few published studies of either the positive-incentive value of food or of conditioned taste aversions in anorexics. Vitousek and Gray's comments about the positive-incentive value of food in anorexics, although intended as an attack on our position, cry out for more research. Anorexics act in some ways as if they are experiencing aversions for food and in others as if food has a very high positive-incentive value—just the sort of ambivalent behavior that one would expect of starving subjects with widespread taste aversions.

We did not suggest that taste aversions are the major causal factor in anorexia nervosa but rather that for some anorexics, taste aversions might make it easier for them to refrain from eating in the face of starvation. Vitousek and Gray (2002) responded by pointing out that the participants in the Keys et al. (1950) study managed to voluntarily starve themselves without apparent taste aversions. In contrast to most anorexics, however, the participants in the Keys et al. study were not continually encouraged to eat. In addition, they requested that they not be asked to perform functions that involved the handling of food "because the temptations under these circumstances were too great" (Keys et al., 1950, p. 832).

Unfortunately, Vitousek and Gray (2002) did not comment on our conclusion that the consumption of meals by anorexics may be contraindicated. The disruptive postingestion effects of meals in starving subjects are well documented. Our suggestion that adverse effects, such as widespread conditioned taste aversions, might be produced in anorexics by meals has immediate implications for the design of treatment programs for anorexia, which often have as their major goal the consumption of meals.

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Facilitating Creativity by Regulating Curiosity

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The labor of love aspect is important. The successful scientists often are not the most talented, but the ones who are just impelled by *curiosity* [italics added]. They've *got* to know what the answer is. (Schawlow, as quoted in Amabile, April 2001, p. 335)

Pauling had the intense *curiosity* [italics added] and abiding love of science needed to fuel long, hard work. (Nakamura & Csikszentmihalyi, April 2001, pp. 337–338)

Curiosity appears to be a fundamental motive in facilitating industry and creativity. Writers, artists, inventors, scientists, and others engaged in the creative process often refer to curiosity to describe the compelling psychological need to work at their craft. Without curiosity, the act of pursuing success, eminence, and creativity is not enough to motivate an individual to consistently maintain 10-, 12-, or even 16-hour workdays at the expense of developing balance between work and other life roles (see the lucid description of Thomas Young's lack of relationship devotion in Martindale, April 2001, p. 344). This is because eminence and creativity are not the result only of individuals but of the receptivity of the social milieu to the novelty and adaptivity of ideas (see, e.g., Csikszentmihalyi, 1988). Although individuals may be effused with self-confidence, domain-relevant and creativity-relevant processes (Amabile, 2001), and the belief that their work will have a potent impact, there will always be gatekeepers who determine if manuscripts get published, if artwork will be presented at galleries, and so on. We therefore expand on Amabile's (2001) refreshing motivational approach to creativity. Specifically, we characterize curiosity as a self-regulatory mechanism that facilitates intrinsic goal effort, perseverance, personal growth, and, under the right conditions, creativity.

With the advent of multidimensional models of creativity, one is immediately struck by the likelihood of positive feedback loops between different intraindividual constructs. For example, as one develops greater expertise and talent in a specific domain, one is likely to find domain-relevant activities to be more positively reinforcing, thus facilitating goal effort and perseverance. Alternatively, individuals reporting intrinsic interest in a domain are likely to report relevant activities as more satisfying, more relevant to their present and future well-being, and thus, central to their sense of self (Ryan & Deci, 2000).

The reinforcing value of being a competent, contributing member to a domain may be reducible to an evolutionary-based motivation for personal growth (Aron & Aron, 1997). Across the life span, individuals seek to expand themselves by gaining knowledge, information, wisdom, relationships, and a better understanding of where they fit in the grand scheme of things. The personal growth motive manifests as the pursuit, integration, and creation of novel ideas, feelings, and experiences. An important step in advancing the understanding of the mechanisms underlying the development of creativity is a coherent theory integrating emotions, behaviors, and, as Amabile (2001) noted, motivation. It seems likely that the self-regulating mechanism of curiosity is important for explaining the link between personality traits, life experiences (e.g., crystallizing mentor relationships), and the development of creativity-relevant skills and creative outcomes.

The emotional–motivational state of curiosity is associated with actively acquiring information to create, maintain, and/or resolve meaningful perceptual conflicts or gaps in knowledge (e.g., Kashdan, 2002). Curiosity energizes the allocation of personal resources toward goal-directed activities that are intrinsically rewarding irrespective of other outcomes. This includes learning the rules of a domain (e.g., through advanced schooling, long hours of practice) and transforming boring activities into exciting ones by changing perspectives, altering rules, and taking risks (e.g., writing an autobiography assignment by reversing the order of events such that one begins with the present and works backward to birth). Curiosity is the prerequisite for exploring the environment and the self (e.g., ideas, emotions), thus leading to the attainment and integration of novel perspectives and experiences (Kashdan, Rose, & Fincham, 2001). If the wellsprings of creativity are the fusion of previously disparate ideas and concepts (Martindale, 2001), then the more ideas, categories, and/or domains accumulated and integrated by an individual, the greater the likelihood of finding novel or creative links among them.

