BEAUTIFUL MINDS

What's it like to raise a family of geniuses? With three highly gifted sons, Billy and Grace Tao have learnt to ignore the advice of experts, writes *Richard Guillatt*.

If you were looking for a place to study the Big Questions about human intelligence - Is genius innate? Why are brilliant minds so often troubled? - the Tao household in Adelaide's southern suburbs might seem an unlikely choice. Built on a hill overlooking Flinders University, the house is a standard, four-bedroom, brick-veneer suburban home with a carport. The occupants, Dr Billy Tao and his wife, Grace, are model Chinese immigrants who embraced their new surroundings so enthusiastically that they christened their sons with the Anglo-Saxon names Terrence, Trevor and Nigel.

Yet it was here, during the early '80s, that the Taos came to realise that some fluke of brain chemistry had bestowed unusual gifts on their children. Terry, the eldest, was a bewilderingly smart tot who mastered most of the primary school maths curriculum while still in kindergarten. At seven he could discuss Boolean algebra, Abelian groups and other advanced mathematical concepts, and by nine he was attending physics and maths lectures at the nearby university. Professor Julian Stanley, a US expert on gifted children, pronounced him the most advanced mathematics prodigy he had ever seen.

Terry's two brothers were similarly gifted. The youngest, Nigel, had an IQ of 180 and as a teenager won bronze medals in two International Mathematical Olympiads. Middle brother Trevor was Australian Junior Chess Champion at 14, won multiple prizes for his classical music compositions, became a gifted pianist and earned a diploma in mathematical sciences. The fact that he is autistic made his story all the more remarkable.

On a recent winter afternoon their proud father reviewed these achievements in the study of his home as Trevor sat playing Rachmaninoff preludes on a grand piano. Dr Billy Tao is a diminutive and voluble 61-year-old with greying, combed-over hair and square-framed spectacles. A pediatrician by training, he has developed an understandably avid interest in the subject of gifted children; before I arrived at the house he had been sitting at his computer, dressed in ugg boots and multiple fleecy sweaters, bashing out his latest thoughts on the subject.

A lot of what Billy Tao has to say runs counter to the accepted wisdom of "gifted education" experts, with their emphasis on IQ ratings and accelerated learning. "It's not helpful to learn what they have done," he says cheerfully. "It's helpful to avoid their mistakes. I have seen too many situations where the parents did the wrong thing." A brilliant mind, he says, is not just a cluster of neurons crunching numbers but a deep pool of creativity, originality, experience and imagination. "This is the difference between genius and people who are just bright. The genius will look at things, try things, do things, totally unexpectedly. It's higher-order thinking. Genius is beyond talent. It's something very original, very hard to fathom."

What makes Billy Tao's musings on this subject more pertinent than most is that he, unlike most parents of gifted children, has helped raise a bona-fide genius. When Terry Tao was awarded the Fields Medal (often described as the Nobel Prize of mathematics) last year at the age of 31, he was vaulted to the pinnacle of the mathematics world. Since he became a professor at the University of California, Los Angeles (UCLA), seven years ago, the Tao's eldest son has dazzled his colleagues with an unstoppable flow of breakthroughs and innovations that some have likened to the musical output of history's greatest prodigy, Mozart.

"Terry Tao is definitely, in my view, a genius," says Professor Allan Snyder, director of the Centre for the Mind at the University of Sydney. "I would rarely use that term, but he is. Because he's not done incremental things; he's made leaps."

For Snyder, the Tao family raises fascinating questions about the way a brilliant mind works. Contrary to popular belief, he points out, it's rare for a child prodigy to blossom into a fully fledged genius; in fact, Snyder ventures to argue that an average kid is much more likely to become an exceptional adult (see box on page 31). What made the Taos an exception to this rule?

For years, Snyder has been researching whether some forms of mental illness open up hidden recesses of the mind which enable great intellectual leaps. Why are autistic people sometimes capable of extraordinary feats of memory or mathematical calculation? Why do bipolar sufferers often produce great art and music?

"Terry has some deep insight that I personally think is facilitated by his type of mind," Snyder says, choosing his words carefully. "I don't know what type of mind

it is but in his family there's a history of different types of mind. He's married, which almost certainly means he's not autistic. But I do think it's important that he comes from this kind of a family."

