

Daniel Tammet first came to world-wide attention in March, 2004 on international Pi Day (3/14 of course) when he recited, from memory, Pi to 22,514 decimal places. It took over five hours and set a new European record. The event, which Daniel named “Pi in the Sky,” coincided with Einstein’s birthday and took place in front of Einstein’s blackboard at the Museum of the History of Science in Oxford, England.

Daniel used that event to raise funds for the National Society for Epilepsy because it was after a series of childhood seizures that his extraordinary number and memory abilities began, aligning him with that rare circumstance of the ‘acquired savant’ in which such exceptional skills surface following some CNS injury or disease. He is proud of the monies raised on behalf of this organization, and certainly gave this worthy cause a good deal of visibility.

In addition to number and massive memory skills, Daniel has exceptional language skills as well. He speaks French, German, Spanish, Lithuanian, Esperanto and Icelandic. He learned the difficult Icelandic language in seven days, which was carefully documented in the one hour film about Daniel titled *Brainman*.

That documentary, *Brainman*, which also goes by the alternative title of “The Boy with the Incredible Brain”, has been shown in both the United Kingdom and the United States on various channels. Whenever that film appears in this country on the Discovery Channel it generates a number of inquiries to this web site about Daniel and his remarkable abilities. In one scene Daniel is asked to calculate 37 raised to the power of 4. He gave the correct answer of 1,874,161 in less than one minute. Then asked to divide 13 by 97 he outdistances the interviewers computer calculator 32 decimal places with the ability to go to over 100 decimal places if one wanted him to recite that long string of digits. The film also shows Daniel’s ability to memorize the position of all the chess pieces on a particular board at a point in time, and, as mentioned, documents Daniel’s acquisition of the Icelandic language in only a seven day time span.

Presently Daniel maintains a Web site at www.optimnem.co.uk, which offers a variety of educational courses for “promoting key skill areas such as literacy and number through spatial learning strategies for English, Math, French, German and Spanish. The Optimnem Web site provides the following description of Daniel:

“Daniel Tammet was born in London, in 1979, with congenital childhood epilepsy. A series of seizures as a young child changed forever the way Daniel saw the world around him. For one thing, Daniel was able to literally ‘see’ numbers in his head as if they were images. Not surprisingly, he quickly became proficient in number patterns, able to figure various roots, powers; even the decimal expansions for prime number fractions—often quicker than a friend with a calculator.”

“A high-functioning autistic savant, Daniel outgrew his disability. His astonishing mental skills however remained. As an example, following an invitation from organizers, he attended the largest ever ‘Memory Olympics’ in London in 2000. He won a gold medal and was subsequently invited to London’s Institute of Neurology to undergo tests for a landmark study of prodigious mental ability. The summarized data, co-written by some of Britain’s leading brain scientists, appeared in the New Year 2003 edition of the highly prestigious *Nature* neuro-scientific magazine.”

While filming *Brainman*, Daniel had the opportunity to meet and interact with Kim Peek. Both Kim and Daniel have massive memory capacity quantitatively, but the nature of that massive memory differs somewhat qualitatively. Kim has a huge store of factual material, but disqualifies himself a bit when it comes to math simply saying that is not an area of interest or strength for him. Daniel’s strength, on the other hand, is not in factual storage, but rather the ability to faithfully recall huge strings of numbers (or other items) which he literally ‘sees’ before him as if on a tapestry of images, and in his ability to manipulate those numbers with incredible speed in various calculations and derivations. Both Kim and Daniel, however, are continually flooded with data within their areas of interest and expertise, vacuuming up such data instantly, and massively, storing it for later retrieval with incredible speed and seemingly bottomless depth.

Daniel’s first book—*Born on a Blue Day: A Memoir of Asperger’s and an Extraordinary Mind*—was published by Hodder & Stoughton in London in 2006. I had the opportunity to write the Foreword to that book. The book was subsequently published in the United States by Free Press and became a *New York Times* best seller. It has been translated now into 18 languages. That book provides a great deal of insight into his very unique number, language and memory skills, and into his life overall.



I had the opportunity to meet Daniel at the Calatrava Art Center in Milwaukee while filming *Brainman*. His digit span memory exceeded that of any one I had ever tested before and other tests of recall were, of course, entirely accurate. Daniel is a very polite, soft-spoken, gentle person; pre-occupied at times and shy, not boastful, about his enormous abilities. He described to me how he assigns a shape and color to each number, reaching into the thousands. As he remembers, or computes, these images appear as just that—images and colors—which he ‘simply’ recites as he views them. When computing, the images merge together and outcome the new, correct combination for his instant inner viewing. At the Calatrava art museum there was a very tall tree-like structure composed of variously shaped and colored blown-glass composite pieces, positioned together like ornaments on a Christmas tree. Daniel identified with many of those shapes and colors, each representing, as it were, one of the numbers and images continually present in his head. While it is difficult to image exactly what Daniel is experiencing as he ‘sees’ numbers and objects flowing before him, that tree-like composite of colors and shapes provided, for me, some reference point, at least to better sense what that colorful, moving tapestry must be like imbedded as it is, with the huge store of numbers which have become, by his own description, Daniel’s friends.

