Chartrand, T. L., & Bargh, J. A. (1996). Automatic activation of impression formation and memorization goals: Nonconscious goal priming reproduces effects of explicit task instructions. *Journal of Personality and Social Psychology, 71*, 464–478.
- Chartrand, T. L., & Bargh, J. A. (1999). The chameleon effect: The perception-behavior link and social interaction. *Journal of Personality and Social Psychology, 76*, 893–910.
- Chartrand, T. L., & Bargh, J. A. (2000). *Downstream consequences of automatic evaluation processes for mood*. Unpublished manuscript, Ohio State University.
- Chen, M., & Bargh, J. A. (1997). Nonconscious behavioral confirmation processes: The self-fulfilling consequences of automatic stereotype activation. *Journal of Experimental Social Psychology, 33*, 541–560.
- Chen, M., & Bargh, J. A. (1999). Consequences of automatic evaluation: Immediate behavioral predispositions to approach or avoid the stimulus. *Personality and Social Psychology Bulletin, 25*, 215–224.
- Chomsky, N. (1959). Review of *Verbal Behavior* by B. F. Skinner. *Language, 35*, 26–58.
- Churchland, P. S. (1997). Can neurobiology teach us anything about consciousness? In N. Block, O. Flanagan, & G. Guzeldere (Eds.), *The nature of consciousness: Philosophical debates* (pp. 127–140). Cambridge, MA: MIT Press.
- Cohen, J. D., Dunbar, K., & McClelland, J. L. (1990). On the control of automatic processes: A parallel distributed processing account of the Stroop effect. *Psychological Review, 97*, 332–361.
- Cohen, J. D., Perlstein, W. M., Braver, T. S., Noll, D. C., Jonides, J., & Smith, E. E. (1997). Temporal dynamics of brain activation during a working memory task. *Nature, 386*, 604–608.
- Cohen, J. D., & Schooler, T. (Eds.). (1997). *Scientific approaches to the study of consciousness*. Cambridge, MA: MIT Press.
- Crick, F., & Koch, C. (1997a). The problem of consciousness. *Scientific American, 7*, 18–26.
- Crick, F., & Koch, C. (1997b). Towards a neurobiological theory of consciousness. In N. Block, O. Flanagan, & G. Guzeldere (Eds.), *The nature of consciousness: Philosophical debates* (pp. 277–292). Cambridge, MA: MIT Press.
- Damasio, A. R. (1994). *Descartes' error: Emotion, reason, and the human brain*. New York: Grosset/Putnam.
- Darwin, C. (1965). *The expression of the emotions in man and animals*. Chicago: University of Chicago Press. (Original work published 1872)
- Deci, E. L., & Ryan, R. M. (1985). *Intrinsic motivation and self-determination in human behavior*. New York: Academic Press.
- Deci, E. L., & Ryan, R. M. (1991). A motivational approach to self: Integration in personality. In R. Dienstbier (Ed.), *Nebraska Symposium on Motivation: Vol. 38. Perspectives on motivation* (pp. 237–288). Lincoln: University of Nebraska Press.
- Deprét, E., & Fiske, S. T. (1993). Social cognition and power: Some cognitive consequences of social structure as a source of control deprivation. In G. Weary, F. Gleicher, & K. L. Marsh (Eds.), *Control motivation and social cognition* (pp. 176–202). New York: Springer.
- deRoy, B. E. (1966). *Automatic control theory*. New York: Wiley.
- Descartes, R. (1931). *The philosophical works of Descartes* (E. S. Haldane & G. R. T. Ross, Trans.). New York: Cambridge University Press. (Original work published 1641)
- Devine, P. G. (1989). Stereotypes and prejudice: Their automatic and controlled components. *Journal of Personality and Social Psychology, 56*, 680–690.
- Dijksterhuis, A., Bargh, J. A., & Miedema, J. (2000). Of men and mackerels: Attention and automatic behavior. In H. Bless & J. P. Forgas (Eds.), *Subjective experience in social cognition and behavior*. Philadelphia: Psychology Press.
- Dijksterhuis, A., Spears, R., Postmes, T., Stapel, D. A., Koomen, W., van Knippenberg, A., & Scheepers, D. (1998). Seeing one thing and doing another: Contrast effects in automatic behavior. *Journal of Personality and Social Psychology, 75*, 862–871.
