Wisdom, Intelligence, and Creativity Synthesized

Intelligence, a Harvard psychologist famously remarked, is whatever intelligence tests measure. The observation may have been made in jest, but its effects have been all too serious. A multibillion dollar "intelligence testing" industry largely determines which children attend the best schools and universities. And local communities, under government pressure to produce results, institute curricula that teach to the test but leave little room for "luxuries" such as music and the arts. But what if the essential nature of intelligence is grossly distorted by the testing industry? For thirty years, Robert J. Sternberg has been among the most vocal critics of narrow conceptions of intelligence. In his most recent book, *Wisdom, Intelligence, and Creativity Synthesized*, Professor Sternberg critically reviews and summarizes the best research available on human intelligence. He argues that any serious understanding of intelligence must go beyond the standard paper and pencil tests currently in use. In addition to analytical and quantitative abilities, a theory of intelligence must take into account people's creative abilities – their ability to go beyond given information and imagine new and exciting ways of reformulating old problems. It must also take into account wisdom – people's ability to weigh options carefully and to act prudently. Understanding one's own intellectual shortcomings and learning how to overcome, Professor Sternberg argues, is just as important as developing one's strengths. As he weaves his way through decades of important research – including recent international studies – on these questions, Professor Sternberg develops a vision of human intelligence that is far more nuanced and accurate than anything offered previously. *Wisdom, Intelligence, and Creativity Synthesized* will be essential reading for psychologists, cognitive scientists, educators, and organizational researchers.

Robert J. Sternberg is IBM Professor of Psychology and Education and Director of the Center for the Psychology of Abilities, Competencies, and Expertise at Yale University. He is also 2003 President of the American Psychological Association and Editor of the *APA Review of Books: Contemporary Psychology*. Professor Sternberg is the author of roughly 950 books, book chapters, and articles in the field of psychology.

Wisdom, Intelligence, and Creativity Synthesized

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This book is dedicated to Elena L. Grigorenko

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Preface

Professor Wormbog had every beastie in his collection except one (Mayer, 1976). He had everything from A to Y: an askingforit, a blowfat-glowfish, a croonie, a diddly-dee, an errg, a fydolagump, and everything else up to the yalapappus. But he lacked the crucial Z, the zipperump-a-zoo. He therefore set out to find the missing zipperump-a-zoo and looked everywhere, including the most exotic places in the world. But the zipperump-a-zoo eluded him. Finally he gave up, came back home, and went to sleep, exhausted. As soon as he fell asleep, a whole tribe of zipperump-a-zoos emerged to party, right in his house. They had been there all the time, hiding. In asking in what exotic place they might be, he had neglected to ask whether they might be in the most obvious place of all, right in his own home. Because he had asked the wrong question, he emerged with the wrong answer.

This book represents, in a sense, a recounting of the tale of a search for my own zipperump-a-zoo (Sternberg, 2000b), the nature of the mind – of human intelligence, creativity, and wisdom, and how they interrelate. I have learned a crucial lesson from Professor Wormbog: You will never come up with the right answer if you ask the wrong question. I still have not figured out quite the right question, but that's fortunate because there is still hope for what's left of the second half of my career.

Because this book represents the culmination of all the work on the human mind I have done in the roughly thirty years since I started graduate school, I should like to say something about how the book came to be, to indulge myself in recounting the tale. (In the main text, I stick to theories, data, and interpretations.) I tell the tale from my own point of view, but I wish to emphasize that I have done nothing by myself. Without support from my family, my mentors, research advisors, granting agencies, and most important, my research group, now the PACE Center at Yale, there would be no story to tell. The critical lesson of the tale is that what seems

to be a complete answer at one stage of a career seems, at a later stage, to be woefully incomplete.

THE PREHISTORY

The prehistory of my search began when I was a primary school student and turned in a dismal performance on the required group IQ tests. I was so test-anxious I could hardly get myself to answer the test questions. When I heard other students turn the test pages, it was all over for me. For three years, my teachers thought me stupid, and I obliged, pleasing them by confirming their self-fulfilling prophecies for me. They were happy, I was happy; everyone was pretty damn happy.

In grade 4, at age nine, I had a teacher who believed in me, and to please her, I became an "A" student. I also learned that, when authority figures set high expectations for a student, it is amazing how quickly that student can defy earlier low expectations.

