Preface

UNIFIED SCIENCE OF PSYCHOLOGY

Moral science is the basic human science, important for self, society, and their interactive relations. Discussions of morality have been unending but only in recent times have methods of science been brought to bear.

Moral cognition, its nature and its functions in person and society, has been the main concern of this book. The three laws of information integration have shown promise in the moral realm. Applications have been made to fairness/unfairness and equity (Chapter 2), blame (Chapter 3), legal issues (Chapter 4), and moral development (Chapter 5). Brief discussions of 28 issues in moral science are given in Chapter 7.

This work also showed that moral cognition is intimately related to traditional areas of psychology, including person science, social attitudes, learning, judgment-decision, and life-span development. Unification of these areas with one another and with moral science can help liberate them from their narrow historical origins to become collaborators on basic problems of self and society. This unification is the main concern of this chapter.

Chapter 8

UNIFIED SCIENCE OF PSYCHOLOGY

Moral science has two basic goals: one goal is theoretical—understanding moral thought and action of individuals and societies; the other goal is practical—improving present moral levels. To achieve these two goals requires unification of moral science with other fields of psychology: person science, learning/memory, and judgment–decision. Moral science provides substantive base for unification.

COGNITIVE THEORY OF INFORMATION INTEGRATION

Two axioms are basic in psychological science. The *Axiom of Purposiveness* recognizes that thought and action are directed toward goals—and hence that each stimulus informer must be valuated to construct its functional value relative to whatever particular goal is operative. The *Axiom of Integration* recognizes that multiple values must generally be integrated to determine thought and action.

This functional framework is shown in the Integration Diagram, Figure 8.1 on the next page. Purposiveness, represented by the threefold GOAL in the Integration Diagram, has a fundamental function in Valuation, namely, construction of goal-relevant values of stimulus informers. Goal-relevance implies that values are not constants, as implicitly assumed in much research and theory. Quite the contrary; the same stimulus may have different values relative to different goals.

The progressive fragmentation of psychology, of which many have complained, is due in good part to lack of capability with integration of multiple variables. Hope for reversing this fragmentation into unification is reviewed in this chapter.

The Integration Diagram is grounded on the Axiom of Integration—thought and action depend on integration of multiple determinants. This axiom is universally recognized but analysis has been handicapped by lack of methods for true psychological measurement. To illustrate, consider the blame law from Chapter 3:
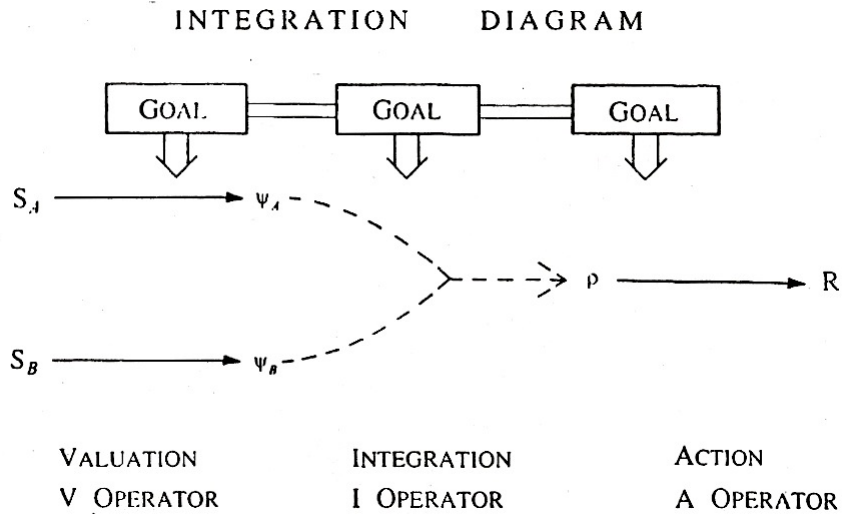
INTEGRATION   DIAGRAM

Figure 8.1. Information integration diagram. Chain of three operators, $\mathbf{V - I - A}$, leads from observable stimulus field, $\{S\}$, to observable response, R.
Valuation operator, $\mathbf{V}$, transmutes stimuli, S, into subjective representations, ψ.
Integration operator, $\mathbf{I}$, transforms subjective field, $\{\psi\}$, into internal response, ρ.
Action operator, $\mathbf{A}$, transforms internal response, ρ, into observable response, R.
(After N. H. Anderson, *Foundations of Information Integration Theory*, 1981a.)

Blame = Responsibility + Consequences.

All three terms in this equation represent personal values of the blamer. In terms of the Integration Diagram, therefore, this blame law should be written.

$$\rho_{Blame} \; = \; \psi_{Responsibility} + \psi_{Consequences}.$$

To establish this blame law thus depended on capability to measure the blamer's personal values for all three terms (see *The Dual Worlds: Internal and External,* Chapter 7).

Two universal measurement obstacles are shown in this blame law. *Response*: the observable response, R, is a stand-in for the subjective response, ρ. *Stimulus*: what is integrated is not a physical stimulus, S, but its subjective value ψ—as constructed for the operative goal.

This twofold measurement obstacle might seem impassible; neither ψ nor ρ is observable. This obstacle can be overcome: the parallelism theorem for adding-type models in Chapter 1 shows how this is possible in principle. The empirical virtue of the three laws of information integration makes this possible in practice, indeed simple.

UNIFIED MORAL SCIENCE

Moral science may be unified around the basic theme of information integration, schematized in the Integration Diagram on the previous page. Moral thought and action typically result from integrated operation of two or more stimulus informers. This problem of integrating multiple informers is well recognized, but previous attempts to develop theories of integration made little progress.

New vistas opened with the three laws of information integration, especially adding-type laws analyzable with the parallelism theorem. These laws resolved the problem of true psychological measurement, which had roadblocked previous work. These laws confer analytic power in simple ways across multiple moral domains.

Fairness is a common principle in social life, but assessing the integration models proposed by Aristotle and modern writers was not possible without true psychological measurement. Application of functional measurement showed that most people followed a different model for integration, namely, the decision averaging model. This work also opened new ground with an algebraic model for *un*fairness, an ubiquitous moral motivation, largely neglected in equity theory (Chapter 2).

Blame and *criticism* are ubiquitous at every social level, from family to national politics. The basic blame law, Blame = Responsibility + Consequences, has shown substantial generality. This blame law has been extended to include healing processes of apology and recompense (Chapters 3 and 5) and forgiveness (Chapter 7).

Legal judgment involves numerous issues of information integration, a few of which are discussed in Chapter 4. Legal psychology has twofold potential—for decreasing injustice and for increasing justice. Legal psychology can help develop a better society.

Moral development has been much studied but progress was led astray by stage-type theories. Very different conclusions were reached in the initial applications of IIT. Moreover, young children showed far higher cognitive capabilities than previously allowed (Chapter 5).

Moral science involves much that is not specifically moral. Person cognition, for example, involves nonmoral and moral variables that may be jointly operative. The same is true of social attitudes. Learning, memory, and judgment–decision are also central in moral theory. The present fragmentation within and mutual neglect between these areas can be replaced by mutual interaction.