It was a very pleasant visit. Daniel summed it up this way: “The line between profound talent and profound disability is really a surprisingly thin one.” The narrator concludes, correctly, that “The way Daniel can describe his inner world is giving scientists a window into the brain that they have not seen before. But the narrator also comments, correctly, that “this journey of explanation is just beginning”.

Daniel’s second book—*Embracing the Wide Sky: A Tour Across the Horizons of the Mind*—was published by Free Press in January, 2009. In this book Daniel explores and summarizes the science surrounding special skills such as he possesses. Since most articles and books are written by others about savant syndrome and other persons with special skills, it is particularly insightful to have a book written by a person with special skills at the prodigious savant level. His firsthand account of his extraordinary number, language, memory abilities, along with his synesthesia capabilities, coupled with his ideas as to how those interrelate causally, represent a truly unique, and particularly insightful, viewpoint and perspective.

A genius explains

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Daniel Tammet is an autistic savant. He can perform mind-boggling mathematical calculations at breakneck speeds. But unlike other savants, who can perform similar feats, Tammet can describe how he does it. He speaks seven languages and is even devising his own language. Now scientists are asking whether his exceptional abilities are the key to unlock the secrets of autism. Interview by Richard Johnson

Daniel Tammet is talking. As he talks, he studies my shirt and counts the stitches. Ever since the age of three, when he suffered an epileptic fit, Tammet has been obsessed with counting. Now he is 26, and a mathematical genius who can figure out cube roots quicker than a calculator and recall pi to 22,514 decimal places. He also happens to be autistic, which is why he can't drive a car, wire a plug, or tell right from left. He lives with extraordinary ability and disability.

Tammet is calculating 377 multiplied by 795. Actually, he isn't "calculating": there is nothing conscious about what he is doing. He arrives at the answer instantly. Since his epileptic fit, he has been able to see numbers as shapes, colours and textures. The number two, for instance, is a motion, and five is a clap of thunder. "When I multiply numbers together, I see two shapes. The image starts to change and evolve, and a third shape emerges. That's the answer. It's mental imagery. It's like maths without having to think."

Tammet is a "savant", an individual with an astonishing, extraordinary mental ability. An estimated 10% of the autistic population - and an estimated 1% of the non-autistic population - have savant abilities, but no one knows exactly why. A number of scientists now hope that Tammet might help us to understand better. Professor Allan Snyder, from the Centre for the Mind at the Australian National University in Canberra, explains why Tammet is of particular, and international, scientific interest. "Savants can't usually tell us how they do what they do," says Snyder. "It just comes to them. Daniel can. He describes what he sees in his head. That's why he's exciting. He could be the Rosetta Stone."

There are many theories about savants. Snyder, for instance, believes that we all possess the savant's extraordinary abilities - it is just a question of us learning how to access them. "Savants have usually had some kind of brain damage. Whether it's an onset of dementia later in life, a blow to the head or, in the case of Daniel, an epileptic fit. And it's that brain damage which creates the savant. I think that it's possible for a perfectly normal person to have access to these abilities, so working with Daniel could be very instructive."

Scans of the brains of autistic savants suggest that the right hemisphere might be compensating for damage in the left hemisphere. While many savants struggle with language and comprehension (skills associated primarily with the left hemisphere), they often have amazing skills in mathematics and memory (primarily right hemisphere skills). Typically, savants have a limited vocabulary, but there is nothing limited about Tammet's vocabulary.

Tammet is creating his own language, strongly influenced by the vowel and image-rich languages of northern Europe. (He already speaks French, German, Spanish, Lithuanian, Icelandic and Esperanto.) The vocabulary of his language - "Mänti", meaning a type of tree - reflects the relationships between different things. The word "ema", for instance, translates as "mother", and "ela" is what a mother creates: "life". "Päike" is "sun", and "päive" is what the sun creates: "day". Tammet hopes to launch Mänti in academic circles later this year, his own personal exploration of the power of words and their inter-relationship.

