

Personality theories and models

An overview

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Editors' General Introduction – Volume 1

Gregory J. Boyle, Gerald Matthews, & Donald H. Saklofske

The thesis of these volumes is that the study of personality traits has advanced towards “normal science” in the sense of a Kuhnian paradigm (cf. Eysenck, 1981; Kuhn, 1962). That is, most researchers in this area share a set of common core beliefs supported by empirical evidence. These include the stability of traits over time, a significant genetic and biological influence on personality, and relevance of traits to many areas of everyday life. Each one of these beliefs has been vigorously contested in the past, but the evidence in favour of each one is now overwhelming (Boyle & Saklofske, 2004; Matthews et al., 2003). At the same time, researchers do not subscribe to some crude biological determinism. The roles of gene-environment interaction in personality development and of person-situation interaction in determining behaviour are also well-established. Within the overall paradigm, trait models have also stimulated important and unresolved debates, including the optimal measurement framework for traits, the mechanisms that transmit causal effects of traits on behaviour, as well as the roles of cultural and social factors in moderating the nature of traits.

The purpose of these handbooks is to review issues of both consensus and controversy. Contributors synthesize the state-of-the-art of the research on the core tenets of trait theory, such as behaviour genetics and trait stability, and present perspectives on unresolved issues such as the important role of culture. In addition, trait theory is only *one* scientific paradigm for personality research. Although the focus here is on trait models, the handbooks also seek to explore key points of contact and differences with traditional approaches to personality

(Campbell, Vol. 1) and with social-cognitive theory and methods (Cervone, Vol. 1; Shoda, Vol. 2).

In this introductory chapter, we will outline the case that the trait model of personality constitutes normal science, and compare the trait perspective with alternative scientific approaches. We will also set out the key criteria that must be satisfied to build a successful trait theory, subdivided into formal and often quantitative criteria such as test-retest stability, and criteria that relate to the psychological meaning and construct validity of traits. As well, we will discuss some of the challenges to trait theory, and the directions the field may take in addressing these challenges. We will conclude the chapter by introducing the various contributions to Vol. 1, related to the pivotal issues previously discussed.

Trait Theory as Normal Science

The basic tenets of modern trait theory are not new – indeed, their origins lie in antiquity (Stelmack & Stalikas, 1991). However, in their contemporary form, they owe much to three founding fathers of trait psychology: Gordon Allport, Raymond Cattell and Hans Eysenck. In his early career, Cattell was influenced by Allport, when both were faculty members at Harvard University. At the outset, Allport (1937) famously remarked that, “in everyday life, no-one, not even a psychologist, doubts that underlying the conduct of a mature person there are characteristic dispositions or traits.”

Allport defined a trait or disposition as “a generalized neuropsychic structure (peculiar to the individual), with the capacity to render many stimuli functionally equivalent, and to initiate and

guide consistent (equivalent) forms of adaptive and stylistic behaviour.” That is, a trait describes the filtering of experience through the self to impose a personal structure on the world, as for example, a trait-anxious person may interpret a miscellany of stimuli as threats. Furthermore, traits generate consistency in response, in the service of adaptive and expressive goals. These remain central assumptions of contemporary trait theory. The phrase “peculiar to the individual” is telling, in that it signals Allport’s predominantly idiographic stance on traits. While this view has been cherished by much of social-cognitive personality psychology, trait theory has been dominated by nomothetic approaches that seek to identify traits that are meaningful for all individuals.

Nomothetic trait models owe much to Raymond Cattell (e.g., Cattell, 1973; Cattell & Kline, 1977: see Boyle; Campbell, Vol. 1), as the most articulate early proponent of the view that the main attributes of personality may be described by a number of discrete dimensions. Cattell’s personality theory is inextricably linked to quantitative measurement models based on factor analysis of questionnaire responses and other sources of personality data (although known for the *16 Personality Factor Questionnaire* or 16PF, Cattell also identified several additional personality traits that were not amenable to questionnaire assessment). Cattell’s formulation of trait models remains influential. Four attributes of these models stand out. First, the trait as a latent construct with causal force, the *source trait*, should be distinguished from superficial regularities in behaviour or *surface traits*. Second, personality models should be hierarchical; broad factors such as extraversion and anxiety are defined by groupings of more narrowly-defined primary traits, such as in the case of extraversion -- dominance, surgency and venturesomeness. Third, the personality sphere should be differentiated from other domains of

individual differences, including ability, motivation and transient mood states. Fourth, the influence of traits on behaviour is moderated by situational factors. Controversies continue over whether numbers can ever capture human personality (see Pervin, 2002), and over the scaling and measurement assumptions inherent in assessment of traits (Barrett, 2005). Nevertheless, the four features of Cattellian theory listed here remain as key principles for most contemporary trait theorists.

The third figure in the trinity is Hans Eysenck (e.g., Eysenck, 1957, 1967; see O'Connor, Vol. 1). His debates with Cattell on the optimal number of factors (Eysenck focused on three broad dimensions, extraversion, neuroticism and psychoticism, as compared with the 16 primary factors and several secondary factors reported by Cattell) – were a precursor to the number-of-factors issues that have embroiled the field ever since. However, this discrepancy was more apparent than real, since Eysenck and Cattell were focusing on measurement at different levels within the hierarchical trait model. In fact, at the second-order 16PF level, communality between the Cattellian and Eysenckian factors was striking, so much so that, “The Cattell and Eysenck constructs and theories should be seen, not as mutually contradictory, but as complementary and mutually supportive” (Eysenck, 1984, p. 336).

We emphasize Eysenck’s attempt to ground traits in heritable properties of the brain, so that extraversion, neuroticism and psychoticism were linked to specific brain systems. In addition, Eysenck pioneered the use of empirical studies to test the relationships between traits and behaviour – and the moderating role of situational factors – in rigorously controlled experiments. As O’Connor (Vol. 1) discusses, building causal models of individual differences requires both

the matching of correlational and experimental methods, and the study of person x situation interaction. Also central to Eysenck's program was empirical investigation of what these days are called *consequential outcomes* (Ozer & Benet-Martinez, 2006); the relevance of traits to real-life outcomes in relation to mental health, academic and work accomplishments and social relationships. Eysenck's specific hypotheses about the biological bases for personality remain open to debate (Matthews & Gilliland, 1999), but there is no serious argument among trait psychologists over the importance of the brain, the use of experimental methods and the investigation of real-life outcomes.

Basic assumptions and principles

Table 1 sets out some basic assumptions of trait theory, to which the great majority of researchers in the field would subscribe (cf. Matthews et al., 2003; Pervin, 2002). We suggest that many of the familiar, defining features of traits reflect four underlying principles, as shown in the Table. The assumption that traits are stable, continuous, dimensional qualities requires a psychometric basis for traits, meeting standard criteria for reliability and validity. The internal consistency of major trait measures and their stability in the adult (e.g., Boyle, 1991; Asendorpf, Vol. 1; Terracciano et al., 2006) are not in question. Validity is a more complex issue that we can only touch upon at this point. The issue here is that traits possess criterion validity in correlating with a variety of quantitative external indices, including objective criteria such as error rates during performance and amplitudes of physiological responses (Matthews et al., 2003; Stelmack & Rammsayer, Vol. 1). The multiplicity of traits requires a focus on a personality structure defined by latent factors. Multivariate methods including factor analysis (Cattell, 1978; Gorsuch, 1983) and structural equation modeling (Cuttance & Ecob, 1987) may be used to propose and

test configurations of multiple dimensions that provide a comprehensive description of personality going beyond an arbitrary collection of single traits (e.g., Cattell's psychometric model). A further consequence is that abnormality in personality may be defined statistically, in relation to the end-points of each trait continuum. Whether abnormality is *pathological* is a distinct question, although, in fact, convergence between normal and abnormality in studies on personality structure (Costa & Widiger, 2002; Malik et al., Vol. 1) suggests a gradation from normal to abnormal personality. The contrary view, expressed by Cattell (see Cattell, 1995; Boyle, Vol. 1), is that pathology may need to be related to abnormal traits beyond the normal personality factor space.

Table 1 about here

The second principle of a genetic basis for the major traits has been supported by behaviour genetic, and, increasingly, molecular genetic evidence (see Johnson et al., Vol. 1; Canli, Vol. 2). Historically, the heritability principle - especially when framed as a crude genetic determinism - clashed with the egalitarian ethos of the 1960s and the social science model of the time that denied any role to the genes (Pinker, 2002). The subsequent accumulation of evidence has been sufficiently persuasive that it is safe to say that the role of genetics is no longer controversial. As Plomin et al. (2001) noted, behaviour genetic studies also provide powerful evidence for the role of the environment in shaping personality (especially, the "non-familial" environment). The genetic assumption implies that traits can be understood within neuroscience models, supported by psychophysiological evidence. If personality is a "window on the brain," it follows too that traits must be universal, in generalizing across the different cultures of *homo sapiens*. The

genetic basis for traits is also compatible with evolutionary accounts of personality.