FOR BILLY AND GRACE TAO, life changed irrevocably one afternoon in 1977 when they were visiting friends and looked over to see their two-year-old son sitting on the floor teaching a group of five-year-olds how to spell and add. Asked how he had learnt these skills, Terry replied that he had been watching *Sesame Street*. By the time he enrolled in primary school three years later, he could sit for hours reading high school calculus textbooks. That same year, 1980, the Taos were told that Trevor, then aged two, was autistic.

"At the time it was a bit like someone throwing a ball to you and saying 'Catch!', then throwing another ball right after it," recalls Billy, with characteristic *sangfroid*. "It's not like you have time to wonder whether the balls will be too heavy; you just catch them. You don't think, 'I've got one child who is gifted and one who is autistic', you just sit down and work out what to do."

Autism scrambles the brain signals that govern human communication, and Trevor showed many classic symptoms. He avoided eye contact, didn't speak, exhibited repetitive behaviours such as endlessly twirling a ball, and would become enraged if his routines were broken. The prognosis for him appeared to be a life of social isolation. But with the help of the Autistic Children's Association of South Australia (now Autism SA), the Taos hired an instructor, Jean Bryant, who began teaching him behaviour modification techniques.

"When we originally looked at him we thought the outlook was pretty bleak," recalls Billy. "In those days, if an autistic person could be taught some basic living skills - to make your bed, do the dishes, make a cup of tea - this would be considered good. To finish high school was a bit of a dream. To finish university was a fantasy."

Jean Bryant later wrote a book about her experience of teaching Trevor Tao, and it's difficult to connect the five-year-old she describes - who needed cue cards to learn how to dress and speak - with the 30-year-old who sits at the piano playing Rachmaninoff. Tall, gangly and bespectacled, with a high-domed forehead and thatch of spiked black hair, Trevor still speaks with the slightly flattened tonality of many autistic people, and exhibits quirky habits such as clasping his hands behind his back. He is, however, a droll and witty presence. Looking at a scrapbook which features him smiling goofily from the pages of *Woman's Day* at the age of 10, he says: "Hmmm. I must have been in my autism mode."

These days Trevor works as a research scientist at the Defence Science and Technology Organisation in Adelaide, specialising in image analysis. Two years ago, he completed a PhD thesis entitled *An Extended Mumford-Shah Model and Improved Region Merging Algorithm for Image Segmentation* (don't ask). He also writes anti-smoking songs set to tunes such as *Supercalifragilisticexpialidocio us* ("Smoking causes heart disease and osteoporosis ...") The day I visited he played me this tune on the guitar and jokingly cited it as evidence that he is himself a genius. "That's not genius," advised his dad. "That's obsession."

Music was the key that first unlocked Trevor's potential. As anyone who has seen the Dustin Hoffman film *Rain Man* will know, autistic savants have an almost paranormal ability to divine the intricate patterns within maths and musical notation. Allan Snyder likens it to a brain that receives information in ultra-high contrast: in social situations this causes overload and confusion, as the mind fixates on myriad irrelevant details, whereas the static data in a musical score or mathematical equation can be absorbed at a glance. Before he could even speak properly, Trevor could memorise music almost instantly and play it back note-perfect.

For the Tao brothers, it was a happy accident of birth that their father was a pediatrician and their mother a teacher with an honours degree in mathematics. While Bill Tao researched gifted education and autism his wife quit her job in order to devote herself to the full-time challenge of rearing their sons. (Grace Tao is an exceptionally gifted mathematician, although she deflects almost all questions to her husband). Ironically, the boys also benefited from the fact that special school programs for prodigies and autistic children were hard to find. In a field still taking shape, the Taos devised their own approach, even taking the family to the United States to tour the major centres of gifted-education research.

"People say Terry is lucky he got the right teachers, the right school, the right mentors," says Billy Tao. "Well, we had to go out and find those people." With the co-operation of his primary school principal, Terry became the first gifted student in Australia to be "radically accelerated" to high school in maths and physics, while remaining at Bellevue Heights Primary for other subjects. After sitting the Year 12 maths exams at the age of eight (he scored 90 per cent), he began studying maths at Flinders University.