Professor Simon Baron-Cohen, director of the Autism Research Centre (ARC) at Cambridge University, is interested in what Mänti might teach us about savant ability. "I know of other savants who also speak a lot of languages," says Baron-Cohen. "But it's rare for them to be able to reflect on how they do it - let alone create a language of their own." The ARC team has started scanning Tammet's brain to find out if there are modules (for number, for example, or for colour, or for texture) that are connected in a way that is different from most of us. "It's too early to tell, but we hope it might throw some light on why we don't all have savant abilities."

Last year Tammet broke the European record for recalling pi, the mathematical constant, to the furthest decimal point. He found it easy, he says, because he didn't even have to "think". To him, pi isn't an abstract set of digits; it's a visual story, a film projected in front of his eyes. He learnt the number forwards and backwards and, last year, spent five hours recalling it in front of an adjudicator. He wanted to prove a point. "I memorised pi to 22,514 decimal places, and I am technically disabled. I just wanted to show people that disability needn't get in the way."

Tammet is softly spoken, and shy about making eye contact, which makes him seem younger than he is. He lives on the Kent coast, but never goes near the beach - there are too many pebbles to count. The thought of a mathematical problem with no solution makes him feel uncomfortable. Trips to the supermarket are always a chore. "There's too much mental stimulus. I have to look at every shape and texture. Every price, and every arrangement of fruit and vegetables. So instead of thinking, 'What cheese do I want this week?', I'm just really uncomfortable."

Tammet has never been able to work 9 to 5. It would be too difficult to fit around his daily routine. For instance, he has to drink his cups of tea at exactly the same time every day. Things have to happen in the same order: he always brushes his teeth before he has his shower. "I have tried to be more flexible, but I always end up feeling more uncomfortable. Retaining a sense of control is really important. I like to do things in my own time, and in my own style, so an office with targets and bureaucracy just wouldn't work."

Instead, he has set up a business on his own, at home, writing email courses in language learning, numeracy and literacy for private clients. It has had the fringe benefit of keeping human interaction to a minimum. It also gives him time to work on the verb structures of Mänti.

Few people on the streets have recognised Tammet since his pi record attempt. But, when a documentary about his life is broadcast on Channel 5 later this year, all that will change. "The highlight of filming was to meet Kim Peek, the real-life character who inspired the film Rain Man. Before I watched Rain Man, I was frightened. As a nine-year-old schoolboy, you don't want people to point at the screen and say, 'That's you.' But I watched it, and felt a real connection. Getting to meet the real-life Rain Man was inspirational."

Peek was shy and introspective, but he sat and held Tammet's hand for hours. "We shared so much - our love of key dates from history, for instance. And our love of books. As a child, I regularly took over a room in the house and started my own lending library. I would separate out fiction and non-fiction, and then alphabetise them all. I even introduced a ticketing system. I love books so much. I've read more books than anyone else I know. So I was delighted when Kim wanted to meet in a library." Peek can read two pages simultaneously, one with each eye. He can also recall, in exact detail, the 7,600 books he has read. When he is at home in Utah, he spends afternoons at the Salt Lake City public library, memorising phone books and address directories. "He is such a lovely man," says Tammet. "Kim says, 'You don't have to be handicapped to be different - everybody's different'. And he's right."

Like Peek, Tammet will read anything and everything, but his favourite book is a good dictionary, or the works of GK Chesterton. "With all those aphorisms," he says, "Chesterton was the Groucho Marx of his day." Tammet is also a Christian, and likes the fact that Chesterton addressed some complex religious ideas. "The other thing I

like is that, judging by the descriptions of his home life, I reckon Chesterton was a savant. He couldn't dress himself, and would always forget where he was going. His poor wife."

Autistic savants have displayed a wide range of talents, from reciting all nine volumes of Grove's Dictionary Of Music to measuring exact distances with the naked eye. The blind American savant Leslie Lemke played Tchaikovsky's Piano Concerto No1, after he heard it for the first time, and he never had so much as a piano lesson. And the British savant Stephen Wiltshire was able to draw a highly accurate map of the London skyline from memory after a single helicopter trip over the city. Even so, Tammet could still turn out to be the more significant.

He was born on January 31 1979. He smiles as he points out that 31, 19, 79 and 1979 are all prime numbers - it's a kind of sign. He was actually born with another surname, which he prefers to keep private, but decided to change it by deed poll. It didn't fit with the way he saw himself. "I first saw 'Tammet' online. It means oak tree in Estonian, and I liked that association. Besides, I've always had a love of Estonian. Such a vowel rich language."

As a baby, he banged his head against the wall and cried constantly. Nobody knew what was wrong. His mother was anxious, and would swing him to sleep in a blanket. She breastfed him for two years. The only thing the doctors could say was that perhaps he was understimulated. Then, one afternoon when he was playing with his brother in the living room, he had an epileptic fit.