The third principle listed in Table 1 is the generality of expression of traits. If, as Allport stated, traits work to render different stimuli equivalent, then the trait will encourage similar responses to different situations perceived as functionally equivalent. The point here is that a trait such as extraversion is not relevant to a single class of situations only - say, lively parties - but influences behaviour across a whole range of different contexts. This position depends on evidence for cross-situational consistency in behaviour (e.g., Funder, 2006); without such consistency, traits could only describe behaviour in specific situations. Historically, cross-situational consistency has also been controversial, as exemplified by Mischel's (1968) famous (or notorious) "situationist" critique of the personality trait field. As with genetics, accumulating evidence based on the important principle of aggregating data to provide reliable behavioural assessment (Epstein, 1977) has persuaded many of the doubters. It follows too that the behavioural expression of traits may be studied in artificial laboratory situations. We are not obliged to study extraverts only during naturalistic revelry; Eysenck's (1967) theory predicts the trait should influence laboratory tasks including conditioning, vigilance and memory, for example. Traits should also influence behaviour across a range of significant real-life contexts including the workplace, leisure pursuits, stressful encounters and intimate relationships (e.g., Furnham & Heaven, 1999).

The fourth principle is interactionism (Endler, 1983), necessary to accommodate the role of the situation evidenced in studies of cross-situational consistency. Most simply, traits may be switched on or off by situational factors; neuroticism might only be expressed in threatening or

stressful situations, for example. More subtly, traits may correspond to parameters of key neural or psychological processes elicited by situational stimuli. For example, trait anxiety might correspond to the sensitivity to activation of a brain punishment system (Gray, 1991; Pickering and Corr, Vol. 1), or to the accessibility in memory of a cognitive code representing threat (Wells & Matthews, 1994). The trait does not directly control behaviour but modulates processing. Some trait theorists (e.g., Eysenck, 1967; Gray, 1991) make explicit predictions about the processes thus modulated, such as reticulo-cortical activation in the case of Eysenck's theory (O'Connor, Vol. 1).

Over the extended timescales of personality development, the modulatory role of personality influences not just immediate behaviour but also feedback from the environment into personality development (Asendorpf, Vol. 1; Caspi et al., 2005; Cattell & Nesselrode, 1988). For example, the risk-taking and the inhibited child are likely to experience rather different formative experiences. A final consequence of interactionism is that - given the resistance to change of adult traits - applied psychologists should address the congruence or compatibility of traits and environments. Examples including selecting job applicants whose personalities are congruent with job demands and tailoring therapies to the strengths and weaknesses conferred by traits; for example, a conscientious patient is more likely to follow programs of "homework" used in cognitive therapy (Bagby & Quilty, 2006; Miller, 1991). Interactionism generates no discernable controversy as a general principle; although, naturally, the specific theories are open to normal scientific criticism (e.g., Matthews & Gilliland, 1999).

Alternative strategies for personality science

The success of trait models as a scientific framework for studying personality does not preclude alternative strategies for scientific advance. A familiar point is that personality psychology is so wide-ranging that it needs multiple levels of explanation (Hettema & Deary, 1992; Matthews, 2000). Zuckerman (1992) refers to the ancient myth that the world rests on a stack of giant turtles. He states that “Each turtle is a distinct creature to be studied at its own level, but for a complete understanding of any turtle one cannot ignore the next turtle down who forms its foundation” (p. 681). Specifically, he lists seven turtles, from the top down, as traits, social behaviour, conditioning, physiology, biochemistry, neurology and genetics. Indeed, researchers working at different levels within this hierarchy propose different explanatory constructs ranging from DNA to high-level traits such as E and N.

The differentiation of levels is uncontroversial, but two more difficult issues remain. The first is how to integrate the different theories relating to each individual level. The second is whether levels that reflect a “natural science” approach to personality (Eysenck & Eysenck, 1985) are adequate to explain traditional concerns of personality psychology such as the nature of the self, social relationships and motives, and individuality. So far as integration of theories is concerned, there have been two broad strategies (Matthews, 2000, 2004). The first is biological reductionism (occasionally, triumphalism) that seeks to explain all expressions of traits, including high-level social behaviours, in terms of brain functioning. The idea underlies the classic theories of Eysenck and Gray, in which individual differences in the brain (influenced by genetic variation) feed up the stack of “turtles,” progressively influencing integrative brain systems (e.g., Eysenck’s reticulo-cortical circuit), learning and behaviour, and actual life outcomes. The strongest contemporary theory of this kind is Nyborg’s (1994) view that the psychology of

personality may be reduced entirely to biochemical explanations. However, a hard reductionism has been criticized on the basis that traits do not appear to be isomorphic with specific brain systems (Zuckerman, 1991). Traits may be seen as emergent, higher-order properties of self-organization that, while influenced by neural processes, do not directly map onto them.

The alternative strategy for accomplishing integration of theories at different levels is to accept that the various constructs used are equally valid as the basis for explanation. At the same time, it is important to explore how different types of explanation may be related to each other, for example by developing neural network models that may support parallel neurological and cognitive accounts of personality effects (Matthews & Harley, 1993). It has been proposed elsewhere that the “classical” theory of cognitive science (Pylyshyn, 1984) provides a suitable framework of this kind (Matthews, 1997, 2000). It differentiates three forms of explanation, relating to the physical (brain) hardware, the virtual, symbolic software (information-processing) and self-knowledge (motives, goals and intentions). The application of cognitive science to integrating different levels of trait theory is discussed further by Matthews (Vol. 1).

The second issue related to theory integration is that personality theory may need to accommodate models that are radically different to trait theory. Pervin (2002) lists psychoanalytic theories originating with Freud and the social-cognitive theory associated with Bandura, Mischel and others as two major systems for understanding, which are at variance with trait theory in important respects. We will not dwell at length on the prospects of psychoanalysis and its successor theories as a basis for scientific understanding. It does not bode well that much of the debate on the scientific status of psychoanalysis hinges on whether it is fundamentally

untestable, and outside the realm of science, or whether it is testable but disconfirmed by data (MacMillan, 1997). As Campbell (Vol. 1) discusses, psychodynamic theories may be important as sources of ideas. Some commentators, notably Westen (1999), have pointed out the re-emergence in scientific studies of some Freudian concepts, such as the importance of the unconscious and repression. However, we agree with Kihlstrom (1999) that the unconscious as revealed by experimental studies of implicit processes does not closely resemble the Freudian unconscious. More generally, whatever heuristic value there may be to Freud's insights, there is no evidence supporting the elaborate theoretical architecture of psychoanalysis.

Social cognitive theories are more deserving of attention as an alternative "normal science." One of the sustained minor chords of personality research has been interest in the systematic study of individual lives, expressed, for example, through research on personal constructs (Grice, 2004). Little and Chambers (2004, p. 65) highlight the "personal projects" that "range from the daily doings of typical Thursdays (e.g., "put out the cat, quickly") to the self-defining passions of a lifetime (e.g., "transform Western thought, slowly)". A more far-reaching approach is that of social-cognitive personality theory. Its antecedents include rigorous work on learning – both conditioning and social learning – and representations in memory of the self (the self-schema). Typically, social-cognitive approaches fuse a concern with general principles of psychological functioning with an emphasis on the individual as the appropriate unit of analysis for personality studies (Caprara & Cervone, 2000). A key question is the extent to which integration of trait theory and social cognitive theory is possible – or even desirable. The two forms of theory might be seen as fundamentally incommensurable (in the Kuhnian sense), and doomed to remain in mutual isolation. A different view (Matthews et al., 2003) is that, while there are important

differences in aims and assumptions, both approaches can learn from one another. Stable social knowledge, shaped by social learning, may contribute to traits, and the basic constructs of social-cognitive theory, including the self-concept, expectancies and motives may not be immune to temperamental and trait influences. Various contributors to this handbook integrate social-cognitive constructs into trait theories, most directly in the section on key self-regulative traits. Self-regulative theories may also serve to elucidate relationships between biologically-based traits and cognitions of the self (Elliott and Thrash, Vol. 1). While the major focus of these volumes is on traits, the editors considered it vital to present also the essentials of social-cognitive theory (Cervone, Vol. 1) and methodologies (Shoda, Vol. 2).

Pushing out the Frontiers: Key Areas of Progress

The hallmark of a successful scientific paradigm is that it is “progressive,” in the sense of stimulating new and informative research (Lakatos, 1977). By contrast, degenerative programs are more concerned with post hoc modifications to theory to explain away contradictory data. Personality trait models are open to progress (or degeneration) on two fronts. First, there is a “syntax” of traits referring to their formal psychometric properties including the definition of reliable latent constructs, long-term stability and cross-situational generality. Second, there is a “semantics” of traits referring to construct validity and an understanding of what traits actually mean in terms of psychological or biological theory. Matthews et al. (2003) identify four major areas of progress in recent trait research that support the scientific credibility of the enterprise. In addition to developments in psychometrics, progress in psychological understanding of traits is signaled by three important advances: a more sophisticated understanding of biological bases of traits, increasing integration of trait research with mainstream cognitive, social and

developmental psychology, and the increasing applied value of assessment of traits.

In this section, we briefly review some of the sources of optimism among trait psychologists, covering both the psychometric “syntax” and the theoretical “semantics.” In the section that follows, we then turn to some of the emerging challenges to personality trait theories.