PERSON SCIENCE

Person science, grounded on the Axiom of Purposiveness, should be the primary concern of psychology. People are fundamentally goal-oriented, as many writers have observed, continually seeking goals, whether by approach or by avoidance (Anderson, 2008, pp. 323ff).

Purposiveness functions at all three stages of the Integration Diagram of Figure 8.1. The valuation stage has special importance for construction of goal-relevant values from informer stimuli. Measurement of these values is central for understanding cognition. True measurement is possible by virtue of the algebraic laws of information integration. These laws provide an effective base for person science.

Person science can unify separate areas of psychology that now go disparate ways. Proposals for unification have been presented by various writers but with little effect (e.g., Note 2, p. 421, Anderson, 2008). A functional approach, based on the laws of information integration, has unifying power because these laws have been found in most areas of human psychology (*Person Science and Personality*, Chapter 7).

Attitudes are fundamental in personality. Strong attitudes are most important, of course, but strong attitudes have been neglected owing to historical emphasis on changing attitudes. An analytic base is available with functional measurement of the goal-directed valuation function of strong attitudes. Attitudes provide a substantive base for unified theory because of their importance in all aspects of life and because of their interrelations with most areas of human psychology.

Learning and memory make us the persons we are. Functional theory of learning and memory focuses on their use in everyday thought and action. Functional theory thus led to a nontraditional conception of learning/memory, illustrated by the dissociation of Figure 8.2 below. Study of moral learning can liberate the learning/memory field from its historical narrowness to flourish with basic issues of person science.

The *judgment–decision* field has pervasive concern with integration models (Anderson, 1996a, Chapter 10). Study of these integration models of judgment-decision has been stunted, however, lacking psychological theory of measurement. The common reliance on objective or makeshift measures misrepresents cognitive processing. True subjective measurement goes hand in hand with the three laws of information integration. These laws have done well with several issues of judgment–decision, illustrated in the moral field in Chapters 2-5.

FUNCTIONAL THEORY OF ATTITUDES

The functions that attitudes perform in everyday life should be a primary concern of attitude theory. Functional views of attitudes go back a half-century and their good sense is generally recognized. They lacked analytical power, however, and made little progress beyond the original typologies of Smith, Bruner, and White (1956) and Katz (1960).

FUNCTIONAL ATTITUDE THEORY

Valuation of stimulus informers is a primary function of attitudes. This functional nature of attitudes is clear in the Axiom of Purposiveness, represented by GOAL in the Integration Diagram of Figure 8.1. Valuation is goal-directed—functional. Goal-directed valuation includes the object-appraisal function of Smith, et al., for example, and the utilitarian function of Katz.

Attitudes and "Nonattitudes." Attitude *change* and *persuasion* have been dominating concerns in the attitude field. These concerns originated in historical focus on changing social prejudice (Allport, 1935; Thurstone & Chave, 1929), which remains a basic social problem, especially in the moral realm. But attitudes about many social issues, women's roles, for example, are strong and resist change. To get results, the field insensibly gravitated to issues on which people held weak opinions easily changed, sometimes called "nonattitudes" (Converse, 1970; Eagly & Chaiken, 1993, pp. 152, 219; Anderson, 2008, pp. 100, 112).

Functional theory entails a conceptual shift to study strong attitudes. Strong attitude knowledge systems (AKSs) underlie valuation in the Integration Diagram which constructs goal-directed values. Measurement of these values can help study function and structure of AKSs. This becomes simple in some useful cases with theory of functional measurement (see index entries for AKS in Anderson, 2008).

Constructionist Theory. Attitude theory must be constructionist, as the Integration Diagram shows. The *valuation* operation in the Integration Diagram constructs goal-relevant meanings of stimulus informers. The *integration* operation constructs a unified response from multiple informer meanings. And the *action* operation constructs an overt response. All three modes of construction can be quantified with laws of information integration (benefits 3, 1, and 2 of the parallelism theorem, see Chapter 1).

IMPLICATIONS OF FUNCTIONAL ATTITUDE THEORY

The discovery that many attitudinal judgments follow the averaging law opened a road to an effective functional theory of attitudes. Strong social attitudes can thus be studied in terms of their main function—constructing goal-oriented values of stimulus informers. Psychological laws of information integration are a foundation for functional theory of attitudes as knowledge systems.

The efficacy of this approach was illustrated with moral attitudes in Chapters 2-5. Four general comments are added here.

"Nontraditional" Definition of Attitude. Attitudes are considered functional knowledge systems (AKSs) in IIT. In sharp contrast, most other approaches continue the classical definition of attitude as a one-dimensional evaluative response on a good-bad dimension. (A sample of such one-dimensional definitions, quoted from eminent authorities, is given in Anderson, 2008, Note 2, p. 109.) These are only attitudinal responses (ARs) in IIT—situation-specific, goal–context-oriented manifestations of underlying AKSs (Notes 1, 2).

Treatment of attitudes as functional knowledge systems embodies a "nontraditional" conception of attitudes (Tesser, 1978, p. 297; see Anderson 2008, p. 151). Attitudes are not enduring one-dimensional propensities, as in the traditional view; instead, attitudes are AKSs that function in construction of goal-oriented attitudinal responses, ARs.

> In a very real sense, therefore, people do not know their own minds. Instead, they are continually making them up. (Anderson, 1974b, p. 89; 1981a, pp. 93f.)

Single Person Theory. Single person design and theory are desirable in attitude research. One reason is that cognition is personal; it occurs separately within each of us. A related reason is that attitudes often differ widely across persons. Traditional attitude theory was hobbled because it relied on group design and shunned single person design, a consequence of historical fixation on persuasion and changing attitudes. Traditional attitude experiments treat real individual differences as error variance.

Functional theory, in contrast, puts major emphasis on studying attitude function in everyday life. For this purpose, it is usually desirable to test each participant under multiple conditions, as in standard integration designs. Batteries of stimulus materials have been developed for this purpose, including the list of 555 personality trait adjectives (see e.g., Figure 8.2) and the 220 president paragraphs (e.g., Figure 6.1) cited in *Batteries of Stimulus Materials* in Chapter 6.

Basal–Surface Structure. Attitudinal judgments have two components: an enduring *basal component* and a labile *surface component* (see discussions of Figures 4.3 and 8.3). Published experiments that have not separated out these two components may be hard to interpret. Their attitude change may be largely surface component that evaporates as their participants depart the experimental room.

Experimental procedures to eliminate surface component before measurement may possibly be as simple as ending with a neutral informer or irrelevant task. On this vital issue, almost nothing is known. Adding-type laws have been extended to quantify basal–surface structure as illustrated in Figure 8.3. However, experimental elimination of surface component would seem often preferable.

Measurement of Attitudes. One-dimensional measures of attitude are widely used and widely useful. It is important, however, to distinguish between such attitudinal response and the underlying AKS that generated that AR.

