

# Bob Zajonc and the Unconscious Emotion

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## Abstract

This article focuses on Bob Zajonc's views on unconscious emotion, especially in the context of the debates about the independence of affect and cognition. Historically, Bob was always interested in the "mere"—basic, fundamental processes. His empirical demonstrations of precognitive and preconscious emotional processes, combined with his elegant expositions of them, sharply contrasted with cold and complex cognitive models. Interestingly, Bob tended to believe that whereas the causes of emotion can be unconscious, the emotional state itself tends to be conscious. However, he reconsidered this assumption and in his later work showed that subjects in affective priming experiments do not experience conscious affect, but instead act on basic preferences. Today, Bob's insights continue to inspire research on "unconscious emotion."

## Keywords

consciousness, emotion, Zajonc

The relation between emotion and consciousness interested Bob Zajonc throughout much of his career. Although he never wrote a comprehensive treatise on "unconscious emotion," he often thought and wrote about it. Most directly, Bob addressed this issue in a short essay published in the book *The Nature of Emotion: Fundamental Questions* edited by Paul Ekman and Richard Davison (1994). One of the chapters in this book asked several prominent emotion theorists to address the question "Can emotions be nonconscious?" Bob responded with an essay unambiguously titled "Evidence for nonconscious emotion." Further, as I discuss below, the idea of unconscious emotion was central to Bob's thinking about the relation between affect and cognition. In fact, in a 2000 review of his work, he wrote that "In seeking to establish the independence of affect and cognition, I relied on the assumption that emotions are often unconscious" (Zajonc, 2000, p. 32).

So, why did Bob assume that emotions are often unconscious? What was the background of this idea? How did he understand it? How do his arguments for unconscious emotion fare from today's perspective? How did they influence research in the field? In this article, I address these questions from several perspectives—historical, academic, and also personal, as one of his graduate students at Michigan. I hope to show that Bob's thinking and empirical work on "unconscious emotion"

has not only redirected the field but continues to inspire new research and new researchers.

## The Background of the Idea

### *The Mere*

Let me start with some general thoughts about how the idea of unconscious emotion fits with Bob's general style of thinking and research. It is now a cliché to say that Bob was interested in the "mere"—the simple, the fundamental, the essential. However, it was not a mere "mere," but rather a multilayered one. Part of it was his intellectual conviction that simple explanations are better explanations. Bob would often refer to the inferential power of parsimony and point out in his erudite way the advantages of Occam's razor. It gives the edge to the theory of relativity over Newtonian physics (by accounting for more data with fewer assumptions). It shaves unnecessary parameters from statistical models (thus avoiding overfitting). It sharpens software development (by eliminating cluttering with non-essential features). As a student, I knew that I was supposed to follow the KISS principle long before I understood exactly why.

Bob liked the mere also for esthetic reasons, and would often justify his theoretical and design choices by "elegance." For him, Occam's razor was good not only because it cut out the fat,

*Author Note:* I appreciate comments by Kent Berridge, Kent Harber, Paula Niedenthal, Andrzej Nowak, and Norbert Schwarz.

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but also because it gave a clean-shaven look. “There is a great deal of elegance in a simple explanation,” wrote Bob in the irreverent and insightful “Styles of Explanation in Social Psychology” (Zajonc, 1989, p. 356). In that article Bob adopted the language and concepts from Galtung’s (1981) classic article on cultural differences in intellectual styles, and showed how theory-building styles of various social psychologists reflect their culturally-bound traditions of a “good explanation.” If I were to apply Galtung’s analysis to Bob himself, I would say that his style combines the Anglo-Saxon focus on data and clarity of explanation with a Teutonic efficiency, where a good theory relies on just a few logically-connected axioms, and a Gallic panache for expression, where good theory is also artistically rendered. Bob was openly (but not blindly) Francophilic, so perhaps making theories “elegantly simple” brought a bit of Montparnasse to Ann Arbor.

One may also speculate how Bob’s preference for the “mere” reflected his need to focus on the “essential.” It is not surprising that someone with Bob’s life experience (see introduction to this issue) would have little interest in exploring how some variable V moderates the action of variable Y in context C, but not D. He did not have much patience for the baroque nature of some theories in psychology, or articles exploring how Shimmelpinnick’s theory of T can be combined with Pumphnick’s notion of Y. In fact, he would say to his students “Don’t waste your life, focus on fundamental problems.”<sup>1</sup>

Of course, for Bob, the most fundamental, the “merest of the mere,” were emotions. Emotions, in the sense that Bob conceived them, and perhaps in the way he experienced them in the peaks and nadirs of his life, were what humans boiled down to. The “mere” in the specific context of the question about unconscious emotion was, I think, about Bob’s attempt to identify the very core, most basic biological processes underlying social behavior. Consciousness (at least the reflective kind) is not a basic biological process, nor is it simple in its cognitive requirements.<sup>2</sup> Bob saw how basic social phenomena can occur with lowly cockroaches (social facilitation) or cute-but-dumb newly-hatched chickens (mere exposure). So, he assumed that there is much that can be explained about emotion without an appeal to complex cognition or consciousness (see Bargh, 2001).<sup>3</sup>