Psychometric advances

The question of how many basic factors are needed to describe human personality has at times seemed like asking “how many angels may dance on the end of a pin?” For a number of years, the issue appeared to founder on disagreements about factor-analytic techniques, sampling of personality data, and what constituted a “basic” factor. However, recent years have seen signs of a growing convergence on psychometric accounts of broad, higher-order personality traits. Based on the work of Costa and McCrae (1997), Goldberg (1990) and others, the Five Factor Model (FFM) has risen into some prominence in some quarters as a putative framework for organizing personality trait data (McCrae and Costa, Vol. 1). At the second-stratum level, a somewhat different five-factor structure can also be derived from Cattell’s personality questionnaires (Krug & Johns, 1995; see Boyle, Vol. 1). Furthermore, Zuckerman’s version of the five-factor model with its emphasis on psychobiological underpinnings (see Zuckerman, 1995), goes considerably beyond the simple trait descriptions postulated in the lexical FFM (see Fraley & Roberts, 2005). Thus, Zuckerman’s five-factor model of personality structure in its incorporation of biological, comparative, experimental, and trait approaches illustrates how descriptive accounts of personality may be integrated with sophisticated theory.

Clearly, consensus about the number of broad personality dimensions is not complete. Although the FFM has generated substantial empirical data spanning the various fields of psychology (McCrae and Costa, Vol. 1), substantive objections to the FFM have been raised in relation both to the validity of dimensional models in general (e.g., McAdams, 1992), and to the specific psychometric evidence supporting it (Block, 1995; Boyle, Vol. 1). There is also considerable current interest in adding additional major factors (e.g., Ashton & Lee, Vol. 2; Bond, 2000; Durrett & Trull, 2005). Indeed, as Eysenck (personal communication, 1996) pointed out, extraction of five factors is somewhat arbitrary. Perhaps, the personality sphere can be divided into any number of factors, depending upon one's particular preference. It remains to be seen whether advances in psychometrics will eventually provide a universally-accepted personality structure, akin to the period table of elements in chemistry.

Perhaps the most controversial element of the “syntax” of traits has been their generality. Even if we accept that traits can be assessed reliably, and show high temporal stability, we may question whether the construct assessed *generalizes* across different situations and different cultures. Indeed, an attack on the cross-situational generalization of behaviour was at the core of Mischel's (1968) critique of traits. He coined the term “personality coefficient” to describe the typical correlation between trait measures and external criteria obtained using other methods (i.e., not further questionnaires). Mischel's claim was that the coefficient rarely exceeded 0.2 – 0.3, which he took as an argument for the triviality of traits. However, as previously noted, we now know that Mischel's argument was over-stated, and convincing evidence for cross-situational consistency of behaviour is obtained when rigorous methods are used (e.g., Epstein, 1977; Funder, 2006). There is now a general consensus in favour of the interactionist position

that both traits and situations are important influences on behaviour.

The issue of whether traits generalize across cultures has also been controversial (see Chiu et al.; Stankov & Lee, Vol. 1). If it is believed that personality is an expression of cultural values, there is no particular reason why personality structures found within different cultures should coincide. On the other hand, if traits reflect universal features of brain physiology – or, indeed, universal themes or challenges of human life – then the same traits should be observed in all cultures. As we have seen, this claim has been of the foundations of the argument for the FFM (Costa & McCrae, 1992). There appear to be different readings of the evidence on this issue. McCrae and Costa (Vol. 1) argue that the five-factor structure of traits has been confirmed in many studies conducted around the world. By contrast, psychologists working with indigenous personality constructs have identified what may be additional major traits such as those relating to “Chinese traditions” (Bond, 2000). Of course, distributions of personality factors in different cultures may differ even if personality structure generalizes. Thus, cross-cultural differences in personality may actually explain some cultural differences in behaviour. Matsumoto (2006) found that differences in emotion-regulation between Japanese and US samples could be entirely explained by the higher neuroticism, and lower conscientiousness and extraversion, of the Japanese respondents.

To summarize, the psychometric criteria for traits refer to whether “the numbers behave properly.” In fact, to a large extent, they do. Confirmatory factor analyses and structural equation modeling demonstrate reliable, and often corresponding, factor structures for leading instruments. Individual differences in behaviour correlate across situations, and relate predictably

to personality traits. Personality structures also correlate across cultures, at least to some degree. New psychometric methods are expected to refine such investigations. At the same time, psychometrics also indicates some of the complexities and challenges which trait theory must accommodate, including the existence of alternate factor models, the powerful role of the situation as an influence on behaviour, and the existence of culture-specific traits. We will return to these challenges later in this chapter.

Towards a psychological understanding of traits

Psychometrics essentially provides a quantitative basis for understanding the network of relationships between various latent and manifest (measured) constructs. The approach was taken furthest by Cattell's notion (Cattell, 1973; Cattell et al., 2002) of the "behavioural specification equation" that predicts some criterion from a linear equation including both trait and situational factors. A psychometric understanding can be pursued with only limited psychological theory. We can develop and validate empirically multiple regression equations that afford prediction of, say, performance at some job, from traits and situational factors without asking whether trait influence is mediated by individual differences in brain functioning or in social learning.

There are several reasons why a purely psychometric understanding is insufficient (in addition to intellectual curiosity). First, quantitative assessment of situational factors is difficult; the lack of good measurement models for the situation is a familiar complaint in personality research. The issue is not just one of ignorance of how to measure the situation. Interactionist studies (e.g., King & Endler, 1990) suggest that it is the individual's appraisals and perceptions that are critical, as much as objective qualities of the situation. The role of trait anxiety in governing

behaviour depends on how much the person “reads” threat into a situation which may or not be objectively dangerous. Threat appraisal itself may depend on trait anxiety, so that trait and situational influences become inter-twined (cf. Endler & Kocovski, 2001).

A second, related issue is that empirical studies do indeed reveal that the influence of traits on behaviour is commonly – and sometimes, confusingly – dependent upon various moderator factors. Whether extraverted or introverted individuals perform better on laboratory tasks depends on whether performance is time-pressured, whether subjects have ingested caffeine, how well they have slept, whether they are rewarded or punished for performance, and even on the time of day of the study (e.g., Revelle et al., 1980). It seems unlikely that each moderator effect could be specified psychometrically on an empirical, actuarial basis. It would certainly be prohibitively expensive. A theory is needed that specifies ante hoc how moderator effects are to be understood. Indeed, Eysenck’s (1967) personality theory sought just this aim, on the basis that the critical attribute of moderator factors was their impact on level of cortical arousal.

A third issue is that applications of personality science beyond the exercises in predictive validity that support occupational selection require theoretical understanding of mediating processes. In designing training programs geared towards extraverts and introverts, we need to know whether the intervention should target brain functioning, information-processing or social interactions. For example, neuroticism appears to predict poorer performance in police officers (Detrick & Chibnall, 2006). Should police departments then simply reject all high N applicants, or should they train the “talented-but-neurotic” in techniques for stress management? The answer depends upon the nature of the processes mediating stress vulnerability, and their amenability to change.

Finally, alternative approaches to personality have often been more concerned with semantics than syntax. Psychodynamic theories are exclusively concerned with finding the supposedly hidden meanings of an individual's behaviour and experience. In this case, neglect of measurement issues puts the approach beyond the scientific pale. Social-cognitive theory, by contrast, retains a strong focus on personal meaning, as expressed in the self, for example, but also incorporates quantitative behavioural measures, as in the assessment of the individual's "behavioural signatures" (Mischel et al., 2002; Shoda, Vol. 2).

Matthews et al. (2003) single out three features of research that are increasingly contributing to psychological theories of traits, which we will now briefly review. These are the growing sophistication and power of biological theories, increasing integration of studies of traits with mainstream psychology, and applications of research supported by studies of consequential outcomes.

Biological bases of personality. As already noted, Eysenck's (1957, 1967) contribution was remarkable in linking traits to neural processes that could be investigated experimentally, through behavioural and psychophysiological measures (O'Connor, Vol. 1)). Eysenck's vision has been broadly substantiated by the ever-accumulating weight of evidence from behaviour genetics and an array of psychophysiological techniques (e.g., Johnson et al., Vol. 1; Stelmack & Rammsayer, Vol. 1; Zuckerman, 2006) – although we may take issue with the specifics of the theory (Matthews & Gilliland, 1999).

Recent research advances are providing fresh impetus to biological approaches. Behaviour genetics is increasingly supplemented by molecular genetics that promises to relate to traits to specific polymorphisms. Tracking down the genes involved may prove to be arduous (cf. Munafò et al., 2003), but the problem is now essentially a technical one. Brain-imaging studies using fMRI (Canli, Vol. 2) also promise to provide much more-fine grained mappings of traits onto specific brain structures than traditional psychophysiology afforded. Finally, evolutionary psychology, although typically directed towards species- rather than individual-level adaptations, may provide a deeper theoretical understanding of why individuals diverge in genotype and phenotype (Michalski & Shackelford, Vol. 1; Penke et al., in press). Enthusiasm for the emerging new biology of traits should be tempered by an appreciation of its limitations (see Matthews, Vol. 1), but there are solid grounds for optimism that these parallel advances in psychobiology, which may inform one another, will in time give us increasingly powerful psychobiological theories of personality (Pickering & Corr, Vol. 1).