Other approaches typically treat attitudes as enduring, one-dimensional properties of persons (Anderson, 2008, p. 109, Note 2). These approaches are one reason for simplistic definitions of attitudes, even by some who recognize that attitudes are not one-dimensional. This conception begins by misunderstanding attitudes, which are *knowledge systems*, more complex than an evaluative response on a good-bad dimension. This simplistic conception has impoverished the attitude field (see *Nonarbitrary Metrics With Functional Measurement*, Chapter 6).

A partial remedy is to recognize that an attitude may have multiple qualities (see *Response Quality* in Chapter 6). Multi-quality analysis is an open field for attitude theory.

A second conceptual problem is whether observed ARs are true measures of underlying feeling, that is, whether AR = ρ in the Integration Diagram. Typical studies rely on ratings but common rating methods suffer well-known biases as Thurstone showed. These biases, fortunately, can be eliminated with the method of functional rating (Chapter 6).

Choice methods, including Thurstone's paired comparisons, cannot measure attitudes (see *Thurstonian Theory*, Section 5.3, Anderson, 1981; *Measurement Theory*, Chapter 6, Appendix). The method of functional rating, in contrast, has been successful across diverse areas of person science, including attitudes (Anderson, 1974b, 1981a, 1996a, 2004, 2008; see Chapters 1-5 in this book). Functional measurement theory provides a base for developing functional theory of attitudes.

PERSON VERSUS PERSUASION

Functional attitude theory is *person-centered*. This contrasts with the traditional *persuasion-centered* framework which goes with the focus on attitude change noted above. As Kruglanski, Thompson, and Spiegel (1999, p. 83) say, "From a social psychological standpoint, the 20th century may well be dubbed the age of persuasion." This persuasion-centered framework is widely accepted (Anderson, 2008, p. 109). Person and persuasion lead to very different conceptions of attitude.

The most obvious person–persuasion difference appears in the valuation operation of the Integration Diagram. Valuation of stimulus informers is a primary function of attitudes. This valuation function is neglected, even denied, in typical persuasion-centered theories.

Functional theory—what functions attitudes perform for a person—had made little progress beyond the typologies of the functional theories of the 1950s. The psychological laws allow systematic progress on functional analysis (see Anderson, 1974b, 2008, Chapters 4-6).

This person–persuasion difference is reflected in experimental design. Most attitude research uses between person design, a consequence of the emphasis on persuasion and changing social attitudes. The functional approach of IIT, in contrast, emphasizes within person design, a consequence of the emphasis on cognition. The large individual differences in attitudes are error noise in between person design; they are real phenomena in within person design (Anderson, 2001, 2002; see *Cluster Analysis* and *Batteries of Stimulus Materials*, Chapter 6).

Person-centered theory seeks new approaches to person science—away from group-derived typologies of traditional personality traits to embrace the individual. This idea goes back to Allport (e.g., 1968) and the single person studies of attitudes by Smith, Bruner, and White (1956), to which IIT contributes a base of psychological law.

UNIFIED THEORY

The attitude field and the rest of psychology should be unified. Because of their precision and generality, the three laws of information integration can contribute to unification.

Personality. Attitudes are basic components of personality. The traditional one-dimensional conception of attitudes noted above is paralleled by simplistic trait conceptions of personality (see *Person Science and Personality* in Chapter 7). Both fields will benefit from unification.

Judgment–Decision. Attitude function is intimately involved with judgment–decision. Integration of values is a central concern of judgment; construction of values is a primary function of attitudes.

This unity was recognized in the attitude integration theories discussed in Chapter 7, but nearly all were roadblocked by lack of true measurement theory. Judgment–decision theory has been similarly obstructed, as shown by its focus on normative models (see *Functional Theory of Judgment–Decision* below). Unification of these areas is possible with the psychological laws of information integration.

Learning. Attitudes are learned knowledge systems—AKSs. Study of attitude learning can help liberate the learning field from its narrow, constrictive heritage of reproductive verbal memory (Figure 8.2). At the same time, attitude learning can help develop a functional framework in the attitude field, especially learning and functioning of moral attitudes.

Development. Attitudes about right and wrong begin early in childhood and are greatly expanded to take account of context variables in later life. One approach to attitude development was assiduously pursued with Kohlberg's moral stages, but this suffered major shortcomings. One shortcoming was inability to study development in the 4–12 year age range, a basic period for development of attitudes and knowledge systems about right and wrong (see *Moral Stage Theories* in Chapter 5).

Integration experiments have found that children as young as 4 years of age follow simple algebraic laws for judgments of fairness/unfairness and blame (Chapter 5). These same integration laws are found at older ages and in different cultures. These laws offer an analytic base to study development and function of attitudes throughout the life span.

Attitude Knowledge System: AKS. Functional theory conceptualizes attitudes as *knowledge systems*. These systems can take account of contextual specifics that operate in constructing ARs. ("Oh, what a tangled web we weave—when *first* we practice to deceive.") In general, an AR about degree and extent of some onerous obligation may depend on many specifics (see *Analytic Context Theory* and *Conflict and Compromise* in Chapter 7).

Structure of AKSs is a fundamental problem. One social–moral aspect of this structure problem concerns understanding of civil and legal regulatory systems. This focus can usefully operate in our schools, as in courses on history and citizenship. Social–moral AKSs of everyday life have central importance for attitude theory. By focusing on AKS function and structure, the attitude field can contribute to social betterment.

MORAL ATTITUDES

Moral attitudes are a well-spring of thought and action. Moral attitudes underlie our feelings and judgments about fairness/unfairness (Chapter 2), responsibility and blame (Chapter 3), and social–legal issues (Chapter 4). Development of moral attitudes (Chapter 5) has twofold importance: for understanding function and structure of attitudes and for improving moral levels of society.

FUNCTIONAL THEORY

Moral attitudes are considered *moral knowledge systems* that function in constructing moral thought and action. Their main function lies in valuation of stimulus informers in relation to operative goals.

Social psychology and moral cognition have much to offer each other. The mountains of work in social psychology cover many issues important in moral thought and action. Besides attitudes, these include roles, self-concepts, social attribution, and group dynamics. Although moral applications have been neglected, much of this work is relevant thereto. Such work can contribute much to moral science.

Moral cognition can in turn be a fertile field for most areas of social–personality, including those cited in the previous paragraph. Many attitudes have substantial moral components. Moral attitudes are often strong and lead naturally to functional theory. Moral attitudes can help liberate the attitude field from preoccupation with "nonattitudes" to study how real attitudes function in real life.

Such liberation was seen in empirical studies of previous chapters. These experiments did not center on changing moral attitudes.   Instead, they studied how these attitudes function in moral judgment.

GENERALITY

Generality of moral attitudes is a notable advantage for the attitude field. Current research rests heavily on convenience issues specific to each investigator with little generality and often with little social relevance. Moral attitudes, in contrast, have universal relevance in every culture.