- Dijksterhuis, A., & van Knippenberg, A. (1998). The relation between perception and behavior or how to win a game of Trivial Pursuit. *Journal of Personality and Social Psychology, 74*, 865–877.
- Dunn, J. C., & Kirsner, K. (1988). Discovering functionally independent mental processes: The principle of reversed association. *Psychological Review, 95*, 91–101.
- Fazio, R. H., Sanbonmatsu, D. M., Powell, M. C., & Kardes, F. R. (1986). On the automatic activation of attitudes. *Journal of Personality and Social Psychology, 50*, 229–238.
- Ferguson, M. J., & Bargh, J. A. (2000). *The impact of automatic evaluations on concept accessibility and social judgment processes*. Manuscript submitted for publication, New York University.
- Fiske, S. T. (1993). Controlling other people: The impact of power on stereotyping. *American Psychologist, 48*, 621–628.
- Fodor, J. A. (1983). *The modularity of mind*. Cambridge, MA: MIT Press.

- Frankfurt, H. G. (1971). Freedom of the will and the concept of a person. *Journal of Philosophy*, 1, 5–20.
- Gabrieli, J. D. E. (1998). Cognitive neuroscience of human memory. *Annual Review of Psychology*, 49, 87–115.
- Gallese, V., Fadiga, L., Fogassi, L., & Rizzolatti, G. (1996). Action recognition in the premotor cortex. *Brain*, 119, 593–609.
- Gardner, W., Bargh, J. A., Shellman, A., & Bessenoff, G. (1999). *This is your brain on primes: Lateralized brain activity is the same for non-conscious and conscious evaluative processing*. Manuscript submitted for publication, Northwestern University.
- Gazzaniga, M. (1985). *The social brain*. New York: Free Press.
- Gilbert, D. T., & Hixon, J. G. (1991). The trouble of thinking: Activation and application of stereotypic beliefs. *Journal of Personality and Social Psychology*, 60, 509–517.
- Giner-Sorolla, R., Garcia, M. T., & Bargh, J. A. (1999). The automatic evaluation of pictures. *Social Cognition*, 17, 76–96.
- Glaser, J., & Banaji, M. R. (1999). When fair is foul and foul is fair: Reverse priming in automatic evaluation. *Journal of Personality and Social Psychology*, 77, 669–687.
- Goldman, A. I. (1997). Consciousness, folk psychology, and cognitive science. In N. Block, O. Flanagan, & G. Guzeldere (Eds.), *The nature of consciousness: Philosophical debates* (pp. 111–126). Cambridge, MA: MIT Press.
- Gollwitzer, P. M. (1990). Action phases and mind-sets. In E. T. Higgins & R. M. Sorrentino (Eds.), *Handbook of motivation and cognition* (Vol. 2, pp. 53–92). New York: Guilford Press.
- Gollwitzer, P. M. (1993). Goal achievement: The role of intentions. In W. Stroebe & M. Hewstone (Eds.), *European review of social psychology* (Vol. 4, pp. 141–185). London: Wiley.
- Gollwitzer, P. M. (1999). Implementation intentions and effective goal pursuit: Strong effects of simple plans. *American Psychologist*, 54, 493–503.
- Gollwitzer, P. M., & Brandstätter, V. (1997). Implementation intentions and effective goal pursuit. *Journal of Personality and Social Psychology*, 73, 186–199.
- Gollwitzer, P. M., & Moskowitz, G. (1996). Goal effects on thought and behavior. In E. T. Higgins & A. Kruglanski (Eds.), *Social psychology: Handbook of basic principles* (pp. 361–399). New York: Guilford Press.
- Guzeldere, G. (1997). The many faces of consciousness. In N. Block, O. Flanagan, & G. Guzeldere (Eds.), *The nature of consciousness: Philosophical debates* (pp. 1–67). Cambridge, MA: MIT Press.
- Hamilton, D. L., Katz, L. B., & Leirer, V. O. (1980). Organizational processes in impression formation. In R. Hastie, T. M. Ostrom, E. B. Ebbesen, R. S. Wyer, D. L. Hamilton, & D. E. Carlston (Eds.), *Person memory: The cognitive basis of social perception* (pp. 121–153). Hillsdale, NJ: Erlbaum.