Integration with mainstream psychology. Traditionally, personality psychology has been a field somewhat set apart from other branches of psychology, with only sporadic points of contact, such as the integration of trait models and psychobiology effected by Eysenck and Gray. Recent trait research has been enriched by the growing adoption of process models from other areas of psychology to explain personality findings: notably, developmental, cognitive and social psychology. There is extensive evidence that biologically-based temperamental factors such as emotionality, inhibition and self-control provide a platform for adult personality development (Eisenberg et al., 2005; Rothbart & Bates, 2006). At a process level, there is growing interest in how interactions between caregivers and children influence both brain development and social-

emotional learning (Zeidner et al., 2003), and in the role of genetics in shaping interactions with the environment (Rutter et al., 2006).

Psychobiological accounts of trait effects on attention and performance have been increasingly complemented - or supplanted - by theories based on a cognitive psychological understanding of performance, using explanatory constructs including resource availability (Humphreys & Revelle, 1984), working memory (Eysenck et al., in press) and spreading activation (Matthews & Harley, 1993). Social psychology has given trait theorists a better understanding of how agreeableness, for example, may influence interactions between people. For example, neuroticism may be related to the content of the social self, represented as a schema or schemas (Matthews et al., 2000). Recent studies of agreeableness demonstrate its relationships with more positive and accepting social perceptions (e.g., Jensen-Campbell & Graziano, 2001), and with nonverbal behaviours that express greater attention and openness towards others (Berry & Sherman-Hansen, 2000).

Higher level integrative accounts inter-relate personality and multiple fields of mainstream psychology. For example, cognitive neuroscience approaches (e.g. Derryberry & Reed, 2001; Matthews et al., 2000) relate personality to both brain systems and the information-processing those systems support. The emerging field of social neuroscience (Cacioppo & Berntson, 2004) offers an approach towards understanding how brain processes may control complex social processes (always a weakness of the traditional biological theories of personality). Matthews (Vol. 1) discusses how cognitive science provides an explanatory framework that may integrate - and, where appropriate, dissociate - biological, information-processing and social-cognitive

explanations for personality.

Integration is a two-way street. Not only is personality research enriched by the infusion of concepts and models from other fields, but accommodating individual differences is increasingly seen as an imperative for mainstream psychology - error variance no longer. Not only is personality psychology becoming a mature science, but so too is psychology in general.

Consequences and applications. Trait psychologists have had to work hard to establish the relevance of traits to applied psychology. Clinical psychologists have typically been conflicted in their stance, on the one hand using abnormal trait measures such as the MMPI extensively, while on the other hand rejecting much of the theory that makes sense of the traits. Eysenck's (e.g., 1994) jousts with the clinical profession illustrate the point. Although the use of the personality measures in organizational psychology dates back to the 1900s (Kanfer et al., 1995), the modest effect sizes for traits as predictors of job performance have inspired skepticism. Some critics (e.g., Blinkhorn, 1997) have seen personality assessment as largely irrelevant to the needs of the practitioner. Many applied psychologists remain unenthused about the utility of trait assessments, but several factors have collaborated to increase acceptance. The most basic of these is the increasing evidence for traits as predictors of "consequential outcomes" in diverse fields including health, work, interpersonal functioning, deviance and community involvement (Ozer & Benet-Martinez, 2006). The final section in this Vol. illustrates some of these research areas. In addition, striking evidence for the predictive power of childhood temperament as a predictor of dysfunction in adults has emerged from longitudinal studies (Asendorpf, Vol. 1; Caspi et al., 2005). Somewhat similarly, while there has been a long-running debate over

whether elevation of neuroticism and other traits is a cause or consequence of mental illness, recent evidence strongly supports an etiological role for traits (e.g., Harkness et al., 2002).

Some more subtle factors are at work also. In clinical psychology, there is increasing acceptance of dimensional models of abnormality, compatible with general trait models (Malik et al., Vol. 1; Widiger & Trull, 2007). The assumption incorporated into the various editions of DSM, that abnormal personality is represented by discrete all-or-nothing categories is simply not supported by the evidence for dimensional constructs. Factor analytic studies (e.g., Austin & Deary, 2002) establish the correspondences between normal and abnormal dimensions. Acceptance of traits is also eased by the integration of abnormal psychology with process models widely used in clinical psychology. Constructs at the center of cognitive-behaviour therapy (Clark & Beck, 1999) such as the self-schema, attentional and memory bias, and dysfunctional coping may readily be related to traits including neuroticism and its various facets (Matthews et al., 2000; Wells & Matthews, 1994). Similarly, measurement of personality and temperament is an integral element of the spectrum of psychoeducational assessments of children (see Andrews et al., 2001).

An important finding from meta-analyses of traits and job performance is that effect sizes are larger for confirmatory studies with an a priori rationale for linking a specific trait to a specific job than for exploratory studies that are no more than fishing trips (Tett & Burnett, 2003; Tett & Christiansen, Vol. 1). This empirical finding reinforces the need for good theories of traits that will support prediction on a reasoned basis, and this thinking appears to be gaining ground in organizational applications (cf. Hogan, 2005, 2006). For example, agreeableness may be an

advantage in jobs requiring teamwork, but a hindrance when the individual must compete against others (Barrick et al., 1998). . Another trend in industrial-organization is the growing realization that it is not just overt job performance that makes an employee valuable. Contextual performance refers to those work behaviours that contribute more widely to the organization, such as supporting coworkers constructively, being a good organizational citizen, and being willing to volunteer (Motowidlo & Van Scotter, 1994). There has been a rapid accumulation of evidence that trait measures predict criteria of this kind (e.g., Judge et al., 2006); multiple correlations for occupational criteria in relation to the Big Five may approach 0.5 (Ones et al., 2005).

Finally, trait psychology has proved to be in tune with contemporary zeitgeists in its focus on emotionality as a vital element of personality. Applied psychology has been both stirred and shaken by the new construct of “emotional intelligence” (EI: Austin et al., Vol. 1; Rivers et al., Vol. 2; Roberts & Schulze, Vol. 2). It is widely believed that enhancing emotional competencies will prove pivotal for addressing deficiencies in provision of mental health services, education and criminal justice. Indeed, programs directed towards various aspects of social-emotional learning in schools have proved effective in meta-analyses (Greenberg et al., 2003). We will note only briefly that existing measures of EI are of questionable construct validity (see Matthews et al., 2002, for a critique). The larger issue is that emotional competencies - and people’s perceptions thereof - may define traits with wide-ranging real-life impacts.

Challenges to Trait Models

So far, we have presented the case for viewing personality research as a maturing science.

Nevertheless, the field continues to face challenges that should be addressed. There is a somewhat standard critique of traits, typically offered by social psychologists, that is sufficiently familiar not to require repetition (e.g., Cervone & Caprara, 2000; Pervin, 2002). It refers to the validity of factor analysis as a means for uncovering personality structure, neglect of the individual in favour of group trends, neglect of dynamic and developmental processes in favour of static measurement structures, and the questionable cross-cultural generality of traits. To some degree, these are matters of the paradigm-defining assumptions that are adopted by researchers, which change, if at all, over generations of scientists. What is more germane here are the challenges which the researcher sympathetic to the trait approach should confront. A detailed critique is beyond the scope of this chapter, but we will offer some general remarks and differentiate some qualitatively different types of challenge. We will summarize these here.

Psychometric challenges.

Traditionally, virtually all personality assessment instruments have comprised subjective self-report questionnaires (Q-data), or subjective reports (rating scales) of other people's personality characteristics (L-data). This approach, albeit economical and easy to apply, nonetheless, is prone to the problems of item transparency and resultant motivational and response distortion, ranging all the way from deliberate dissimulation, to either conscious or unconscious faking (good or bad), to lack of adequate self-insight, and/or biased perceptions of others. If we consider the Freudian "tip of the iceberg" analogy, it becomes readily apparent that much of human personality is at the unconscious level of the psyche, and therefore unavailable to conscious self-reports or to reports of others. In this light, most personality assessment instruments amount to subjective "opinionnaires". Whereas such introspective approaches would not be regarded as

valid in the measurement of cognitive abilities, the current plethora of personality rating scales and questionnaires seems restricted by this fundamentally flawed methodology. One way forward would be to construct objective (T-data) tests of personality traits, wherein the respondent cannot detect what personality factors are being tapped by the various subtests, thereby alleviating the possibility of motivational and response distortion. Such an approach initially was advocated some 40 years ago by Cattell and Warburton (1967), and was actualized in the factor-analytic construction of the *Objective Analytic Battery* (OAB) by Cattell and Schuerger (1978; Schuerger, 1986). However, little subsequent research has been undertaken into the construction of objective tests of personality. Clearly, construction of objective, computer-interactive T-data personality tests will require a major research effort in the years to come. This is the great challenge for personality assessment.