By age thirteen, I was determined to understand why I was now achieving at high levels despite my low IQ, so I did a science project on mental testing. I found the Stanford-Binet Intelligence test in the adult section of my town library and thought it would be good practice to give it to some classmates. I chose poorly. The first person I selected was a girl in whom I was romantically interested, and I soon discovered that giving a potential girl friend an IQ test is a bad way to break the ice. The second person I chose tattled on me, and I ended up in serious trouble with the school authorities when they learned I was giving IQ tests to my classmates. After they threatened to burn the book if I ever brought it to school again, I went underground, only to re-emerge some years later.

I also thought it would be a good idea to create a group test comprising not just eight or nine subtests, but two dozen. My idea was to improve IQ testing by giving a wider range of subtests. So I created the Sternberg Test of Mental Abilities (STOMA), no copies of which I have been able to locate in my adulthood. I had asked the wrong question – whether adding more of essentially the same kinds of subtests to create a super-duper-extra-long test would substantially improve reliability or validity. The answer was no. I quickly stumbled into the general (*g*) factor, which represents the individual-differences variation common to virtually all conventional psychometric tests of intellectual abilities. I was a bit too late. Charles Spearman (1904) had already speculated on the *g* factor at the turn of the twentieth century, as have many others since. Spearman believed the *g* factor represents "mental energy." Other psychologists have had other ideas about it, but the question of what it represents remains unresolved even today.

As a youth, I discovered that mental testing has many peculiarities. Over the summer after grade 10, when I was sixteen, I did a project on

the effect of distractions on mental ability test scores. I discovered that of four distractions – a car headlamp shining in the eyes, a slowly ticking metronome, a rapidly ticking metronome, and the Beatles singing "She has the Devil in Her Heart" – only one had an effect relative to a control condition in which there were no distractions. Students performed better on both verbal and math ability tests when listening to the Beatles!

The next year, at seventeen, I created a Physics Aptitude Test as a physics project to save my flagging physics grade, and the test was successful, predicting physics grades with a correlation in the mid .60s. The test actually was used by my high school for several years after I created it to help screen for honors physics.

At age twenty, as a junior in college, I thought I really had the solution: The answer to the problem of understanding intelligence was not more tests, but more refined scoring of the items already in tests. So I devised partial systems of scoring psychometric test items, and discovered, as had many of my colleagues at the Educational Testing Service (where I worked for the summer), that partial scoring adds very little reliable or valid variation in test scores. Wrong question again: The answer was not to be found in cosmetic manipulations such as adding more of essentially the same kinds of items or in seeking to extract partial information from such items. And so ended my largely futile prehistory as an apprentice.

THE HISTORY

Stage 1: Componential Analyses of Analytical Abilities

As a first-year graduate student I despaired of having any good ideas for studying intelligence. One day, I saw Betty, my wife at the time, using People Pieces in her work – a math-manipulative material for young children consisting of small square tiles that vary with respect to four binary features – color, height, weight, and sex. I visualized creating analogies from them, and so began my efforts at what I came to call componential analyses of human abilities.

The basic idea of componential analysis is that underlying intelligence is a series of information-processing components. The questions intelligence researchers should be asking are not merely what psychometric factors underlie these tests, but also (a) what information-processing components underlie the tests, (b) on what forms of mental representation these components act, (c) how the components combine into coherent strategies for solving problems, (d) how long each component consumes in real time, and (e) how liable each component is to errors in implementation. I started by describing componential analysis in detail and showing its implementation with various kinds of analogies (such as People Pieces, verbal, and figural ones – Sternberg, 1977).

Componential analyses served many useful purposes. They told psychologists how people were processing IQ-test-like problems in real time. The models accounted for large proportions of both stimulus and person variation in reaction-time data. Interesting specific findings also emerged. For example, I discovered that early real-time information processing in the solution of a given analogy is exhaustive and then later becomes self-terminating. I also found that being smart is not just a matter of being fast: Better reasoners tend to spend relatively more time encoding the terms of analogy problems but relatively less time operating on those encodings (Sternberg & Rifkin, 1979). They want to make sure they have understood what they are doing before they go ahead and do it.

The methodology also enabled me to discover why people may be doing poorly on a given type of test item. For example, is a low verbal-analogies score due to problems understanding the vocabulary required to solve the analogies or is it due to faulty reasoning operating on known vocabulary (Sternberg, 1977)?

