Computing the Mathematical Face of God
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Computing the Mathematical Face of God

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He died on his bed after scribbling down revolutionary mathematical formulas that bloomed in his mind like ethereal floes - gifts, he said, from a Hindu Goddess.

He was 32, the same age that the advaitan advocate Adi Shankara died. Shankara, born in 788, left earth in 820. Srinivasa Ramanujan was born in 1887. He died in 1920 - an anonymous Vaishnavite Brahmin who became the first Indian mathematics Fellow at Cambridge University. Both Shankara and Ramanujan possessed supernatural intelligence, a well of genius that leaves even brilliant men dumb-founded. Ramanujan was a meteor in the mathematics world of the World War I era. Quiet, with dharmic sensibilities, yet his mind blazed with such intuitive improvisation that British colleagues at Cambridge - the best math brains in England - could not even guess where his ideas originated. It irked them a bit that Ramanujan told friends the Hindu Goddess Namagiri whispered equations into his ear. Today's mathematicians - armed with supercomputers - are still star-struck, and unable to solve many theorems the young man from India proved quickly by pencil and paper.

Ramanujan spawned a zoo of mathematical creatures that delight, confound and humble is peers. They call them "beautiful," "transcendent," and marvel how he reduced very complex terrain to simple shapes.

In this day these equations were mainly pure mathematics, abstract computations that math sages often feel describe God's precise design for the cosmos. While much of Ramanujan's work remains abstract, may of his theorems are now the mathematical power behind several 1990's disciplines in astrophysics, artificial intelligence and gas physics. According to his wife - Janaki, who still lives outside

Madras - her husband predicted "his mathematics would be useful to mathematicians for more than a century." Yet, before sailing to England, Ramanujan was largely ignorant of the prevailing highest-level math. He flunked out of college in India. Like Albert Einstein, who toiled as a clerk in a Swiss patent office while evolving his Special Theory of Relativity at odd hours, Ramanujan worked as a clerk at a port authority in Madras, spending every spare moment contemplating the mathematical face of God. It was here in these sea-smelling, paper-pushing offices that he was gently pushed into destiny - a plan that has all the earmarks of divine design.

Ramanujan was born in Erode, a small, rustic town in Tamil Nadu, India. His father worked as a clerk in a cloth merchant's shop. His namesake is that of another medieval philosophical giant - Ramanujan - a Vaishnavite who postulated the Vedanta system known as "qualified monism." The math prodigy grew up in the overlapping atmospheres of religious observances and ambitious academics. He wasn't spiritually preoccupied, but he was steeped in the reality and beneficence of the Deities, especially the Goddess Namagiri. Math, of course, was his intellectual and spiritual touchstone. No one really knows how early in life Ramanujan awakened to the psychic visitations of Namagiri, much lesbian show the interpenetrating of his mind and the Goddess' worked. By age twelve he had mastered trigonometry so completely that he was inventing sophisticated theorems that he was inventing sophisticated theorems that astonished teachers. In fact his first theorems unwittingly duplicated those of a great mathematician of hundred years earlier. This feat came after sifting once through a trigonometry book. He was very disappointed that his "discovery" had already been found. Then for four years there was numerical silence. At sixteen a copy of an out-of-date math book from Cambridge University came into his hands. It listed 5,000 theorems with sparse, short-cut proofs. Even initiates in the arcane, language of mathematics could get lost in this work. Ramanujan entered it with the giddy ambition and verve of an astronaut leaping onto the moon. It subconsciously triggered a love of numbers that completely saturated his mind. He could envision strange mathematical concepts like ordinary people see the waves of an ocean.

Ironically, his focus on math became his academic undoing. He outpaced his college teachers in numbers theory, but neglected all other subjects. He could speak adequate English, but failed in it and history and other science courses. He lost a scholarship, dropped out, attempted a return but fell ill and quit a second time. By this time he was married to Janaki, a young teenager, and was supporting his mother. Often all night he continued his personal excursions into the math universe - being fed rice balls by his wife as he wrote lying belly-down on a cot. During the day he factored relatively mundane accounts at the port office for [?]20 a year. He managed to publish one math paper.

As mathematicians would say, one branch of potential reality could have gone with Ramanujan squandering his life at the port. But with one nudge from the invisible universe, Namagiri sent his Westward. A manager at the office admired the young man's work and sensed significance. He talked him into writing to British mathematicians who might sponsor him. Ramanujan wrote a simple letter to the renowned G.W. Hardy at Cambridge, hinting humbly at his breakthroughs and describing his vegetarian diet and Spartan needs if he should come to the university. He enclosed one hundred of his theorem equations.

