

PERSONALITY PROCESSES

William Revelle

Department of Psychology, Northwestern University, Evanston, Illinois 60208

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INTRODUCTION

The development of psychological theory tends to oscillate between optimistic advances and self-critical analyses and retrenchment. Personality theory is no

different. In the past 40 years personality research has seen at least one full cycle of uncritical enthusiasm turn into bleak pessimism and again to enthusiasm. Recent events suggest that the field is again becoming a focal area of psychological study. Exciting discoveries are being made in behavior genetics, there is a growing consensus about the relationship between personality traits and emotional states, biological theorists of adult personality are exchanging ideas with theorists of childhood temperament, and long-term studies of personality development across the life span are delivering on the promises made many years ago. Upon reading the most recent *Handbook of Personality* (Pervin 1990a) one cannot help being excited by the progress that has been made since the previous edition (Borgatta & Lambert 1968). Many of the tentative findings of the early 1950s (Eysenck 1952, MacKinnon 1951, Sears 1950) have led to substantial contributions that continue to influence our thinking. This claim of a renaissance in personality theory has, however, been made before (Allport & Vernon 1930, Bronfenbrenner 1953, Pervin 1990b). Unfortunately, many promising approaches have led nowhere.

Personality theories attempt to account for individual behavior. The scope of such theories is vast. They describe how genetic predispositions and biological mechanisms combine with experience as children develop into young adults who will show behavioral consistencies over their life spans. Personality researchers report heritability coefficients, relate MRI scans and EEG activity to intellectual performance and emotional reactions, and predict job outcomes and lifetime satisfaction. They examine the dimensions of self-description and the many ways feelings, knowledge, and beliefs combine in behavior. Personality research ranges from tests of evolutionary theories of jealousy to analyses of the structure and content of one's life story.

After 20 years there is a resurgence of interest in the fundamental questions of personality, including 1. What are the relevant dimensions of individual differences in personality? 2. How do genetic mechanisms lead to individual differences? 3. Does personality have a biological basis? 4. How does personality develop? 5. How does personality change? 6. What are the social determinants of personality?

Personality constructs are again being seen in the literature of behavior genetics, cognitive psychology, developmental psychology, evolutionary psychology, physiological psychology, psychopathology, and social psychology. This review focuses on these related areas partly to clarify their links to personality theory and also to guide those who might be interested in recent advances in personality theory. In addition, it is meant to guide personality researchers to developments reported outside the usual personality journals. Because personality is the study of the whole person, this review focuses on the interrelationships of personality theory with other areas of psychology. Just as other areas of psychology have become more aware of advances in

personality, theoreticians within the field must be aware of recent advances in related disciplines.

The earliest reviews of personality were able to address the entire field. Starting with Atkinson (1960), issues of personality dynamics were separated from those of structure and development because it was no longer possible to give adequate coverage in less than book form (if at all). Similarly, this review focuses more on the how and why of personality processes than on the what of personality taxonomy and structure (Digman 1990, Wiggins & Pincus 1992). I consider the metatheoretic question of what is personality and what are the appropriate ways to study it.

A METATHEORETIC TAXONOMY OF PERSONALITY THEORIES AND PROCESSES: THREE DIMENSIONS OF PERSONALITY THEORY

The questions that scientists ask about the world are driven by their scientific metaphors. The chasm between the two disciplines of psychological inquiry so well described by Atkinson (1960), Cronbach (1957, 1975), Eysenck (1966), and Vale & Vale (1969) was a split between two world views, two scientific metaphors, and two data-analytic strategies. The experimentalists emphasized control, manipulation, and the t-test. The individual differences psychologists emphasized adaptation, variation, and the correlation coefficient.

Unfortunately, theoretical and research emphases have splintered beyond even two disciplines. Even within the field of personality there are many different, seemingly unrelated approaches. Current research in personality can be organized along three dimensions: level of generality between people, levels of analysis, and degree of adaptability of the behavior. The first dimension ranges from generalizing to all people to focusing on single individuals and was captured by Kluckhohn & Murray (1948) as emphasizing how all people are the same, some people are the same, and no people are the same. These ways of knowing (McAdams 1994a) can be crossed with a second dimension of analysis, ranging from analyses of the genetic code, through biological mechanisms, learning and developmental processes, and temporary cognitive and emotional structures and processes, to the study of overall life meaning and satisfaction. Phenomena at one level of analysis are only loosely coupled with those at different levels (Figure 1). The third dimension, not shown in the figure, is one of adaptability and functioning. Personality theories need to account for normal adaptive processes as well as extreme psychopathologies. Although broad theories consider issues across these three dimensions, most theorists focus on phenomena that range across levels of analysis at one level of generality, or across levels of generality at one level of explanation.

A conceptual organization of personality theory and research

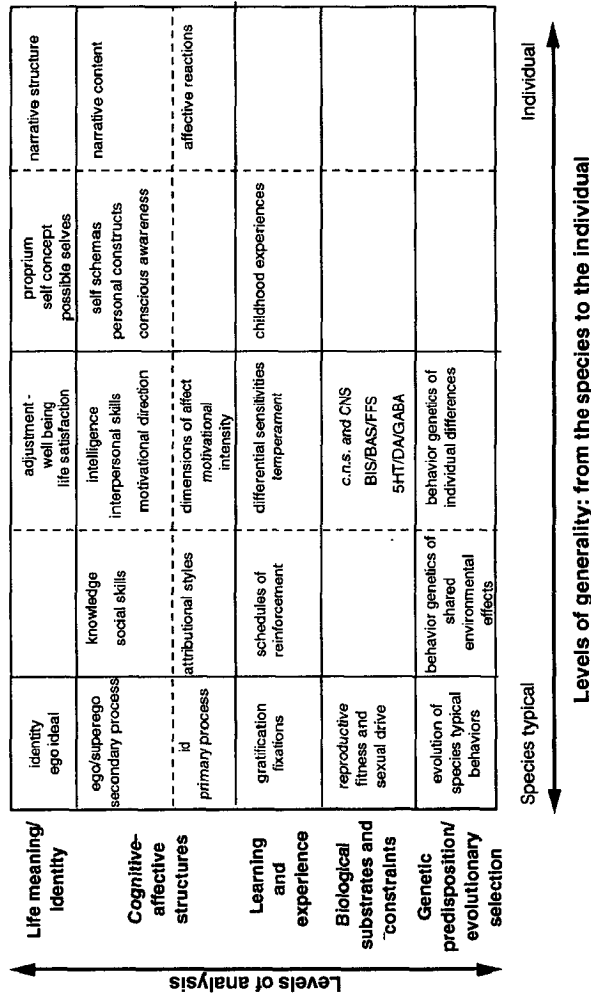


Figure 1 A conceptual organization of the multiple approaches to personality. Theories differ in level of analysis as well as in level of generality. The third dimension, levels of functioning, has not been shown. Cell entries are representative of phenomena studied. Specific theorists are discussed in the text. Broader theories account for phenomena across more cells than do narrower theories. Theorists tend to emphasize either multiple levels of analysis at the same level of generality or multiple levels of generality at the same level of analysis. Solid lines indicate larger differences of level than do dashed lines.

Levels of Generality—From the Species to the Individual

Just as psychology is the study of behavior, personality is the study of individual behavior. Although to many the study of individual behavior has meant the study of individual differences in behavior, an adequate theory of personality process and structure must also account for similarities in behavior. A complete personality theory needs to focus on the three levels of personality identified by Kluckhohn & Murray (1948).