"I was given medication - round blue tablets - to control my seizures, and told not to go out in direct sunlight. I had to visit the hospital every month for regular blood tests. I hated those tests, but I knew they were necessary. To make up for it, my father would always buy me a cup of squash to drink while we sat in the waiting room. It was a worrying time because my Dad's father had epilepsy, and actually died of it, in the end. They were thinking, 'This is the end of Daniel's life'."

Tammet's mother was a secretarial assistant, and his father a steelplate worker. "They both left school without qualifications, but they made us feel special - all nine of us. As the oldest of nine, I suppose it's fair to say I've always felt special." Even if his younger brothers and sisters could throw and catch better than him, swim better, kick a ball better, Daniel was always the oldest. "They loved me because I was their big brother and I could read them stories."

He remembers being given a Ladybird book called Counting when he was four. "When I looked at the numbers I 'saw' images. It felt like a place I could go where I really belonged. That was great. I went to this other country whenever I could. I would sit on the floor in my bedroom and just count. I didn't notice that time was passing. It was only when my Mum shouted up for dinner, or someone knocked at my door, that I would snap out of it."

One day his brother asked him a sum. "He asked me to multiply something in my head - like 'What is $82 \times 82 \times 82 \times 82$?' I just looked at the floor and closed my eyes. My back went very straight and I made my hands into fists. But after five or 10 seconds, the answer just flowed out of my mouth. He asked me several others, and I got every one right. My parents didn't seem surprised. And they never put pressure on me to perform for the neighbours. They knew I was different, but wanted me to have a normal life as far as possible."

Tammet could see the car park of his infant school from his bedroom window, which made him feel safe. "I loved assembly because we got to sing hymns. The notes formed a pattern in my head, just like the numbers did." The other children didn't know what to make of him, and would tease him. The minute the bell went for playtime he would rush off. "I went to the playground, but not to play. The place was surrounded by trees. While the other children were playing football, I would just stand and count the leaves."

As Tammet grew older, he developed an obsessive need to collect - everything from conkers to newspapers. "I remember seeing a ladybird for the first time," he says. "I loved it so much, I went round searching every hedge and every leaf for more. I collected hundreds, and took them to show the teacher. He was amazed, and asked me to get on with some assignment. While I was busy he instructed a classmate to take the tub outside and let the ladybirds go. I was so upset that I cried when I found out. He didn't understand my world."

Tammet may have been teased at school, but his teachers were always protective. "I think my parents must have had a word with them, so I was pretty much left alone." He found it hard to socialise with anyone outside the family, and, with the advent of adolescence, his shyness got worse.

After leaving school with three A-levels (History, French and German, all grade Bs), he decided he wanted to teach - only not the predictable, learn-by-rote type of teaching. For a start, he went to teach in Lithuania, and he worked as a volunteer. "Because I was there of my own free will, I was given a lot of leeway. The times of the classes weren't set in stone, and the structures were all of my own making. It was also the first time I was introduced as 'Daniel' rather than 'the guy who can do weird stuff in his head'. It was such a pleasant relief." Later, he returned home to live with his parents, and found work as a maths tutor.

He met the great love of his life, a software engineer called Neil, online. It began, as these things do, with emailed pictures, but ended up with a face-to-face meeting. "Because I can't drive, Neil offered to pick me up at my parents' house, and drive me back to his house in Kent. He was silent all the way back. I thought, 'Oh dear, this isn't going well'. Just before we got to his house, he stopped the car. He reached over and pulled out a bouquet of flowers. I only found out later that he was quiet because he likes to concentrate when he's driving."

Neil is shy, like Tammet. They live, happily, on a quiet cul-de-sac. The only aspect of Tammet's autism that causes them problems is his lack of empathy. "There's a saying in Judaism, if somebody has a relative who has hanged themselves, don't ask them where you should hang your coat. I need to remember that. Like the time I kept quizzing a friend of Neil's who had just lost her mother. I was asking her all these questions about faith and death. But that's down to my condition - no taboos."

When he isn't working, Tammet likes to hang out with his friends on the church quiz team. His knowledge of popular culture lets him down, but he's a shoo-in when it comes to the maths questions. "I do love numbers," he says. "It isn't only an intellectual or aloof thing that I do. I really feel that there is an emotional attachment, a caring for numbers. I think this is a human thing - in the same way that a poet humanises a river or a tree through metaphor, my world gives me a sense of numbers as personal. It sounds silly, but numbers are my friends."

Brainman Lab Questions

What disorder or issue does Daniel attribute his ability and issues to? What event caused his “ability”?

Daniel sees numbers in what way?

Can anyone be “trained” to do math as well (or almost as well) as Daniel? Explain.

When Daniel met Kim, what differences in social skills did you notice?