

# Uncommon Talents:

## Gifted Children, Prodigies and Savants

*Possessing abilities well beyond their years, gifted children inspire admiration, but they also suffer ridicule, neglect and misunderstanding*

by Ellen Winner

**O**ne evening a few years ago, while I was attending a concert, a young boy in the audience caught my attention. As the orchestra played a Mozart concerto, this nine-year-old child sat with a thick, well-thumbed orchestral score opened on his lap. As he read, he hummed the music out loud, in perfect tune. During intermission, I cornered the boy's father. Yes, he told me, Stephen was really reading the music, not just looking at it. And reading musical scores was one of his preferred activities, vying only with reading college-level computer programming manuals. At an age when most children concentrate on fourth-grade arithmetic and the nuances of playground etiquette, Stephen had already earned a prize in music theory that is coveted by adults.

Gifted children like Stephen are fascinating but also intimidating. They have been feared as "possessed," they have been derided as oddballs, they have been ridiculed as nerds. The parents of such young people are often criticized for pushing their children rather than allowing them a normal, well-balanced childhood. These children are so different from others that schools usually do not know how to educate them. Meanwhile society expects gifted children to become creative intellectuals and artists as adults and views them as failures if they do not.

Psychologists have always been interested in those who deviate from the norm, but just as they know more about psy-



WANG SHIQIANG

chopathology than about leadership and courage, researchers also know far more about retardation than about giftedness. Yet an understanding of the most talented minds will provide both the key to educating gifted children and a precious glimpse of how the human brain works.

### The Nature of Giftedness

Everyone knows children who are smart, hard-working achievers—youngsters in the top 10 to 15 percent of all students. But only the top 2 to 5 percent of children are gifted. Gifted children (or child prodigies, who are just extreme versions of gifted children) differ from bright children in at least three ways:

- *Gifted children are precocious.* They master subjects earlier and learn more quickly than average children do.
- *Gifted children march to their own drummer.* They make discoveries on their own and can often intuit the solution to a problem without going through a series of logical, linear steps.
- *Gifted children are driven by "a rage to master."* They have a powerful interest in the area, or domain, in which they have high ability—mathematics, say, or art—and they can readily focus so intently on work in this domain that they lose sense of the outside world.

These are children who seem to teach themselves to read



## **Pull Harder, Wang Yani**

as toddlers, who breeze through college mathematics in middle school or who draw more skillfully as second-graders than most adults do. Their fortunate combination of obsessive interest and an ability to learn easily can lead to high achievement in their chosen domain. But gifted children are more susceptible to interfering social and emotional factors than once was thought.

The first comprehensive study of the gifted, carried out over a period of more than 70 years, was initiated at Stanford University in the early part of this century by Lewis M. Terman, a psychologist with a rather rosy opinion of gifted children. His study tracked more than 1,500 high-IQ children over the course of their lives. To qualify for the study, the “Termites” were first nominated by their teachers and then had to score 135 or higher on the Stanford-Binet IQ test (the average score is 100). These children were precocious: they typically spoke early, walked early and read before they entered school. Their parents described them as being insatiably curious and as having superb memories.

Terman described his subjects glowingly, not only as superior in intelligence to other children but also as superior in health, social adjustment and moral attitude. This conclusion easily gave rise to the myth that gifted children are happy and well adjusted by nature, requiring little in the way of spe-

*GIFTED CHILD ARTIST WANG YANI from China painted at a nearly adult skill level at the age of five, when she completed this painting in 1980. As a child, she produced a prodigious number of works, at one point finishing 4,000 paintings within the space of three years.*

cial attention—a myth that still guides the way these children are educated today.

In retrospect, Terman’s study was probably flawed. No child entered the study unless nominated by a teacher as one of the best and the brightest; teachers probably overlooked those gifted children who were misfits, loners or problematic to teach. And the shining evaluations of social adjustment and personality in the gifted were performed by the same admiring teachers who had singled out the study subjects. Finally, almost a third of the sample came from professional, middle-class families. Thus, Terman confounded IQ with social class.

The myth of the well-adjusted, easy-to-teach gifted child persists despite more recent evidence to the contrary. Mihaly Csikszentmihalyi of the University of Chicago has shown that children with exceptionally high abilities in any area—not just in academics but in the visual arts, music, even athletics—are out of step with their peers socially. These children tend to be highly driven, independent in their thinking and introverted. They spend more than the usual amount of time alone, and although they derive energy and pleasure from their soli-



*DRAWING SAVANT NADIA* was a “low-functioning” autistic child, whose mental age was three years and three months when she was six. But this sketch by Nadia, done at age five and a half in 1973, exhibits a command of line, foreshortening and motion reminiscent of adult Renaissance masters.

pletes college as an early teen—or even as a preteen—is likely to be globally gifted. Such children are easy to spot: they are all-around high achievers. But many children exhibit gifts in one area of study and are unremarkable or even learning disabled in others. These may be creative children who are difficult in school and who are not immediately recognized as gifted.