The classical test theory metaphor used by applied and personnel psychologists, and the analysis of variance metaphor used by the interactionists, although compelling, both emphasize sources of variation rather than sources of consistency. Although it is important to consider the interaction of persons and situations as well as the effects of individual and situational differences, by using either a correlational or an analysis of variance metaphor we are unable to ask questions other than how some people are the same and some are different.

A generalization of the analysis of variance metaphor is to consider the other components of the general linear model. Estimates of any particular behavior are expressed in terms of the central tendency across all people, the responsivity to particular situational and person variables, the interaction between the situational and person variables, as well as the reliable within-person variance and that associated with unknown sources of variance.

Theories differ in their central focus as well as in their range of generalizability. Evolutionary personality theory, psychoanalytic theory, behavior theory, and sociology emphasize the commonalities of individual behaviors. Every member of every species needs to meet the challenges of survival and of reproduction. How these challenges are met within a species reflects species-typical solutions. By understanding how these problems are answered by humans as a species we can understand the fundamentals of human nature. Trait theorists focus on systematic individual differences and similarities among people. Although some emphasize how general laws lead to behavioral differences (Eysenck 1990), at the extreme, this approach consciously shuns universal theories (Hofstee 1991). Social constructionists, phenomenologists, and biographers focus on the unique patterns of a life story after species-typical and broad individual differences and trait influences have been removed (Allport 1962; but see Holt 1962).

Levels of Explanation—From the Gene to the Society

Current research in personality and individual differences ranges from attempts to identify particular genetic sequences associated with behavior to studies of how one's life meaning can be affected by societal changes such as the Depression or a world war. Species-typical behaviors that are the result of

genetic selection are proposed by evolutionary psychologists who ask about the origins and reasons for human nature. Behavior geneticists examine the genetic architecture of specific traits as well as the covariances of traits with each other and with different parts of the environment. Behavior genetic analyses also demonstrate within-family and between-family environmental effects. Genes affect particular dimensions of individual differences by modifying biological structures and regulating ongoing processes. Rather than the evolutionary question of *why*, explanations at the biological level ask *how*. Although ultimately rooted in biology, cognition, affect, and behavior may be studied independently of biological mechanisms. These are studies of *what* is human nature. Examining individual differences in behavior in terms of cognitive structures and affective reactions is perhaps the most common personality research. Broad questions of meaning tend to be associated with philosophically and clinically oriented theorists who emphasize how people organize their lives in terms of recurrent themes and problems. Research on the effect of the self-concept, self-esteem, career choice, personality disorders, satisfaction, and development throughout the life span also emphasizes this highest level of analysis.

Levels of Functioning

Personality theories are not just theories of normal functioning. They also address dysfunctional as well as high-level behavior. Although many limit their studies to unselected groups of adolescents and adults, others examine selected groups such as prisoners, patients, and professionals.

RECENT TRENDS IN PERSONALITY AND RELATED FIELDS

Recent *Annual Review of Psychology* chapters on personality theory and research reflect the breadth and scope of the field. Buss (1991) proposed that evolutionary theory provides the necessary framework for the study of personality. Evolutionary personality theory addresses the goals and mechanisms to achieve them that are typical of our species. It also focuses on individual strategies that are used to meet species-typical challenges. Magnusson & Törestad (1993) evoked biological models and systems theory to emphasize the need to consider dynamic processes of cognitive construals as active, purposeful agents interact with their world. Digman (1990) reviewed the consistent findings in personality taxonomic work and reported strong agreement across different research groups on the number and identification of the basic dimensions of personality. Wiggins & Pincus (1992) elaborated on structural questions of the assessment of basic dimensions and concluded that there is strong agreement on personality structure from those examining enduring disposi-

tions, dyadic-interactions, social competencies, or natural language. Ozer & Reise (1994) shared that view and emphasized methodological rather than substantive issues in personality assessment.

Even with the diversity of perspectives seen in the above chapters, personality theory is too broad to be included in a single review. A complete review of personality processes needs to include recent social psychology advances in self-theory and social cognition, cross-cultural sources of variation, biological theories of memory structure, and techniques of brain imaging. Theoretical advances in the biological nature of schizophrenia and the affective disorders shed light on both normal and psychopathological functioning. Techniques of treatment of the anxiety disorders are relevant to theories of normal personality. These topics and more have appeared in recent issues of the *Annual Review of Psychology*.

In addition, there has been a proliferation of "handbooks" devoted to various aspects of personality. For an overview of the field, the *Handbook of Personality Theory* (Pervin 1990a) is essential reading. Gale & Eysenck (1992) review advances in biological approaches. Smith & Jones (1992) review individual differences in trait and states as they affect human performance. Conferences and edited volumes sponsored by the American Psychological Association have emphasized longitudinal research (Funder et al 1993, Heatherton & Weinberger 1994), temperament (Bates & Wachs 1994), and the application of personality assessment to psychopathology (Costa & Widiger 1994). Special issues of the *Journal of Personality* have been devoted to long-term stability and change in personality (West & Graziano 1989), the biological foundations of personality (Buss 1990), personality and daily experience (Tennen et al 1991), the five-factor model (McCrae 1992), and personality judgment (Funder & West 1993). Special issues of *Cognition and Emotion* particularly relevant to personality processes have addressed the psychological aspects of relationships between emotion and cognition (Gray 1990, Watts 1993), the question of whether there are basic emotions (Stein & Oatley 1992), and the role that cognitive appraisals play in emotion (Frijda 1993).

ALL PEOPLE ARE THE SAME: THE STUDY OF SPECIES-TYPICAL BEHAVIOR

It is easy to forget, when considering human behavior, how similar we all are to each other. Demonstrations of this similarity include the compelling "Bar-num effect" observed when judging the accuracy of self-descriptions based on human universals. That one experiences some anxiety when meeting an attractive stranger, or sometimes thinks about things that other people might find peculiar, is not a sign of uniqueness but rather something one shares with everyone. Rather than dismissing these similarities, evolutionary theorists,

psychodynamicists, sociologists, and others hope to find an understanding of the universalities and general laws of human nature.

Evolutionary Personality Psychology

Evolutionary personality theory focuses on the *why* of behavior, rather than the *how* of biological models, or the *what* of descriptive taxonomies. It is “best regarded as a theory about the origins, rather than the content of human nature” (Buss 1991, p. 463). It has been described as providing a grand framework that “links the field with what is known about the processes that govern all forms of life [and identifies] the central human goals and the psychological and behavioral strategic means deployed to obtain these goals” (p. 486). “Evolutionary psychology is simply psychology that is informed by the additional knowledge that evolutionary biology has to offer, in the expectation that understanding the process that designed the human mind will advance the discovery of its architecture” (Cosmides et al 1992, p. 3).

Evolutionary Causes for Individual Differences

Although focusing on general laws, evolutionary theory tries to explain individual differences. The problem of reconciling genetic diversity within species with principles of evolutionary adaptation is complex: “Both the psychological universals that constitute human nature and the genetic differences that contribute to individual variation are the product of the evolutionary process.... [Personality is from an] evolutionary perspective, analyzable as either (a) an adaptation, (b) an incidental by-product of an adaptation, (c) the product of noise in the system, or (d) some combination of these” (Tooby & Cosmides 1990, p. 19).