In summary, systematic investigation of the role of curiosity in the development of creative cognitive processes, creative personalities, and the production of creative works is urgently needed. From the little

child spending hours drawing an intricate picture of a colony of humans living in space to the computer engineer forgoing food and sleep to complete an interactive Web site where users can safely experience the inside of a tidal wave, curiosity and creativity resonate as interrelated constructs. We are not suggesting that high curiosity leads directly to high creativity but that high curiosity is necessary, though not sufficient, for creativity. There are many unanswered questions about the biopsychosocial mechanisms that facilitate and constrain curiosity and creativity. Why do individuals gravitate toward certain disciplines and not others? For highly curious individuals, what predicts creative compared with noncreative work? What are the consequences of channeling the majority of one's resources into a single domain (e.g., as in the life of Thomas Young; see Martindale, 2001) as opposed to multiple life domains? What role do gene–environment interactions play? With the advent of continual psychometric improvements in the theoretical underpinnings and measurement of curiosity (Kashdan, 2002) and creativity, psychologists can begin to formulate and test cohesive theories of the multifaceted pathways to creativity.

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Implications of the Case Studies of Creative People for Psychometrics

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There are at least three generalizations to be drawn out of the extremely engaging series of case studies of creative people that appeared in the April 2001 issue of the *American Psychologist* (Sternberg & Dess, April 2001). One is that no profile of scores on a range of psychometric tests, or even such a profile accompanied by a profile of the environment of the kind typically generated from questionnaires designed to measure home, school, and organizational climate, would have made it possible to describe these people in meaningful ways, let alone capture the person–environment interactions described.

The cases thus provide striking illustrations of the proposition that the way in which most psychologists have tried to describe and explain individual differences is not only unduly simplistic but actually inappropriate.

In essence, what these authors actually did was spell out the way in which specific aspects of the environment engaged with the motives of the person concerned to release a subset of the components of competence that make for one type of effective behavior or another. To do this formally, it would be necessary to develop an agreed-on descriptive framework akin to that used by biologists to describe the features of organisms that interact with specific features of their environments to make for different types of effectiveness.

The consequences of not developing such a framework may be highlighted by pursuing the analogy with biology. Where would zoologists have got to if they had sought to account for the bulk of the variance in the animal kingdom in terms of 1 (*g*), 5 (Big 5), or even 16 variables? Where would they have got to if they had tried—independently of the variance between species—to describe the variance in environments in terms of 10 or 12 variables? Just where would they have ended up if they had then tried to account for the effects of environments on animals by correlating the scores on the animal variables (taken one at a time) with the environmental variables?

From our present vantage point, such a procedure would be patently absurd. Yet this is precisely what most psychologists concerned with individual differences have sought to do for the past century.

If psychologists wish to move forward, it would behoove them to pay close attention to what the authors of these articles actually did. As I see it, this was first to note the idiosyncratic motives or preoccupations of the individuals they set out to describe. They then moved on to discuss the particular pattern of competencies those individuals brought to bear to translate their motives into effect. While doing this, they looked at the way various aspects of the environment reinforced or negated the individuals' values and led them to release and develop competencies crucial to modifying their environments and translating their motives into effect.

If I am right, what this means, given the analogy suggested earlier, is that psychologists need to develop agreed-on descriptive frameworks, somewhat like those used by chemists and biologists, to describe people, their environments, and the interactions that transform both people and their environments as the environment and the individual engage with each other.

In developing such frameworks, it will be necessary to pay attention to the fact—so far almost completely neglected by psychologists—that groups of people have emergent properties that cannot be determined by adding up the properties of the individuals who compose them any more than it is possible to determine the properties of copper sulfate by adding up the properties of copper, sulfur, and oxygen. What is more, people behave very differently in different contexts, just as copper behaves very differently in an environment consisting of pure water and in an environment of sulfuric acid. Just as both the copper and the sulfuric acid mutually transform each other (while their components remain unchanged), so people and their environments mutually transform each other.

Thus, psychologists not only need to set about mapping the transformational processes that occur in homes, schools, and workplaces, they also need to develop frameworks of descriptors suitable for use at different levels in the system. Psychologists need frameworks equivalent to the hierarchy of frameworks used to classify foodstuffs, digestive systems, animals, and ecological niches.

There is another generalization to be drawn out of the case studies. This is that creativity is a difficult and demanding process that is only engaged in—and thus only becomes visible—while people are engaged in activities that motivate them. Thus, some