### *Old Work on the “New Look”*

Bob was long interested in the ideas of the “New Look” in perception research, in which emotion and motivation could influence perceptual and cognitive processes (Bruner, 1957). One specific claim was that the conscious mind can protect itself from threatening realities by raising the perceptual recognition threshold for undesired content (e.g., painful or taboo words, words related to one’s suppressed desires, etc.). The existence of such “perceptual defense” would suggest not only an unconscious detection of an emotional content, but also its ability to modify subsequent cognitive processing. McGinnes expressed this idea over 60 years ago in a logic that is not that different from contemporary statements about unconscious emotion:

One might conjecture, for example, that stimuli of an appropriate sort will arouse autonomic reactions characteristic of anxiety or pleasure *prior* to conscious awareness of the nature of the stimulus. If this is the case, we might expect to find a change in galvanic skin response in reaction to visually presented stimuli with emotion-provoking connotations before the subject is able to report the exact nature of the stimulus. In short, autonomic reactivity may have a lower threshold to threat than do those neural systems which mediate consciousness. (McGinnes, 1949, p. 244)

Bob was curious about this possibility of emotion preceding cognition, and intrigued by some data suggesting that high detection thresholds for taboo words were indeed related to the enhanced electrodermal response (McGinnes, 1949). So, he tested the question empirically armed with a tachistoscope, a machine for measuring electrodermal responses, and a list of then-taboo words<sup>4</sup> (Zajonc, 1962). But his results, and other related research, suggested that the “defense” might be not very perceptual. After all, he reported, “the recognition threshold was found to be a function not of what the subject saw but what he had to say” (p. 213). In concluding the article, Bob wrote, “It is not claimed here that the perceptual defense phenomenon has been disproven. But if the phenomenon is empirically demonstrable, its proof must be established by experimental methods other than those commonly used” (p. 214). In short, the question of unconscious emotion was not dead, but needed better methods and better theoretical development.

So, Bob took a break from unconscious emotions and returned to the topics he started to explore in his dissertation—mental representations of people. While doing so, he helped create a new field that we now refer to as Social Cognition. Besides writing some classic theoretical integrations of the field (Zajonc, 1968), he did so by looking at such fundamental problems as tuning of cognitive representations in the process of an interaction (Zajonc, 1960), and how these cognitive representations depend on structural factors, such as balance (Zajonc & Burnstein, 1965). It is easy to forget that Bob—the emotion scientist—was also a prominent cognitive scientist.

### **Affective Primacy and Nonconscious Emotion**

The opportunity to confront the question of unconscious emotion with more precise methods and theories came in the mid-1970s, in the context of Bob’s work on his thesis about affective primacy and independence from cognition. Methodologies for subliminal presentations became more reliable and verifiable, and Bob was eager to take advantage of them (see Figure 1).<sup>5</sup> Theoretically, the “New Look” received a reviving new look (Erdelyi, 1974), the topic of (un)consciousness became respectable (Mandler, 1975), and cognitive psychology turned to investigating relations between automatic and controlled processes (e.g., Shiffrin & Schneider, 1977). Yet mainstream psychology seemed ideologically stuck in the straightjacket of the computer metaphor. Its flow-charts, boxes, and the cold syntax of programming languages must have been seen by Bob as obscuring, distorting, and negating the essence of human experience—emotion.



**Figure 1.** Robert Zajonc in front of a device measuring reaction time in group experiments. Reproduced with permission of Institute for Social Research in Ann Arbor, Michigan, USA.

All these trends and discontents came into expression in “Feeling and Thinking: Preferences Need No Inferences”—Bob’s famous 1980 article in the *American Psychologist*. Bob not only marshaled evidence for affective primacy and independence of affect from cognition, he also forcefully decried the neglected and disparaged status of emotion in experimental psychology. By treating emotion as inconsequential “noise,” or as a secondary process marginally tacked on to cognitive models, the field had lost an essential part of itself.<sup>6</sup> Modern cognition-focused psychology departed from the founding fathers who, like Wundt, believed that “the clear apperception of ideas in acts of cognition and recognition is always preceded by special feelings” (Wundt, 1907, p. 244). And worse still, academic psychology contradicted real human experience. Bob made this point with a quote from e.e. cummings: “since feeling is first, who pays any attention to the syntax of things will never wholly kiss you” (cummings, 1973, p. 160). In short, “Feeling and Thinking” is a statement of passion intended to turn the tide, as it eventually did.