Evolutionary theorists ask why there are genetically based individual differences. Individual differences might result from frequency-dependent selection pressures that can lead to complex polymorphisms and maintain a stable mix of genotypes. In an environment with many potential niches, individuals, by being different, can select the niches that maximize their own fitness, and thus the population is a mix of multiple genotypes each searching for and creating optimal environments (D Wilson 1994, D Wilson et al 1993, D Wilson et al 1994).

Another intriguing hypothesis for the adaptive significance of individual differences, for sexual reproduction, as well as for much greater genetic diversity within rather than between racial groups, is that variation and recombination is a response to parasites. “Large, complex, long-lived organisms constitute ecological environments for immense numbers of short-lived, rapidly evolving parasites—disease causing microorganisms. ...Parasites and hosts are locked in an antagonistic coevolutionary race” (Tooby & Cosmides 1990, p. 32). Sexual reproduction, although genetically costly (without assortative

ating, sexual reproduction assesses a 50% “inheritance tax” at each generation), produces offspring with a genetic makeup that one’s parasites have never before encountered. The function of individual differences and sexual rather than asexual reproduction might be to survive this constant onslaught of parasitic infestation. In humans, the importance of physical appearance (a sign of pathogen resistance) in mate selection may be associated with pathogen prevalence (Gangestad & Buss 1993).

Sexual Strategies

Survival and reproduction are the two fundamental challenges of evolution. This general principle leads to individual differences between the sexes in terms of reproductive strategies. Males and females differ in the costs associated with reproduction and use different strategies to maximize their fitness. Although males are potentially almost unlimited in their number of offspring, females are not. Females can be certain about motherhood, but males can never be certain of paternity. From these biological realities, several interesting predictions have been tested. Male swallows, dunlocks, and humans “take a proprietary view of women’s sexuality and reproductive capacity” (M Wilson & Daly 1992, p. 289). Males, thought to be concerned with paternity certainty, are more upset by sexual infidelity of their partners, while females, thought to be concerned with the long-term emotional investment of their partners, are more concerned about emotional infidelity (Buss et al 1992). In general (but see Gangsted & Simpson 1990), females are more choosy about sexual partners than are males, even though males and females do not differ in their preferences for long-term relationships (Kenrick et al 1990). In a powerful example of the theoretical possibilities, Buss & Schmitt (1993) formalized the predictions of evolutionary personality theory with nine hypotheses about human mating patterns.

Sociology of Generational Effects

Sociological approaches to personality are strikingly different from evolutionary personality theory in terms of level of analysis, but they are similar with respect to the level of generality. For example, it is easy for personality theorists to forget that different generations have experienced significantly different challenges and opportunities throughout their life spans. The experience of war, national economic collapse, or the threat of nuclear extinction have had profound effects on those who have experienced them. Although these are universal experiences for all alive at the time, only generational cohorts share both the experience as well as the timing at the same stage in their lives. Detection of potential generational effects requires many waves of longitudinal data for people of different age cohorts. A single longitudinal study that focuses on the experiences of a particular cohort will show impres-

sive consistencies and coherencies over large parts of the life span but will fail to detect the effect on personality of the timing of major life events. Data from several of the classic longitudinal studies have been used to address such generational effects on personality through the life span (Elder 1994).

Archival data from the 12 waves (1922 through 1986) of the Terman (1925) study show cohort effects on later career achievement, transitions, and trajectories (Elder & Pavalko 1993). The age of experiencing the Great Depression and the disruption of career upon entry into the military during World War II had reliable effects on lifetime accomplishment for this group.

Psychodynamic Theory

Psychoanalytic approaches "take as axiomatic the importance of conflicting mental processes; unconscious processes; compromises among competing psychological tendencies that may be negotiated unconsciously; defense and self-deception; the influence of the past on current functioning; the enduring effects of interpersonal patterns laid down in childhood; and the role of sexual and aggressive wishes in consciously and unconsciously influencing thought, feeling, and behavior" (Westen 1990, p. 21). With such an inclusive definition, it is not surprising that discussions of psychodynamic approaches integrate findings from more experimental areas of psychology about self (Markus & Cross 1990), unconscious awareness (Kihlstrom 1987, 1990), and even biological distinctions in memory systems.

Psychodynamic theories with an emphasis on cognitive representations rather than biological drives (i.e. object relations theory) are more compatible with the research paradigms of social cognition (Westen 1991). Obstacles to integration of these two approaches, however, include strong differences in the data used for theory building (clinical insights versus systematic laboratory-based data) and in the level of generality that the theory addresses (Westen 1990). Some psychiatric theories propose useful links of psychodynamic with psychobiological approaches to personality and the personality disorders (Siever & Davis 1991).

SOME PEOPLE ARE THE SAME: THE STUDY OF INDIVIDUAL DIFFERENCES AND SIMILARITIES

That people who share a similar upbringing are more similar than those who do not is obvious. Similarities based on linguistic and cultural background have never been denied. The utility of using individual differences in one situation to predict individual differences in another situation, however, has been hotly contested. Debates about the relative importance of situational versus individual causes of consistencies and differences dominated a disproportionate amount of the literature of the 1970s and 1980s but became less

virulent as both sides developed more tolerance, became exhausted, or developed a richer understanding of the underlying issues. By changing their emphases, both sides have made theoretical advances by better understanding their limits.

Trait-Based Differences and Similarities

In a tradition strongly associated with prediction and selection (Kanfer et al 1994), the study of individual differences in personality represents the greatest amount of personality research. Indeed, so much work has been done that to some the field of personality *is* the study of individual differences (Buss 1989). Just as personality theories can be organized in terms of their level of explanation and level of generality, so can studies of individual differences be further organized along two dimensions: cognitive versus affective-temperamental and descriptive versus causal-explanation.

COGNITIVE ABILITIES VERSUS AFFECTIVE-TEMPERAMENTAL TRAITS The first dimension distinguishes analyses of intellectual abilities from those of noncognitive variables associated with affective reactions and behavior. The cognitive-noncognitive distinction runs throughout the field and some personality theorists specifically rule out cognitive ability as an area of study. Others include both cognitive abilities and temperamental traits as part of personality structure, whereas still others discuss personality and intelligence as separate domains but routinely study both. The distinction between cognitive and affective components of personality is both clarified and muddled by the labels given to measures in these two domains: tests of intellectual ability and tests of personality.

Ackerman and Kanfer and their colleagues have attempted to integrate individual differences in cognitive and noncognitive function in applied settings. Not only do cognitive and noncognitive measures differ in content, but they also differ in typicality. Intelligence tests are meant to be maximal performance measures, whereas most noncognitive scales are measures of typical behavior. Furthermore, cognitive tasks are direct behavioral measures, whereas noncognitive measures are typically based on self-reports of average behaviors or of intentions (Brody 1994). The predictive relationship with performance outcome of cognitive and noncognitive measures changes as people become more experienced with the task at hand. Noncognitive measures and typical intellectual engagement become more important predictors over trials and maximal cognitive performance becomes less important (Ackerman 1994). Further clarifying the relationship between maximal and typical performance, Goff & Ackerman (1992) report that typical intellectual engagement, although independent of fluid intelligence, is correlated positively with crystallized intelligence. Typical intellectual engagement is highly related to the "Big 5" dimension of openness (Rocklin 1994) but differs somewhat at

lower-order components of both openness and typical intellectual engagement (Ackerman & Goff 1994).