Unevenness in gifted children is quite common. A recent survey of more than 1,000 highly academically gifted adolescents revealed that more than 95 percent show a strong disparity between mathematical and verbal interests. Extraordinarily strong mathematical and spatial abilities often accompany average or even deficient verbal abilities. Julian Stanley of Johns Hopkins University has found that many gifted children selected for special summer programs in advanced math have enormous discrepancies between their math and verbal skills. One such eight-year-old scored 760 out of a perfect score of 800 on the math part of the Scholastic Assessment Test (SAT) but only 290 out of 800 on the verbal part.

In a retrospective analysis of 20 world-class mathematicians, psychologist Benjamin S. Bloom, then at the University of Chicago,

reported that none of his subjects had learned to read before attending school (yet most academically gifted children do read before school) and that six had had trouble learning to read. And a retrospective study of inventors (who presumably exhibit high mechanical and spatial aptitude) showed that as children these individuals struggled with reading and writing.

Indeed, many children who struggle with language may have strong spatial skills. Thomas Sowell of Stanford University, an economist by training, conducted a study of late-talking children after he raised a son who did not begin to speak until almost age four. These children tended to have high spatial abilities—they excelled at puzzles, for instance—and most had relatives working in professions that require strong spatial



*TYPICAL DRAWING* by a five-year-old of average ability lacks detail and is highly schematic.

tary mental lives, they also report feeling lonely. The more extreme the level of gift, the more isolated these children feel.

Contemporary researchers have estimated that about 20 to 25 percent of profoundly gifted children have social and emotional problems, which is about twice the normal rate; in contrast, moderately gifted children do not exhibit a higher than average rate. By middle childhood, gifted children often try to hide their abilities in the hopes of becoming more popular. One group particularly at risk for such underachievement is academically gifted girls, who report more depression, lower self-esteem and more psychosomatic symptoms than academically gifted boys do.

The combination of precocious knowledge, social isolation and sheer boredom in many gifted children is a tough challenge for teachers who must educate them alongside their peers. Worse, certain gifted children can leap years ahead of their peers in one area yet fall behind in another. These children, the unevenly gifted, sometimes seem hopelessly out of sync.

## The Unevenly Gifted

Terman was a proponent of the view that gifted children are globally gifted—evenly talented in all academic areas. Indeed, some special children have exceptional verbal skills as well as strong spatial, numerical and logical skills that enable them to excel in mathematics. The occasional child who com-



ET ARCHIVE, LONDON/SUPERSTOCK

WOLFGANG AMADEUS MOZART is among the best-known child prodigies. He began picking out tunes on the piano at three years of age; by four he could tell if a violin was a quarter tone out of tune, and by eight he could play without hesitation a complex piece he had never seen before. Mozart began composing at the age of five, when he wrote two minuets for the harpsichord. Even as a young child, he could play pieces perfectly from memory, having heard them only once, and improvise on a theme without ever repeating himself.



THE COLLECTIONS OF THE EDISON NATIONAL HISTORIC SITE, NATIONAL PARK SERVICE

THOMAS ALVA EDISON exemplifies the unevenly gifted individual. Edison was a prolific inventor, obtaining 1,093 patents for innovations ranging from the phonograph to the incandescent light. As a child, he was obsessed with science and spent much time tinkering in a chemistry laboratory in his parents' cellar. Edison had some difficulties learning, though, especially in the verbal areas; he may have had symptoms of dyslexia. The coexistence of strong spatial-logical skills with a weakness in language is common in the unevenly gifted.

skills. Perhaps the most striking finding was that 60 percent of these children had engineers as first- or second-degree relatives.

The association between verbal deficits and spatial gifts seems particularly strong among visual artists. Beth Casey of Boston College and I have found that college art students make significantly more spelling errors than college students majoring either in math or in verbal areas such as English or history. On average, the art students not only misspelled more than half of a 20-word list but also made the kind of errors associated with poor reading skills—nonphonetic spellings such as “physicain” for “physician” (instead of the phonetic “fiscian”).

The many children who possess a gift in one area and are weak or learning disabled in others present a conundrum. If schools educate them as globally gifted, these students will continually encounter frustration in their weak areas; if they are held back because of their deficiencies, they will be bored and unhappy in their strong fields. Worst, the gifts that these children do possess may go unnoticed entirely when frustrated, unevenly gifted children wind up as misfits or troublemakers.