Stage 1 of my research was actually divided into two substages. In Substage 1a, I merely posited the existence of information-processing components (Sternberg, 1977). In Substage 1b, I distinguished metacomponents – higher order executive processes that decide what to do, how to do it, and how well it was done; performance components – lower order processes that execute the instructions of the metacomponents; and knowledge-acquisition components, which figure out how to do things in the first place (Sternberg, 1980b). Using this framework, I was able to discover that better reasoners tend, for example, to spend relatively more time on the metacomponent of global planning, but less time on the metacomponent of local planning, than do poorer reasoners (Sternberg, 1981). In other words, the better reasoners realize that they need to plan in advance to conserve time and effort when they later begin getting into the details of the problem. We were also able to isolate the knowledge-acquisition components used in the acquisition of vocabulary from context (Sternberg & Powell, 1983), such as selective encoding of relevant cues in distinction from irrelevant cues for figuring out a word's meaning.

But the wrong questions had once again led to the wrong answers, or, to be more precise, *incomplete* answers. Puzzles were emerging. Why was the regression constant (i.e., the a in the equation $a + bx$) instead of the regression coefficient (i.e., the b in the equation) for the mathematical models we were constructing the best predictor of scores on psychometric tests? Were we just rediscovering g again, but this time as an information-processing construct? Why, when we assessed people's implicit (folk) theories of intelligence, were analytical abilities only a small aspect of what people broadly consider intelligence to be (Okagaki & Sternberg, 1993; Sternberg, 1985b; Sternberg, Conway, Ketron, & Bernstein, 1981; see also Yang & Sternberg,

1997b)? The main factor leading to my puzzlement, however, was really not a research finding, but an observation.

Stage 2: The Triarchic Theory of Human Intelligence

I have always been one to get most of my ideas not from reading academic materials or listening to academic lectures, but from my daily experience. And my experience was not fitting my theory. I was teaching three graduate students who provided a curious contrast. (The names given below are fictitious, although they represent real people.)

One, who I call Alice, was brilliant academically and at the kinds of memory and analytical skills conventional psychometric tests of intelligence emphasize. She started off our graduate program in psychology as one of the top students in the program but ended up as one of the bottom students. The reason was transparent: Alice was brilliant analytically but showed only the most minimal creative skills. I was not convinced that Alice was born creatively retarded. It seemed more likely that Alice had been so over-reinforced for her school smarts during her life that she had never had any incentive to develop or even to find whatever creative skills may have lain latent within her.

Another student, Barbara, was marvelously creative, if we were to believe her portfolio of research work and the recommendations of her undergraduate professors, but her scores on the largely analytical Graduate Record Examination (GRE) were weak. Other professors were reluctant to admit her because of these GRE scores, and Barbara was rejected from our program, with mine the only vote in her favor. I hired her as a research associate, which gave her a chance to show her creative brilliance. Barbara was admitted as the top pick to our graduate program a couple of years later. Some years later, we did a study on twelve years of graduate students in psychology at Yale. The study showed that, although the GRE was a good predictor of first-year grades, it was a satisfactory predictor of little else, such as students' analytical, creative, practical, research, or teaching abilities, or the quality of their dissertations (Sternberg & Williams, 1997). Concerning these other criteria, for men the analytical section (since discontinued) had some predictive power; for women none of the sections had significant predictive power.

The third student, Celia, was admitted not because she was spectacular but because she appeared to be good (but not great) in both analytical and creative skills, and every program needs students who are good in several things, if not great in any of them. But Celia surprised us when she was besieged with job offers. She was the kind of person who could go into a job interview, figure out what her potential employers wanted to hear, and give it to them. In contrast, Paul, a student who was analytically and creatively brilliant, received many job interviews but only one very weak

job offer. In some respects the opposite of Celia, he managed to insult his interviewers at every turn. He was as low as Celia was high in practical intelligence.

I now realize that once again I had been asking the wrong question. By asking what information-processing components underlie performance on conventional mental tests, I had been able to identify how people solve such conventional problems. But I had assumed that these tests measured the universe of skills relevant to intelligence, and my assumption was false. By asking the wrong question, I ended up with an incomplete answer.

These observations led to the development of the triarchic theory of human intelligence (Sternberg, 1984, 1985a, 1988c). This theory has three subtheories. A componential subtheory specifies the information-processing components of human intelligence, such as recognizing, defining, and representing problems. An experiential subtheory specifies the regions of experience at which these components are most relevant to the demonstration and assessment of intelligence. These regions are relative novelty and automatization. The former region refers to the solving of problems that are rather different in kind from what one is used to, but not wholly different. A problem that is too novel (e.g., calculus problems for five-year-olds) does not provide a good measure of intelligence. The second region refers to rendering unconscious and automatic a process that starts off as conscious and controlled, such as reading (see Sternberg, 1985a). A contextual subtheory specifies the real-world contextual functions of intelligence: adaptation to existing environments; shaping of existing environments into new and, it is hoped, better environments; and selection of different environments (usually when adaptation and shaping fail).

