Chapter 1

In a Nutshell

The original scene: Paris, 1900—La Belle Epoque. The city fathers approached a talented psychologist named Alfred Binet with an unusual request. Families were flocking to the capital city from the provinces, and a good many of their children were having trouble with their schoolwork. Could Binet devise some kind of a measure that would predict which youngsters would succeed and which would fail in the primary grades of Paris schools?

As almost everybody knows, Binet succeeded. In short order, his discovery came to be called the "intelligence test"; his measure, the IQ, for "intelligence quotient" (mental age divided by chronological age and multiplied by 100). Like other Parisian fashions, the IQ soon made its way to the United States, where it enjoyed a modest success until World War I, when it was used to test over one million American military recruits. With its use by the U.S. armed forces, and with America's victory in the conflict, Binet's invention had truly arrived. Ever since, the IQ test has looked like psychology's biggest success—a genuinely useful scientific tool.

What is the vision that led to the excitement about IQ? At least in the West, people had always relied on intuitive assessments of how smart other people were. Now intelligence seemed to be quantifiable. Just as you could measure someone's actual or potential height, now, it seemed, you could measure someone's actual or potential intelligence. We had one dimension of mental ability along which we could array everyone.

The search for the perfect measure of intelligence has proceeded apace. Here, for example, are some quotations from an advertisement for one such test:

> Need an individual test which quickly provides a stable and reliable estimate of intelligence in four or five minutes per form? Has three forms? Does not depend on verbal production or subjective scoring? Can be used with the severely physically handicapped (even paralyzed) if they can signal yes or no? Handles two-year-olds and superior adults with the same short series of items and the same format? Only $16.00 complete.

Now, a single test that can do all that is quite a claim. American psychologist Arthur Jensen suggests that we could look at reaction time to assess intelligence: a set of lights go on; how quickly can the subject react? British psychologist Hans Eysenck recommends that investigators of intelligence look directly at brain waves. And with the advent of the gene chip, many look forward to the day when we can glance at the proper gene locus on the proper chromosome, read off someone's IQ, and confidently predict his or her life chances.

There are also, of course, more sophisticated versions of the IQ test. One of them is the SAT. Its name originally stood for Scholastic Aptitude Test, although with the passage of time, the meaning of the acronym has been changed—it became the Scholastic Assessment Test, and, more recently, it has been reduced to the plain old SAT—just the initials. The SAT purports to be a similar kind of measure, and if you add up a person's verbal and math scores, as is often done, you can rate him or her along a single intellectual dimension. (Recently, writing and reasoning components have been added.) Programs for the gifted, for example, often use that kind of measure; if your IQ is in excess of 130, you're admitted to the program—if it's 129, "Sorry, no room at the inn."

Along with this one-dimensional view of how to assess people's minds comes a corresponding view of school, which I will call the "uniform view." A uniform school features a core curriculum—a set of facts that everyone should know—and very few electives. The better students, perhaps those with higher IQs, are allowed to take courses that call on critical reading, calculation, and thinking skills. In the uniform school, there are regular assessments, using paper and pencil instruments, of the IQ or SAT variety. These assessments yield reliable rankings of people; the best and the brightest get into the better colleges, and perhaps—but only perhaps—they will also get better rankings in life. There is no question that this approach works well for certain people—schools such as Harvard and Stanford are eloquent testimony to that. Since this measurement and selection system is clearly meritocratic in certain respects, it has something to recommend it.

The uniform school sounds fair—after all, everyone is treated in the same way. But some years ago it occurred to me that this supposed rationale was completely unfair. The uniform school picks out and is addressed to a certain kind of mind—we might call it provisionally the IQ or SAT mind. I sometimes call it the mind of the future law professor. The more your mind resembles that of the legendary law professor Dr. Charles W. Kingsfield Jr., played on-screen by John Houseman in *The Paper Chase*, the better you will do in school and the more readily you will handle IQ-SAT-type measures. But to the extent that your mind works differently—and not that many of us are cut out to be law professors—school is certainly not fair to you.

I would like to present an alternative vision—one based on a radically different view of the mind, and one that yields a very different view of school. It is a pluralistic view of mind, recognizing many different and discrete facets of cognition, acknowledging that people have different cognitive strengths and contrasting cognitive styles. I introduce the concept of an individual-centered school that takes this multifaceted view of intelligence seriously. This model for a school is based in part on findings from sciences that did not even exist in Binet's time: cognitive science (the study of the mind) and neuroscience (the study of the brain). One such approach I have called the theory of multiple intelligences. Let me tell you something about its sources and claims to lay the groundwork for the discussions on education in the chapters that follow.