An innovative use of cognitive and noncognitive variables in the study of creativity is proposed by Eysenck (1993). Eysenck reviews the J-shaped distribution of creative output and suggests that it results from the interactive product of cognitive ability, societal constraints and opportunities, and non-cognitive variables including confidence, nonconformity, and originality. He places particular emphasis on the role that the psychoticism dimension plays in creative productions.

Experimental analyses have shown systematic although complex relationships between noncognitive personality variables and cognitive performance. These relationships are moderated by a variety of situational manipulations that affect motivational states (Anderson 1994; Anderson & Revelle 1994; Matthews et al 1989, 1990; Revelle 1989). These are theoretically driven tests of the arousal model of extraversion (Eysenck 1967, 1990) and its modification and extension to impulsivity (Humphreys & Revelle 1984). Helpful reviews of the effects on performance of extraversion (Matthews 1992a) and anxiety (Mueller 1992) summarize many theoretical approaches to the combination of cognitive and noncognitive individual differences.

In applied settings, cognitive measures have been used since at least the Army Alpha Test in World War I. Noncognitive variables have a long and checkered past but "the emergence of an acceptable taxonomy of personality during the 1980s has provided applied psychologists with a sorely needed organizational framework for investigation of personality-work linkages" (Kanfer et al 1994, p. 30). Conscientiousness, experience, and ability combine to predict job performance (Schmidt & Hunter 1992).

DESCRIPTIVE TAXONOMIES VERSUS CAUSAL THEORY After many years of bitterly fought debate about the appropriate number and identification of the fundamental dimensions of personality, the past several years have seen a remarkable consensus among most but not all descriptive taxonomists around five robust factors (the "Big 5" or B5): extraversion, emotional (in)stability or neuroticism, agreeableness, conscientiousness, and openness or culture (see Digman 1990; Goldberg 1992, 1993a,b; John 1990; Ozer & Reise 1994; Widiger & Costa 1994; Wiggins & Pincus 1992). Critics have suggested that this consensus is premature and overstated (Pervin 1994). Although much of the work on the B5 addresses the number and identification of personality dimensions, there are some particular instantiations such as the Five Factor Model (FFM) that are more concerned with underlying mechanisms (John & Robins 1993, McCrae & Costa 1990, 1994).

Descriptive taxonomies of individual differences have been a tradition in personality theories since Plato and Galen. Most taxonomic systems of cogni-

tive and noncognitive attributes are hierarchical: clustering similar behaviors into narrow traits, then clustering these into higher-order traits, and eventually into a limited number of dimensional types (Eysenck 1991a). At any level of this hierarchy, behaviors and traits can be found that represent blends of separate dimensions, resisting any appearance of factorial simple structure and requiring a horizontal as well as a vertical structure (Goldberg 1993a,b). The problem for taxonomists thus becomes determining the optimal number of factors to describe these structures. Optimality means different things to different investigators, but includes being parsimonious, replicable, and useful. It is not surprising that there is not perfect agreement among all taxonomists given the many assumptions implicit to factor or principal components analysis.

There is strong agreement that the dimensions of extraversion-introversion and neuroticism–emotional stability are fundamental parts of any personality taxonomy. But proponents of what can be called “The Even Bigger 3” (EB3) suggest that openness is more of a cognitive than noncognitive construct, and that agreeableness and conscientiousness are both parts of a higher-order factor of psychoticism (Eysenck 1990, 1991b), or psychoticism-impulsivity–sensation seeking (Zuckerman 1991, 1994).

The dimensions of the B5 and the EB3 can be used to classify and provide order to the multiplicity of psychiatric diagnoses found useful by therapists and clinical researchers. The numerous personality disorders listed in the *Diagnostic and Statistical Manual of Mental Disorders (DSM-III-R)* (American Psychiatric Association 1987) may be organized parsimoniously in terms of the FFM (Widiger & Costa 1994). Neuroticism is a risk factor for depression and anxiety, and introversion in combination with neuroticism increases risk of depression (Clark et al 1994, Costa & McCrae 1993). The hypothesized biological basis of the EB3 has been used to organize both the Axis I and Axis II dimensions of the *DSM-III-R* (Siever & Davis 1991). A reconceptualization of the EB3 has been used to categorize the personality disorders (Cloninger 1987). It is uncertain whether personality traits are the causal sources of psychopathology, co-occurring signs, or the resulting psychological scars left by experiencing these disorders. Taxonomic work on interpersonal problems suggests a general factor of distress and a two-dimensional–circumplex structure that has been described in terms of love and trust or the B5 dimensions of emotional stability, extraversion, and agreeableness (Gurtman 1992, 1994).

Taxonomic studies of individual differences in mood have extended the earlier work of Tellegen (1985), Russell (1979), Thayer (1989), and Watson & Tellegen (1985) on identifying two independent dimensions of mood and emotion that are associated with positive and negative affect or energetic and tense arousal. These two dimensions of mood are, in turn, related to the EB3 and the B5. Extraversion is associated with measures of positive affect, and

neuroticism is associated with measures of negative affect (Meyer & Shack 1989, Saucier 1992, Watson et al 1994).

CAUSAL MODELS OF INDIVIDUAL DIFFERENCES The descriptive taxonomies associated with the proponents of the B5 are in contrast to those theories concerned with developing causal models of individual differences. Much of the recent consensus around the B5 has been on the number of dimensions useful in the description of individual differences rather than on any causal basis for these purported structures. Descriptive taxonomists suggest that before it is possible to develop causal explanations it is necessary to agree on the fundamental dimensions to be explained. Causal theorists, on the other hand, have focused on biological explanations of the EB3 and have emphasized the relationships of biological mechanisms of emotional reactivity with dimensions of stable individual differences. These theorists have suggested that problems of taxonomy can best be solved in terms of underlying mechanisms.

Until recently, this work has followed two related paths: demonstrations of the genetic basis of particular traits and explorations of particular biological mechanisms thought to be associated with individual differences in the major affective and cognitive traits (see Buss 1990). Among the mechanisms proposed are differences in relative activation of specific brain structures as well as differences in the relative amounts of specific neurotransmitters. More recently, some causal explanations for individual differences of some of the B5 have been proposed in terms of evolutionary theory (MacDonald 1992).

Genetics of individual differences in behavior Recent evidence suggests that practically any trait of interest has a substantial genetic component. Excellent monograph-length reviews summarize studies of the heritabilities of the B5 (Loehlin 1992), review how behavior genetic studies help clarify the "nature of nurture" (Plomin 1994), or integrate many different approaches (Plomin & McClearn 1993). Behavioral patterns as complex as sexual orientation for males (Bailey & Pillard 1991) and females (Bailey et al 1993), political attitudes (Tessor 1993), or various personality disorders (Nigg & Goldsmith 1994) show strong evidence for heritability. Direct comparisons of results from cognitive and noncognitive studies suggest higher heritabilities of cognitive measures than of B5 or EB3 noncognitive dimensions (Brody 1993, 1994), although this may be the result of differences in scale reliability.

Kimble (1993) points out that the sudden resurgence of debates about nature versus nurture is surprising for those who remember learning that asking which is more important is like asking which contributes more to the area of a rectangle, the width or the length. That almost all of the major personality dimensions seem to have a substantial (50% +/- 20%) heritability is no longer a point of contention. What is more interesting is the genetic

nature of the covariances between traits, the way in which one's environment contributes the remaining 30–70% of the variance (Brody 1993, Plomin 1994), and thus, the way that genotypes lead to phenotypes.