The vexations of normal science

As with any science in its early maturity, there are significant disputes among scientists who hold broadly similar views on the nature of personality. Critiques of trait theory (e.g., Block, 1995, 2001) make much of uncertainties over whether the FFM provides the optimum description of broad personality factors. The personality model outlined by Ashton and Lee (Vol. 2) posits a new factor of Honesty-Humility, and also makes some substantial modifications to the standard Big Five. However, finding additional broad factors that meet standard criteria (e.g., Gorsuch, 1983) does not threaten the trait approach (e.g., any more than the finding of additional solar planets threatens our understanding of the solar system).

Similarly, we should not be too disturbed that specific theories of traits have experienced

vicissitudes. The pioneering psychobiological theories, in fact, transpired to show a spotty record of success in predicting psychophysiological and behavioural indices (Matthews & Gilliland, 1999). In response, researchers within this tradition have modified the theories (e.g., Corr, 2004; Pickering & Corr, Vol. 1), which still await large-scale testing. It is not surprising that building good, predictive theories is difficult; thus far, it does not appear that theory modifications are regressive.

Structure, process and causality

A more fundamental issue is how to progress from the structural descriptions of traits afforded by psychometric models to process-based models that specify causal agents. There is a danger that broad, process-based models of traits will degenerate into platitudes. Block (2001) criticizes theories that are expressed in terms solely of broad principles such as the interaction of trait and situational factors. Similarly, it is unclear what is the contribution of “systems theory” versions of interactionism that, in effect, state that everything interacts with everything else (cf. Cattell’s, 1980, VIDAS systems model). At the same time, there is a genuine theoretical challenge in that personality and environment do interact in complex, bidirectional fashion (e.g., Caspi & Bem, 1990). Traits affect the environment that surrounds a person, and that environment, in turn, feeds back to influence personality – think, for example, of an adolescent whose life goes off the rails after falling in with bad company.

As Matthews (Vol. 1) argues, a particular challenge is the multiplicity of processes that may mediate the influence of traits. The hope of the early psychobiologists that we could find a small number of key neurological factors from which everything else would flow has proved to be

forlorn (Matthews & Gilliland, 1999; Zuckerman, 2006). Traits are distributed across multiple processes; biological, cognitive and social. Suls (2001) aptly refers to the “neurotic cascade” in referring to the multiple paths that link neuroticism to stress vulnerability. Thus, different mediating processes will emerge from different empirical paradigms, but no single process can bear the weight of fully explaining trait action. At the same time, as the contributors to these volumes demonstrate, good progress is being made in isolating specific mediating paths.

What do we do with a half-full glass?

Another source of frustration is that the data do not always provide unequivocal answers to the big questions. A case in point is the cross-cultural generality of traits (see Chui et al., Vol. 1); we often find factor structures roughly corresponding to the FFM in non-Western cultures, but these are not always a perfect match (but see McCrae & Costa, Vol. 1). How concerned should we be? Is a rough correspondence sufficient to demonstrate some universality of personality traits?

There are no criteria for deciding how large a discrepancy is tolerable for upholding the universality principle. Similar issues arise in evaluating the mixed success of psychobiological theories, the modest effect sizes of traits as predictors of job performance, and discrepancies in self- and other-ratings of personality. The long-term answer is that we need more comprehensive theories that integrate trait and contextual effects on outcomes, but it may be hard to gauge the rate of progress towards this goal.

The unconscious

There is some force to the criticism that trait assessments may be biased through their typical basis in questionnaire measurement, and there is a worthy tradition within trait research of

measuring response styles and differentiating them from more substantive traits (e.g., Paulhus, 2002). There are longstanding traditions of using objective tests, originating in Cattell's original work (Schuerger, Vol. 2), and the classical clinical projective tests (Blais & Baity, Vol. 2). The issue has gained impetus from recent research on implicit traits (see Langens & Schmalt, Vol. 1). A variety of novel behavioural techniques for assessing stable traits have emerged, such as the increasingly popular Implicit Activation Test (IAT: Schnabel et al., Vol. 2) and structured nonverbal tests (Paunonen & Hong, Vol. 2). It is still too early to say whether this work will support over-arching structural models of "unconscious" personality of similar scope to standard personality models. The impact of Cattell and Warburton's (1967), and Cattell and Schuerger's (1978) initial work on objective tests was limited by the excessive time taken to carry out such testing (e.g., administration of the OAB takes more than five hours), and by the limited convergence with subjective questionnaire and rating scale indices of personality. However, the potential importance of implicit personality is also signaled by the growing interest within social psychology in unconscious priming effects (Bargh & Williams, 2006).

Few would wish to return to the dark ages of psychoanalysis or the notion that conscious experience of the self is simply the froth on the surface of the true, unconscious structure of personality. Nevertheless, recent work on implicit processes challenges researchers to explore both the measurement and influence on behaviour of unconscious traits.

Setting the boundaries

A final challenge is the demarcation of those issues that trait psychology is apt to explain, and those features of personality that lie outside its boundaries. For example, limitations of the trait

approach for understanding the individual person on an idiographic basis are generally accepted. Similarly, change in personality through the adult lifespan may be difficult to capture within the trait model to the extent that change depends on idiographic processes such as the long-term pursuit of “personal projects” (Little & Chambers, 2004).

Boundary issues are also relevant to an issue that Pervin (2002) flags as fundamental: what “units of personality” we should adopt. He contrasts motivational units (e.g., needs) and cognitive units (e.g., self-referent beliefs) as alternatives to traits as units. Pervin does not do sufficient justice to the extent that contemporary trait psychology is in fact concerned with relating motives and cognitions to traits, but the general point is valid. There may be some individual differences in motivation, such as traditional implicit achievement motivation, that should be separated from trait psychology (cf. Langens & Schmalt, Vol. 1). As noted earlier, the extent to which stable social cognitions may be accommodated within trait theory is also open to debate (Caprara & Cervone, 2000).

A recent article by McAdams and Pals (2006) makes some reasonable suggestions. As well as dispositional traits, they define two further levels of understanding of personality, they describe as *characteristic adaptations* and *integrative life narratives*, both of which are more strongly influenced by culture than are dispositional traits. Characteristic adaptations refer to contextualized goals, values, coping strategies, relational patterns etc. that fill in the details of individuality and describe everyday social functioning. Integrative life narratives refer to longer-term personal narratives and sources of identity that individuals construct to make sense of their place in the world and their contribution to it. The McAdams and Pals analysis is valuable in

providing a sense of what expressions of personality trait models are well- or poorly-equipped to explain. Although they do not make this point, we may also see characteristic adaptations as a half-way house between general trait dimensions and idiographic dispositions. There are successful research programs on “contextualized” traits such as test anxiety (Zeidner, 1998) and work self-efficacy (Judge et al., 2007) that may be assessed and investigated much as broader traits. As we narrow down the context, the trait becomes increasingly idiographic. Computer anxiety qualifies as a standard (contextualized trait); stress induced by a particular misbehaving machine is idiographic. In sum, it is unlikely that any single approach will attain hegemony over the entirety of personality research; instead, we may look forward to a multipolar research world, in which there is a place for those varying perspectives that meet acceptable scientific standards.

Structure of Volume 1

Explanatory Models for Personality

This first section of the book elaborates on the theoretical issues briefly introduced above, in reviewing and differentiating the key research strategies for investigating personality. How personality is studied depends on how it is conceptualized, and the chapters here serve to illustrate the range of explanatory models that may support a science of personality. Stelmack and Rammsayer review the biological bases of personality and individual differences, as revealed by over four decades of psychophysiological and neurochemical research. Their review focuses especially on the pivotal traits of extraversion, neuroticism and impulsive sensation-seeking, and identifies several robust associations between these traits and electrocortical and biochemical responses. It also highlights the methodological challenges of work on these issues and inconsistencies requiring further work to resolve. Biological perspectives may be contrasted

with the viewpoint from cognitive psychology. Matthews reviews studies that link traits to individual differences in information-processing, using performance data. It is argued that these studies identify multiple processes that underpin the major dimensions of personality. The empirical data may be understood within a multi-leveled cognitive science framework that refers both to the neurological underpinnings of cognition and to high-level strategies for goal attainment. Traits are distributed across many component processes but derive functional unity as adaptive constructs.

Yet another distinctive approach to understanding personality is provided by social-cognitive models, reviewed by Cervone. His review of the field includes an analysis of what such models should seek to explain, on the basis that mere prediction of behaviour is inadequate for understanding personality. Social-cognitive models are based on an intra-individual understanding of personality that finds coherence in the individual's construction of personal meaning. Cervone outlines the key contributions of Bandura and Mischel to personality theories built on social-cognitive principles. He also describes his KAPA (Knowledge Knowledge-and-Appraisal Personality Architecture) model that – recapitulating the traditional distinction between structure and process – aims to specify the knowledge structures and appraisal processes that support personality coherence.