I introduce this new point of view by asking you to suspend for a moment the usual judgment of what constitutes intelligence, and let your thoughts run freely over the capabilities of human beings—perhaps those that would be picked out by the proverbial visitor from Mars. Your mind may turn to the brilliant chess player, the world-class violinist, and the champion athlete; certainly, such outstanding performers deserve special consideration. Are the chess player, violinist, and athlete "intelligent" in these pursuits? If they are, then why do our tests of "intelligence" fail to identify them? If they are not intelligent, what allows them to achieve such astounding feats? In general, why does the contemporary construct of intelligence fail to take into account large areas of human endeavor?

To approach these questions I introduced the theory of multiple intelligences (MI) in the early 1980s. As the name indicates, I believe that human cognitive competence is better described in terms of a set of abilities, talents, or mental skills, which I call *intelligences.* All normal individuals possess each of these skills to some extent; individuals differ in the degree of skill and in the nature of their combination. I believe this theory of intelligence may be more humane and more veridical than alternative views of intelligence and that it more adequately reflects the data of human "intelligent" behavior. Such a theory has important educational implications.

WHAT CONSTITUTES AN INTELLIGENCE?

The question of the optimal definition of intelligence looms large in my inquiry. And it is here that the theory of multiple intelligences begins to diverge from traditional points of view. In the classic psychometric view, intelligence is defined operationally as the ability to answer items on tests of intelligence. The inference from the test scores to some underlying ability is supported by statistical techniques. These techniques compare responses of subjects at different ages; the apparent correlation of these test scores across ages and across different tests corroborates the notion that the general faculty of intelligence, called *g* in short, does not change much with age, training, or experience. It is an inborn attribute or faculty of the individual.

Multiple intelligences theory, on the other hand, pluralizes the traditional concept. An intelligence is a computational capacity—a capacity to process a certain kind of information—that originates in human biology and human psychology. Humans have certain kinds of intelligences, whereas rats, birds, and computers foreground other kinds of computational capacities. An intelligence entails the ability to solve problems or fashion products that are of consequence in a particular cultural setting or community. The problem-solving skill allows one to approach a situation in which a goal is to be obtained and to locate the appropriate route to that goal. The creation of a cultural product allows one to capture and transmit knowledge or to express one's conclusions, beliefs, or feelings. The problems to be solved range from creating an end for a story to anticipating a mating move in chess to repairing a quilt. Products range from scientific theories to musical compositions to successful political campaigns.

MI theory is framed in light of the biological origins of each problem-solving skill. Only those skills that are universal to the human species are considered (again, we differ from rats, birds, or computers). Even so, the biological proclivity to participate in a particular form of problem solving must also be coupled with the cultural nurturing of that domain. For example, language, a universal skill, may manifest itself particularly as writing in one culture, as oratory in another culture, and as the secret language composed of anagrams or tongue twisters in a third.

Given the desideratum of selecting intelligences that are rooted in biology and that are valued in one or more cultural settings, how does one actually identify an intelligence? In coming up with the list, I reviewed evidence from various sources: knowledge about normal development and development in gifted individuals; information about the breakdown of cognitive skills under conditions of brain damage; studies of exceptional populations, including prodigies, savants, and autistic children; data about the evolution of cognition over the millennia; cross-cultural accounts of cognition; psychometric studies, including examinations of correlations among tests; and psychological training studies, particularly measures of transfer and generalization across tasks. Only those candidate intelligences that satisfied all or a healthy majority of the criteria were selected as bona fide intelligences. A more complete discussion of each of these criteria and of the intelligences that were initially identified may be found in *Frames of Mind* (1983b), especially chapter 4. In that foundational book I also consider how the theory might be disproved and compare it with competing theories of intelligence. An update of some of these discussions is presented in *Intelligence Reframed* (1999a), and in the chapters that follow.

In addition to satisfying the aforementioned criteria, each intelligence must have an identifiable core operation or set of operations. As a neurally based computational system, each intelligence is activated or triggered by certain kinds of internal or external information. For example, one core of musical intelligence is the sensitivity to pitch relations, and one core of linguistic intelligence is the sensitivity to the phonological features of a language.

An intelligence must also be susceptible to encoding in a symbol system—a culturally contrived system of meaning that captures and conveys important forms of information. Language, picturing, and mathematics are but three nearly worldwide symbol systems that are necessary for human survival and productivity. The relationship of an intelligence to a human symbol system is no accident. In fact, the existence of a core computational capacity anticipates the actual or potential creation of a symbol system that exploits that capacity. While it may be possible for an intelligence to develop without an accompanying symbol system, a primary characteristic of human intelligence may well be its gravitation toward such an embodiment.