But behind Bob’s passion for reinstating emotion to its proper and central role, many of his arguments for affective primacy and independence from cognition served to support the notion of unconscious emotion. Let us have a look at a few of them, and offer some comments from the perspective of 30 years.

### *Physical and Chemical Sources of Affects*

Bob liked to emphasize that affect sometimes derives from “non-informational origins,” which, almost by definition, are unconscious. He liked to talk about emotion being about the transformation of “physical and chemical” energy, and how it was encoded and processed in the bodily systems.<sup>7</sup> Cognition was about transformation of information or, more formally, about truth-preserving manipulations of feature-encoding propositions. In “Feeling and Thinking” he discussed how “affect is not always transformed into semantic content but is instead often encoded in, for example, visceral or muscular symbols.” This is a direct foreshadowing of his later work on embodied emotion, and also his work on the vascular theory of emotion efference. The present contributions by Paula Niedenthal and colleagues, and also by Kent Berridge, describe this work in detail, but for the current purposes I note that for Bob these phenomena were further evidence that emotion can originate and operate noncognitively and unconsciously.

### *Subliminal Mere Exposure: The Unconscious, Perceptual Source of Affect*

How was Bob to empirically show the noncognitive and unconscious operations of emotion? The mere exposure effect played a critical role. The present contribution by Dick Moreland and Sasha Topolinski describe in detail the history and current work on this phenomenon. But, let me make some comments on the role of subliminal mere exposure in the argument for unconscious emotion.

Equipped with new tools for subliminal presentations, Bob took on the challenge in a pioneering (and still massively cited) study published in *Science* (Kunst-Wilson & Zajonc, 1980). In that study, participants were first subliminally (1 ms) exposed to a subset of octagons. Later they were shown pairs of octagons at visible durations (1 second), with one being the “old,” previously seen octagon, and the other “new.” Participants were asked questions about preference (which one do you like better?) and recognition (which one was shown previously?). Participants preferred the previously exposed octagons. But the recognition memory for them was at chance. Thus, along with the earlier mere exposure demonstrations in animals, the demonstration that a rudimentary manipulation such as subliminal repetition could influence people’s preference, but not memory, for a stimulus seemed to clinch the case for the unconscious and cognitively unmediated induction of affect.

However, Bob’s claims about the lack of cognitive mediation did not go unchallenged. In fact, some critics doubted that “mere exposure” actually induces anything emotional. The “non-specific activation model” of the mere exposure effect claimed that “the prior exposure generates and activates the stimulus representations, and that such activation may then be related to any judgment about the stimuli that is stimulus relevant” (Mandler, Nakamura, & Van Zandt 1987, p. 647). This non-specific activation model prepared the ground for later fluency models of mere exposure, where repetition changes the ease with which the stimulus is perceived and interpreted (see

Moreland & Topolinski, 2010). These models predicted, and found, that subliminal mere exposure influenced not only affective judgments, but also cognitive judgments, including stimulus clarity, contrast, familiarity, fame, truth, risk, and so forth (Schwarz, 2004). For example, contrary to the claim that subliminal mere exposure only influences preferences, but not recognition (Kunst-Wilson & Zajonc, 1980), later work showed that mere exposure can also enhance judgments of previous occurrence (Whittlesea & Price, 2001). This occurs so long as participants are freed from the analytic constraints of the more verifiable memory judgments and approach the task nonanalytically, in the same way they approach preference judgments (Whittlesea & Price, 2001).

But these subsequent models and findings do not pose as great a problem for Bob's view as some believe. First, changes in fluency are not based on descriptive features of a stimulus, but instead on its processing dynamics—how smoothly it travels through the mental system. There is no elaborating, no structuring, no categorizing, no interpreting. This is as noncognitive as it gets.

Second, fluent processing can mark early and unconscious stages of stimulus analysis, before stimulus identity has been determined. These points were elegantly demonstrated by connectionist modeling work by Andrzej Nowak and his colleagues at the University of Warsaw (for brief overview, see Winkielman & Nowak, 2005; for a comprehensive discussion see Rychwalska, Jablonski, Zochowski, & Nowak, 2005). For example, Andrzej and colleagues showed that in the mere-exposure effect, many prior encounters establish a strong memory (attractor) for a pattern, whereas few prior exposures establish a relatively weak memory. When encountered later by the network, a test pattern with a relatively stronger memory (i.e., stronger attractor) elicits little volatility (fewer state changes). Volatility is one dynamical parameter by which novelty can be noncognitively assessed by the network. Another parameter is the coherence of the signals traveling in the network. These dynamical changes can be detected extremely early and be used for a quick affective decision, explaining how a previously encountered stimulus can be immediately liked (Lewenstein & Nowak, 1989). Drogosz and Nowak (2006) demonstrated the applicability of these computer models to the human data on the mere exposure effect by simulating the results obtained by Seamon, Marsch and Brody (1984). Specifically, extremely short exposure durations were sufficient for an "affective" (dynamics-based) discrimination of the old versus new stimuli, but not for "cognitive" (pattern matching-based) recognition. This result fits very well with Bob's discussion of the brain's fast novelty networks, and with recent neuroscience studies implicating those networks in affective reactions to familiarity (Elliott & Dolan, 1998). Of course, given that other variables besides repetition (e.g., clarity, contrast) have also been shown to enhance fluency and liking, the mere exposure phenomenon might be less tied to the assessment of familiarity–novelty, but instead be just one example of the hedonic implications of fluency (Reber, Winkielman, & Schwarz, 1998).