Understanding personality development requires a multi-leveled understanding of the interplay between maturation of the brain, and cognitive and social development. Asendorpf's survey of the major developmental issues for personality psychology arrives at three major principles for understanding stability and change. First, personality retains plasticity throughout life; it never

becomes “set like plaster.” Indeed, in line with a social psychological concern with the individual, plasticity can be demonstrated in individuals using the Q-sort technique. Second, the stability of interindividual differences increases with age, because of several factors including genetic influence, dynamic person-environment interaction and the coherence conferred by stabilization of personal identity. Third, there is a synergy between person and environment in that the person’s most characteristic traits interact most strongly with situational influences. Somewhat similar themes of dynamic interaction arise in the Chiu et al. account of personality and culture. A traditional assumption is a duality between nature (biology) and culture; in fact, personality research reveals the intricate interactions and interdependency of nature and social ecology. The authors propose an integrated framework that describes how culture influences personality, and personality influences culture. For example, culture may affect the knowledge structures that support the self, but personality shapes the strategies the individual uses to adapt to the cultural milieu. People are not pawns of their cultural programming.

The next two chapters in this section elaborate on biological bases for personality. Johnson, Vernon and Mackie present a comprehensive review of the many behaviour-genetic studies that have investigated the contribution of genetic and environmental factors to both normal and abnormal personality traits. Beyond the familiar conclusion that both environmental and genetic factors are implicated, the authors identify some of the key methodological and theoretical issues in contemporary research. These include the role of the non-shared environment unique to each family member, correlations between genetic and environmental factors, and recent molecular genetic research which has attempted to identify specific polymorphisms that may influence personality development. Michalski and Shackelford set out the evolutionary psychology

perspective on personality. Initially, they make the strong, potentially controversial claim that the evolutionary sciences provide the only scientifically viable framework for understanding the historical origins of human personality. They illustrate the contribution of evolutionary psychology to several areas of personality psychology including personality consistency, individual differences in personality, sex differences and similarities, and contextual determinants of personality. It is necessary to understand both the many species-typical adaptations that characterize humans, and the place for individual differences in these mechanisms.

The final chapter, by Campbell, places modern explanatory models for personality in their historical context. Personality models have changed substantially from those proposed by the “classic” personality theorists of the last century, including Allport, Murray and Lewin. Campbell traces the cultural evolution of personality from these theories to modern times. The classic models provide a direct or indirect basis for much contemporary research and application. Furthermore, their empirical utility is under-utilized; in particular, Cattell’s multivariate approach has much to offer in predicting behavioural outcomes from personality data (Cattell & Nesselroade, 1988). The chapter summarizes what has been lost and what has been gained as theory has developed.

Comprehensive trait models

It follows naturally from the nomothetic trait approach that a comprehensive, universal description of the major personality dimensions may be determined. Indeed, like the periodic table of elements in chemistry, a comprehensive trait model may be a necessity for a true science

of personality (Cattell, 1973). The idea also gains plausibility from the thesis that dimensions correspond to brain systems that influence personality in all cultures. At the same time, there are some obvious difficulties in making progress. Historically, the key question of how many dimensions to list has tended to degenerate into technical arguments over alternative factor solutions; confirmatory methods are stronger in this respect, but they remain vulnerable to variation in the initial sampling of data. Research also tends to proliferate minor traits of questionable generality; what criteria indicate whether a trait is truly universal, as opposed to being linked to a specific context? Hierarchical models in which a multiplicity of primary traits are overlaid by a smaller number of broad universal factors provide one answer to this issue. The assumption of a strong isomorphism between brain systems and basic traits is also open to question (Zuckerman, 1991). If traits are admitted to be indirectly rather than directly linked to the brain, the dimensionality of personality may in fact become rather more contingent, and the assumption of universality is thus undermined. A final difficulty is that progress has been slow. Although there may seem to be a partial consensus over the Five Factor Model, points of serious contention remain, as explored by contributors to this and other sections of Vol. 1. Furthermore, there appears to be little progress towards any comprehensive description of primary traits.

The contributors to this section review the major comprehensive trait models that have shaped personality research. Hans Eysenck's model of individual differences, reviewed by O'Connor, is the most parsimonious of the major theories, in reducing personality to major dimensions of extraversion, neuroticism and psychoticism. O'Connor outlines the conceptual and methodological principles of Eysenck's individual difference paradigm, which has a good claim to have introduced a Kuhnian revolution into personality research. O'Connor also addresses the

translation of psychobiological theory into applied fields, illustrated by diverse examples related to education, drug addiction and psychotherapy. Eysenck's theory will always be paired with its major competitor, the Reinforcement Sensitivity Theory (RST) developed by Jeffrey Gray, which is outlined by Pickering and Corr. RST shares many of the basic assumptions of Eysenck's theory but differs most sharply in attributing the major traits to motivational rather than generalized arousal systems. As Pickering and Corr discuss, personality reflects individual differences in processing reward and punishment stimuli. RST has evolved over time to meet the inevitable conceptual and empirical challenges that arise in a vigorous research program. The chapter reviews these challenges, and the modifications to theory they have inspired, in order to set the course for future research. They point out that it is especially important to bring the neuroscience and personality wings of the theory into better alignment by capitalizing on methodological advances in biological psychology.

Raymond Cattell's work (see Boyle, 2006) was unparalleled in its dedication to developing a truly comprehensive model for individual differences, taking in not just orthodox personality dimensions, but also ability, abnormal personality, normal and abnormal moods and dynamic motivational traits. Boyle's chapter points out that the complexity and statistical sophistication of Cattell's program may have impeded its general acceptance. He describes a programmatic series of psychometric studies directed towards uncovering higher-order factor structures that serve to simplify the Cattellian model, reducing 92 constructs to 30 broad factors that may jointly provide comprehensive coverage of six major domains of differential psychology. Boyle also emphasizes the importance of developing objective, interactive tests that counter the over-reliance of the field on subjective, self-report methodology.

The last two chapters in this section address the currently popular Five Factor Model (FFM). McCrae and Costa set out a case for the FFM that emphasizes its heritability, temporal stability and generalization across gender and cultures. Key issues here include the validity of alternate dimensional models, the optimal choice of lower-level personality facets and the taxing theoretical issue of how causation at the individual level can be understood by studying correlation at the group level. The last issue is central to social-cognitive critiques of trait theory (Cervone, Vol. 1), but McCrae and Costa counter that trait explanations provide abstract, high-level causal accounts that complement more fine-grained, mechanistic explanations for behaviour. Insightful critiques, including those of Cervone and Block reject at least some of the core assumptions of nomothetic trait psychology. However, the FFM is also open to criticisms from within trait psychology. Boyle provides a critique of this kind. One line of questioning is psychometric in nature; re-examination of the empirical data suggests that the five-factor solution may not be optimal, in view of the frequent application of less than adequate factor-analytic procedures (Boyle et al., 1995; Boyle & Saklofske, 2004).

Furthermore, although proponents of the FFM claim there is a convergence between normal and abnormal personality dimensions, the FFM may not in fact provide adequate coverage of several major abnormal traits, including those related to psychoticism. A final source of difficulty is that lack of underlying theory and a neglect of dynamic personality processes make the FFM less than ideal for predicting behaviour in applied fields including clinical and occupational psychology. Debate over the FFM is likely to continue; our hope is that the complementary chapters by McCrae and Costa and by Boyle will highlight the issues that are decisive for resolving its place as a comprehensive trait model.

Key traits: Psychobiology

The search for comprehensive trait models occupies the conceptual high ground of personality research. By contrast, much of the daily grind of working to understand in detail the origins and consequences of traits is based on single traits. The next two sections of this book are survey some of the key traits whose psychological significance is mapped by their relationships with other constructs. The painstaking exploration of these “nomological networks” is essential for theory-building in personality research. Indeed, given that single traits may be placed within more comprehensive trait models (see McCrae & Costa, Vol. 1), such work serves to deepen understanding of the higher-level superfactors also. We have, somewhat arbitrarily, divided key traits into those for which research is guided by psychobiological theory, and those understood within the cognitive frameworks of self-regulation and stress theories. This distinction is made for convenience. As discussed previously (see also Matthews, Vol. 1), traits are typically multi-layered entities with both biological and cognitive expressions, and theory must integrate both aspects. Complementary sections in Volume 2 of the Handbook set out to cover the assessment of biological and self-regulative traits.

Thus far, we have highlighted Eysenck’s arousal theory and Gray’s RST as the leading comprehensive personality theories based on psychobiology. This section covers research that focuses more narrowly on specific traits rooted in brain functioning. It has something of a psychopathological flavor, in that much of this work reflects concerns with abnormalities in brain functioning that may contribute to personality disorders. Indeed, it may be seen as an outgrowth of Eysenck’s and Gray’s interests in the clinical significance of traits.

Zuckerman's work on sensation-seeking may be seen as a paradigm for developing a theory of specific traits. It has generated a reliable and validated questionnaire, ample evidence for validity and a detailed model of the biological underpinnings of the trait. Furthermore, sensation-seeking may be located within the more comprehensive personality model developed by Zuckerman (2006; see also Zuckerman, Vol. 2). The chapter reviews both behavioural expressions of sensation-seeking across a wide range of risky behaviours, and also the biological bases for the trait. The psychobiological account is supported by evidence from behaviour and molecular genetics, along with extensive psychophysiological and biochemical evidence. By contrast with Eysenck and Gray, Zuckerman sees phenotypic traits as emerging from multiple physiological processes; there is no isomorphism between the trait and any single biological system.