THE ORIGINAL SET OF INTELLIGENCES

Having sketched the characteristics and criteria for an intelligence, I turn now to a brief consideration of each of the intelligences that were proposed in the early 1980s. I begin each sketch with a thumbnail biography of a person who demonstrates an unusual facility with that intelligence. (These biographies were developed chiefly by my longtime colleague Joseph Walters.) The biographies illustrate some of the abilities that are central to the fluent operation of a given intelligence. Although each biography illustrates a particular intelligence, I do not wish to imply that in adulthood intelligences operate in isolation. Indeed, except in abnormal individuals, intelligences always work in concert, and any sophisticated adult role will involve a melding of several of them. Following each biography is a survey of the various sources of data that support each candidate as an intelligence.

Musical Intelligence

When Yehudi Menuhin was three years old, his parents smuggled him into San Francisco Orchestra concerts. The sound of Louis Persinger's violin so entranced the young child that he insisted on a violin for his birthday and Louis Persinger as his teacher. He got both. By the time he was ten years old, Menuhin was an international performer (Menuhin, 1977).

Violinist Yehudi Menuhin's musical intelligence manifested itself even before he had touched a violin or received any musical training. His powerful reaction to that particular sound and his rapid progress on the instrument suggest that he was biologically prepared in some way for a life in music. Menuhin is one example of evidence from child prodigies that support the claim that there is a biological link to a particular intelligence. Other special populations, such as autistic children who can play a musical instrument beautifully but who cannot otherwise communicate, underscore the independence of musical intelligence.

A brief consideration of the evidence suggests that musical skill passes the other tests for an intelligence. For example, certain parts of the brain play important roles in the perception and production of music. These areas are characteristically located in the right hemisphere, although musical skill is not as clearly localized in the brain as natural language. Although the particular susceptibility of musical ability to brain damage depends on the degree of training and other individual characteristics, there is clear evidence that amusia, or a selective loss of musical ability, occurs.

Music apparently played an important unifying role in Stone Age (Paleolithic) societies. Birdsong provides a link to other species. Evidence from various cultures supports the notion that music is a universal faculty. Studies of infant development suggest that there is a "raw" computational ability in early childhood. Finally, musical notation provides an accessible and versatile symbol system. In short, evidence to support the interpretation of musical ability as an intelligence comes from many different sources. Even though musical skill is not typically considered an intellectual skill like mathematics, it qualifies under our criteria. By definition it deserves consideration; and in view of the data, its inclusion is empirically justified.

Bodily-Kinesthetic Intelligence

Fifteen-year-old Babe Ruth was playing catcher one game when his team was taking a "terrific beating." Ruth "burst out laughing" and criticized the pitcher loudly. Brother Mathias, the coach, called out, "All right, George, YOU pitch!" Ruth was stunned and nervous: "I never pitched in my life . . . I can't pitch." The moment was transformative, as Ruth recalls in his autobiography: "Yet, as I took the position, I felt a strange relationship between myself and that pitcher's mound. I felt, somehow, as if I had been born out there and that this was a kind of home for me." As sports history shows, he went on to become a great major league pitcher (and, of course, attained legendary status as a hitter) (Ruth, 1948, p. 17).

Like Menuhin, Babe Ruth was a prodigy who recognized his "instrument" immediately on his first exposure to it, before receiving any formal training.

Control of bodily movement is localized in the motor cortex, with each hemisphere dominant or controlling bodily movements on the contralateral side. In right-handers, the dominance for bodily movement is ordinarily found in the left hemisphere. The ability to perform movements when directed to do so can be impaired even in individuals who can perform the same movements reflexively or on a nonvoluntary basis. The existence of apraxia constitutes one line of evidence for a bodily-kinesthetic intelligence.

The evolution of specialized body movements is of obvious advantage to the species, and in human beings this adaptation is extended through the use of tools. Body movement undergoes a clearly defined developmental schedule in children; there is little question of its universality across cultures. Thus, it appears that bodily-kinesthetic "knowledge" satisfies many of the criteria for an intelligence.

The consideration of bodily-kinesthetic knowledge as "problem solving" may be less intuitive. Certainly carrying out a mime sequence or hitting a tennis ball is not solving a mathematical equation. And yet, the ability to use one's body to express an emotion (as in a dance), to play a game (as in a sport), or to create a new product (as in devising an invention) is evidence of the cognitive features of body usage. The specific computations required to solve a particular bodily-kinesthetic problem, hitting a tennis ball, are summarized by Tim Gallwey:

> In order to anticipate how and where to move the feet and whether to take the racket back on the forehand or backhand side, the brain must calculate within a fraction of a second the moment the ball leaves the server's racket approximately where it is going to land, and where the racket will intercept it. Into this calculation must be computed the initial velocity of the ball, combined with an input for the progressive decrease in velocity and the effect of wind and of spin, to say nothing of the complicated trajectories in-

> volved. Then, each of these factors must be recalculated after the bounce of the ball to anticipate the point where contact will be made by the racket. Simultaneously, muscle orders must be given—not just once, but constantly refined on updated information. Finally, the muscles have to respond in cooperation with one another . . . Contact is made at a precise point that depends on whether the order was given to hit down the line or cross-court, an order not given until after a split-second analysis of the movement and balance of the opponent. . . . Even if you are returning the serve of an average player, you will have only about one second. Just to hit the ball is clearly a remarkable feat; to return it with consistency and accuracy is a mind-boggling achievement. Yet it is not uncommon. The truth is that everyone who inhabits a human body possesses a remarkable instrument (Gallwey, 1976, pp. 33–34).