- Haney, C., Banks, C., & Zimbardo, P. (1973). Interpersonal dynamics in a simulated prison. *International Journal of Criminology and Penology*, 1, 69–97.
- Hebb, D. O. (1949). *Organization of behavior*. New York: Wiley.
- Heckhausen, H. (1991). *Motivation and action*. New York: Springer.
- Hermans, D., Baeyens, F., & Eelen, P. (1998). Odors as affective-processing context for word evaluation: A case of cross-modal affective priming. *Cognition and Emotion*, 12, 601–613.
- Herrnstein, R. J., & Boring, E. (1965). *A source book in the history of psychology*. Cambridge, MA: Harvard University Press.
- Hertel, G., & Kerr, N. L. (2000). *Priming ingroup favoritism: The impact of normative scripts in the minimal group paradigm*. Manuscript submitted for publication, University of Kiel.
- Higgins, E. T. (1989). Knowledge accessibility and activation: Subjectivity and suffering from unconscious sources. In J. S. Uleman & J. A. Bargh (Eds.), *Unintended thought* (pp. 75–123). New York: Guilford Press.
- Higgins, E. T. (1996). Knowledge activation: Accessibility, applicability, and salience. In E. T. Higgins & A. W. Kruglanski (Eds.), *Social psychology: Handbook of basic principles* (pp. 133–168). New York: Guilford Press.
- Higgins, E. T., Bargh, J. A., & Lombardi, W. (1985). The nature of priming effects on categorization. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 11, 59–69.
- Higgins, E. T., King, G. A., & Mavin, G. H. (1982). Individual construct accessibility and subjective impressions and recall. *Journal of Personality and Social Psychology*, 43, 35–47.
- Hilgard, E. R. (1965). *Hypnotic susceptibility*. New York: Harcourt, Brace & World.
- Hogarth, R. (1980). *Judgement and choice*. New York: Wiley.
- Holland, J. H., Holyoak, K. J., Nisbett, R. E., & Thagard, P. R. (1986). *Induction. Processes of inference, learning, and discovery*. Cambridge, MA: MIT Press.
- Hull, C. L. (1931). Goal attraction and directing ideas conceived as habit phenomena. *Psychological Review*, 38, 487–506.
- Iyengar, S. S., & Lepper, M. R. (1999). Rethinking the value of choice: A cultural perspective on intrinsic motivation. *Journal of Personality and Social Psychology*, 76, 349–366.
- Jackson, F. (1986). What Mary didn't know. *Journal of Philosophy*, 5, 291–295.
- Jacoby, L. L., Kelley, C. M., & McElree, B. D. (1999). The role of cognitive control: Early selection versus late correction. In S. Chaiken & Y. Trope (Eds.), *Dual process theories in social psychology* (pp. 383–400). New York: Guilford Press.
- James, W. (1890). *The principles of psychology* (Vol. 2). New York: Holt.
- Jastrow, J. (1906). *The subconscious*. Boston: Houghton-Mifflin.
- Koestler, A. (1967). *The ghost in the machine*. London: Hutchinson.
- Kuhn, T. S. (1962). *The structure of scientific revolutions*. Chicago: University of Chicago Press.
- Lachman, R., Lachman, J., & Butterfield, E. C. (1979). *Cognitive psychology and information processing: An introduction*. Hillsdale, NJ: Erlbaum.
- LaFrance, M. (1982). Posture mirroring and rapport. In M. Davis (Ed.), *Interaction rhythms: Periodicity in communicative behavior* (pp. 279–298). New York: Human Sciences Press.
- Langer, E. J. (1975). The illusion of control. *Journal of Personality and Social Psychology*, 32, 311–328.
- Langer, E. J., Blank, A., & Chanowitz, B. (1978). The mindlessness of ostensibly thoughtful action: The role of “placebic” information in interpersonal interaction. *Journal of Personality and Social Psychology*, 36, 635–642.
- Lashley, K. S. (1951). The problem of serial order in behavior. In L. A. Jeffress (Ed.), *Cerebral mechanisms in behavior: The Hixon Symposium* (pp. 112–136). New York: Wiley.