### **S**avants: Uneven in the Extreme

The most extreme cases of spatial or mathematical gifts coexisting with verbal deficits are found in savants. Savants are retarded (with IQs between 40 and 70) and are either autistic or show autistic symptoms. “Ordinary” savants usually possess one skill at a normal level, in contrast to their oth-

erwise severely limited abilities. But the rarer savants—fewer than 100 are known—display one or more skills equal to prodigy level.

Savants typically excel in visual art, music or lightning-fast calculation. In their domain of expertise, they resemble child prodigies, exhibiting precocious skills, independent learning and a rage to master. For instance, the drawing savant named Nadia sketched more realistically at ages three and four than any known child prodigy of the same age. In addition, savants will often surpass gifted children in the accuracy of their memories.

Savants are like extreme versions of unevenly gifted children. Just as gifted children often have mathematical or artistic genius and language-based learning disabilities, savants tend to exhibit a highly developed visual-spatial ability alongside severe deficits in language. One of the most promising biological explanations for this syndrome posits atypical brain organization, with deficits in the left hemisphere of the brain (which usually controls language) offset by strengths in the right hemisphere (which controls spatial and visual skills).

According to Darold A. Treffert, a psychiatrist now in private practice in Fond du Lac, Wis., the fact that many savants were premature babies fits well with this notion of left-side brain damage and resultant right-side compensation. Late in pregnancy, the fetal brain undergoes a process called pruning, in which a large number of excess neurons die off [see “The Developing Brain,” by Carla J. Shatz; SCIENTIFIC AMERICAN,



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CALENDARICAL CALCULATORS GEORGE AND CHARLES, identical twins, are the most famous of such savants. Each could instantly compute the day of the week on which any given date, past or future, would fall. The twins were born in 1939 three months premature and retarded; their IQs tested between 40 and 70. Such an extraordinary ability to calculate in an otherwise extremely mentally disabled child mirrors the milder unevenness of gifts seen in children highly talented in mathematics but learning disabled in language.

September 1992]. But the brains of babies born prematurely may not have been pruned yet; if such brains experience trauma to the left hemisphere near the time of birth, numerous uncommitted neurons elsewhere in the brain might remain to compensate for the loss, perhaps leading to a strong right-hemisphere ability.

Such trauma to a premature infant's brain could arise many ways—from conditions during pregnancy, from lack of oxygen during birth, from the administration of too much oxygen afterward. An excess of oxygen given to premature babies can cause blindness in addition to brain damage; many musical savants exhibit the triad of premature birth, blindness and strong right-hemisphere skill.

Gifted children most likely possess atypical brain organization to some extent as well. When average students are tested to see which part of their brain controls their verbal skills, the answer is generally the left hemisphere only. But when mathematically talented children are tested the same way, both the left and right hemispheres are implicated in control-

ling language—the right side of their brains participates in tasks ordinarily reserved for the left. These children also tend not to be strongly right-handed, an indication that their left hemisphere is not clearly dominant.

The late neurologist Norman Geschwind of Harvard Medical School was intrigued by the fact that individuals with pronounced right-hemisphere gifts (that is, in math, music, art) are disproportionately nonright-handed (left-handed or ambidextrous) and have higher than average rates of left-hemisphere deficits such as delayed onset of speech, stuttering or dyslexia. Geschwind and his colleague Albert Galaburda theorized that this association of gift with disorder, which they called the “pathology of superiority,” results from the effect of the hormone testosterone on the developing fetal brain.

Geschwind and Galaburda noted that elevated testosterone can delay development of the left hemisphere of the fetal brain; this in turn might result in compensatory right-hemisphere growth. Such “testosterone poisoning” might also account for the larger number of males than females who exhibit mathematical and spatial gifts, nonright-handedness and pathologies of language. The researchers also noted that gifted children tend to suffer more than the usual frequency of immune disorders such as allergies and asthma; excess testosterone can interfere with the development of the thymus gland, which plays a role in the development of the immune system.

Testosterone exposure remains a controversial explanation for uneven gifts, and to date only scant evidence from the study of brain tissue exists to support the theory of damage and compensation in savants. Nevertheless, it seems certain that gifts are hardwired in the infant brain, as savants and gifted

children exhibit extremely high abilities from a very young age—before they have spent much time working at their gift.