Logical-Mathematical Intelligence

In 1983 Barbara McClintock won the Nobel Prize in Medicine or Physiology for her work in microbiology. Her intellectual powers of deduction and observation illustrate one form of logical-mathematical intelligence that is often labeled "scientific thinking." One incident is particularly illuminating. When she was a researcher at Cornell in the 1920s, McClintock was faced one day with a problem: while theory predicted 50 percent pollen sterility in corn, her research assistant (in the "field") was finding plants that were only 25 to 30 percent sterile. Disturbed by this discrepancy, McClintock left the cornfield and returned to her office where she sat for half an hour, thinking:

> Suddenly I jumped up and ran back to the (corn) field. At the top of the field (the others were still at the bottom) I shouted, "Eureka, I have it! I know what the 30% sterility is!" . . . They asked me to prove it. I sat down with a paper bag and a pencil and I started from scratch, which I had not done at all in my laboratory. It had all been done so fast; the answer came and I ran. Now I worked it out step by step—it was an intricate series of steps—and I came out with [the same result]. [They] looked at the material and it was exactly as I'd said it was; it worked out

exactly as I had diagrammed it. Now, why did I know, without having done it on paper? Why was I so sure? (Keller, 1983, p. 104).

This anecdote illustrates two essential facts of the logical-mathematical intelligence. First, in the gifted individual, the process of problem solving is often remarkably rapid—the successful scientist copes with many variables at once and creates numerous hypotheses that are each evaluated and then accepted or rejected in turn. The anecdote also underscores the nonverbal nature of the intelligence. A solution to a problem can be constructed before it is articulated. In fact, the solution process may be totally invisible, even to the problem solver. This phenomenon need not imply, however, that discoveries of this sort—the familiar "aha!"—are mysterious, intuitive, or unpredictable. The fact that it happens frequently to some people (e.g., Nobel Prize winners) suggests the opposite. We interpret this phenomenon as the work of the logical-mathematical intelligence.

Along with the companion skill of language, logical-mathematical reasoning provides the principal basis for IQ tests. This form of intelligence has been thoroughly investigated by traditional psychologists, and it is the archetype of "raw intelligence" or the problem-solving faculty that purportedly cuts across domains. It is perhaps ironic, then, that the actual mechanism by which one arrives at a solution to a logical-mathematical problem is not as yet completely understood—and the processes involved in leaps like those described by McClintock remain mysterious.

Logical-mathematical intelligence is supported as well by empirical criteria. Certain areas of the brain are more prominent in mathematical calculation than others; indeed, recent evidence suggests that the linguistic areas in the frontotemporal lobes are more important for logical deduction, and the visuospatial areas in the parietofrontal lobes for numerical calculation (Houdé & Tzourio-Mazoyer, 2003). There are savants who perform great feats of calculation even though they are tragically deficient in most other areas. Child prodigies in mathematics abound. The development of this intelligence in children has been carefully documented by Jean Piaget and other psychologists.

Linguistic Intelligence

At the age of ten, T. S. Eliot created a magazine called *Fireside*, to which he was the sole contributor. In a three-day period during his winter vacation, he created eight complete issues. Each one included poems, adventure stories, a gossip column, and humor. Some of this material survives, and it displays the talent of the poet (see Soldo, 1982).

As with the logical intelligence, calling linguistic skill an intelligence is consistent with the stance of traditional psychology. Linguistic intelligence also passes our empirical tests. For instance, a specific area of the brain, called Broca's area, is responsible for the production of grammatical sentences. A person with damage to this area can understand words and sentences quite well but has difficulty putting words together in anything other than the simplest of sentences. Other thought processes may be entirely unaffected.

The gift of language is universal, and its rapid and unproblematic development in most children is strikingly constant across cultures. Even in deaf populations where a manual sign language is not explicitly taught, children will often invent their own manual language and use it surreptitiously. We thus see how an intelligence may operate independently of a specific input modality or output channel.

Spatial Intelligence

Navigation around the Caroline Islands in the South Seas is accomplished by native sailors without instruments. The position of the stars, as viewed from various islands, the weather patterns, and water color are the principal signposts. Each journey is broken into a series of segments, and the navigator learns the position of the stars within each of these segments. During the actual trip the navigator must mentally picture a reference island as it passes under a particular star. From that envisioning exercise, he computes the number of segments completed, the proportion of the trip remaining, and any corrections in heading that are required. The navigator cannot see the islands as he sails along; instead he maps their locations in his mental picture of the journey (see Gladwin, 1970).