The algebra of moral attitudes is *idiographic* and *nomothetic*. This algebra can deal with personal differences, often large, in moral values. And it promises nomothetic generality across issue, context, and culture.

FUNCTIONAL THEORY OF MEMORY

How does memory function in everyday life? A main function of memory follows the Axiom of Purposiveness: goal-oriented selection and valuation of stimulus information. This function underlies virtually all thought and action. Judgment of blame or deserving, for example, may require valuation of responsibility, both social and causal, in which memory knowledge systems function in selection and valuation of stimulus informers. Similar function appears generally in thought and action.

The need for a functional approach to memory arose in a study of attitudes toward persons. At that time, it was an "article of faith" that attitude at any later time would rest on what was remembered of the original stimulus materials. This faith underlay the attempt of the Yale group led by Carl Hovland to ground attitude theory on the mass of results about verbal memory.

This faith in verbal memory ran aground in Anderson and Hubert (1963) who used the personality adjective task to study both the judgment of the person described by trait adjectives and the recall of the adjectives themselves. The two should covary according to the "article of faith" that judgment depends on recall. Instead, a *dissociation* was found: *what was best remembered had least effect on attitude*.

Striking confirmation of this dissociation was obtained in subsequent work that used functional measurement to assess the contribution of the adjective at each trial to the judgment made after all the adjectives had been presented. The *attitude judgment curve* in Figure 8.2 showed near-linear primacy; the *recall curve* showed uniform recency (next page). This dissociation of judgment and verbal memory has been amply confirmed (Note 3).

Once recognized, this dissociation makes good sense. The primary task was to judge likableness of the person described by the list of adjectives. As each adjective is given, it may be valuated on likableness and this value integrated into the cumulating person cognition. This done, the adjective itself need not be retained in memory.

This dissociation showed that functional memory differs conceptually from traditional verbal memory, which is dominated by concern with *accuracy*: how accurately the learner's response mirrors given stimulus materials. This accuracy misfocus appears in the universal measures of *recall* and *recognition* which conceptualize memory as *remembering*.
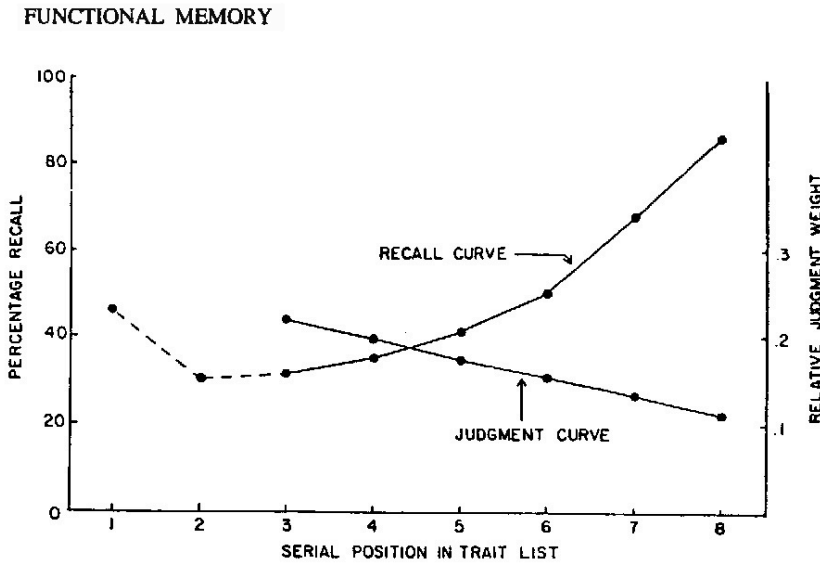
FUNCTIONAL MEMORY

Figure 8.2. Functional memory differs conceptually and empirically from traditional verbal memory. *Recall curve* for adjectives in person description shows strong recency over last six serial positions, a standard result. *Judgment curve* for effect of these same adjectives in person cognition shows uniform primacy, with lesser effects at later serial positions. This contrast implies basic differences between person memory and verbal memory. (Recall curve from Anderson and Hubert, 1963; judgment curve slightly idealized from Anderson, 1965b, 1973c).

Memory function has central importance in goal-oriented thought and action. Knowledge systems are the main form of memory. Knowledge systems function in valuation of stimulus informers relative to operative goals, as with attitudes about U.S. presidents (Figure 6.1).

Constructionist views of memory have been pursued since Bartlett's (1932) "remembering . . . is an imaginative reconstruction," but had focused on *accuracy* of *remembering* given stimulus materials (Anderson, 1989a, 2008, p. 279). Theory and research on memory have been trapped in focus on accuracy, neglecting the main function of memory in living (Anderson, 1996a, Chapters 11 and 12).

In sharp contrast, the functional conception of memory illustrated in this experiment on person cognition has fundamental differences. The main function of memory is not the given stimulus materials but goal-oriented construction therefrom—construction that may be entirely different for different goals. And for different persons. Such goal-oriented function should become a primary concern of memory theory.

FUNCTIONAL THEORY OF LEARNING

Learning is information integration. Learning has two main aspects. One has been much studied, namely, integration of the same stimulus information repeated over a succession of "trials." Less studied, although more important, is function of past learning in valuation and integration of stimulus informers to attain present goals.

The dissociation of Figure 8.2 above illustrates a basic property of functional learning. "Correct response" and "reinforcement," the backbone of traditional learning, often lack relevance or meaning in everyday life, as with social and moral learning. The psychological laws of information integration make this functional approach effective.

AVERAGING LAW OF LEARNING

Learning is a process of information integration. This process often obeys an averaging law, as in Equation 1 of Chapter 4:

$$\rho_n = \omega_n \, \psi_n + (1 - \omega_n) \, \rho_{n-1}.$$

The response ρ_n on trial n is an average of the value ψ_n of the informer stimulus on that trial and the response ρ_{n-1} from the previous trial, with respective weights of ω_n and $(1 - \omega_n)$. This learning law embodies a functional, goal-directed conception of learning.

This functional focus may be illustrated with the bigamy trial of Thomas Hoag, summarized in the learning curves of Figure 4.3. Verbal memory for the quoted testimony of Catherine Conklin, Hoag's bigamous wife, has minor relevance; of importance is the value of this testimony relative to guilt of the prisoner at the bar. The main functions of learning lie in constructing this short-term value and then of integrating this value into the longer-term, cumulating attitudinal knowledge system. The learning curves of Figure 4.3 represent such functional learning.