Third, and perhaps most importantly, a number of studies have shown that low-level changes in fluency have genuine

affective consequences. For example, repeatedly exposed neutral stimuli elicit stronger activity over the "smiling" region of the face without changing the activity over the "frowning" region (Harmon-Jones & Allen, 2001). Subliminal presentations of mere exposed stimuli can also enhance self-reported mood (Monahan, Murphy, & Zajonc, 2000). Other nonrepetition-based fluency enhancements (priming, contrast, clarity, prototypicality) also lead to similarly positive effects (Winkielman & Cacioppo, 2001; Winkielman, Halberstadt, Fazendeiro, & Catty, 2006). In sum, the available data suggest that the mechanisms underlying the mere exposure effect are indeed precognitive, can operate unconsciously, and are closely tied to the affect system. As such, the phenomenon can be viewed as an example of preferences without inferences, and its subliminal version is a demonstration of unconscious emotion (Zajonc, 1980, 2000).

### *Separate Ways*

For Bob, emotion could be unconscious, not only because it was noncognitive, but because it could operate independently from a cognitive processing stream. In his 1980 *American Psychologist* article, Bob talks about how fear responses in rabbits can be triggered very fast and with minimal cognitive processing. He also discusses neural separation of affective pathways, presciently placing this idea in a larger context of discoveries about many different processing streams in the brain.<sup>8</sup> This discussion, of course, predated systematic investigation by LeDoux on the "high" and "low" (subcortical) pathways to the amygdala. In fact, in his 1996 book, LeDoux gracefully acknowledges Zajonc's influence on his thinking and sees the 1980 paper as a turning point for emotion research. Though from the contemporary perspective, the strong claims for neural separation of affect and cognition may need to be qualified (Pessoa, 2008), the essential insight that neural circuitry allows for fast affective responses based on rudimentary stimulus features remains true 30 years later.

### *Subliminal Faces*

Bob thought that one domain in which affect is primary and neatly separated from cognition is facial processing. He was fascinated by the phenomenon of neonatal recognition of faces and their early imitation of parental expressions. He followed research in prosopagnosia ("face blindness"), especially cases where perception of facial identity dissociates from perception of expression. He was excited by reports of "affective blindsight"—a phenomenon in which a person can make simple discriminations of affective aspects of a stimulus, without being able to consciously report it. He followed debates on the "angry face in the crowd" effect, where a hostile face "pops out" from a crowd of distracters (suggesting preattentional processing). So, Bob was naturally curious whether affect could be induced by subliminally-presented emotional facial expressions. In the late 1980s several of his students were toying with these ideas, and one of the first to turn it into an experiment was Paula Niedenthal. She also receives (from me, at least) the "unconscious emotion pioneer" award for actually writing a dissertation on that topic (Niedenthal, 1987). Empirically, Paula

showed that subliminally-flashing emotional faces (disgusted vs. happy) changed the evaluation of subsequent cartoons.<sup>9</sup>

Following this in the 1990s were papers using a methodology of subliminal affective priming, where emotional (but not descriptive) dimensions of very briefly presented faces were shown to bias evaluation of subsequent stimuli. Here Bob tried to separate unconscious emotion from unconscious cognition. This became important because Bob was sometimes accused by his critics of pushing the idea of unconscious elicitation of affect, without giving cognition that same chance of demonstrating unconscious processing. An article he wrote with Sheila Murphy addressed this in a clever way by giving the priming face a reasonably fair chance to influence judgment of target ideograph via its affective features (happy vs. angry) or nonaffective feature (gender). Under subliminal exposures, only affective features made a difference (i.e., influenced liking judgments), whereas under supraliminal exposures, nonaffective features had more impact (i.e., influenced masculinity/femininity judgments; Murphy & Zajonc, 1993, Study 5).