By 1984, the media publicity surrounding this "boy genius" had attracted the attention of international academics. Dr Julian Stanley, who ran a program for maths prodigies at the Johns Hopkins University in Baltimore, sent the Taos a copy of the US College Board's admission test and was duly astonished by the youngster's score, the highest he had seen in 14 years of research. Meanwhile, Trevor had become the youngest autistic child ever integrated into a mainstream primary school in South Australia.

Billy Tao recalls that early on he and his wife were helped by the Gifted and talented Children's Association of South Australia, but they became uncomfortable with the fixation some parents in the association had with their children's achievements and IQ ratings. The Taos had already seen the pitfalls of this approach during a trip to the US when they met Jay Luo, a prodigy who had earned a university science degree at age 12, but later dropped out during his PhD studies.

"Many parents of gifted children tend to overestimate their children's ability, they want to maximise speed," says Billy. "One thing I disagreed about with the gifted-children movement is the emphasis on acceleration. Many gifted-education people, particularly teachers who have diplomas in gifted education, are all brainwashed with this idea of acceleration, acceleration, acceleration. What about lateral thinking? What about creativity?"

In contrast to the effusive praise other parents heaped on their little Mozarts, the Taos avoided excessive flattery and downplayed the importance of winning. It was a policy they put in place partly to deal with the challenge presented by their youngest son, Nigel. A prodigy at chess and maths - his IQ qualifies him as profoundly gifted - Nigel faced the difficulty of being merely exceptional in a family where extraordinary was the norm. At 14 he won a bronze medal in the International Mathematical Olympiad in Hong Kong. By then, however, Trevor had become an international chess player, met prime minister Bob Hawke and been made the subject of a book, a PhD thesis and countless media appearances. Terry, meanwhile, had written his first maths textbook at 15, earned a masters degree at 17 and was starting a doctoral thesis on harmonic analysis oat Princeton University.

Miraca Gross, a professor of gifted education at the University of NSW who has known the Taos since 1984, is among the many who note that one of the family's most remarkable qualities is the absence of egotism and rivalry. "There's an enormous, deep affection between the three boys," says Gross. "By the time Terry was 10 years old he was actively looking for ways he could help his brothers on their paths."

Today, Nigel in 28. After studying maths

and economics at the Australian National University he seemed destined for a career as an academic but took a sideways step and now works as a software programmer in the more relaxed environs of the Google headquarters in Sydney. Emerging from his office there recently, he was barefoot and dressed like a teenager in camouflage pants and a blue hoodie.

Talking to Nigel is a reminder that the Tao boys are Aussies. While they may have inherited a genetic gift and a strong work ethic from their Chinese parents, the Australian egalitarian ethos rubbed off along the way and probably helped them avoid the pitfalls of the "troubled genius".

"I skipped Year 5," Nigel notes, "but I don't try and make a big deal of it and I don't let that define me. Maybe that's an Australian thing, where you admire someone for being a good bloke rather than something they've achieved. If we'd grown up in the US it might have been different. In Australia you can be tremendously good at something but if you're a whacker, people still aren't going to like you.

"To me, Terry is just a brother, rather than the towering figure of later years, And Trevor, he's kind of kooky, but as far as autism goes it's relatively mild - he's keeping down a job and once you get past his quirks he's genuinely friendly and likes making jokes, so he's fun to be around. So they weren't outrageously special to me."

Asked if he sees any parallels between Trevor's autistic quirks and his own, Nigel doesn't seem in the least offended. "Well, I think there is a correlation between autistic behaviour and maths and music - that's quite frequently commented on. And even myself and Terry, we do quite like our clever little puns and crosswords and games, If there are shades of stereotypical autistic behaviour, I'm sure I've got fractions of it. The little intellectual patterns in maths and music, I'm quite happy to amuse myself with those things, more than the average man, I think. It's just a different mindset."

ON PROFESSOR SNYDER'S OFFICE wall at the University of Sydney is a framed sketch of a charging stallion, drawn with perfect perspective and the skill of a masterful illustrator. "That's by a three-and-a-half-year-old girl who's mentally impaired, can't tell her mother from the nurse, but who draws like Leonardo da Vinci," he says. Such feats of automatic drawing fascinate Snyder, suggesting as they do that savants can tap into the brain's deeper reservoirs of ability at will. Much of his research involves trying to work out how that occurs.