Schizotypy refers to a dimension of abnormal personality characterized by subclinical levels of oddities of belief and behaviour that resemble psychosis. The review by Green et al. of the trait illustrates a variety of themes in contemporary abnormal personality studies. Schizotypy can be assessed as a continuous trait in the normal population, grading increasingly into clinical symptoms at the top end of the scale. Subdimensions of schizotypy may be distinguished both psychometrically and in relation to etiology. Following Raine (2006), Green et al. distinguish a "neuroschizotypy" that should be seen as a brain disorder from a "pseudoschizotypy" that may be more dependent upon psychosocial factors. In both cases, the interplay between genetic and environmental factors is likely to be critical. Rawlings' chapter addresses some related issues in the context of the broader trait of psychoticism (P), and its relationship with impulsivity. The psychometric identification of P was motivated by Eysenck's interest in the diathesis for clinical

psychosis. In fact, the evidenced reviewed suggests that the P scale is inadequate as a measure of the essential elements of classic psychotic disorder (to which schizotypy may be more relevant). P has greater validity as a measure of impulsive, antisocial forms of behaviour, and the chapter concludes with an account of the relationships between different forms of impulsivity and P.

Also discussed is evidence relating aggression and impulsivity to personality traits and related neurophysiological mechanisms (see Lijffijt et al., Vol. 1). Underlying biological causes for higher trait impulsivity and emotional arousal in aggression could be related to suboptimal processing of errors, reward, and punishment. Without checks and balances of either low neuroticism with high impulsivity, or low impulsivity with high neuroticism, it is less likely that stress can be countered effectively, thereby exacerbating pre-existing heightened levels of emotional arousal in aggressive individuals.

The final chapter in this section, Elliott and Thrash's account of approach and avoidance temperaments, bridges the somewhat artificial divide between psychobiological and self-regulative traits explicitly. Basic traits related to approach and avoidance motivations appear to have a biological basis conceptualized here in relation to Gray's RST (see Corr, Vol. 1). Neurobiological sensitivity to reward is controlled by Gray's Behaviour Activation System (BAS); punishment sensitivity relates to the behaviour inhibition system (BIS). Elliott and Thrash go on to discuss the measurement of approach and avoidance temperaments, and evidence that these personality factors influence self-regulative processes such as adoption of goals for mastery and performance.

Key traits: Self-Regulation and Stress

Self-regulative models of personality are built on the assumption that behaviour is controlled by a feedback loop that serves to reduce the discrepancy between ideal and desired behaviour, supported by various cognitive processes including goal setting, strategy choice and self-evaluation (Zeidner et al., 2000). Personality traits may relate both to the contents of stable self-knowledge that guides self-regulation, and to biases in specific information-processing components such as retrieval from memory and selective attention (Carver & Scheier, 1998; Matthews et al., 2000). Self-regulative models are thus compatible with notions of approach and avoidance motivation (Elliott & Thrash, Vol. 1), with the transactional theory of stress (Lazarus, 1999), and with social-cognitive perspectives (Cervone, Vol. 1), at least to the extent they lend themselves to nomothetic understanding of personality.

Contributions to this section illustrate the range and depth of personality theories of this kind. Several general issues are evident. First, there is a tension between general self-regulative trait models and contextualized models that differentiate multiple dimensions of self-regulation linked to specific situations or challenges. The former approach may add to understanding of general traits, for example, through exploring the role of low self-esteem in neuroticism. The second approach contributes to understanding what lies beyond standard traits; e.g., how research on evaluative anxieties complements general trait anxiety work (e.g., Endler & Kocovski, 2001). A second issue is whether research is directed towards the *content* of self-beliefs that guide self-regulation (e.g., self-concept, outcome expectancy) or towards specific self-regulative *processes* (e.g., self-directed attention, choice of coping strategy). Third, self-regulative models are intimately concerned with emotion and stress, and the interplay between negative affect and

styles of self-regulation (Carver & Scheier, 1998). Dysfunctional self-regulation may contribute to clinical disorder so that therapeutic interventions may be usefully directed towards harmful content and process factors (Wells & Matthews, 1994).

Trait anxiety may relate to individual differences in strategies for self-preservation in threatening environments. Zeidner's review of trait and test anxiety points out that in modern times, the most salient threats are often social-evaluative in nature. The chapter reviews assessment issues, biological and environmental influences on anxiety, and the behavioural expressions of anxiety revealed by performance studies. Evaluative anxieties may significantly interfere with personal goal attainment, causing test performance and job proficiency to fall short of actual competence. The chapter prefigures the applied issues that conclude Vol. 1 by reviewing how psychological research supports interventions for excessive evaluative anxiety. Naturally, an understanding of the self-concept is central to self-regulative models of personality. Research on self-concept may also serve to integrate personality trait models with social-cognitive theory. In reviewing the field, Marsh describes a unidimensional conception of self-concept that focuses on global self-esteem. However, research shows that specific domains of self-concept are more useful than a general domain construct for understanding the self. In line with social-cognitive concerns about the context for behaviour, Marsh advocates a multidimensional approach to self-concept. Measurement of self-concept across different domains appears to provide better predictive validity for educational criteria than general self-esteem or standard personality traits. Domain-specific self-concepts may be reciprocally linked to personality traits, through mutual causal effects.

Outcome expectancies also play a pivotal role in self-regulation. Optimists and pessimists appear to differ in these beliefs. Chang et al. define optimism and pessimism as generalized positive and negative outcome expectancies that directly or indirectly contribute to a variety of physical and psychological outcomes. They review several lines of research on these constructs, including alternate unidimensional and multidimensional measurement models, and the costs and benefits of the traits in dealing with stressful encounters. Optimism-pessimism research also adds to perspectives on cultural differences in personality (see Chiu et al., Vol. 1): the adaptive functions of optimism and pessimism may differ in Western and East Asian cultures.

Research on the contents of self-knowledge (e.g., self-concept) are complemented by studies of key self-referent processes that influence the availability and accessibility of self-knowledge. As Smári et al. discuss, an important family of constructs relates to self-consciousness. As traits, these constructs relate to the person's style of attention to internal states and/or social personae. The distinction between public and private self-consciousness has been especially influential, but other important dimensions also include rumination, mindfulness, self-monitoring and related traits. Smári et al. review the inter-relationships between different operationalizations of these traits. They suggest that advances in both psychometric and conceptual models are needed in order to resolve some theoretical ambiguities and empirical problems that have arisen from research on self-consciousness.

Process issues are also central to Parker and Wood's review of personality and coping. Growing out of earlier work on defense mechanisms, coping is now understood within an interactional model, such that due attention to both person and situation factors is essential. There is a

considerable degree of consistency in individual differences in coping, supporting a role for personality traits as drivers of coping style. However, although various robust associations between standard traits and basic dimensions of coping have been established, the field has been held back by neglect of the intra-individual variation in coping that demonstrates situational influences. A truly interactionist perspective requires a more detailed examination of the interplay between personality and situational factors in determining coping.

New trait and dynamic trait constructs

As Boyle (Vol. 1) notes, operationalization of personality as a relatively small number of traits measured by questionnaire may fail to illuminate important aspects of the personality sphere. At any given time, there are always some personality psychologists who seek to add to the number of recognized traits by developing and validating new measures. Sometimes these efforts succeed; at other times, new traits lack validity or prove to be no more than old traits repackaged. At the lower end of the radicalism scale are those investigators who accept the broad validity of a questionnaire-based approach but seek to modify or extend canonical models such as the FFM. The chapters of Zuckerman and Ashton and Lee in Volume 2 represent such an approach. Rather more radical are attempts to redefine the scope of the personality domain, by identifying new kinds of content for personality questionnaires, such as culturally-dependent belief structures. There may also be new traits to be found at the interface of personality and ability, such as metacognitions of task performance and “emotional intelligence.” In such cases, the researcher must define both the overlaps and the distinctive features of the new traits, in relation to personality and intelligence. Developing psychometrically adequate measurement models that meet this goal may prove challenging, as the example of emotional intelligence shows (see

Roberts & Schulze, Vol. 2).

The greatest challenge to existing trait models derives from the recent resurgence of interest in implicit traits (i.e., those evident through behavioural consistency rather than from conscious experience and self-report). Interest in the unconscious both looks back to psychoanalysis (see Campbell, Vol. 1) and looks sideways to modern experimental studies of implicit processes – although it is debatable whether the experimental findings support Freudian notions (Kihlstrom, 1999). Some researchers (e.g., Schmukle & Egloff, 2005) see explicit and implicit traits as representing largely different domains; we may have separate unconscious personalities that interact rather weakly with our explicit self-beliefs. On the other hand, psychobiological models imply – given that we are largely unaware of subcortical processes – that implicit neural processes provide the foundation for “explicit” traits such as E and N. Thus (as with self-regulative approaches), work on implicit traits has the potential both for deepening our understanding of existing constructs, and adding novel dimensions to the personality sphere. Contributors to this section address some of the key principles that guide conceptualization of new explicit and implicit traits. Work concerned more directly with measurement of specific traits is covered in Volume 2, including a section devoted to implicit, projective and objective measures of personality.