### *Unconscious Induction of Emotion versus Unconscious Emotional State*

Bob saw subliminal mere exposure and subliminal affective priming phenomena as clear evidence for nonconscious emotion. But note that in all of these studies only the causation of affect is unconscious. The elicited affect was always assumed to be consciously experienced (Zajonc, 2000).<sup>10</sup> In fact, in some studies on subliminal mere exposure, the participant was explicitly asked to introspect on the mood caused by the unconscious stimulus and report on it using mood scales (Monahan et al., 2000). One can see that Bob was theoretically focused on the unconscious sources of affect, rather than unconscious state, when reading the following:

What happens when we induce nonconscious affect? Nonconscious affect has been recognized in clinical psychology in the form of the phenomenon of free-floating anxiety. Free-floating anxiety is a state—a feeling—a mood, in which the person has no idea of the origin of the feeling. It is a sort of fear, but the person does not know what he or she is afraid of, and has no idea of how to escape it. It is diffuse and nonspecific. (Zajonc, 2000, pp. 47–48)

In other words, in Bob's prototypical example, a free-floating anxiety is a conscious fear—the person experiences ordinary subjective anxiety, but is unaware of its cause.

### *Initial Evidence for Truly Unconscious Emotion*

But, is there such a thing as a “truly unconscious emotion”? That is, emotion that is not only unconsciously induced but one that operates without conscious feeling? Bob always had his doubts about this possibility, but somewhat unwittingly ended up providing initial evidence for it. The opportunity arose in the early 1990s with the arrival of two people at Michigan. One was a new faculty member from Germany, Norbert Schwarz. The other was a new graduate student, myself. I am originally from

Poland and went to the University of Warsaw where I devotedly studied Bob's paper on affective primacy. However, before arriving at Michigan in 1991, I spent three years at the University of Bielefeld in Germany.<sup>11</sup> There I became fascinated by Norbert's thinking on emotion, including the “mood-as-information” model he developed with Jerry Clore (Schwarz & Clore, 1983; Schwarz, in press). Appreciating Bob's and Norbert's scientific approaches, and having some Slavo-teutonic bi-cultural experience, I thought (and was encouraged) to serve as a bridge between Bob's and Norbert's congenial but strong personalities and compatible but very divergent viewpoints.

The germane reason why Norbert and Bob were poles apart had to do with the interpretation of the process by which subliminally-presented affective faces influence judgment of neutral targets (e.g., Murphy & Zajonc, 1993). Norbert thought of it as a “mood-as-information” effect and wrote,

Given the absence of any useful knowledge about the ideograph, subjects may be likely to turn to their affective response, asking themselves, “How do I feel about it?” If they encounter positive feelings, they may conclude that the ideograph may mean something positive—unless they have reason to doubt the informational value of their feelings. (Schwarz, 1990, p. 538)

For Bob, this sounded “too inferential.” He thought of unconsciously elicited preferences as primitive, unappraised, pre-experiential “mere” outputs, which do not easily communicate with conscious beliefs and attributions. I don't remember if he ever did, but I can imagine Bob quoting Pascal, “the heart has reasons that the reason does not know.”

Debating the various theoretical perspectives on this result, Bob, Norbert, and I began to suspect that the affective priming phenomenon may indeed operate without a change in consciously experienced feelings. In the mid-1990s there were enough clues in the literature to realize that some affective influences on perception and judgment are mediated by low-level systems, which do not produce any accompanying conscious affect, but only change people's response dispositions or how appealing the stimulus appears to them (e.g., Bechara, Damasio, Tranel, & Damasio, 1997). We wrote that “even if affective priming leads to a noticeable affective reaction, this reaction may not be represented as a feeling, but only as a change in a preference” (Winkielman, Zajonc, & Schwarz, 1997, p. 436).

We ran a series of studies to explore this point (Winkielman et al., 1997). In all of them, participants were asked to rate neutral Chinese ideographs preceded by subliminally presented happy faces or angry faces. To this basic procedure we added standard misattribution manipulations, in which participants were directed not to use their feelings as a source of their preference ratings. In some studies, participants were provided plausible (but false) alternative explanations for why their feelings might change (music that was playing in the background). In other studies, participants were told the truth, about briefly flashing pictures that might influence the feelings. In effect, these explanations encouraged corrective attributions that typically eliminate the contaminating influence of conscious feelings on evaluative judgments (Clore, 1994).

However, in all of our studies the results were clear: no misattribution effect, just the standard affective priming. That is, even for participants who clearly knew to disregard their “contaminated” feelings, subliminally-presented happy faces increased preference ratings and subliminal angry faces decreased preference ratings. Furthermore, when asked after the experiment about their emotions, participants did not remember experiencing any changes in their mood.

