to the disgusting substance, and learn to avoid it. Again, learning is guided by a universal psychological architecture and explained according to the adaptive challenges it has been designed to solve.

If all humans have the same design of the mind, does that mean human behavior is genetically determined? Adaptations have a genetic basis. However, Hagen argues that because the mind contains many adaptations, all of which respond to cues in the environment, the mind could encompass an enormous number of states with an enormous number of behavioral outcomes. Because humans have an evolved fear of snakes does not mean that everyone is destined to fear all snakes in all situations. Many people have an affinity for snakes, even allowing them into their home as pets. Adaptations do not limit behavior, but instead enable behavior and create behavioral flexibility because a larger set of adaptations can respond with a greater array of behavioral outcomes. Insights from biology, cognitive science, ecology, anthropology, and psychology have been combined to examine genes from an adaptationist perspective in the emerging discipline of evolutionary psychology. Strict genetic determinism is rejected in favor of an account of human behavior that includes both genetic and environmental influences.

SEE ALSO *Determinism; Determinism, Reciprocal; Evolutionary Psychology; Nature vs. Nurture; Phenotype*

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DETERMINISM, NONADDITIVE

The principle of *nonadditive determinism* derives from the literature on integrative, multilevel analyses, which extend across levels of organization (e.g., psychological, physiological, cellular) and analysis (e.g., behavioral, neurophysiological, molecular). The principle of nonadditive determinism specifies that properties of the whole are not always readily predictable from the properties of the parts (see Cacioppo and Berntson 1992). Some properties of crystals (e.g., table salt) cannot be predicted from the characteristics of the individual elements (sodium and chloride) in isolation. Those properties become known only when the elements are found in association or interaction with others. A behavioral example comes from the considerable individual differences that are apparent in the effects of drugs. Some individuals are more affected by, and at greater risk for addiction to, cocaine or other drugs of abuse. Similarly, studies with primates have shown that some monkeys work harder and self-administer more cocaine than others (Morgan et al. 2002). This is not mere random variation, but relates to the animal's social status—submissive animals show higher levels of cocaine self-administration than dominant animals. This is now understood to be attributable to reciprocal interactions between social dominance, brain dopamine function, and drug reward processes. The important point is that social status, which serves as the informative and organizing construct in this literature, could not be determined in the absence of behavioral measures in a social context.

Even if the properties of, for example, Beethoven's Ninth Symphony can be fully specified through reference to lower-level physical characteristics (i.e., time-varying frequencies), the composition's aesthetic features may be more readily apparent or appreciated through higher-level auditory perception. This presence of higher-level aesthetic processes defines a functional quality of the acoustic signals that might otherwise escape recognition. It also serves to focus attention on the important interactions among levels of organization and analysis that may ultimately contribute to the development of a science of aesthetics.

Reciprocal determinism is a related construct. Reciprocal determinism is the mutual back-and-forth interaction among distinct levels of organization (e.g., behavioral and cellular) that requires consideration of both levels for a comprehensive understanding of either. Hormones, for example, can have notable psychological effects, but it is also the case that psychological variables can powerfully impact hormone levels. It is this reciprocal back-and-forth interaction among levels that often under-

lies nonadditive determinism, in which the whole can seem to be more than the sum of its parts.

Nonadditive determinism is not inconsistent with genetic determinism. Drug administration is subject to potent *genetic determinants*, related to dopamine functions as well as a range of other heritable characteristics, including behavioral variables that contribute to dominance status. Rather, nonadditive determinism is orthogonal to genetic determinism—that is, the two operate independently but simultaneously, emphasizing the multiple levels of organization that interact in the manifestations of genetic (as well as environmental) determinants. Genetic determinism focuses on the gene and gene products, whereas nonadditive determinism emphasizes the structural and functional architectures through which genetic and environmental factors determine outcomes and behaviors.

SEE ALSO *Neuroscience, Social*

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DETERMINISM, RECIPROCAL

In 1986 the psychologist Albert Bandura put forth a social cognitive theory of human behavior in which human functioning is viewed as the product of a dynamic interplay between personal, behavioral, and environmental influences. This interplay is the foundation of reciprocal determinism, the view that (a) personal factors, such as habits of thinking, emotions, and biological characteristics, (b) human behavior, and (c) environmental forces influence each other reciprocally.

This reciprocal nature of the causes of human functioning makes it possible to direct attention at people's personal, environmental, or behavioral factors. In school, for example, teachers can foster the competence and confidence of the students in their care by improving their students' emotional states and by correcting their faulty self-beliefs and habits of thinking (personal factors), enhancing students' academic skills and self-regulatory practices (behavior), and altering the school and classroom structures that may work to undermine student success (the environment).

Social cognitive theory stands in contrast to views of human functioning that overemphasize the role that environmental factors play in the development of human behavior. Behaviorist theories, for example, show little interest in self-processes because theorists assume that human behavior is caused by external forces. Inner processes, which are viewed as transmitting rather than causing behavior, are dismissed as a redundant factor in the cause and effect workings of behavior. For Bandura, people make sense of their psychological processes by looking into their own conscious mind.

Similarly, social cognitive theory differs from views of human functioning that overemphasize the influence of biological factors. Although it acknowledges the influence of evolutionary factors in human adaptation, the theory rejects the type of evolutionism that views human behavior as the product of evolved biology. Instead, reciprocal determinism posits a bidirectional influence between evolutionary pressures and human development such that individuals create increasingly complex social and technological innovations that in turn create new selection pressures for adaptiveness. These new selection pressures result in the evolution of specialized biological systems for functional consciousness, thought, language, and symbolic communication. It is this bidirectional influence that is responsible for the remarkable intercultural and intracultural diversity evident on the planet.

Rooted within Bandura's conception of reciprocal determinism is the understanding that individuals are imbued with the personal factors that define what it is to be human. Primary among these are the capabilities to symbolize, plan alternative strategies (forethought), learn through vicarious experience, self-regulate, and self-reflect. These capabilities provide human beings with the cognitive means by which they are influential in determining their own destiny. The capability that is most distinctly human is that of self-reflection, for it is through self-reflection that people make sense of their experiences, explore their own cognitions and self-beliefs, engage in self-evaluation, and alter their thinking and behavior accordingly. Through self-reflection people also assess their own capabilities. These self-efficacy beliefs provide