- Lepore, L., & Brown, R. (1997). Category and stereotype activation: Is prejudice inevitable? *Journal of Personality and Social Psychology*, 67, 808–817.
- Lewin, K. (1926). Vorsatz, Wille, und Bedürfnis [Intention, will, and need]. *Psychologische Forschung*, 7, 330–385.
- Lewin, K. (1931). *Die psychologische Situation bei Lohn und Strafe* [The psychological situation of reward and punishment]. Leipzig, Germany: Hirzel.
- Lewin, K. (1951). *Field theory in social science*. Chicago: University of Chicago Press.
- Libet, B. (1985). Unconscious cerebral initiative and the role of conscious will in voluntary action. *Behavioral and Brain Sciences*, 8, 529–566.
- Lisak, D., & Roth, S. (1988). Motivational factors in nonincarcerated sexually aggressive men. *Journal of Personality and Social Psychology*, 55, 795–802.
- Locke, E. A., & Latham, G. P. (1990). *A theory of goal setting and task performance*. Englewood Cliffs, NJ: Prentice Hall.
- MacCorquodale, K. (1970). B. F. Skinner's *Verbal Behavior*: A retrospec-

- tive appreciation. In P. B. Dews (Ed.), *Festschrift for B. F. Skinner* (pp. 340–350). New York: Appleton-Century-Crofts.
- Macrae, C. N., Bodenhausen, G. V., Milne, A. B., Castelli, L., Schloerscheidt, A. M., & Greco, S. (1998). On activating exemplars. *Journal of Experimental Social Psychology, 34*, 330–354.
- Macrae, C. N., & Johnston, L. (1998). Help, I need somebody: Automatic action and inaction. *Social Cognition, 16*, 400–417.
- Malamuth, N. M. (1989). The attraction to sexual aggression scale: Part 1. *Journal of Sex Research, 26*, 26–49.
- McClelland, J. L., & Rumelhart, D. E. (1986). A distributed model of human learning and memory. In J. L. McClelland & D. E. Rumelhart (Eds.), *Parallel distributed processing* (Vol. 2, pp. 170–215). Cambridge, MA: MIT Press.
- Milgram, S. (1963). Behavioral study of obedience. *Journal of Abnormal and Social Psychology, 67*, 371–378.
- Miller, G. A., Galanter, E., & Pribram, K. H. (1960). *Plans and the structure of behavior*. New York: Holt.
- Mischel, W. (1973). Toward a cognitive social learning reconceptualization of personality. *Psychological Review, 80*, 252–283.
- Mischel, W., Cantor, N., & Feldman, S. (1996). Goal-directed self-regulation. In E. T. Higgins & A. W. Kruglanski (Eds.), *Social psychology: Handbook of basic principles* (pp. 329–360). New York: Guilford Press.
- Moskowitz, G. B., Wasel, W., Gollwitzer, P. M., & Schaal, B. (1999). Preconscious control of stereotype activation through chronic egalitarian goals. *Journal of Personality and Social Psychology, 77*, 167–184.
- Mower, O. H. (1960). *Learning theory and the symbolic processes*. New York: Wiley.
- Mozer, M. C. (1998). The neural network house: An environment that adapts to its inhabitants. In M. Coen (Ed.), *Proceedings of the American Association for Artificial Intelligence Spring Symposium on Intelligent Environments* (pp. 110–114). Menlo Park, CA: AAAI Press.
- Mozer, M. C., Dodier, R. H., Anderson, M., Vidmar, L., Cruickshank, R. F., & Miller, D. (1995). The neural network house: An overview. In L. Niklasson & M. Boden (Eds.), *Current trends in connectionism* (pp. 371–380). Hillsdale, NJ: Erlbaum.
- Murphy, S. T., & Zajonc, R. B. (1993). Affect, cognition, and awareness: Affective priming with optimal and suboptimal stimulus exposures. *Journal of Personality and Social Psychology, 64*, 723–739.
- Müsseler, J., & Hommel, B. (1997). Blindness to response-compatible stimuli. *Journal of Experimental Psychology: Human Perception and Performance, 23*, 861–872.