### *Bob Leaves Michigan, but Unconscious Emotions Do Not*

In 1995 Bob retired from the University of Michigan and moved to Stanford University. But I continued thinking about unconscious emotion. A happy trigger to get back to the topic was a seminar on consciousness taught at Michigan by Kent Berridge, a hard-nosed but open-minded and intellectually generous biopsychologist. We started to discuss Zajonc’s arguments, as well as related views on unconscious emotion (e.g., Kihlstrom, Mulvaney, Tobias, & Tobis, 2000; Öhman, Flykt, & Lundqvist, 2000). Kent also liked Zajonc’s empirical work and collaborated with him on explorations of “brain cooling” for liking and wanting in rats (see Berridge, 2010). Kent has a biopsychological perspective on the question of unconscious emotion, grounded in classic evolutionary thinking, and modern affective neuroscience. So he sees conscious feelings as a late achievement, compared with behavioral affective reactions to emotional stimuli, which in rudimentary form occur even in reptiles and fish (one may debate about cockroaches). Empirically, Kent beautifully demonstrated the role of subcortical mechanisms in liking and wanting in animals (Berridge, 2003). So Kent Berridge and I started to write about unconscious emotion, first describing our thoughts in a theoretical article on unconscious emotion published in the special issue of *Cognition & Emotion* (Berridge & Winkielman, 2003). We felt so indebted to Bob that in a somewhat unusual practice in academia, we actually dedicated this article to him.

However, Kent was not overwhelmed with the strength of the human evidence for truly unconscious emotion in humans that we presented in the 1997 article. Perhaps participants misunderstood the attributional manipulations? Perhaps they forgot their conscious emotions by the time they were interviewed about them? And finally, why would anyone care about bias in their ratings of affective ideographs? I agreed with Kent that more compelling evidence for unconscious emotion would show that cognitively able and motivated participants are unable to report a conscious feeling at the same time their behavior reveals the presence of an affective reaction. Ideally, the affective reaction should be strong enough to change behavior that has real consequences for the individual.

To obtain such evidence, we assessed participants’ beverage consumption after first exposing them to happy, neutral, or angry subliminal emotional facial expressions (Winkielman, Berridge, & Wilbarger, 2008). Each of the subliminal facial expressions was masked by a clearly visible neutral face on which participants performed a simple gender detection task. Immediately

after the subliminal affect induction, some participants rated their feelings (mood and arousal) and then drank a fruit beverage. Other participants first drank the beverage and then provided feeling ratings. In Study 1, the consumption behavior involved pouring themselves a cup of a novel drink from a pitcher and then drinking it. In Study 2, participants were asked to take a small sip of the drink and rate it on different dimensions (e.g., monetary value). In both studies, there was no evidence of any change in conscious mood or arousal, regardless of whether participants rated their feelings on a simple scale from positive to negative or on a multi-item scale asking about specific emotions.

Yet participants’ consumption behavior and drink ratings were influenced by those subliminal affective stimuli, especially when participants were thirsty. Specifically, after being exposed to happy faces thirsty participants poured significantly more drink from the pitcher and drank more from their cup than after angry faces (Study 1). Thirsty participants were also willing to pay about twice as much more for the drink after happy, rather than angry expressions (Study 2). That is, subliminal emotional faces evoked affective reactions that altered participants’ consumption behavior and evaluation of the beverage, but produced no mediating change in their conscious feelings at the moment the affective reactions were caused. Since participants rated their feelings of mood immediately after the subliminal affect induction, these results cannot be explained by the failure of affective memory. In sum, the concept of “truly unconscious emotion” finally had some empirical proof.

### **Bob’s Legacy**

The work continues. The question about the relation between emotion and consciousness is now “hot” and is being explored not only by psychologists, but also neuroscientists, animal researchers, and even philosophers (see Feldman-Barrett, Niedenthal, & Winkielman, 2005). Several groups pursue questions directly inspired by Bob’s studies on unconscious affect. One group involves researchers who benefited directly and indirectly from Bob’s involvement in the Polish scientific community. Their questions include (a) how specific is the information extracted from unconscious affective stimuli, such as facial expressions, (b) how does unconscious affect interact with cognitive functions, such as categorization, memory and attention, and (c) how do individual differences in temperament and cognitive styles modify the impact of unconscious affect on later judgments and behavior? (See Ohme, 2007, for a collection of articles summarizing this work.)

Below I will highlight only a few questions that I have tried to address in my lab. I will also try to point out some challenges and future directions.

#### *Physiological Concomitants*

One current question is the extent to which the reactions elicited by unconscious affective faces are truly “affective,” in the sense of involving “hot and juicy” representation of valence in the bodily systems traditionally associated with emotion

(Winkielman, Berridge, & Wilbarger, 2005). Perhaps they are only “evaluative,” in the sense of activation of certain meaning components (Clore, 1994). One way to address this issue, which is at the heart of the affect versus cognition debate, is psychophysiology. In fact, one reason for the use of galvanic skin response (GSR) in the earlier discussed “New Look” papers on perceptual defense was to get at the underlying unconscious affect (McGinnies, 1949; Zajonc 1962). In fact, describing GSR as a measure of emotionality, McGinnies (1949, p. 244) says: “The term ‘emotionality’ is employed here in the sense of automatic response without regard to presence or absence of phenomenological content.”