Spatial problem solving is required for navigation and for the use of the notational system of maps. Other kinds of spatial problem solving are brought to bear in visualizing an object from different angles and in playing chess. The visual arts also employ this intelligence in the use of space.

Evidence from brain research is clear and persuasive. Just as the middle regions of the left cerebral cortex have, over the course of evolution, been selected as the site of linguistic processing in right-handed persons, the posterior regions of the right cerebral cortex prove most crucial for spatial processing. Damage to these regions causes impairment of the ability to find one's way around a site, to recognize faces or scenes, or to notice fine details.

Blind populations provide an illustration of the distinction between the spatial intelligence and visual perception. A blind person can recognize shapes by a nonvisual method: running a hand along the contours of an object translates into length of time of movement, which in turn is translated into the size and shape of the object. For the blind person, the perceptual system of the tactile modality parallels the visual modality in the seeing person. The analogy between the spatial reasoning of the blind and the linguistic reasoning of the deaf is notable.

There are few child prodigies among visual artists, but there are savants like Nadia (Selfe, 1977), a preschool child who, despite a condition of severe autism, made drawings of the most remarkable representational accuracy and finesse.

Interpersonal Intelligence

With little formal training in special education and nearly blind herself, Anne Sullivan began the formidable task of instructing a blind and deaf seven-year-old, Helen Keller. Sullivan's efforts at communication were complicated by the child's emotional struggle with the world around her. At their first meal together, this scene occurred:

> Annie did not allow Helen to put her hand into Annie's plate and take what she wanted, as she had been accustomed to do with her family. It became a test of wills—hand thrust into plate, hand firmly put aside. The family, much upset, left the dining room. Annie locked the door and proceeded to

> eat her breakfast while Helen lay on the floor kicking and screaming, pushing and pulling at Annie's chair. [After half an hour] Helen went around the table looking for her family. She discovered no one else was there and that bewildered her. Finally, she sat down and began to eat her breakfast, but with her hands. Annie gave her a spoon. Down on the floor it clattered, and the contest of wills began anew (Lash, 1980, p. 52).

Anne Sullivan sensitively responded to the child's behavior. She wrote home: "The greatest problem I shall have to solve is how to discipline and control her without breaking her spirit. I shall go rather slowly at first and try to win her love." In fact, the first "miracle" occurred two weeks later, well before the famous incident at the pump house. Annie had taken Helen to a small cottage near the family's house, where they could live alone. After seven days together, Helen's personality suddenly underwent a change—the therapy had worked: "My heart is singing with joy this morning. A miracle has happened! The wild little creature of two weeks ago has been transformed into a gentle child" (Lash, 1980, p. 54).

It was just two weeks after this that the first breakthrough in Helen's grasp of language occurred; and from that point on, she progressed with incredible speed. The key to the miracle of language was Anne Sullivan's insight into the person of Helen Keller.

Interpersonal intelligence builds on a core capacity to notice distinctions among others—in particular, contrasts in their moods, temperaments, motivations, and intentions. In more advanced forms, this intelligence permits a skilled adult to read the intentions and desires of others, even when they have been hidden. This skill appears in a highly sophisticated form in religious or political leaders, salespersons, marketers, teachers, therapists, and parents. The Helen Keller–Anne Sullivan story suggests that this interpersonal intelligence does not depend on language. All indices in brain research suggest that the frontal lobes play a prominent role in interpersonal knowledge. Damage in this area can cause profound personality changes while leaving other forms of problem solving unharmed—after such an injury, a person is often not the "same person."

Alzheimer's disease, a form of dementia, appears to attack posterior brain zones with a special ferocity, leaving spatial, logical, and linguistic computations severely impaired. Yet people with Alzheimer's often remain well groomed, socially proper, and continually apologetic for their errors. In contrast, Pick's disease, a variety of dementia that is localized in more frontal regions of the cortex, entails a rapid loss of social graces.

Biological evidence for interpersonal intelligence encompasses two additional factors often cited as unique to humans. One factor is the prolonged childhood of primates, including the close attachment to the mother. In cases where the mother (or a substitute figure) is not available and engaged, normal interpersonal development is in serious jeopardy. The second factor is the relative importance in humans of social interaction. Skills such as hunting, tracking, and killing in prehistoric societies required the participation and cooperation of large numbers of people. The need for group cohesion, leadership, organization, and solidarity follows naturally from this.