ACROSS-TRIAL LEARNING

Much learning takes place over a succession of experiences, formalized in the trial-by-trial learning curves of traditional learning theories. New methods to analyze such trial-wise learning processes were provided by the theory of information integration.
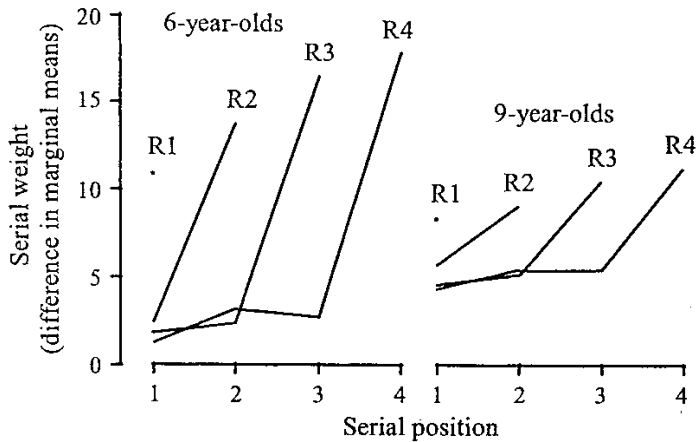
Figure 8.3. Basal–surface structure revealed in serial weight curves. Each point on R4 curves represents relative effect of each serial position on the response at trial 4. (After Schlottmann, 2001; Schlottmann & Anderson, 2007.)

Integration learning design is a useful method. In one simple form, some trials are treated as a factor with two levels, high and low. The response on any later trial can then be dis-integrated to measure the contributions from such prior trials. One result was shown in the contrast between the recall and judgment curves of Figure 8.2—what was best remembered had least effect on the final response.

Analytic potential of this integration-theoretical analysis may be seen in Schlottmann's (2001) experiment, in which children judged amount of treasure hidden under streets of a city. Each trial presented one street, which revealed precious gold or worthless rock, the two levels of each trial in her serial-factor design. Judgments of amount of treasure in the city were made on a graphic rating scale on each trial.

The two curves labeled R4 in Figure 8.3 show relative effect of each of the four trials on the final judgment. Each data point on the R4 curve represents the difference between effects of gold and rock at each trial on the final response. The first three trials have roughly equal effect whereas the last trial has much larger effect, especially for 6–year-olds. Similar pattern appears with the R3 curves.

This pattern in these curves represents *basal–surface structure*. The near-total disappearance of each sharp upswing on the next trial shows that it represents surface learning. The near-equality of effects of preceding trials represents enduring basal component, nearly equal across trials. Note that 9–year-olds learn more basal and less surface on each trial than

6–year-olds. This represents a novel developmental trend that deserves systematic study (Note 4).

The basal–surface pattern of Figure 8.3 is not peculiar to simple stimuli judged by children. Similar patterns were obtained with adults' attitudes about U. S. presidents based on biographical paragraphs (Anderson & Farkas, 1973; see Figure 2.ll, p. 152 in Anderson, 1981a).

CONDITIONING THEORY

Traditional S–R conditioning theory has limited relevance to information learning. In classical conditioning, what is learned is prescribed: the unconditioned response or some closely related response, as with Pavlov's bell-shock leg flexion in dogs. In instrumental conditioning, what is learned is a response emitted by the organism that has satisfying consequences. Examples include the exit latch on Thorndike's puzzle boxes and the bar or key in a Skinner box. Both have some importance in human life. This work, however, is grounded on observables in the external world (see *The Dual Worlds: Internal and External,* Chapter 7). The concept of *reinforcer* needs replacement by the concept of *informer* (see *The Matching Law*, Chapter 6).

Human learning needs a broader conceptual base—in the internal world. The present functional approach to learning/memory is effective by virtue of functional measurement based on the psychological laws of information integration. These laws of the internal world can help liberate learning theory from bondage to the external world.

ASSOCIATIVE NETWORKS

Associative networks are a basic form of knowledge. Moral attitudes about obligation and deserving, for example, are considered associative knowledge systems. Network representation is also needed for valuation processes that can take account of multiplicity of goals, multiplicity of context variables, and multiplicity of past experience.

Attitudes provide a fertile domain for studying associative networks. Goal-oriented valuation of a stimulus informer depends on associative networks. What is learned becomes part of an AKS, also an associative network.

Functional theory requires extensions of connectionist theories. The narrow constraint of correct response must be given up. This was discussed with the Hoag bigamy trial (Chapter 4) in which the value of the testimony of each witness was an idiographic construction of each indi-

vidual juror. Instead of correct response, constraints of goal-directed valuation must be incorporated.

The integration laws of IIT can dis-integrate a response to obtain functional measures of each operative variable. These capabilities with metric response as true psychological measurement could be useful with connectionist theory. Cognitive Unitization (benefit 5 of the parallelism theorem) allows complex informers to be treated as units whose net effect can be exactly measured. This functional measurement can help with deeper analysis of networks (*Analytic Context Theory,* Chapter 7).

WITHIN-TRIAL INTEGRATION

Traditional across-trial integration, exemplified in the foregoing learning equation, needs extension to include within-trial integration. Conjoint within-trial/across-trial integration is common in everyday life. Examples appeared in the Hoag bigamy trial of Figure 4.3 and the presidents experiment of Figure 6.1. In both cases, each trial presented a paragraph that needed to be integrated to construct its value relative to the assigned goal. This value would then be integrated with the cumulative value from previous trials, ready to serve similar function on any future trial.

Information learning theory has two ways to study within-trial learning. One way is to construct each trial from an integration design, either across-trial as in Figure 8.3, or within-trial which has not yet been done. The other way is to apply the principle of Cognitive Unitization, treating each trial as a unit, as with the paragraphs of the cited jury trial and presidents experiments (Figures 4.3 and 6.1).

Traditional learning theory has narrow relevance to psychological science. Major focus should be on adaptive transfer.

ADAPTIVE TRANSFER

Adaptive transfer is the fundamental issue in education. How much of your school learning will be pertinent in later life? This transfer question once had a simple answer—teach logic and Latin; these formal disciplines instill thought processes with universal efficacy.

But when Thorndike put this dogma to experimental test around 1900, he found learning to be task-specific, a conclusion well supported over the following century. Several hypotheses about transfer have been suggested (Haskell, 2001), but experimental evidence remains distressingly meager despite its paramount importance in education.

Thorndike deserves high tribute for his condemnation of then-current anthropomorphic views of animal psychology and introduction of sound experimental method. Unfortunately, his approach hardened into narrow behaviorism that, despite many solid, worthwhile contributions to psychological science, has contributed little to the fundamental issue: adaptive transfer. Study of adaptive transfer requires a base in information learning theory and knowledge systems.

Adaptive transfer should be the guide for teaching at every level, from preschool to postgraduate and beyond (Notes 5-7).

> **Education: *Serve the Student*.** Functional theory of learning is a framework for education. *Adaptive transfer* is the central problem—to teach so learners will be better able to utilize their school learning in later life. Transfer requires constructionist, contextual thinking—adapting one's KSs to valuation and integration of multiple stimulus informers in the situation at hand.
>
> The need for new ideas and methods is clear from the massive unconcern of the educational establishment with *adaptive transfer*. Typical textbooks aim to teach their specific subject as a self-contained body of knowledge; instructors follow suit. Concern with transfer is focused on the final exam.
>
> *Serve the student* is the proper goal of education. Student-oriented education is needed. Education should aim to teach students what they need to know—ability with *adaptive transfer*.
>
> Study of adaptive transfer faces three problems. *First*, to find out what students need to know in later life. *Second*, to find out what they actually transfer from what they are currently being taught. *Third*, to find ways to teach for better transfer [italics added].
>
> The first two problems are little studied. The third has been an earnest concern of many dedicated teachers (e.g., Bernstein, Jonson, & Smith, 2000; Halpern, 1998; Haskell, 2001; McDermott, 1991) but little is yet known about adaptive transfer. Creative thinking courses, Headstart programs, and other such movements have positive value, but they have contributed little definite knowledge. These three problems deserve foremost consideration in cognitive theory and throughout the educational system (Anderson, 2008, pp. 282f).