Fifty years later, my colleagues and I are trying to do a similar thing. Specifically, we are looking for psychophysiological traces of emotion in the ideograph-rating and drinking studies described above using techniques of EMG and affective startle modulation. We found that unconscious smiling and angry faces elicit congruent facial EMG responses (smiling to happy faces and frowning to angry faces). These subliminal faces also lead to emotion-congruent startle modulation. These findings suggest that subliminal emotional primes that do not elicit conscious feelings are able to activate emotional channels that produce appropriate bodily response (Starr, Lin, & Winkielman, 2007). This is consistent with neuroimaging studies showing that subliminal angry and fearful faces activate the amygdala and related limbic structures (Morris, Öhman, & Dolan, 1999; Whalen et al., 1998). Much more needs to be known about the specific pathways underlying such effects, and the conditions under which they occur (Pessoa, 2008). But, in short, it looks like again Bob got it mostly right.

### *Images and Words*

Another way to distinguish between the “cold” (evaluative) and “hot” (affective) aspects of the process is to use different materials for emotion induction. Specifically, affective words have long been known to prime evaluative processes (e.g., as assessed by changes in interpretation of the target material). On the other hand, affective pictures are more efficient than words in eliciting physiological reactions, which reflect changes in core affective systems (Larsen, Norris, & Cacioppo, 2003). This is true even if words and pictures are matched on self-reported valence and frequency. Consistent with these observations, we found that subliminal (and supraliminal) emotional facial expressions influence consumption in an affect-congruent way, whereas words do not (Starr, Winkielman, & Gogolushko, 2008). Thus, it appears that even though the reaction induced by the emotional facial expressions is unconscious, it works via modification of a low-level emotional response, rather than via high-level evaluative priming.

### *Affect or Emotion?*

There is now ample evidence for unconscious affect—changes in general positivity–negativity. But what about unconscious emotion—categorically different states such as fear, anger, disgust, sadness, joy, love, shame, guilt, or pride? Some skeptics,

even Bob, expressed doubt about this possibility, arguing that many emotional states require sophisticated cognitive differentiation (Zajonc, 1998). For example, an emotion such as guilt requires entertaining several beliefs such as “I did something wrong to another person, I was responsible, I could have done something to prevent it.” This argument may hold for higher-order social emotion, but not for basic emotions. After all, animals, even reptiles, appear to show categorically different reactions to situations demanding different emotional response (e.g., fear, rage, rejection; see Panksepp, 2005). It is also interesting that human neuroimaging studies reveal unique patterns of amygdala activation to consciously presented facial expressions of fear, anger, sadness, and disgust (Phan, Wagner, Taylor, & Liberzon, 2002; Whalen et al., 1998).

If future research shows that, say, masked facial expressions of fear, anger, sadness, or disgust can create different physiological reactions with different behavioral consequences, all without eliciting conscious feelings, then there might indeed be processes fully deserving the label “unconscious emotion.” Thus far, I am not aware of such studies, but the empirical challenges lie more in making, for example, the disgust- or sadness-inducing stimuli convincingly “invisible” (which is difficult for faces, but especially for complex pictures), rather than with the emotional reaction of disgust or sadness being necessarily conscious. In fact, there are some intriguing hints from a series of studies using subliminal words related to guilt and sadness—two negative but qualitatively different emotions (Zemack-Rugar, Bettman, & Fitzsimons, 2007). When participants were subliminally primed with guilt-related words, they showed less indulgence in their behavior than participants primed with sad words. Unfortunately, it is unclear in these studies whether the words worked because they induced actual emotions, or via regular mechanisms of concept priming (Bargh, 2001). After all, there was no evidence of any feeling changes on the self-report level, but also no physiological measure of actual emotion. Still, these results at least raise a possibility that basic triggers of social emotions can operate unconsciously.

### *More Complex Behavior*

Can unconscious emotional reactions drive more complex social behavior? After all, a decision to pour and drink a novel beverage is relatively simple and could be driven by activation of basic approach–avoidance tendencies. Would an abstract and cognitive incentive, such as an investment prospect that requires an active decision whether to allocate money, also be increased in attractiveness by a subliminal positive prime? In an initial attempt to address this issue, we have used the affective priming paradigm with subliminal faces but asked participants to make more complex financial decisions (for an overview, see Winkielman, Knutson, Paulus, & Trujillo, 2007). For example, in one study participants decided whether to gamble \$1 for a 50% chance of winning \$2.50 or whether to simply pocket the dollar. Participants primed with subliminal happy faces were more likely to choose the investment than participants primed with angry faces, presumably reflecting a more favorable evaluation

of the bet. Future studies will certainly focus on the interaction of unconscious affect with rational decision processes.