"If you put into a box all the people who have bipolar disorder, you would find very few of them are creative in any way. But if you take all the people who are creative and put them in a box, you will find a large number with bipolar disorder. Now, why is that?" he asks. "Maybe a lot of geniuses are people who switch uncontrollably between our normal state and that bewildered autistic state where they are overwhelmed by details without interpretation."

Not everyone in the Tao family is persuaded by this theory. Snyder once wrote to Terry Tao and asked, delicately, whether the mathematician felt he had access to some "privileged" mental ability. Terry replied that mathematics is mainly hard work, pointing out that it took two years of relentless study for him to achieve an acclaimed breakthrough in prime number research. (Asked to comment for this story, Terry demurred; his wife Laura explained that he's "embarrassed" by the focus on his achievements).

Nor is Billy Tao amenable to Allan Snyder's speculations. "There is no connection between the savant and the genius," he asserts. "Allan Snyder seems to have a theory that we all have this hidden potential. But at the end of the day it depends on the child, the time and facilities available to the parents, and a certain serendipity or luck."

These days, Billy Tao sometimes talks about his oldest son as if he were describing a distant satellite, shot into space by his parents and now freely orbiting. As a young professor at UCLA, Terry works in fields of abstract thinking - combinatorics, harmonic analysis, wave maps, Kakeya conjecture - that his father admits are completely beyond his comprehension. Terry was married five years ago and the Taos have been to the US to meet their daughter-in-law and grandson, William. But their communication is sporadic. "We don't talk," says Billy. "We exchange emails."

If there is a genetic gift of brilliance, however, it may already have passed to the next generation of Taos. A couple of years ago, Terry's son was eating dirt when his mother told him to stop or he would get germs. "It's okay," the three-year-old replied. "The white blood cells will help me fight them off." ●

Staff writer Richard Guillatt's previous story was "What's really happening behind these doors?" (June 30 - July 1), about Australia's domestic violence laws.

WHAT BECOMES OF THE GIFTED? *By Richard Guillatt*

Albert Einstein and Charles Darwin, the two towering scientific geniuses of the past 150 years, were pretty average students. And therein lies a paradox, because most child prodigies grow up to be pretty ordinary adults.

"If I had a child who was six, seven years old and considered a prodigy, I would be sincerely, extremely worried," says Professor Allan Snyder, director of the Centre for the Mind at the University of Sydney. "The chances of their being able to do something extraordinary are probably far less than someone else coming from a home with a normal background."

Snyder's rather harsh summary is backed up by decades of research. In 1921, the American psychologist Lewis Terman began tracking the progress of 1500 intellectually advanced children from California. By the late '50s, only one had made an enduring impact - Jess Oppenheimer, creator of the sitcom I Love Lucy.

Terman's results were mirrored in the early '90s by a retrospective survey of 210 people who had been high-IQ students at Hunter College in New York in the years 1948-60. "Contrary to the expectations associated with the label of 'genius'," the study noted, "they tended to hold modest goals for themselves ..."

Miraca Gross, a professor of gifted education at the University of NSW, has been following the progress of 40 high-IQ students in Australia since 1989. One of these students is Terry Tao, whose success is outstanding, but the others have had mixed outcomes. Several took successful corporate jobs - actuary, strategic consultant, hedge fund manager - which don't require a towering intellect. One has become a high-level physicist. One became a disability worker, another failed to get a job in public relations and went back to study law. Several dropped out of their courses, and one developed depression.

Professor Gross says it's too early to judge the achievements of many of her subjects, the oldest of whom are still in their 30s. But she says her research shows that the students who had the most satisfactory outcomes were those who had the benefits of accelerated learning.

To Allan Snyder, however, a genius is someone who changes the way humanity thinks, a path that requires not just a high IQ but the ability to withstand adversity and take on conventional wisdom. Steve Jobs and Bill Gates, he points out, were college dropouts who changed the world by creating the personal computer revolution.

"It's a tall order, being a genius," he concludes.