FUNCTIONAL THEORY OF JUDGMENT–DECISION

Judgment and decision are central in moral thought and action. Aristotle's justice equation, $O_A/I_A = O_B/I_B$, involves judgment about input, outcome, and their proportionality for two persons, an idea continued in modern equity theory (Chapter 2). The utilitarian "greatest good for the greatest number" asks for maximization of good. Resolving moral dilemmas requires compromise among conflicting alternatives.

COGNITIVE AND NORMATIVE

Multiple determination is well recognized in judgment–decision; mathematical models for integration of multiple stimulus informers are stock-in-trade, as with multiattribute analysis. *Normative* models that prescribe optimal behavior have dominated the field. Unfortunately, normative models have obstructed understanding actual behavior. Functional theory requires that normative models of judgment–decision be replaced by cognitive laws.

Cognitive Laws. Three cognitive laws govern many issues in judgment–decision. They often disagree, however, with normative dicta. Three of numerous examples are noted next (see also *"Bias"* in Chapter 6).

A starkly nonnormative behavior appears with the ubiquitous averaging law. The sure-thing axiom, once a cornerstone in attempts to develop rational theory of judgment–decision, implies that adding a positive good to a positive good will increase the value of the whole. This sure-thing axiom has been repeatedly falsified by findings of opposite effects (e.g., Figures 5.2, 6.1) of the nonnormative averaging law.

Another nonoptimal behavior is the confidence-proportional multiplying law revealed in Lopes' (1976b) PhD thesis with a poker game— betting real money on an even-money gamble in proportion to confidence of winning. Rationally, participants should have bet the (small) maximum when their confidence was greater than ½, the minimum if less than ½ (see *Irrational Betting*, Anderson, 1996a, p. 327).

Bayesian statistical theory incorporates subjective probability and so was thought to provide a base for cognitive theory of judgment–decision. But Bayesian theory has severe limitations (see *Cognitive Alternative to Bayesian Theory*, Anderson, 1996a, pp. 331ff). One failure is the *water down (dilution)* effect discovered by Shanteau (1975): uninformative samples can have substantial effect (by virtue of averaging process).

Measurement Theory. Much work on judgment–decision has suffered a critical roadblock—lack of true measurement of psychological quantities. Subjective values—the heart's blood of living judgment–decision—remain largely outside the normative framework. Cognitive theory of judgment–decision requires true measurement of personal values.

A classic case of necessity for true measurement appeared in repeated conjectures that the objective multiplication,

Expected Value = Prob × Value,

had a subjective counterpart:

Subjective Expected Value = Subjective Prob × Subjective Value,

finally established with the linear fan theorem of functional measurement (Anderson & Shanteau, 1970; Anderson, 1981a, Figures 1.13-1.19). Functional measurement helped overcome this measurement roadblock to a cognitive theory of judgment–decision (Note 8).

MORAL JUDGMENT–DECISION

Moral thought and action are inherently matters of judgment and decision. The moral algebra presented in previous chapters provided an effective analytic base for several issues. These include deserving and fairness (Chapter 2), blame (Chapter 3), legal issues (Chapter 4), and moral–social development (Chapter 5).

Moral dilemmas have long been popular, not only in psychology, but especially in philosophy, as stark examples of conflicting considerations. They should have catalyzed psychological analysis of conflict. Instead, they obscured the problem (see *Moral Philosophy* in Chapter 7). Cost-benefit analysis, however rough, underlies all judgment–decision. The algebraic laws, conjoined with functional measurement, allow progress on moral cost-benefit analysis (*Conflict and Compromise*, Chapter 7).

UNIFIED THEORY

Unification of moral psychology and judgment–decision has much to offer both fields. Moral psychology can benefit from analytic modes of thinking developed in judgment–decision research. Such benefit was illustrated repeatedly in studies in the initial empirical chapters.

Judgment–decision research can benefit even more by shifting from preoccupation with normative models of optimal behavior in artificial tasks to deal with real psychology of real life. An effective foundation is available with the psychological laws (see also *Cognitive Theory of Judgment–Decision*, Chapter 10 in Anderson, 1996a).

FOUNDATIONS OF SOCIAL MORALITY

Human societies are an astonishing phenomenon, unprecedented biologically. Modern systems of production and distribution of material goods can provide opportunity for all. No less important are moral forces, including caring and fairness, as realized in family and groups, custom, religion, and law that keep self-interest and anti-social tendencies under some measure of control.

Moral considerations infuse every society, as once in divine right of pharaohs or kings, currently in doctrines of equality, and always in social hierarchies. Progress has been substantial, as with rights of children and women. Further progress is desirable and many directions have been advocated. How to accomplish this must be determined by experimental analysis embedded in field situations, especially families, schools, peer groups, work, and civic agencies.

This position may seem unattractive because it does not give an explicit foundation or final goal. Moral philosophy, in sharpest contrast, has been dominated by the idea of absolute moral law that holds for all times and cultures. But although contractarian and utilitarian theorists have fostered the concept of equality, moral philosophy has been largely barren verbal subtleties (see *Moral Philosophy*, Chapter 7).

Indeed, most writing on morality has aimed at general formulations with slight regard for empirical base in psychosocial reality. Innumerable books are written with slight concern for family life, schools, friendships, or social groups as matrices of morality. Moral science requires empirical grounding on problems of cooperation and conflict such as those discussed previous chapters (Notes 9 and 10).

A functional perspective is adopted in this book: moral systems are studied in terms of their dual functions—for individuals and for society. These two functions are intimately related. Society consists of individuals who have self-interests that need to be harmonized enough to allow social groups to persist and accomplish social goals.

One function of moral systems is thus to entrain self-interest to the interest of the group. This function appears in everyday beliefs and customs about caring, friendship, fairness/unfairness, obligation, praise and blame as well as in work organizations and legal/regulatory systems. These have done remarkably well for they allow existence of societies of many millions of individuals, immeasurably aided by developments in utilizing natural resources, in farming and manufacturing, and in socio-economic organization (Note 11).

The family is primary in social–moral functions. The high divorce rate is just one indication of the need for education to improve family interaction and increase family satisfaction. The need for such education is underscored by its near-total absence in our educational system, especially in our colleges and universities. Education for raising children has foremost importance.