Intrapersonal Intelligence

In an essay called "A Sketch of the Past," written almost as a diary entry, Virginia Woolf discusses the "cotton wool of existence"—the various mundane events of life. She contrasts this cotton wool with three specific and poignant memories from her childhood: a fight with her brother, seeing a particular flower in the garden, and hearing of the suicide of a past visitor:

> These are three instances of exceptional moments. I often tell them over, or rather they come to the surface unexpectedly. But now for the first time I have written them down, and I realize something that I have never realized before. Two of these moments ended in a state of despair. The other ended, on the contrary, in a state of satisfaction. . . . The sense of horror [in hearing of the suicide] held me powerless. But in the case of the flower, I found a reason; and was thus able to deal with the sensation. I was not powerless. . . . Though I still have the peculiarity that I receive these sudden shocks, they are now always welcome; after the first surprise, I always feel instantly that they are particularly valuable. And so I go on to suppose that the shock-receiving capacity is what makes me a writer. I hazard the explanation that a shock is at once in my case followed by the desire to explain it. I feel that I have had a blow; but it is not, as I thought as a child, simply a blow from an enemy hidden behind the cotton wool of daily life;

it is or will become a revelation of some order; it is a token of some real thing behind appearances; and I make it real by putting it into words (Woolf, 1976, pp. 69–70).

This quotation vividly illustrates the intrapersonal intelligence—knowledge of the internal aspects of a person: access to one's own feeling life, one's range of emotions, the capacity to make discriminations among these emotions and eventually to label them and to draw on them as a means of understanding and guiding one's own behavior. A person with good intrapersonal intelligence has a viable and effective model of him- or herself—one consistent with a description constructed by careful observers who know that person intimately. Since this intelligence is the most private, evidence from language, music, or some other more expressive form of intelligence is required if the observer is to detect it at work. In the above quotation, for example, linguistic intelligence serves as a medium in which to observe intrapersonal knowledge in operation.

We see the familiar criteria at work in the intrapersonal intelligence. As with the interpersonal intelligence, the frontal lobes play a central role in personality change. Injury to the lower area of the frontal lobes is likely to produce irritability or euphoria, whereas injury to the higher regions is more likely to produce indifference, listlessness, slowness, and apathy—a kind of depressive personality. In persons with frontal lobe injury, the other cognitive functions often remain preserved. In contrast, among aphasics who have recovered sufficiently to describe their experiences, we find consistent testimony: while there may have been a diminution of general alertness and considerable depression about the condition, the individual in no way felt himself to be a different person. He recognized his own needs, wants, and desires and tried as best he could to achieve them.

The autistic child is a prototypical example of an individual with impaired intrapersonal intelligence; indeed, the child may not even be able to refer to himself. At the same time, such children may exhibit remarkable abilities in the musical, computational, spatial, mechanical, and other nonpersonal realms.

Evolutionary evidence for an intrapersonal faculty is more difficult to come by, but we might speculate that the capacity to transcend the satisfaction of instinctual drives is relevant. This potential becomes increasingly important in a species not perennially involved in the struggle for survival. The neural structures that permit consciousness probably form the basis on which self-consciousness is constructed.

In sum, then, both interpersonal and intrapersonal faculties pass the tests of an intelligence. They both feature problem-solving capacities that have significance for the individual and the species. Interpersonal intelligence allows one to understand and work with others. Intrapersonal intelligence allows one to understand and work with oneself. In the individual's sense of self, one encounters a melding of interpersonal and intrapersonal components. Indeed, the sense of self emerges as one of the most marvelous of human inventions—a symbol that represents all kinds of information about a person and that is at the same time an invention that all individuals construct for themselves.

NEWLY IDENTIFIED INTELLIGENCES

For the first ten years after I proposed the theory of multiple intelligences, I resisted any temptation to alter the theory. Many individuals proposed candidate intelligences—humor intelligence, cooking intelligence, sexual intelligence. One of my students quipped that I would never recognize those intelligences, because I lacked them myself.

Two factors led me to consider additional intelligences. Once I spoke about the theory to a group of historians of science. After my talk, a short, elderly man approached and said, "You will never explain Charles Darwin with the set of intelligences that you proposed." The commentator was none other than Ernst Mayr, probably the most important twentieth-century authority on evolution.

The other factor was the frequent assertion that there was a spiritual intelligence, and the occasional assertion that I had identified a spiritual intelligence. In fact, neither statement was true. But these experiences motivated me to consider whether there is evidence for either a naturalist or a spiritual intelligence.

This inquiry led to very different conclusions. In the first case, the evidence for the existence of a naturalist intelligence is surprisingly persuasive. Biologists like Charles Darwin and E. O. Wilson and ornithologists like John James Audubon and Roger Tory Peterson excel at identifying and distinguishing one species from another. Persons with a high degree of naturalist intelligence are keenly aware of how to distinguish the diverse plants, animals, mountains, or cloud configurations in their ecological niche. These capacities are not exclusively visual; the recognition of birdsong or whale calls entails auditory perception. The Dutch naturalist Geermat Vermij, who is blind, depends on his sense of touch.