## Emphasizing Gifts

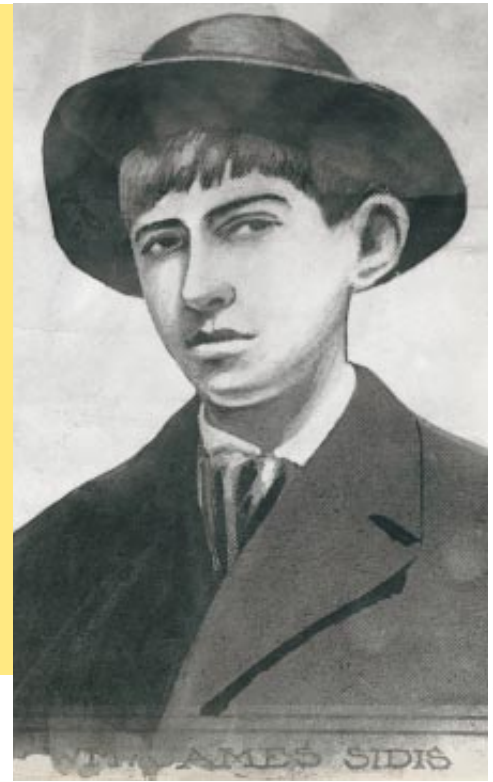
Given that many profoundly gifted children are unevenly talented, socially isolated and bored with school, what is the best way to educate them? Most gifted programs today tend to target children who have tested above 130 or so on standard IQ tests, pulling them out of their regular classes for a few hours each week of general instruction or interaction. Unfortunately, these programs fail the most talented students.

Generally, schools are focusing what few resources they have for gifted education on the moderately academically gifted. These children make up the bulk of current “pull-out” programs: bright students with strong but not extraordinary abilities, who do not face the challenges of precocity and isolation to the same degree as the profoundly gifted. These children—and indeed most children—would be better served if schools instead raised their standards across the board.

Other nations, including Japan and Hungary, set much higher academic expectations for their children than the U.S. does; their children, gifted or not, rise to the challenge by succeeding at higher levels. The needs of moderately gifted children could be met by simply teaching them a more demanding standard curriculum.

The use of IQ as a filter for gifted programs also tends to tip these programs toward the relatively abundant, moderately academically gifted while sometimes overlooking profoundly but unevenly gifted children. Many of those children do poorly on IQ tests, because their talent lies in either math or language, but not both. Students whose talent is musical, artistic or ath-

WHEN BRILLIANCE ISN'T ENOUGH: William James Sidis (1898–1944) was profoundly gifted as a child, reading and spelling at the age of two, inventing a new table of logarithms at eight, speaking six languages by 10. By age 11 he was enrolled at Harvard University, delivering lectures on mathematics to the faculty. But Sidis's father had driven him mercilessly as a child, denying him any youthful pleasures and letting the media hound him. He grew deeply bitter and resentful of his father and lost all interest in mathematics after graduating from Harvard at 16. This talented young man spent the rest of his life in mindless clerical jobs, and his interests became obsessive and autisticlike: at 28 he wrote a comprehensive book on the classification of streetcar transfer slips. He died, alone, from a brain hemorrhage at 46.



BROWN BROTHERS

letic are regularly left out as well. It makes more sense to identify the gifted by examining past achievement in specific areas rather than relying on plain-vanilla IQ tests.

Schools should then place profoundly gifted children in advanced courses in their strong areas only. Subjects in which a student is not exceptional can continue to be taught to the student in the regular classroom. Options for advanced classes include arranging courses especially for the gifted, placing gifted students alongside older students within their schools, registering them in college courses or enrolling them in accelerated summer programs that teach a year's worth of material in a few weeks.

Profoundly gifted children crave challenging work in their domain of expertise and the companionship of individuals with similar skills. Given the proper stimulation and opportunity, the extraordinary minds of these children will flourish. SA

## About the Author

ELLEN WINNER was a student of literature and painting before she decided to explore developmental psychology. Her inspiration was Harvard University's Project Zero, which researched the psychological aspects of the arts. Her graduate studies allowed her to combine her interests in art and writing with an exploration of the mind. She received her Ph.D. in psychology from Harvard in 1978 and is currently professor of psychology at Boston College as well as senior research associate with Project Zero.

One of Winner's greatest pleasures is writing books; she has authored three, one on the psychology of the arts, another on children's use of meta-

phor and irony and, most recently, *Gifted Children: Myths and Realities*. “I usually have several quite different projects going at once, so I am always juggling,” she remarks. She is especially intrigued by unusual children—children who are gifted, learning disabled, gifted and learning disabled, nonright-handed or particularly creative. “The goal is to understand cognitive development in its typical and atypical forms.”

When she has time to play, Winner devours novels and movies and chauffeurs her 13-year-old son on snowboarding dates. She is married to the psychologist Howard Gardner and has three grown stepchildren.



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