- Nagel, E. (1952). Self-regulation in automatic control. *Scientific American, 187*, 44–47.
- Neely, J. H. (1977). Semantic priming and retrieval from lexical memory: Roles of inhibitionless spreading activation and limited-capacity attention. *Journal of Experimental Psychology: General, 106*, 226–254.
- Neely, J. H. (1991). Semantic priming effects in visual word recognition: A selective review of current findings and theories. In D. Besner & G. Humphreys (Eds.), *Basic processes in reading: Visual word recognition* (pp. 264–336). Hillsdale, NJ: Erlbaum.
- Neisser, U. (1967). *Cognitive psychology*. New York: Appleton-Century-Crofts.
- Neisser, U. (1976). *Cognition and reality*. San Francisco: Freeman.
- Newell, A., & Rosenbloom, P. S. (1981). Mechanisms of skill acquisition and the law of practice. In J. R. Anderson (Ed.), *Cognitive skills and their acquisition* (pp. 1–55). Hillsdale, NJ: Erlbaum.
- Newman, L. S., & Uleman, J. S. (1990). Assimilation and contrast effects in spontaneous trait inferences. *Personality and Social Psychology Bulletin, 16*, 224–240.
- Niedenthal, P. M. (1990). Implicit perception of affective information. *Journal of Experimental Social Psychology, 26*, 505–527.
- Niedenthal, P. M., & Cantor, N. (1986). Affective responses as guides to category-based influences. *Motivation and Emotion, 10*, 217–231.
- Nisbett, R. E., & Ross, L. (1980). *Human inference: Strategies and shortcomings of social judgment*. Englewood Cliffs, NJ: Prentice Hall.
- Ovsiankina, M. (1928). Die Wiederaufnahme unterbrochener Handlungen [The resumption of interrupted tasks]. *Psychologische Forschung, 11*, 302–379.
- Penfield, W. (1958). *The excitable cortex in conscious man*. Liverpool, England: Liverpool University Press.
- Penfield, W., & Perot, P. (1963). The brain's record of auditory and visual experience. *Brain, 86*, 595–696.
- Pitcher, T. J. (1983). Heuristic definitions in fish shoaling behaviour. *Animal Behaviour, 31*, 611–613.
- Plous, S. (1993). *The psychology of judgment and decision making*. New York: McGraw-Hill.
- Posner, M. I., & Snyder, C. R. R. (1975). Attention and cognitive control. In R. L. Solso (Ed.), *Information processing and cognition: The Loyola Symposium* (pp. 55–85). Hillsdale, NJ: Erlbaum.
- Prinz, W. (1987). Ideo-motor action. In H. Heuer & A. F. Sanders (Eds.), *Perspectives on perception and action* (pp. 47–76). Hillsdale, NJ: Erlbaum.
- Prinz, W. (1990). A common coding approach to perception and action. In O. Neumann & W. Prinz (Eds.), *Relationships between perception and action* (pp. 167–201). Berlin, Germany: Springer-Verlag.
- Prinz, W. (1997). Explaining voluntary action: The role of mental content. In M. Carrier & P. K. Machamer (Eds.), *Mindscapes: Philosophy, science, and the mind* (pp. 153–175). Pittsburgh, PA: University of Pittsburgh Press.
- Pryor, J. B., & Stoller, L. M. (1994). Sexual cognition processes in men who are high in the likelihood to sexually harass. *Personality and Social Psychology Bulletin, 20*, 163–169.
- Rescorla, R. A., & Solomon, R. L. (1967). Two-process learning theory: Relationships between Pavlovian conditioning and instrumental learning. *Psychological Review, 74*, 151–182.
- Rescorla, R. A., & Wagner, A. R. (1972). A theory of Pavlovian conditioning: Variations in the effectiveness of reinforcement and nonreinforcement. In A. H. Black & W. F. Prokasy (Eds.), *Classical conditioning II: Current research and theory* (pp. 64–99). New York: Appleton-Century-Crofts.
- Reynolds, C. W. (1987). Flocks, herds, and schools: A distributed behavioral model. *Computer Graphics, 21*, 25–34.