Heritability is a population value reflecting the amount of between-individual variability associated with additive (narrow heritability) or total (broad heritability) genetic variation. Heritability does not imply immutability; a lack of heritability does not imply a lack of a biological mechanism; nor does a high heritability imply a simple biological mechanism. Thus, that 90% of the variance in height is under additive genetic control does not preclude a several centimeter increase in height due to improved nutrition. That there is no additive genetic component to the sex of one's offspring does not imply that sex chromosomes don't matter. And finally, that 52% of the variability in the likelihood of divorce is under genetic control (McGue & Lykken 1992) does not imply that there is a divorce gene, nor does it imply that there is a divorce nucleus somewhere in the limbic system, nor is it inconsistent with large temporal variation in divorce rates. Complex behaviors reflect the sum and interaction of many separate predispositions. Although the similarity of monozygotic twins reared apart allows for estimates of broad heritability (Bouchard et al 1990, Bouchard & McGue 1990), these estimates may be inflated estimates of narrow (additive) genetic influences due to the effects of scaling, dominance, and gene-gene interactions (epistasis, also called emergence by Lykken et al 1992).

Creative research designs take advantage of the power of structural modeling procedures to estimate genetic and environmental parameters from adopted and biological siblings living together, biological siblings living apart, parent-child correlations for adopted and biological children, and many of the other living arrangements modern society provides (Eaves et al 1989, Loehlin 1992, Plomin et al 1990). Each unique family constellation can be fitted with alternative genetic models and the resulting path diagrams allow one to choose the most parsimonious.

One consequence of systematic modeling is that much more is known about environmental influences on personality development than was known before behavior genetic modeling was done. Just as classic behavior genetics analysis allows for a decomposition of genetic variance into additive and nonadditive within- and between-family genetic effects, so can estimates be derived for shared and unshared family environment effects. A striking conclusion is that in general, the shared family environment contributes little if anything to the similarity of children growing up in the same home. That is, within a similar culture, biologically related children growing up together tend to be as similar on most personality traits as they would be growing up apart, and unrelated children growing up together tend to be no more similar than unrelated children in general. In fact, it is likely that some similarities of child rearing

practices that are experienced by children are largely the result of the genetic similarity of the children. Environment means more than one's family, for it includes cultural as well as prenatal environments.

Behavior genetic techniques can be applied to the covariances between traits as well as to the variances of traits. These techniques, although long available, have become more useful as larger samples and more powerful algorithms have become available. A useful example of such modeling is the examination of the genetic covariance of neuroticism, anxiety, and depression to analyze the direction of causation between them (Carey & DiLalla 1994).

The consistency of the behavior genetic evidence can be interpreted in two ways. Rather than showing whether or not environments are important determinants of personality, genetic modeling has shown how dynamic is the process of personality development. Gene-environment covariation suggests that people are selecting and shaping the environments in which they live, rather than being passively acted on by the environment. Children shape the action of their parents just as parents try to modify the behavior of their children (Rowe & Waldman 1993, Scarr 1992).

Biological substrates Genes do not act directly on behavior. Genes code for proteins that in turn affect structures and regulate processes. Most biologically based theorists have asked what particular structure, neural pathway, transmitter, or hormone is associated with a particular individual difference in affect, cognition, or behavior. Much of this theorizing has been at the level of the conceptual nervous system (cns) rather than actually describing the Central Nervous System (CNS). That is, broad-brush behavioral systems have been described and linked, sometimes closely, sometimes loosely, to known physiological structures and transmitters. To the biologically oriented radical trait theorists, taxonomies should be developed in terms of cns or CNS biological systems rather than phenotypic behaviors. Individual differences in the functioning of these systems are believed to cause differential sensitivities to environmental cues, leading to differential affective and cognitive states. Traits refer to the probabilities of being in a particular state, or to the latency to achieve a state following a specific environmental elicitor. Although it is not necessary to know the specifics of a neural system to test the implications of a conceptual system, by limiting theorizing to known neural architectures, personality theories become more constrained.

That the proposed biological mechanisms for these conceptual systems differ from investigator to investigator should not be taken as a sign of theoretical weakness but rather as a sign of the complexity of the purported systems. No single structure, transmitter, or gene controls the entire system, but rather each plays a supporting and limiting role. Consider by analogy the case of oxygen flow to the brain. Experimental demonstrations of the impor-

tance of the heart to oxygen levels in the cortex or low correlations across subjects between measures of heart and lung functioning do not imply that the lungs, veins, arteries, and vagal nerve are not also involved in oxygen transport and regulation, for they are all in fact part of the same circulatory system.

Further complicating any simple review is the multiplicity of analytic techniques. Data are reported in terms of structures, transmitters, and electrophysiology. Generalizations are drawn from rodents, primates, and humans. Dominant EEG frequencies for children are labeled in terms of higher frequencies found in adults. Correlations are made with structures identified by MRI and PET, or with functioning observed by evoked potentials or hormone levels.

Most experimental and theoretical statements concerning the biological substrates of personality are directly or indirectly related to the theories of Hans Eysenck, whose theory of the biological basis of introversion-extraversion, neuroticism-stability, and socialization-psychoticism (Eysenck 1990) has evolved from taxonomic work (Eysenck 1947) to a proposed biological model (Eysenck 1967) that has been the basis of a variety of suggested modifications (Cloninger 1987; Gray 1972, 1981, 1991, 1994). In broad strokes, Eysenck's theory and subsequent modifications (1990, 1991a) are theories of approach and reward, inhibition and punishment, and aggression and flight. All three constructs have been, of course, fundamental concerns for many years and have been the basis for descriptive as well as nonbiological theories of motivation and learning (Atkinson 1960, Dollard & Miller 1950). Approach and withdrawal are behavioral characteristics of amoebae, insects, and human infants (Schneirla 1959). Unifying recent biological work is an emphasis on these three interrelated biological and behavioral systems as sources of individual differences in affective reactions and interpersonal behavior. Although differing in the particular mechanisms proposed at the level of the CNS, these models show striking agreement at the behavioral and conceptual (cns) level.

Central constructs of Eysenck's biological theory of introversion-extraversion (I-E) and stability-neuroticism were cortical arousal and limbic activation (Eysenck 1967). Arousal was originally postulated as reflecting activation of the Ascending Reticular Activating System (ARAS) and the associated cortical-reticular loop. Activation reflected limbic activity of the hippocampus, amygdala, singulum, septum, and hypothalamus. Introverts were thought to have higher levels of resting arousal than did extraverts. With the assumption that some intermediate level of arousal was preferred, the stimulus-seeking behavior of extraverts was explained as a compensation for a lower resting level. With the recognition that ARAS arousal was too broad a concept, Eysenck subsequently modified his theory to include a limbic arousal system, the monoamine oxidase system, and the pituitary-adrenocortical system (1990). He suggested that the apparent diversity of multiple arousal mechanisms "may not prevent the systems from operating in a relatively unified

fashion" (p. 249). He associates subjective arousal with Thayer's (1989) measures of energetic arousal (feelings of energy, vigor, and pep). Extraversion and feelings of energetic arousal are both associated with approach behavior and with positive affect following reward or cues for reward.