Analytical abilities are engaged when information-processing components are applied to relatively familiar problems that are largely academic because they are abstracted from the substance of everyday life. Creative abilities are engaged when the components are applied to relatively novel problems. Finally, practical abilities are engaged when the components are applied to adaptation to, shaping of, and selection of everyday environments.

My group expanded its research into the creative and practical domains, with some interesting results, we thought.

In Stage 2a, we focused on creative abilities, which seemed complementary to analytical ones. Some of this research used convergent measures. For example, we might introduce participants to relatively novel concepts, such as Goodman's (1955) concepts of *grue* – say, of the color green until the year 3000 and blue thereafter – and *bleen* – say, of the color blue until the year 3000 and green thereafter. We pointed out that one could not say whether an emerald was green or grue because one would not know until the year 3000 (actually, 2000 in the research, which was done in the 1980s: Sternberg, 1982; Tetewsky & Sternberg, 1986). Or we might

introduce participants to the planet Kyron, where there are four kinds of people – *plins,* who are born young and die young; *kwefs*, who are born old and die old; *balts*, who are born young and die old; and *prosses*, who are born old and die young. Participants had to solve reasoning problems that involved these novel concepts. We found that the information-processing component that distinguished the more from the less creative reasoners was the component that measured the ability to transit back and forth between conventional (*green–blue*) and unconventional (*grue–bleen*) thinking. The more creative individuals found it easier to switch back and forth.

In Stage 2b, which largely overlapped with Stage 2a, we focused on practical abilities. The basic idea motivating this research is that practical intelligence derives largely from the acquisition and utilization of *tacit knowledge* – the procedural knowledge not explicitly taught and often not even verbalized that one needs to know to succeed in an environment. For an academic psychologist, for example, tacit knowledge would include knowing how to win acceptance of articles submitted to journals and knowing how to get resources from the Chair of one's department. We represent this knowledge in the form of production systems, which are ordered series of conditional ("if–then") statements. Thus, one keeps asking which piece of tacit knowledge to apply (the "if" antecedent) and executes the tacit knowledge (the "then" consequent) when the right piece of tacit knowledge is found.

We have developed (Sternberg, Wagner, Williams, & Horvath, 1995; Wagner & Sternberg, 1985) and continue to develop (Sternberg et al., 2000) instruments to assess the acquisition and utilization of tacit knowledge. We have now tested thousands of people in more than two dozen occupations, including that of academic psychologist.

The tests are all based on the same notion. Participants are presented with scenarios from the everyday life of people going about their business (as students, as employees, or whatever). The participants then either state a solution to the problem posed in the scenario (in one format), or evaluate the quality of alternative solutions proposed to them (in another format).

The results have been fairly consistent across studies: Tacit knowledge typically does not correlate with IQ-based measures but predicts school and job performance as well as or better than IQ-based measures. The correlations are not always zero. At the lower (but not higher) ranks of military officers, we obtained weak but significant positive correlations. Among children in rural Kenya, we obtained significant negative correlations: The anthropological members of our team – Wenzel Geissler and Ruth Prince – recognized a fundamental fact about family values. The children saw that their path to success was not through obtaining high grades in formal schooling but rather through acquiring the tacit knowledge that led to adaptation to the demands of village life.

In other words, our measures supplement, although obviously do not replace, the IQ-based measures. They are not replacements because we are focusing here on practical abilities, whereas IQ-based measures focus on analytical abilities.

But I eventually came to the conclusion that I was once again asking the wrong question. I was emphasizing analytical, creative, and practical abilities and thinking loosely in terms of some additive combination rule. Observation of effective people in a variety of occupations convinced me that there was no single combination rule, however. For example, my two mentors and greatest role models – Endel Tulving and Gordon Bower – are both wonderfully successful psychologists, but they have gotten to where they are in very different ways. There seems to be an infinite number of combination rules.

Stage 3: The Theory of Successful Intelligence

The theory of successful intelligence (Sternberg, 1997b, 1999d) is in many respects an expansion of the triarchic theory. It states that people are successfully intelligent to the extent that they have the abilities needed to succeed in life, according to their own definition of success within their sociocultural context. They succeed by adapting to, shaping, and selecting environments, which they do by recognizing and then capitalizing on their strengths, and by recognizing and then compensating for or correcting their weaknesses. Thus, there is no one path to success in life. Each person must chart his or her own way, and the job of the teacher is to help students in this endeavor. Teaching in just one way can never work.