## Summary and Conclusion

In this article I have tried to characterize Bob Zajonc's views on unconscious emotion and place them in the context of the debates about the independence of affect and cognition. I pointed out that Bob has always been interested in the "mere"—fundamental, basic, and essential aspects of psychology. He assumed that emotion process can operate precognitively and preconsciously. Empirically, Bob first demonstrated this in the studies showing subliminal mere exposure effect. He then showed that subliminal emotional faces bias affective evaluations, but not cognitive dimensions of subsequent stimuli. Interestingly, Bob tended to believe that whereas the causes of emotion can be unconscious, the emotional state itself tends to be conscious. However, he reconsidered this assumption in his work, showing that despite showing preference changes in their behavior, people sometimes do not report the unconsciously induced affect and fail to attribute it to alternative causes. These insights inspired a variety of recent studies on "unconscious emotion," many using psychophysiological methods. These studies further supported Bob's notion of affective primacy and affective independence, while qualifying conditions when the most radical aspects of his thesis hold.

Collectively, Bob's insights reasserted the importance of emotions generally, and pioneered new research on "unconscious emotion." Much has been said already about Bob's impact on psychology, his students, and his importance in the life of so many people, including myself. Even though emotions are indeed sometimes unconscious, with regard to Bob, I still miss him and feel admiration, gratefulness, and sadness—all of them strongly and very much consciously.

## Notes

- 1 Some eminent scholar apparently said that much of academic psychology consisted of solving puzzles posed and appreciated only by other psychologists. Though the same could probably be said about most fields (e.g., geology), the quote captures a bit of Bob's worry about psychology becoming too self-focused and losing track of big issues.
- 2 As an anecdote, my colleagues and I once edited a book called *Emotion and Consciousness* (Feldman-Barrett, Niedenthal, & Winkielman, 2005). When I sent it to Bob he commented that the title "combines two complex phenomena we know nothing about."
- 3 Some assume that Bob did not have much use for consciousness. On the contrary, he was so fascinated by consciousness that he started writing a book about it. He would also lament the fact that the contemporary experimental social psychology has little to say about the relation between social life and conscious thought—a theme picked up by recent research (for discussion see Winkielman & Schooler, 2008).
- 4 The words tested in the experiment included: APPLE, BROOM, CANDY, CHAIR, CHILD, FLOOR, MUSIC, RAINS, RIVER, SHELF, STOVE, TRADE, BALLS, BELLY, BLEED, FAIRY, FILTH, HYMEN, KOTEX, PENIS, PUBIC, RAPED, VOMIT, WHORE.
- 5 Bob liked his toys. Figure 1, which is hanging in the Institute for Social Research in Michigan, shows him in front of a state-of-the-art device measuring group reaction time in the experiments. In the basement of ISR, he had equipment for subliminal presentations consisting of a full bank of slide projectors and shutters (militantly called Uniblitz). I also

remember the delight he took in showing me a thermography camera he acquired from army surplus to measure the impact of cooling and heating on emotion. Bob repeatedly "suggested" I use it, until I could prove beyond reasonable doubt that it was permanently broken. Danny McIntosh and I were not so lucky with a large plastic helmet he designed to measure people's brain temperature, and we spent a few years of my life learning how to pump cool and hot air into it, while subjects were evaluating scents, music, and degree of dental pain (e.g., McIntosh, Zajonc, Vig, & Emerick, 1997).

- 6 Similar desperation motivated our recent criticisms of semantic network models where emotion is a simple add-on, and functions as "just another node in the network" (Niedenthal, Barsalou, Winkielman, Krauth-Gruber, & Ric, 2005).
- 7 One of Bob's very close colleagues was severely depressed. Despite therapy he eventually committed suicide by jumping off a building from across the Institute for Social Research. Recounting this tragic case, Bob would often wonder about the respective role of cognitive and biological factors (e.g., serotonin) in depression.
- 8 Bob would point out that psychologists who vehemently oppose separation of affect and cognition are often the same who gladly talk about separate processing stream for "where and what" or "faces and places," and endorse all kinds of "two systems" theories of cognition.
- 9 The theme of implicit affective influences became an interest of many of Bob's students in the late 1980s and 1990s (Bargh & Apsley, 2001). Shinobu Kitayama studied emotional and content processing in voice. John Bargh, though more cognitively oriented, thought about the role of unconscious valence. Paula Niedenthal also conducted studies showing that simply manipulating the size of a pupil in a person's face can change affective disposition (Niedenthal, 1990).
- 10 Öhman and his colleagues make a similar use of the term "unconscious emotion" to refer primarily to unconsciously caused occurrences of conscious affective states (Öhman et al., 2000).
- 11 I provide a short story about the path that led me to Bob here (Winkielman, 2009).

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