Langens and Schmalt review the state of the art in the implicit measurement of human motives. Their approach builds on the earlier contributions of Cattell, in distinguishing dynamic traits from conventional personality (see Boyle, Vol. 1), and McClelland’s use of the Thematic Apperception Test (TAT) in measurement of basic needs. Implicit measures such as the TAT

may provide a path towards motivational processes that instigate behaviour by means of unconscious affective processes, processes which are inaccessible to self-report. The authors' Multi-Motive Grid (MMG) affords valid assessment of achievement, power and affiliation motives. It also differentiates implicit approach and avoidance components of these motives (compare the explicit measurement model reviewed by Elliott and Thrash, Vol. 1). Integrating the concept of motivational traits into the larger field of personality may cast light on the hidden forces that shape behaviour.

One contribution to new traits at the interface of ability and personality is provided by Stankov and Kleitman's account of confidence and its realism. A person's confidence in their performance may be measured separately from performance itself, i.e., as an aspect of metacognition. The chapter shows that confidence can be assessed as a trait that is distinct – but meaningfully related to – cognate constructs including performance accuracy, standard personality traits and questionnaire assessments of metacognition. A separate issue is the realism of judgements and confidence; can we find individuals who are systematically over- and under-confident? Stankov and Kleitman identify some psychometric difficulties in the measurement of realism – but also some application towards understanding group differences.

There is increasing interest in traits relating to standards and attitudes that are at least somewhat detached from conventional personality traits (e.g., Saucier, 2000). Stankov and Lee identify three trait domains distinct from the personality traits that describe broadly the way we “think, feel or act”. These domains describe dealing with others (social attitudes), attaching meanings to long term goals (values), and considering societal milieu (social norms). The authors describe

empirical work supporting a factor model that may capture differences between a variety of different cultures. In addition to the domain-factors already described, a further conservatism factor also emerges in the data. The factor model also serves to illuminate cultural dimensions in cognitive, gender and ethnic differences.

The last chapter in this section (Austin et al.) provides a second contribution to new directions in understanding the ability-personality interface, focusing on the new and sometimes controversial construct of emotional intelligence (EI: see also Roberts & Schulze, Vol. 2). EI is broadly defined as a set of abilities for perceiving, understanding and managing emotions, but differing conceptualizations have emerged. “Trait EI” refers to the construct operationalized as an explicit aspect of personality that can be measured by questionnaire. Alternatively, EI may be treated as a true ability that requires implicit assessment using objective tests (see Salovey et al., Vol. 2). Austin et al. review contemporary research based on trait and ability models for EI and the relevance of the construct to health, educational and occupational psychology.

Applications

On the basis that “nothing is so practical as a good theory,” it is expected that an increasingly rigorous science of personality should support a range of real-world applications. Growing evidence for the “consequential validity” of personality traits (Ozer & Benet-Martinez, 2006) especially supports application. Indeed, there is a long tradition of using personality assessments as an aid to diagnosis and intervention in a variety of applied fields including organizational, clinical and educational psychology. The chapters in this section together provide a comprehensive survey of these principal applications of personality research: note that

educational issues are treated from an assessment perspective by Kamphaus (Vol. 2).

In clinical practice, the two major applications are in diagnosis and treatment. As Malik et al. point out, the diagnosis of psychopathology has long been defined in the United States by the *American Psychiatric Association's Diagnostic and Statistical Manual (DSM)*. Their chapter reviews the relationship between this standard framework for diagnosis and abnormal personality traits. They identify various weaknesses of the DSM as a means for understanding personality disorder; weaknesses that may be remedied by use of dimensional models of abnormality. Such models may better fit the data than the categorical approach of DSM, and provide better psychological understanding of disorder. Furthermore, dimensional models may provide with guidance as to the etiology and treatment of personality disorders, a topic further addressed by Groth-Marnat et al. These authors introduce the Systematic Treatment Selection (STS) model which aims to optimize the *fit* between the client's personality and various strategies of psychotherapy. They discuss the application of STS to conditions including depression, substance abuse and trauma, and look forward to realizing the benefits of the approach.

Health psychology is a newer field than clinical psychology, but, here too, interest in personality traits is growing. Traits are relevant both to the medical patient's awareness and regulation of illness (e.g., complaining behaviours), and to the physiological processes that may contribute to objective pathology (e.g., stress-linked changes in immune system function). Williams et al. provide a general survey of the role of personality in health psychology, behavioural medicine and psychosomatics. Personality may be linked to a variety of physical health outcomes, including longevity and vulnerability to specific illnesses such as cardiovascular disease and

cancer. The chapter reviews conceptual issues and methodological challenges, together with the main topics addressed by empirical studies. As Fernandez and Kerns discuss, medical illness is often accompanied by negative affect. Emotional disturbances may indeed become clinically significant. Their review of the field proposes that fear, sadness, and anger should be identified as correlated but functionally distinct aspects of negative affect. The chapter reviews the evidence on the medical significance of these components of emotion, including strategies for assessment and treatment.

Studies of substance abuse bring together practitioners of both clinical and health psychology. Two chapters here cover alcohol and nicotine abuse respectively. Given the damaging effects on health of these drugs, studies of personality may potentially make an important contribution to identifying and treating those individuals prone to substance abuse. Ibáñez et al. review the relationship between personality and individual differences in alcohol use and misuse. Traits including E, N and impulsivity/disinhibition are implicated in normal and pathological alcohol consumption. The authors caution that multiple mechanisms contribute to these behaviours, so that personality is only one piece in the complex puzzle of multiple biological, psychological and social variables. Their biopsychosocial model accommodates the role of personality traits by linking them to the biological trait models reviewed elsewhere in Vol. 1 (Pickering & Corr; Zuckerman). Byrne and Mazanov likewise emphasize the multiple determinants of smoking behaviour: socio-demographic, environmental, behavioural and personal. Personality is related to smoking in cross-sectional studies of adolescents, but it has proved challenging to establish causal effects in longitudinal studies. There is better evidence for a causal effect of stress; personality may contribute to the onset of smoking behaviour by enhancing vulnerability to

external stress or by undermining available coping strategies. The authors also indicate the need for better theories to guide the applied research in this area.

The chapter that concludes the section, Tett and Christiansen's review of personality assessment in organizations, covers one of the major applications of personality research. Their review of the literature on personality traits as predictors of job performance states that recent meta-analyses may underestimate the importance of traits by ignoring critical conditions favouring personality test use. They review essential methodological recommendations including the use of a formal job analysis to identify relevant personality factors, and generation of predictive directional hypotheses. Practical issues covered include the problem of faking, applicant reactions, alternative measurement strategies and legal issues. Tett and Christiansen also survey the importance of personality beyond the traditional concern of predicting performance. Personality information may be used not only in hiring, but for post-hire practices including worker motivation, team building, and promotion.

Concluding Remarks

The editors believe that the contributions to this handbook volume will speak for themselves in highlighting the strength, diversity and relevance to multiple fields of psychology of contemporary personality science. The integration of psychometrics and theory envisioned by Eysenck, Cattell and others provides a basis for exploring stable individual differences in a multitude of traits that permeate every area of life. The chapters illustrate also how the controversies that have historically divided personality researchers have in the end served to enhance the evidence for trait models. Moving on from debates over the stability, generality and heritability of traits has served to maintain the momentum of the field. The field is not free of

controversy (and nor should it be). The biological basis of personality is evident, but it has sometimes seemed difficult to translate the general principle into theories that are effective in predicting behavior. The challenge from social psychological perspectives remains. Social-cognitive theory has inspired important self-regulative accounts of traits, but the idiographic focus of much of this work remains problematic. The Freudian unconscious is an historical relic for most researchers, but important questions about the role of conscious and unconscious processes in personality are still to be resolved. Given that validity coefficients in relation to real-life criteria are widespread but often modest in magnitude, it is still unclear how applied psychologists can best make use of personality assessment. Perhaps the most compelling sign of the vitality of personality research is that its most pressing problems are those that are critical to psychology in general. We look forward to future personality research helping to resolve the tension between biological and social psychological models, the impact of unconscious processes on behavior, and the application of psychological theory to real-world issues.

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Stable quantitative dimensions	Reliability and validity	Traits may be assessed as numeric scales, evaluated against psychometric and external criteria
	Latent factor models	Multivariate methods indicate personality structure
	Abnormality	Pathology may correspond to the extremes of trait dimensions
Genetic basis	Behavior genetics	Genetic influences are necessary to model effects of kinship on personality similarity
	Molecular genetics	DNA is linked to phenotypic personality
	Psychophysiology	Neuroscience models of traits generate testable predictions
	Universality	Traits correspond to individual differences in brain functioning evident in all cultures
Generality of trait expression	Cross-situational consistency	Traits are expressed in multiple situations and contexts
	Laboratory studies	Traits are expressed in controlled environments and psychological tasks
	Consequential outcomes	Traits are expressed in real-life contexts including health, work and relationships
	Pathology	Abnormal traits are sufficiently far-reaching to increase vulnerability to clinical disorder
Interactionism	Situational moderation	Situational factors moderate trait expression
	Dynamics of development	Personality development depends on the interplay between temperament and environment

	Applications	Traits may be matched against jobs, therapies and teaching styles, for example, to achieve real-world benefits.
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