- Reynolds, C. W. (1993). An evolved, vision-based behavioral model of coordinated group motion. In J.-A. Meyer, H. L. Roitblat, & S. W. Wilson (Eds.), *From animals to animats 2* (pp. 384–392). Cambridge, MA: MIT Press.
- Rizzolatti, G., & Arbib, M. A. (1998). Language within our grasp. *Trends in Neuroscience, 21*, 188–194.
- Roediger, H. L., & McDermott, K. B. (1993). Implicit memory in normal human subjects. In F. Boller & J. Grafman (Eds.), *Handbook of neuropsychology* (Vol. 8, pp. 63–131). New York: Elsevier.
- Russell, B. (1938). *Power: A new social analysis*. London: Unwin.
- Ryle, G. (1949). *The concept of mind*. Chicago: University of Chicago Press.
- Sappington, A. A. (1990). Recent psychological approaches to the free will versus determinism issue. *Psychological Review, 108*, 19–29.
- Schwarz, N. (1990). Feelings as information: Informational and motivational functions of affective states. In E. T. Higgins & R. M. Sorrentino (Eds.), *Handbook of motivation and cognition* (Vol. 2, pp. 527–561). New York: Guilford Press.
- Searle, J. R. (1992). *The rediscovery of the mind*. Cambridge, MA: MIT Press.
- Searle, J. R. (1997). *The mystery of consciousness*. New York: New York Review of Books.
- Sedikides, C., & Skowronski, J. J. (1991). The law of cognitive structure activation. *Psychological Inquiry, 2*, 169–184.
- Séguin, C., & Pelletier, L. G. (2000). Automatic activation of intrinsic and

- extrinsic motivation*. Manuscript submitted for publication, University of Ottawa.
- Shallice, T. (1972). Dual functions of consciousness. *Psychological Review*, 79, 383–393.
- Sherrington, C. (1906). *Integrative action of the nervous system*. New York: Holt.
- Shiffrin, R. M., & Dumais, S. T. (1981). The development of automatism. In J. R. Anderson (Ed.), *Cognitive skills and their acquisition* (pp. 111–140). Hillsdale, NJ: Erlbaum.
- Shiffrin, R. M., & Schneider, W. (1977). Controlled and automatic human information processing: II. Perceptual learning, automatic attending, and a general theory. *Psychological Review*, 84, 127–190.
- Shoemaker, S. (1997). The first-person perspective. In N. Block, O. Flanagan, & G. Guzeldere (Eds.), *The nature of consciousness: Philosophical debates* (pp. 503–516). Cambridge, MA: MIT Press.
- Skinner, B. F. (1938). *The behavior of organisms*. New York: Appleton-Century-Crofts.
- Skinner, B. F. (1953). *Science and human behavior*. New York: Free Press.
- Skinner, B. F. (1957). *Verbal behavior*. New York: Appleton-Century-Crofts.
- Skinner, B. F. (1971). *Beyond freedom and dignity*. New York: Knopf.
- Smith, A. (1966). *The theory of moral sentiments*. New York: Augustus M. Kelley. (Original work published 1759)
- Smith, E. E., & Jonides, J. (1998). Working memory: A view from neuroimaging. *Cognitive Psychology*, 33, 5–42.
- Smith, E. E., & Jonides, J. (1999, March 12). Storage and executive processes in the frontal lobes. *Science*, 283, 1657–1661.
- Smith, E. E., & Medin, D. L. (1981). *Categories and concepts*. Cambridge, MA: Harvard University Press.
- Smith, E. R. (1996). What do connectionism and social psychology offer each other? *Journal of Personality and Social Psychology*, 70, 893–912.
- Smith, E. R., & Lerner, M. (1986). Development of automatism of social judgments. *Journal of Personality and Social Psychology*, 50, 246–259.
- Solarz, A. (1960). Latency of instrumental responses as a function of compatibility with the meaning of eliciting verbal signs. *Journal of Experimental Psychology*, 59, 239–245.
- Spencer, S. J., Fein, S., Wolfe, C. T., Fong, C., & Dunn, M. A. (1998). Automatic activation of stereotypes: The role of self-image threat. *Personality and Social Psychology Bulletin*, 24, 1139–1152.