Stelmack (1990) summarized 20 years of psychophysiological research on Eysenck's hypothesis that introverts have higher arousal levels than extraverts and concluded that there "is a good deal of evidence that introverts are characterized by greater physiological reactivity to sensory stimulation than extraverts...[but] there is little compelling evidence that introverts and extraverts differ in tonic or basal levels" (p. 307). Indirect tests of the arousal hypothesis have examined the relationship between extraversion and cognitive performance under various experimentally induced arousers. These studies do not support the hypothesis of a stable I-E difference in tonic arousal levels, but they do show that I-E, or the impulsivity component of I-E, moderates the relationship between induced arousal and performance (Anderson 1994; Anderson & Revelle 1994; Matthews 1992a; Matthews et al 1989, 1990; Revelle 1993).

The Behavioral Approach System (BAS) (Gray 1994), also known as the Behavioral Activation System (Fowles 1988), or Behavioral Facilitation System (Depue & Iacono 1989), activates approach behaviors in response to cues for reward or nonpunishment. It may be associated neurophysiologically with the motor programming system. "The key components are the basal ganglia (the dorsal and ventral striatum, and dorsal and ventral pallidum); the dopaminergic fibers that ascend from the mesencephalon (substantia nigra and nucleus A 10 in the ventral tegmental area) to innervate the basal ganglia; thalamic nuclei closely linked to the basal ganglia; and similarly, neocortical areas (motor, sensorimotor, and prefrontal cortex) closely linked to the basal ganglia." (Gray 1994, p 41). Dopamine is said to play an essential moderating role in the functioning of the BAS (Depue & Iacono 1989, Depue et al 1994), but the full relationship of dopaminergic activation and reward is less than clear (Wise and Rompre 1989).

The cluster of approach traits of extraversion (Eysenck 1990), impulsivity (Barratt 1994, Gray 1994, Zinbarg & Revelle 1989), novelty seeking (Cloninger 1987), and positive affectivity (Depue & Iacono 1989, Depue et al 1994, Tellegen 1985) as well as the states resulting from approach or reward, energetic arousal (Thayer 1989), and positive affect (Watson et al 1994) have all been discussed in terms of the BAS.

If the BAS is the engine of behavior, the Behavioral Inhibition System (BIS) is the braking system. Signals of punishment, nonreward, novel stimuli, and innate fear stimuli lead to behavioral inhibition, an increment in tense arousal, and increased attention. The BIS may be considered as both a cognitive and a physiological system (Fowles 1988, Gray 1982). Cognitively, the

role of the BIS is to compare the current state of the world with expectations, and to inhibit and modify behavior that leads to deviations from expectation. Physiologically, the comparator function of the BIS is associated with the septohippocampal system. Input to this system comes from the prefrontal cortex, and output flows through the noradrenergic fibers of the locus coeruleus and the serotonergic fibers from the median raphe (Gray 1994). More detailed reviews of the neurophysiology of the BIS emphasize the role of serotonin (Cloninger 1987, Depue & Iacono 1989, Spont 1992) and the amygdala (Kagan et al 1993).

Just as approach traits are associated with the BAS, so are avoidant and inhibitory traits associated with the BIS. Anxiety and neuroticism are believed to reflect chronically high levels of BIS function (Gray 1994). Negative affect and state anxiety are both state markers of BIS activation. Depression has been proposed to reflect high BIS and low BAS activity (Clark & Watson 1991).

Aggression and hostility have been associated with the third dimension of the EB3, psychoticism. In terms of the B5, psychoticism is a combination of (dis)agreeableness and (un)conscientiousness. Neurologically, the Fight Flight System has been associated with the amygdala, the medial hypothalamus, and the central gray of the midbrain (Gray 1994). Neurochemically, serotonin, gamma-aminobutyric acid, the endorphins, and testosterone have been implicated in aggression and hostility (Dabbs & Morris 1990).

In partial agreement with the dichotomization of affect into positive and negative systems are studies of the lateralization of emotionality that suggest an association between left-frontal activation and approach-related positive affect and right-frontal activation and inhibitory or withdrawal-related behavior and negative affect (Davidson 1992, 1993a, 1994). Unfortunately, identification of particular biological systems with particular personality traits or psychopathological disorders tends to ignore the complexity of neural architecture. The brain has evolved to solve many different problems and primitive systems are controlled by later, more complex systems (Derryberry & Tucker 1992, MacLean 1990).

Amelang & Ullwer (1991) and Fahrenburg (1991) discuss data that are quite critical of the uniform acceptance of simple relationships between self-report dimensions and biological systems. Their criticism is twofold: The complex specification of parameters necessary to find the purported results make theories overly complicated, and based on their empirical investigations, there is little evidence for the proposed mechanisms.

The need to optimally specify parameters to detect presumed relationships has long plagued the field of personality research (Eysenck & Levey 1972). It is useful to consider this issue in some detail, for appropriate parameter values are a consistent difficulty in personality research. At the most naive level, individual differences in a trait would be expected to produce consistent indi-

vidual differences in an associated construct independent of other parameters. This assumption is typical of classical test theory, which assumes that equal true score differences are equally discernible (i.e. will lead to equal observed score differences) at all levels of true score. More recent approaches (e.g. item response theory), however, make it clear that this is not the case. Observed scores are a monotonic but nonlinear function of individual differences on some underlying attribute. They also reflect differential response probabilities (difficulty) associated with the situation (item) being measured. That is, even large differences on a latent trait are not easily detectable if the situational parameters are inappropriately specified. Such scaling artifacts include ceiling or floor effects. These scaling problems can lead to inappropriate inferences about group differences as well as about interactions of multiple variables (Revelle & Anderson 1992).

Another problem arises when consistent individual differences reverse direction depending on the value of a specific parameter. This is not a problem of mere scaling but can be a much more serious theoretical challenge. Some reversals are predictable consequences of nonmonotonic relationships (Anderson 1990, 1994; Humphreys & Revelle 1984; Yerkes & Dodson 1908). But other reversals cannot be explained in terms of theory-related parameters. For example, the supposed greater rate of decay in performance over time for high impulsives than for low impulsives reverses when studies are conducted in the morning versus the evening (Anderson & Revelle 1994).

Temperament and development In parallel with the development of the biological models of personality developed from rodents and adult humans is the work on children. As all parents know, children are different from each other. Some are shy, some are bold, some are slow to warm up, some are unafraid of new challenges. Child developmental research concerned with seemingly biological traits has emphasized the temperamental aspects of personality development. This work on temperament has, until recently, been somewhat independent of the adult research literature in personality, although "a complete understanding of personality and psychopathology must be a developmental one" (Rothbart & Ahadi 1994, p. 55). Theories of adult personality and childhood temperament, besides being isolated from each other, have tended to be parochial, with a lack of communication between American and Eastern European researchers. Attempts have been made to reverse both of these trends. Recent conferences and edited volumes reporting work on both adults and children have included contributions by both Eastern and Western researchers (Bates & Wachs 1994, Strelau & Angleitner 1991).

Temperament may be seen "as constitutionally based individual differences in reactivity and self-regulation, influenced over time by heredity, maturation, and experience" (Rothbart & Ahadi 1994, p. 55). Aspects of reactivity include

activation of physiological and behavioral systems. Regulatory processes that modulate reactivity include selective attention and processing of cues to reward and punishment, as well as approach and inhibition to novel stimuli (Rothbart et al 1994). Discussions of reactivity and regulatory processes bear a striking resemblance to those of approach and avoidance traits in adults (Strelau 1987, 1994).