Hardy was the brightest mathematician in England. Yet, as he knew and would write later at the conclusion of his life, he had done no original, mind-bending work. At Cambridge he collaborated with an odd man named Littlewood, he was so publicly retiring that people joked Hardy made him up. The two, though living within a hundred yards of each other, communicated by exchange of terse, math-laden letters. Ramanujan's letter and equations fell to them like broadcast from alien worlds. At first they dismissed it as a curiosity. Then, they suddenly became intrigued by the Indian's musings. Hardy later wrote: "A single look at them written down by a mathematician of the highest class. They must be true, because, if they were not true, no one would have had the imagination to invent them."

Hardy sensed an extremely rare opportunity a "discovery," and quickly arranged a scholarship for the then 26-year-old Ramanujan. The invitation came to India an landed like a bomb in Ramanujan's family and community circle. His mother was horrified that he would lose caste by traveling to foreign shores. She refused to let him go unless it was sanctioned by the goddess. According to one version of the story, the aged mother then dreamt of the blessing from Namagiri. But Janaki says her husband himself went to the Namagiri temple for guidance and was told to make the voyage. Ramanujan consulted the astrological data for his journey. He sent his mother and wife to another town so they wouldn't see him with his long Brahmins hair and bun trimmed to British short style and his Indian shirt and wrapcloth swapped for European fashion. He left India as a slightly pump man with apple-round cheeks and eyes like bright zeroes.

Arriving in 1914 on the eve of World War I, Ramanujan experienced severe culture shock at Cambridge. He had to cook for himself and insisted on going bare foot Hindu-style on the cold floors. But Hardy, man without airs or inflated ego, made his feel comfortable amidst the stuffy Cambridge tradition. Hardy and Littlewood both served as his mentors for it took two teachers to keep pace with his advances. Soon, as Hardy recounts, it was Ramanujan who was teaching them, in fact leaving

them in the wake of his incandescent genius.

Within a few months war broke out. Cambridge became a military college. Vegetable and fruit shortages plagued Ramanujan's already slim diet. The war took away Littlewood to artillery research, and Ramanujan and Hardy were left to retreat into some of the most recondite math possible. One of the stunning example of this endeavor is a process called partitioning, figuring out how many different ways a whole number can be expressed as the sum of other whole numbers. Example: 4 is partitioned 5 ways (4 itself, 3+1 2+2, 2+1+1, 1+1+1+1), expressed as p(4)=5. The higher the number the more the partitions. Thus p(7)=15. Deceptively though, even a marginally larger number creates astronomical partitions: p(200)=397,999,029,388. Ramanujan - with Hardy offering technical checks - invented a tight, twisting formula that computers the partitions exactly. To check the theorem a fellow Cambridge mathematician tailed by hand the partitions for 200. It took one month. Ramanujan's equation was precisely correct. US mathematician George Andrews, who in the late 1960's rediscovered a "lost notebook" of Ramanujan's and became a lifetime devotee, describes this accuracy as unthinkable to even attempt. Ramanujan's partition equation helped later physicists determine the number of electron orbit jumps in the "shell" model of atoms.

Another anecdote demonstrates his mental landscape. By 1917, Ramanujan had fallen seriously ill and was convalescing in a country house. Hardy took a taxi to visit him. As math-masters like to do he noted the taxis number - 1729 - to see if it yielded any interesting permutations. To him it didn't and he thought to himself as he went up the steps to the door that it was a rather dull number and hoped it was not an inauspicious sign. He mentioned 1729 to Ramanujan who immediately countered "Actually, it is a very interesting number. It is the smallest number expressible as the sum of two cubes in two different ways."

Ramanujan deteriorated so quickly he was forced to return to India - emaciated - leaving his math notebooks at Cambridge. He spent his final year face down on a cot furiously wiring out pages and pages of theorems as if a storm of number concepts swept through his brain. Many remain beyond today's best math minds.

Debate still lingers as to the origins of Ramanujan's edifice of unique ideas. Mathematicians eagerly acknowledge surprise states of intuition as the real break-throughs, not logical deduction. There is reticence to accept mystical

overtones though, like Andrews, many can appreciate intuition in the guise of a Goddess. But we have Ramanujan's own testimony of feminine whisperings from a Devi and there is the sheer power of his achievements. Hindus cognize this reality. As an epilogue to this story, a seance held in 1934 claimed to have contracted Ramanujan in the astral planes. Asked if he was continuing his work, he replied, 'No, all interest in mathematics dropped out after crossing over."