On the eight criteria for an intelligence, the naturalist intelligence scores well. In this type of intelligence, there is the core capacity to recognize instances as members of a species. There is also the evolutionary history of survival often depending on recognizing conspecifics and on avoiding predators. Young children easily make distinctions in the naturalist world—indeed, some five-year-olds are better than their parents or grandparents at distinguishing among dinosaur species.

Examining the naturalist intelligence through the cultural or brain lenses brings some interesting phenomena into focus. Today few people in the developed world are directly dependent on naturalist intelligence. We simply go to the grocery store or order groceries on the phone or the Internet. And yet, I suggest, our entire consumer culture is based on the naturalist intelligence. It includes the capacities we deploy when we are drawn to one car rather than another, or when we select one pair of sneakers or gloves rather than another.

The study of brain damage provides intriguing evidence of individuals who are able to recognize and name inanimate objects but who lose the capacity to identify living things; less often, one encounters the opposite pattern, where individuals are able to recognize and name animate entities but fail with artificial (man-made) objects. These capacities probably entail different perceptual mechanisms (Euclidean geometry operates in the world of artifacts but not in the world of nature) and different experiential bases (we interact with inanimate objects and tools very differently than with living beings).

My review of the evidence on spirituality proved less straightforward. People have very strong views on religion and spirituality. For many (particularly in the contemporary United States), experiences of the spirit are the most important ones; and many assume that a spiritual intelligence not only exists but actually represents the highest achievement of human beings. Others, particularly those of a scientific bent, cannot take seriously any discussion of the spirit or the soul; it smacks of mysticism. And they may be deeply skeptical about God and religion—especially so in the academy. Asked why I had not endorsed a spiritual or religious intelligence, I once quipped, "If I did so, it would please my friends—but it would please my enemies even more!"

Quips are no substitute for scholarship. I devoted the better part of a year to reviewing the evidence for and against a spiritual intelligence. I concluded that at least two facets of spirituality were quite remote from my conception of an intelligence. First, I do not believe that an intelligence should be confounded with an individual's phenomenological experience. For most observers, spirituality entails a certain set of visceral reactions—for example, a feeling that one is in touch with a higher being or "at one" with the world. Such feelings may be fine, but I do not see them as valid indicators of an intelligence. A person with a high degree of mathematical intelligence may undergo feelings of "flow" in the course of solving a difficult problem, but the person is equally mathematically intelligent even if he or she has no such phenomenological reaction.

Second, for many individuals, spirituality is indissociable from a belief in religion and God generally, or even from allegiance to a particular faith or sect: "Only a real Jew/Catholic/Muslim/Protestant is a spiritual being" is the explicit or implicit message. This requirement makes me uncomfortable and takes us far from the initial set of criteria for an intelligence.

But although a spiritual intelligence does not qualify on my criteria, one facet of spirituality seems a promising candidate. I call it the existential intelligence—sometimes described as "the intelligence of big questions." This candidate intelligence is based on the human proclivity to ponder the most fundamental questions of existence. Why do we live? Why do we die? Where do we come from? What is going to happen to us? What is love? Why do we make war? I sometimes say that these are questions that transcend perception; they concern issues that are too big or too small to be perceived by our five principal sensory systems.

Somewhat surprisingly, the existential intelligence does reasonably well in terms of our criteria. Certainly, there are individuals—philosophers, religious leaders, the most impressive statesman—who come to mind as high-end embodiments of existential intelligence. Existential issues arise in every culture—in religion, philosophy, art, and the more mundane stories, gossip, and media presentations of everyday life. In any society where questioning is tolerated, children raise these existential questions from an early age—though they do not always listen closely to the answers. Moreover, the myths and fairy tales that they gobble up speak to their fascination with existential questions.

My hesitation in declaring a full-blown existential intelligence comes from the dearth, so far, of evidence that parts of the brain are concerned particularly with these deep issues of existence. It could be that there are regions—for example, in the inferotemporal lobe—that are particularly crucial for dealing with the Big Questions. However, it is also possible that existential questions are just part of a broader philosophical mind—or that they are simply the more emotionally laden of the questions that individuals routinely pose. In the latter instances, my conservative nature dictates caution in giving the ninth place of honor to existential intelligence. I do mention this candidate intelligence in passing, but, in homage to a famous film by Federico Fellini, I shall continue for the time being to speak of "8 $^1/_2$ Intelligences."

The Unique Contributions of the Theory

As human beings, we all have a repertoire of skills for solving different kinds of problems. My investigation began, therefore, with a consideration of these problems, the contexts in which they are found, and the culturally significant products that are the outcome. I did not approach "intelligence" as a reified human faculty that is brought to bear in literally any problem setting; rather, I began with the problems that human beings solve and the products that they cherish. In a sense I then worked back to the intelligences that must be responsible.