Temperamental differences in reactivity to novelty and to strangers (Kagan et al 1992) show striking correlates with hemispheric differences in activation (Davidson 1993b). Shy or inhibited children identified at 31 months showed more right hemispheric activation than did uninhibited children when they were tested at 38 months. This effect seems to be due to a deficit in the left-frontal approach system for the inhibited children rather than to a hyperactivation of the right-frontal withdrawal system (Calkins & Fox 1994, Davidson 1993a). Gray's model of approach and avoidance is discussed in the context of infants and the neural structure of temperament (Nelson 1994, Strelau 1994). In a discussion of the relationship between temperament and attachment, Goldsmith & Harman (1994) point out that physiological measures do not explain temperament and suffer the same difficulties in interpretation as do behavioral measures.

Longitudinal studies of temperamental differences suggest long-term consistencies in behavior (Caspi & Bem 1990). In a continuing study of the antecedents and correlates of delinquency, B5 measures were found by Robins et al (1994) to be related to dynamic conceptions of ego-control and ego-resiliency. In a 15-year-long study of impulsivity and disinhibitory behavior, children diagnosed as hyperactive or attention-deficit disorder continue to show impulsive behavior in early adulthood and to be at greater risk for alcoholism and committing violence (af Klinteberg et al 1994).

Affective and cognitive processes—how traits relate to states Traits are not behavior. They are summary statements describing likelihood of and rates of change in behavior in response to particular situational cues. In addition to their relationship to the probability and latency of response, stable predispositions may be conceptualized in terms of differential sensitivities to situations and differential response biases. Intervening between traits, situations, and responses are momentary affective and cognitive states.

Taxonomic analyses of mood and emotion disagree about categorical versus dimensional representations. Do the many separate emotional terms in the natural language describe many different emotions, or are there a limited number of affective states that differ in intensity and duration? Two affective dimensions that relate to stable personality traits are positive and negative affect (Meyer & Shack 1989, Watson et al 1994) or the related constructs of energetic and tense arousal (Thayer 1989). Extraversion tends to be related to

positive affect, neuroticism with negative affect. These relationships, however, are not strong and interact predictably with the situation. In positive, rewarding situations, extraversion is associated with positive affect, but this relationship vanishes in threatening situations. Similarly, neuroticism is related to negative affect under threat but not under reward conditions (Larsen & Kettlar 1989). Although these relationships are consistent with theories of traits and states, they are small enough to require assessing traits and states separately in order to study relationships with performance (Matthews 1992b).

Further complicating the trait-state relationship is its dynamic nature. When free to choose situations, individuals sensitive to negative affect (neurotics) will try to avoid threatening situations. It is the emotionally stable individual who is more likely to participate voluntarily in activities that are likely to induce negative affect. Thus, it is necessary to distinguish between externally imposed and freely selected situations as well as within- and between-subject differences in the use of affective scales.

Traits as well as emotional states affect the detection, encoding, storage, retrieval, and integration of information (Christianson 1993). Trait and state effects may be seen at each of these conceptual stages (Revelle 1993). Impulsivity interacts with time of day to affect energetic arousal, which in turn is related to the detection and storage of information (Anderson & Revelle 1994, Revelle & Loftus 1993). Anxiety shifts attention to threat-related cues whereas depression biases memory toward depression-related material (Matthews 1993, Mueller 1992). Relations between anxiety and memory vary as a function of trait and state anxiety as well as implicit and explicit memory conditions (Eysenck & Mogg 1993).

Life satisfaction, identity, and death Personality characteristics of young adults predict lifelong risks for neuroticism, emotional health, and even death (McCrae 1994). The effect of neuroticism and extraversion on psychological distress over a ten-year period has been estimated to be four times greater than the effects of psychological interventions to reduce distress (Brody 1994).

Conley (1985) examined the multitrait-multimethod-multitime structure of self-reports and peer ratings of neuroticism, social extraversion, and impulse control from the Kelly longitudinal study measures taken in 1935–1938, 1954–1955, and 1980–1981. Neuroticism at times 1 and 2 reliably predicted neuroticism and emotional health at time 3. Similarly, social extraversion measures at times 1 and 2 predicted social extraversion and social activity at time 3.

Measures of conscientiousness taken in 1922 as part of the Terman (1925) study predicted mortality risk through 1986 through age 76 with a relative hazard of death of roughly .75. Stated differently, for someone at the 25th

percentile of conscientiousness at age 12, there is a 35% greater risk of dying before age 70 than for someone at the 75th percentile (Friedman et al 1993).

Situation-Based Differences and Similarities

Social learning theory explains consistent individual differences in behavior in terms of stabilities in the supporting environment rather than in terms of an individual's characteristics. Consistency across situations reflects similarity of situations rather than stable individual traits. Behavior can be modified by changing the environmental cues. Total reliance on prior learning experiences rather than on individual readiness is as much a straw man for social learning theory as total cross-situational consistency is for trait theory. Adherents of social learning theory now emphasize the need to understand how individual cognitive representations of the environment lead to behavior (Cantor 1990, Cantor & Zirkel 1990).

Some of the clearest evidence for the effect of the formative and sustaining environment on determining individual differences comes from behavioral genetic analyses. That identical twins are not perfectly concordant for extraversion, neuroticism, schizophrenia, or homosexuality demonstrates environmental effects. More importantly, that identical twins growing up together seem to be no more similar than those growing up apart (Eaves et al 1989, Tellegen et al 1988) implies that the formative environment is not the set of experiences shared within a family, but is either unique to each individual or common to their culture.

Part of the unique family environment is birth order. Although genetically related, siblings differ in age, experience, and in reproductive value to their parents. Differences between siblings growing up together can be magnified by contrast effects. Sulloway (1995) applies an evolutionary perspective on sibling rivalry in a meta-analysis of birth order effects on the traits of the B5 and reports that first-borns are more extraverted and conscientious but less emotionally stable, agreeable, or open than are later-borns. Later-borns are more likely to adopt radical innovations in science than are first-borns.

Trait-by-Situation Interactions

Although interactionism was claimed to be the new and improved way to study personality (Magnusson & Endler 1976), most personality research has gone beyond the simple assertion that consistencies exist in the interactions of traits and situations. Theoretically driven trait theorists have long recognized that stable individual differences produce predictably different patterns of results in different situations. Failure to change one's actions across situations is a sign of pathology, not adaptive behavior. The utility of demonstrations of trait-by-situation interactions lies in the exclusion of many competing hy-

potheses, as well as in the setting of boundary conditions for individual and situational effects, for theories are best tested at their limits.

Consider delinquency as an example of the setting of boundary conditions. Delinquency may be conceived as the outcome of the interaction of lack of social constraints with a biological propensity. When social constraints are diminished, the relationship between testosterone and delinquency and antisocial behavior increases (Dabbs et al 1990, Dabbs & Morris 1990). Among lower-SES military veterans there is a positive relationship between testosterone and antisocial behavior, but this relationship vanishes among higher-SES subjects. These results might be due to a lack of social control or, alternatively, to the existence of more legal ways to seek stimulation among higher-SES groups than among lower-SES groups.