Schools could be central in social–moral education. Present curricula focus on specific subjects such as history, literature, and science. These tend to be taught as self-contained bodies of knowledge. Every one, however, could be directly relevant to moral education as suggested in *Education* (Chapter 7).

Experimental–field studies are needed to improve social–moral education in family and schools. There is no shortage of well-intentioned opinions or books. But good intentions need to be grounded on scientific method and knowledge, which is in short supply (see quote from Brooks and Goble under *Education* in Chapter 7).

Moral systems should seek to promote individual self-interest without detracting unduly from others' interests. Instilling positive attitudes of family, friendship, helpfulness, and job performance, as well as respect for law, can contribute to both goals. The hopeful work on character education (e.g., Lapsley & Power, 2005) needs to be grounded on experimental method.

No less important is to encourage pursuit of individual goals, not merely those that benefit society, but also those that enhance individual accomplishments and feelings of worth without necessary regard to social benefit. Self-fulfillment has fundamental moral significance (Chapter 7, *Self-fulfillment*).

SOCIAL–MORAL BETTERMENT

The human species is remarkable in having developed social morality, manifested in family interaction, social custom, religion, legal systems, multiple levels of government, and throughout socioeconomic organization. Although these developments leave much to be desired, they provide good hope for improvement. Social-moral betterment should be a primary goal of moral science (Note 12).

Conflict is central in moral thought and action. Within-person conflict may arise from deciding between two goals, as with temptation or laziness. Between-person conflict is ubiquitous because different persons have different attitudes and goals. Social-moral betterment thus depends on teaching social-moral attitudes and conflict resolution.

Conflict has been a major issue in previous chapters: fairness/unfairness in Chapter 2, blame in Chapter 3, laws and courts in Chapter 4, moral development in Chapter 5, and diverse moral issues in Chapter 7. The three mathematical integration laws revealed in these chapters have unique value for social-moral betterment because they can measure the true values of each person for multiple experimental variables. These laws hold across age, issue, and culture, allowing for different values across all three.

Family life is one basic area for social-moral betterment. Experimental studies are summarized in *Moral-social Development* (Anderson, 1991h) and in *Family Life and Personal Design* (Anderson, 1991f). Further discussion is given in *Moral Algebra* and *Group Dynamics*, Chapters 7 and 8 in Anderson (2008). Character education begins in the family—in marital interaction and in parenting..

Our schools are also a primary domain for social-moral betterment. U.S. history is one base for moral attitudes and values in the secondary schools. At the college level, as D. Bok (2006, p. 38) comments, moral reasoning and civic education were the two most neglected areas in twentieth century undergraduate education. Instead, these two areas should have primary importance. Social-moral education in the family, no less important, could surely be greatly improved by now nonexistent instruction on marriage and parenting in our schools.

TOWARD UNIFICATION OF PSYCHOLOGY

The moral domain can be a foundation for unifying much of psychology. Unification has been illustrated in areas discussed in preceding sections: person science, social attitudes, learning/memory, and judgment–decision. Each of these areas is important in moral thought and action; all can interact constructively in this domain. Moral attitudes are basic components of the person that each of us is; how moral attitudes are learned and how they function in judgment–decision are important for theory and practice.

> , , , the concept of person constitutes a prime base for cognitive theory. Not only does person unify diverse areas of psychology, but it reveals them in a new light, as with affect, memory, and social–cognitive development. In this functional perspective, psychology focuses on what many think should be its primary concern—the study of phenomenal experience and purposiveness in everyday thought and action. (Anderson, 1996a, p. 464).

The moral domain can facilitate unification by providing common ground for these several areas of psychology, which now pursue their several directions with little interaction. Many writers have complained of this fragmentation, but fragmentation proliferates, even within each area (see e.g., Anderson, 2008, Notes 1-4, pp. 421f).

Unification is possible by shifting to a functional approach in each of these areas. Person science needs to shift from static traits to dynamic knowledge systems. Attitude theory needs to shift from "nonattitudes" to study how strong attitudes function in everyday life. Learning/memory needs to shift from reproductive memory and conditioned reflexes to study goal-oriented constructions that may have distant relation to the stimulus materials per se (see e.g, dissociation in Figure 8.2). And the field of judgment–decision needs to continue its shift from normative models to psychological laws of information integration, a shift already pursued by a number of workers.

Conceptual foundation for unification is provided by two axioms: Purposiveness and Integration (see Integration Diagram of Figure 8.1). Purposiveness underlies the valuation operation, an essential link between the external world of stimulus informers and the internal world of goal-oriented meanings and values. Integration of multiple informers is basic in all thought and action. Valuation and integration are fundamental processes of purposiveness in every field of psychology.

Empirical foundation for unification is provided by an almost miraculous blessing of Nature—three algebraic laws of information integration. A simple pattern of parallelism in an integration graph gives an exact test of adding-type laws; nothing need be known about the values that are integrated. Indeed, these values may be derived from the integration graph. These laws thus solve the long-standing roadblock of true measurement in psychology, not only on the response side but also on the stimulus side (benefits 2 and 3 of the parallelism theorem in Chapter 1).

These three integration laws have extensive empirical validity across diverse areas. They are common throughout human psychology, not only in the moral domain (Chapters 2-5), but also in general cognition (e.g., Anderson, 1974a,b,c, 1996a, 2013). They operate in young children, revealing high cognitive capabilities previously denied, and continue across the life span. Hence they can help study development and functioning of knowledge systems and values. They have shown promising generality across cultures. They have done well in single person experiments, recognizing and measuring large individual differences in values. These laws of cognition are thus both *nomothetic* and *idiographic*.

Social betterment should be no less important than cognitive analysis for psychological science. The present research program began with cognition; appreciation of the importance of bettering everyday life developed gradually, in part a consequence of the experimental studies of moral cognition discussed in previous chapters, especially studies of children and marriage. Also, this work led to realization that the moral realm provided substantive ground for unifying the psychological field as indicated in this chapter. This grounding can be actualized by virtue of the three laws of information integration (Note 13).

Investigators in many countries have contributed to Information Integration Theory (see *Dedication* of this book; *Acknowledgment* in Anderson, 2013). Their work has established moral cognition as a base for unification and working interaction across the diverse areas of our field. This book stands as tribute to their insight and dedication.

NOTES

Note 1. The present distinction between AKS (attitude knowledge system) and AR (attitudinal response) has similarity to William James' *ME* and *I* respectively. Much of I, however, may remain nonconscious (*Self-Cognition: **I** and **ME***, p. 411, in Anderson, 2008).

Note 2. Similar "nontraditional" view appears in "Attitudes as temporary constructions" (Wilson & Hodges, 1992). In IIT, however, such temporary constructions are only attitudinal responses (ARs), as indicated in the quote in the text. Attitude proper is a more enduring knowledge system (AKS).

Note 3. The dissociation between attitude and verbal memory discovered by Anderson and Hubert (1963) has been supported by other investigators including Dreben, Fiske, and Hastie (1979), Riskey (1979), Brink (1974), and Crano (1977), discussed in Anderson (1981a, pp. 249ff). As Crano (1978) concluded

> It seems apparent now . . . that the simple isomorphism of retention and attitude, so long an article of faith of the classical attitude theorists, simply does not exist. (p. 94.)