- Srull, T. K., & Wyer, R. S., Jr. (1979). The role of category accessibility in the interpretation of information about persons: Some determinants and implications. *Journal of Personality and Social Psychology*, 37, 1660–1672.
- Srull, T. K., & Wyer, R. S., Jr. (1986). The role of chronic and temporary goals in social information processing. In R. M. Sorrentino & E. T. Higgins (Eds.), *Handbook of motivation and cognition* (Vol. 1, pp. 503–549). New York: Guilford Press.
- Strawson, P. (1962). *Freedom and resentment, and other essays*. London: Methuen.
- Tajfel, H., Billig, M. G., Bundy, R. P., & Flament, C. (1971). Social categorization and intergroup behaviors. *European Journal of Social Psychology*, 1, 149–178.
- Tajfel, H., & Turner, J. C. (1986). The social identity theory of intergroup behavior. In S. Worchel & W. Austin (Eds.), *Psychology of intergroup relations* (pp. 7–24). Chicago: Nelson-Hall.
- Taylor, R. (1963). *Metaphysics*. Englewood Cliffs, NJ: Prentice Hall.
- Taylor, S. E. (1989). *Positive illusions*. New York: Basic Books.
- Tesser, A., Martin, L. L., & Cornell, D. P. (1996). On the substitutability of self-protective mechanisms. In P. M. Gollwitzer & J. A. Bargh (Eds.), *The psychology of action* (pp. 48–68). New York: Guilford Press.
- Tolman, E. C. (1932). *Purposive behavior in animals and men*. New York: Appleton-Century-Crofts.
- Uleman, J. S., Newman, L. S., & Moskowitz, G. B. (1996). People as flexible interpreters: Evidence and issues from spontaneous trait inference. In M. P. Zanna (Ed.), *Advances in experimental social psychology* (Vol. 28, pp. 211–279). New York: Academic Press.
- Watson, J. B. (1913). Psychology as the behaviorist views it. *Psychological Review*, 20, 158–177.
- Wegner, D. M., & Bargh, J. A. (1998). Control and automaticity in social life. In D. T. Gilbert, S. T. Fiske, & G. Lindzey (Eds.), *Handbook of social psychology* (4th ed., pp. 446–496). Boston: McGraw-Hill.
- Wegner, D. M., & Wheatley, T. P. (1999). Why it feels as if we're doing things: Sources of the experience of will. *American Psychologist*, 54, 480–492.
- Wicklund, R. A., & Steins, G. (1996). Person perception under pressure: When motivation brings about egocentrism. In P. M. Gollwitzer & J. A. Bargh (Eds.), *The psychology of action* (pp. 511–528). New York: Guilford Press.
- Wiener, N. (1948). *Cybernetics: Control and communication in the animal and the machine*. Cambridge, MA: MIT Press.
- Wiles, J., & Humphreys, M. S. (1993). Using artificial neural nets to model implicit and explicit memory test performance. In P. Graf & M. E. J. Masson (Eds.), *Implicit memory: New directions in cognition, development, and neuropsychology* (pp. 141–165). Hillsdale, NJ: Erlbaum.
- Winter, L., & Uleman, J. S. (1984). When are social judgments made? Evidence for the spontaneousness of trait inferences. *Journal of Personality and Social Psychology*, 47, 237–252.
- Wood, J. V. (1989). Theory and research concerning social comparisons of personal attributes. *Psychological Bulletin*, 106, 231–248.
- Wyer, R. S., Jr. (Ed.). (1997). *Advances in social cognition: Vol. 10. The automaticity of everyday life*. Mahwah, NJ: Erlbaum.
- Wyer, R. S., Jr., & Srull, T. K. (1989). *Memory and cognition in its social context*. Hillsdale, NJ: Erlbaum.
- Zimbardo, P. (1969). The human choice: Individuation, reason, and order versus deindividuation, impulse, and chaos. In W. J. Arnold & D. Levine (Eds.), *Nebraska Symposium on Motivation* (Vol. 17, pp. 237–307). Lincoln: University of Nebraska Press.
- Zuriff, G. E. (1985). *Behaviorism: A conceptual reconstruction*. New York: Columbia University Press.

Received July 6, 1999

Revision received May 30, 2000

Accepted June 6, 2000 ■