Interactions also allow for tests of theories. Consider the relationship between impulsivity and cognitive performance, which changes as a function of caffeine (Anderson 1994) or time of day (Anderson & Revelle 1994) and differs as a function of the particular task used (Revelle et al 1987). These interactive results allow for precise tests of the competing theories relating to the arousal interpretations of impulsivity (Revelle & Anderson 1992).

In a thoughtful review of the many meanings of person-by-situation interactions, Higgins (1990) emphasizes the interplay between situational standards and individual beliefs. Differences in cognitive representations and activation prime reactions to specific situational cues. This social psychological emphasis on contextual priming of memories relates to the personality concern with individual differences in cognitive structures.

NO PERSON IS THE SAME: THE STUDY OF UNIQUE PATTERNS OF BEHAVIOR

Individual differences research is not the same as theories of personality of the individual (Rorer 1990). A person is not just the simple combination of universals of human nature and specific values on two, three, five, or even ten independent trait dimensions. A person is also a dynamic information processor whose unique memories and perceptual structures lead to a unique cognitive, affective, and behavioral signature. Structural studies of individual differences emphasize between-subject correlational patterns of variables. But these structures are not the same as studying the coherent patterns of an individual over a lifetime, or even across different situations (York & John 1992). Those theorists emphasizing uniqueness have tended to be more cognitively oriented than are the biologically oriented trait theorists, or the pragmatic psychometricians concerned with cross-situational prediction.

Social-cognitive theorists emphasize the dynamic and flexible use of multiple cognitive structures as one solves the problems of day-to-day interaction.

Although recognizing the importance of dispositional structures (i.e. traits), the focus is on the adaptive use of schemas, tasks, and strategies (Cantor 1990). Schema-driven processing describes the assimilation of new information into existing cognitive structures and recognizes that physically identical inputs will lead to dramatically different outputs depending on prior knowledge and beliefs. Although this cognitive orientation at first seems different from the dispositional approach, in fact, biological theorists also suggest that information is processed differently according to existing structures (e.g. Gray's description of anxiety and impulsivity as sensitivities to cues for punishment and reward). The difference is thus one of emphasis on the particular schemas, tasks, and strategies that one uses rather than on the determination of the causes for differences.

Although it is logically possible to study the effects of unique organizations of biological structures (anatomical texts emphasize the similarities of structure, but anatomists quickly realize the variation and unique patterning that exist), the primary emphasis on individuality is expressed by those studying cognitive structures and processes. By emphasizing the uniqueness of individual construals, cognitive theorists attempt to move beyond the "psychology of the stranger" (McAdams 1994b) characteristic of trait theory and instead study the personalities of individuals.

Personal Construals

The study of cognitive aspects of personality is not new (Kelly 1955) but has become a focal point of social-cognitive theorists as they apply cognitive theory to the study of individuality. People are seen as active processors of information, forming, testing, and acting on hypotheses about their selves and others. This active social construal process can be seen as the basis of the lexical hypothesis that individuals will code important phenomena linguistically. What is important to people in the aggregate becomes coded into the language.

SELF-SCHEMAS The multiple hypotheses one has about one's self guide one's perceptions, thoughts, and actions. Self is the insider's view of personality (Markus & Cross 1990). As a fundamentally social construal (Banaji & Prentice 1994), the "working self-concept is influential in the shaping and controlling of intrapersonal behavior (self-relevant information processing, affect regulation, and motivational processes) and interpersonal processes, which include social perception, social comparison, and social interaction" (Markus & Cross 1990, p. 578). One's theory of intelligence guides one's responses to success and failure and resulting school achievement (Dweck 1991), and a negative self-concept leads to seeking self-verification through failure (Swann 1992).

REVERSAL THEORY—DYNAMIC CONCEPTUALIZATIONS OF SITUATION Changes in interpreting motivational phenomena such as arousal in terms of metamotivational states (e.g. the telic state that emphasizes goal driven behaviors versus the paratelic state that emphasizes the behaviors themselves) can lead to dramatic reversals of thought and action (Apter 1989). When in a telic state of trying to achieve an important goal, high arousal is associated with anxiety and low arousal with relaxation. In contrast, when in a paratelic state of playfulness, high arousal is exciting and low arousal is boring. Phenomenological interpretation of a situation affects physiological responses in that situation (Apter & Svebak 1992).

The dynamic pattern of reversals over time that occur in a constant situation are reminiscent of those modeled by the dynamics of action (Atkinson & Birch 1970, Revelle 1986). Although the emphasis in reversal theory is on the metamotivational state within an individual and the reversals in behavior resulting from changes in state, most research studies use between-individual analyses of dominant or typical state.

Life Histories and the Study of Lives

An attempt at understanding the coherencies within individuals rather than within variables has been a theme of the longitudinal studies done at Berkeley (Block 1971, Block & Robins 1993, Helson 1993, Helson & Roberts 1992, York & John 1992). These were ambitious studies when initiated, and have shown the costs, difficulties, and benefits of “studying personality the long way” (Block 1993). These longitudinal studies emphasize person-centered as well as variable-centered analyses and represent a powerful blend of psychometric and theoretical sophistication. For example, Block & Robins (1993) report that mean self-esteem, indexed as the correlation between self and ideal-self ratings, increases slightly for males and decreases slightly for females from ages 14 to 23. Individual differences in self-esteem are more consistent across this period for females than for males and show different correlates of change across the two genders. Personality correlates of later drug use, political attitudes, or even subsequent parental divorce show strong and meaningful patterns that are not detectable in cross-sectional analyses (Block 1993).

Life Stories

Whereas the Berkeley group focuses on the coherencies over time of individual life histories, others emphasize the autobiographical story of the self that makes up one’s identity (McAdams 1990, 1993, Runyan 1990). McAdams suggests that the narrative tone of a life story is set by the quality of early experience and the forming of attachment. As children mature they are exposed to many different legends and myths as they develop their own life story

and their conception of their self. Story scripts change with age and tend to be concerned with future generations. Studying the origins, characters, settings, and scripts of a life story is said to provide "a framework for conceptualizing the development of the whole person, from birth to death" (McAdams 1990, p. 192).

FUTURE DIRECTIONS: CHALLENGES AND PROMISES

Based on the mixed success of previous reviewers and prognosticators, it is risky to make any strong predictions about the future. There are several themes, however, that have emerged in the past several years that offer both promises and challenges to the field of personality research.

Challenges

As the rise of neuroscience and cognitive science threatens to split the discipline of psychology, so does the emphasis on biological mechanisms of individual differences and cognitive mechanisms of uniqueness threaten personality theory. There is an unfortunate tendency for the more biologically oriented to dismiss cognitive approaches as focusing on epiphenomena, and for cognitive theorists to ignore the advances in biological bases as irrelevant for understanding a person. There are far too few researchers emphasizing how cognitive interpretations can affect physiological state and in turn, how physiological structures and processes constrain and affect cognitive and affective reactions.

Promises

The past few years have seen a resurgence of interest in personality. Research spanning the range from genes to the life span, from the individual to the species, and from the normal to the pathological is being carried out in the name of personality theory. Once again, researchers and theorists from all parts of psychology are working on the fundamental questions of personality. What is integrating much of this work is an emphasis not just on description, but on the functions that personality serves. Evolutionary, biological, sociological, developmental, cognitive, and clinical approaches all provide unique perspectives to the field. What the next decade promises is an integration of these many separate foci.

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