This dissociation led directly to the functional conception of learning. Effective analytical tools are available with the integration law, illustrated in Figure 8.2.

The availability heuristic of Tversky and Kahneman (1973) could not explain such dissociation, not even with the attempt to salvage it by Reyes, Thompson, and Bower (1980, p. 10) who concluded that "important arguments that are unrecallable" will have little or no effect—contrary to the dissociation illustrated in Figure 8.2.

Note 4. Basal component that lasted over a hundred trials has been found with adults in probability learning, both with choice response (Anderson, 1960; Friedman, Carterette, & Anderson, 1968) and with metric response (Anderson, 1969). Basal-surface structure may thus have some generality in learning. Functional learning theory may thus help extend the short-term/long-term theory of Atkinson and Shiffrin (1968) from traditional reproductive memory to functional memory.

Note 5. This disjunction of education from student needs for adaptive transfer is extreme in undergraduate statistics in psychology. A review of the first edition of one such text concluded, "Until there is an end to teaching statistics and a beginning of teaching the student, undergraduate statistics will remain one of the professions' principle misfeasances" (Anderson, 1962, p. 313). This misfeasance continues. Indeed, this statistics text has prospered through multiple editions.

Statistics should not be taught as such at the undergraduate level. Instead, primary focus should be on research goals and methods, statistics a secondary aid thereto.

Note 6. This disjunction of education from student needs with adaptive transfer seems general across disciplines. Standard texts typically aim to teach their subject per se. Most instructors follow suit (*Conceptual Physics* is a notable exception: Hewitt, 2009). Students are being shortchanged by our current educational system.

Texts and teachers need to focus on the three problems of adaptive transfer listed in this quotation. Teaching for adaptive transfer seems a moral responsibility.

Note 7. Contributions to adaptive transfer have been discussed by a number of persons, including McDermott (1991), Halpern (1998), Haskell (2001), Bernstein, et al. (2006), and in contributed chapters on creative thinking in Dunn, Halonen, & Smith (2008).

Note 8. *Moral Measurement*. The importance of moral measurement was recognized two centuries ago by Jeremy Bentham. He took pleasure and pain as basic and listed variables that influenced their values. Bentham's successors, the utilitarians, lost sight of the measurement problem (see *Utilitarianism*, Chapter 7).

Measurement is central in modern judgment–decision theory. But it has been addressed by ad hoc procedures that have only face validity. Functional measurement provides a validity criterion; all these ad hoc procedures failed the functional measurement analysis in Zhu and Anderson (1991). The most popular procedure had the largest errors.

Solving the measurement problem required a basic conceptual shift: a shift to treat measurement jointly with integration. This joint approach is shown in the Integration Diagram and illustrated with the parallelism theorem for adding-type models and with the linear fan theorem for multiplying models.

This integration-theoretical approach succeeded not only in moral cognition (Chapters 2-5), but also in most areas of human psychology as illustrated in this chapter.

Note 9. One empirically oriented approach seeks to base human morality on evolution, an approach foreshadowed by Darwin (*Descent of man*, 1871). He argued that natural selection had acted to enhance altruistic behavior because it helped preserve human groups. Survival of the fittest was thus extended from the individual to the group.

Another appeal to evolution appears in sociobiology (Wilson, 1975; Stent, 1980), especially in its emphasis on genes that tend to perpetuate themselves. Few can doubt that humans are evolutionary products or that genes underlie behavior. However, the immense gap between morality in humans and parental behavior or pecking orders in infrahumans casts doubt on explanatory capability of sociobiology. Indeed, genetic explanations largely ignore culture, as noted by several contributors to Stent (1980).

Sociobiology also hardly recognizes the importance of family life in transmitting culture across generations. More generally, Fried (1980, pp. 193f) comments that

> Social theorists have always been troubled by the tendency of the family to interfere with their projects for the ideal society, whether it be a community of perfection, as in Plato's Republic, or of equality, as in the Marxist state. Thus Rawls is troubled by the tendency of the family to make more difficult the establishment of a regime of distributive justice. My suggestion is that the family is the cradle of individuality.

In the present view, the family is the cradle of morality and of society.

Another empirically oriented approach seeks a base for morality in neuroscience. Thus, Churchland (2011) is enthusiastic about findings that oxytocin increases mother–child attachment. Such findings can lead to useful techniques for social betterment, as suggested in work on contact comfort by Harlow and on attachment by Bowlby. But they are far from being able to explain fairness/unfairness, praise/blame, or even attachment itself (see quote in *Science of Phenomenology*, Chapter 7).

Note 10. Evolution and sociobiology have distant relevance to moral science. It is interesting, of course, to see primitive signs of human social behavior in lower animals. But these primitive signs largely emphasize the immense gap below language, schools, and legal systems. Such claims obscure real social–moral problems: cognitive theory and social betterment.

Note 11. The importance of natural resources for social morality deserves consideration. Past progress has depended heavily on increasing exploitation of natural resources but these are steadily diminishing. And overpopulation in Africa and elsewhere is an increasing problem with little sign of solution. How long equalitarianism can survive is thus open to question.

Note 12. A primary function of morality is to resolve conflict, both intra- and interpersonal. The moral integration laws discussed in this chapter provide a base for science of morality. Moral dilemmas, beloved of philosophers, can be used for social-moral betterment. They can embed common social conflicts in integration designs that can measure changes in moral attitudes produced by experimental manipulations such as attitude messages or group discussion. These laws appear to be universal, holding for issue, age, and culture. They make morality scientific and socially useful by providing true measurement of moral attitudes that depend on issue, individual, and culture (see *Moral Attitudes* above).

Integration laws can incorporate multiple levels of two or more variables and provide true measures of their values for each person. The long tradition of moral dilemmas (see Gowans, 1987) can thus be put to scientific use for social-moral betterment. As one example, changes in moral attitude produced by individual or group discussion of a dilemma can be exactly measured, thus providing a base for developing an instructional battery of moral dilemmas. This approach is illustrated with studies of marital interaction discussed in Anderson (2008, pp. 224-232).

Note 13.   Unified Human Science. Moral thought and action pervade everyday life. The three mathematical laws of information integration can unify the diverse social disciplines. A key property of these integration laws is their applicability to measure values for single persons.

In psychology, this measurement capability has transformed the attitude field in which real individual differences have traditionally been treated as error variance.

In sociology, the schools of symbolic interaction aim to study language and other symbols of everyday social interaction. For this purpose, the laws of information integration can provide unique analytic power (Anderson, 2008, Note 2, p. 194).

In anthropology, the integration laws can measure the diverse determinants of cultural motives (goals) discussed by contributors to *Human motives and cultural models* (D'Andrade & Strauss).

In all social sciences, real subgroups can be determined using cluster analysis (Chapter 6).