Many societies, especially developed ones, tend to focus a spotlight on just one group of students – those with high levels of memory and analytical abilities. But in doing so, they create self-fulfilling prophecies, developing assessments of ability, instruction, and assessments of achievement that identify as intelligent this one group of students. They can create whatever kinds of self-fulfilling prophecies they wish. If they bestow benefits primarily or exclusively on children of certain religions, castes, skin colors, or accents of speech, they quickly find that only those children succeed. They then convince themselves, as did Herrnstein and Murray (1994), that the success of these individuals represents an "invisible hand of nature" rather than a system created by the society.

Our research has shown that analytical, creative, and practical abilities are largely independent. When students' abilities and achievements are assessed not just for memory and analytical abilities, but also for creative and practical abilities, students formerly considered as not very bright can succeed in school at higher levels (Sternberg, Grigorenko, Ferrari, &

Clinkenbeard, 1999). Moreover, students taught for successful intelligence do better across grade levels and subject matter areas, regardless of how their performance is assessed, and even if it is assessed merely for memory learning (Sternberg, Torff, & Grigorenko, 1998a). The students learn better because they can use their abilities more effectively and because the greater interest of the material better motivates them to learn.

Stage 4: The Investment Theory of Creativity and the Propulsion Theory of Creative Contributions

After studying intelligence for a number of years, it became clear to me that there is more to creativity than creative intelligence. There are people who appear to have creative intelligence but are unable to use it effectively in their lives because they have various kinds of blocks. More and more, I came to believe that creativity is a decision.

Eventually, Todd Lubart and I (Sternberg & Lubart, 1991, 1995) proposed an investment theory of creativity, according to which more creative thinkers are those who buy low and sell high in the world of ideas (Sternberg & Lubart, 1995). In other words, they are people who generate ideas that are relatively unpopular (buy low); convince others of the worth of these ideas (sell high); and then move on to the next unpopular idea. We had people write stories with diverse titles such as *The Octopus's Sneakers*; or do art work for topics such as *Earth from an Insect's Point of View*; or produce advertisements for boring products such as a new brand of bow tie; or solve quasi-scientific problems such as how we could tell whether there are extraterrestrial aliens among us seeking to escape detection. Products were evaluated for their novelty and quality.

Two major findings emerged. First, creativity tends to be fairly but not completely domain-specific. Second, it tends to be rather but not totally distinct from psychometrically measured intelligence.

Today, I believe the investment theory was a bit of an oversimplification. Whereas the investment theory holds that creative ideas tend to be unappreciated and devalued, I now believe, according to a new propulsion theory of creative contributions (Sternberg, 1999c; Sternberg, Kaufman, & Pretz, 2002), that whether creative ideas are valued or not depends on which of seven kinds of creative ideas they are. Ideas that are consistent with ongoing paradigms tend to be welcome. Forward incrementations, for example, which move existing paradigms forward, tend to be valued. Redirections, which move existing paradigms in new directions, or reinitiations, which reject current paradigms and start at a different point of departure, tend not to be recognized as creative because they are often too novel for people to appreciate their value. Of course, novelty is no guarantee of quality.

Stage 5: The Balance Theory of Wisdom

My latest work has taken a somewhat different direction. I have come to realize that some of the world's cruelest despots and greediest business tycoons are successfully intelligent. They have played within the sociocultural rules, which they have largely set. Thus, they have been enormously successful, often at the expense of countless countrymen who are left to their own devices, and often to death. It is for this reason that I have now turned my attention to wisdom (Sternberg, 1998b, 2001a). In my balance theory, I view wisdom as the value-laden application of tacit knowledge not only for one's own benefit (as can be the case with successful intelligence) but also for the benefit of others, in order to attain a common good. The wise person realizes that what matters is not just knowledge, or the intellectual skills one applies to this knowledge, but how the knowledge is used.

IQs have been rising over the past several generations (Flynn, 1987; Neisser, 1998). The perpetuation of ever worse massacres and genocides suggests that wisdom has not been rising concomitantly. If there is anything the world needs, it is wisdom. Without it, I exaggerate not at all in saying that very soon, there may be no world, or at least none with humans populating it. Perhaps the only ones left will be zipperump-a-zoos.

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