Evidence from brain research, human development, evolution, and cross-cultural comparisons was brought to bear in the search for the relevant human intelligences: a candidate was included only if reasonable evidence to support its membership was found across these diverse fields. Again, this tack differs from the traditional one: since no candidate faculty is necessarily an intelligence, I could make an up-or-down decision on a motivated basis. In the traditional approach to intelligence, there is no opportunity for this type of empirical decision.

My belief is that these multiple human faculties, the intelligences, are to a significant extent independent of one another. Research with brain-damaged adults repeatedly demonstrates that particular faculties can be lost while others are spared. This independence of intelligences implies that a particularly high level of ability in one intelligence, say mathematics, does not require a similarly high level in another, like language or music. This independence of intelligences contrasts sharply with traditional measures of IQ that find high correlations among test scores. I speculate that the usual correlations among subtests of IQ tests come about because all of these tasks in fact measure the ability to respond rapidly to items of a logical-mathematical or linguistic sort; these correlations might be substantially reduced if one were to survey in a contextually appropriate way—what I call "intelligence-fair assessment"—the full range of human problem-solving skills.

Until now, my discussion may appear to suggest that adult roles depend largely on the flowering of a single intelligence. In fact, however, nearly every cultural role of any degree of sophistication requires a combination of intelligences. Thus, even an apparently straightforward role, like playing the violin, transcends a reliance on musical intelligence. To become a successful violinist requires bodily-kinesthetic dexterity and the interpersonal skills of relating to an audience and, in a different way, of choosing a manager; quite possibly it involves an intrapersonal intelligence as well. Dance requires skills in bodily-kinesthetic, musical, interpersonal, and spatial intelligences in varying degrees. Politics requires an interpersonal skill, a linguistic facility, and perhaps some logical aptitude.

Inasmuch as nearly every cultural role requires several intelligences, it becomes important to consider individuals as a collection of aptitudes rather than as having a singular problem-solving faculty that can be measured directly through pencil-and-paper tests. Even given a relatively small number of such intelligences, the diversity of human ability is created through the differences in these profiles. In fact, it may well be that the total is greater than the sum of the parts. An individual may not be particularly gifted in any intelligence, and yet, because of a particular combination or blend of skills, he or she may be able to fill some niche uniquely well. Thus, it is of paramount importance to assess the particular combination of skills that may earmark an individual for a certain vocational or avocational niche.

In brief, MI theory leads to three conclusions:

1. All of us have the full range of intelligences; that is what makes us human beings, cognitively speaking.
2. No two individuals—not even identical twins—have exactly the same intellectual profile because, even when the genetic material is identical, individuals have different experiences (and identical twins are often highly motivated to distinguish themselves from one another).

3. Having a strong intelligence does not mean that one necessarily acts intelligently. A person with high mathematical intelligence might use her abilities to carry out important experiments in physics or create powerful new geometric proofs; but she might waste these abilities in playing the lottery all day or multiplying ten-digit numbers in her head.

All of these statements are about the psychology of human intelligence—to which MI theory seeks to make a contribution. But of course they raise powerful educational, political, and cultural questions. Those questions will engage us in later parts of the book.

Conclusion

I believe that in our society we suffer from three biases, which I have nicknamed "Westist," "Testist," and "Bestist." "Westist" involves putting certain Western cultural values, which date back to Socrates, on a pedestal. Logical thinking, for example, is important; rationality is important; but they are not the only virtues. "Testist" suggests a bias towards focusing on those human abilities or approaches that are readily testable. If it can't be tested, it sometimes seems, it is not worth paying attention to. My feeling is that assessment can be much broader, much more humane than it is now and that psychologists should spend less time ranking people and more time trying to help them.

"Bestist" is a thinly veiled reference to David Halberstam's 1972 book *The Best and the Brightest.* Halberstam's title referred ironically to the figures, among them Harvard faculty members, who were brought to Washington to help President John F. Kennedy and in the process launched the Vietnam War. I think any belief that all the answers to a given problem lie in one certain approach, such as logical-mathematical thinking, can be very dangerous. Current views of intellect need to be leavened with other, more comprehensive points of view.

It is of the utmost importance that we recognize and nurture all of the varied human intelligences and all of the combinations of intelligences. We are all so different largely because we have different combinations of intelligences. If we recognize this, I think we will have at least a better chance of dealing appropriately with the many problems that we face in the world. If we can mobilize the spectrum of human abilities, not only will people feel better about themselves and more competent; it is even possible that they will also feel more engaged and better able to join the rest of the world community in working for the broader good. Perhaps if we can mobilize the full range of human intelligences and ally them to an ethical sense, we can help increase the likelihood of our survival on this planet, and perhaps even contribute to our thriving.