[Ebook free] File size: 36.Mb

The Man Who Knew Infinity: A Life of the Genius Ramanujan (English Edition)

Download Read Online

Par Robert Kanigel
*ePub | *DOC | audiobook | ebooks | Download PDF*

Dtails sur le produit Rang parmi les ventes : #48925 dans eBooksPubli le: 2014-12-04Sorti le: 2014-12-04Format: Ebook Kindle

[Ebook free] The Man Who Knew Infinity: A Life of the Genius Ramanujan (English Edition)

Par Robert Kanigel : The Man Who Knew Infinity: A Life of the Genius Ramanujan (English Edition) before purchasing it in order to gage whether or not it would be worth my time, and all praised The Man Who Knew Infinity: A Life of the Genius Ramanujan (English Edition):

Description :

Prsentation de l'diteurIn 1913, a young unschooled Indian clerk wrote a letter to G H Hardy, begging the pre-eminent English mathematician's opinion on several ideas he had about numbers. Realising the letter was the work of a genius, Hardy arranged for Srinivasa Ramanujan to come to England. Thus began one of the most improbable and productive collaborations ever chronicled.With a passion for rich and evocative detail, Robert Kanigel takes us from the temples and slums of Madras to the courts and chapels of Cambridge

University, where the devout Hindu Ramanujan, 'the Prince of Intuition,' tested his brilliant theories alongside the sophisticated and eccentric Hardy, 'the Apostle of Proof'. In time, Ramanujan's creative intensity took its toll: he died at the age of thirty-two and left behind a magical and inspired legacy that is still being plumbed for its secrets today.ExtraitThe Man Who Knew Infinity CHAPTER ONE In the Temples Coolness [1887 to 1903] 1.DAKSHIN GANGE He heard it all his lifethe slow, measured thwap... thwap... thwap... of wet clothes being pounded clean on rocks jutting up from the waters of the Cauvery River. Born almost within sight of the river, Ramanujan heard it even as an infant. Growing up, he heard it as he fetched water from the Cauvery, or bathed in it, or played on its sandy banks after school. Later, back in India after years abroad, fevered, sick, and close to death, he would hear that rhythmic slapping sound once more. The Cauvery was a familiar, recurring constant of Ramanujans life. At some places along its length, palm trees, their trunks heavy with fruit, leaned over the river at rakish angles. At others, leafy trees formed a canopy of green over it, their gnarled, knotted roots snaking along the riverbank. During the monsoon, its waters might rise ten, fifteen, twenty feet, sometimes drowning cattle allowed to graze too long beside it. Come the dry season, the torrent became a memory, the riverbanks wide sandy beaches, and the Cauvery itself but a feeble trickle tracing the deepest channels of the riverbed. But always it was there. Drawing its waters from the Coorg Mountains five hundred miles to the west, branching and rebranching across the peninsula, its flow channeled by dams and canals some of which went back fifteen hundred years, the Cauvery painted the surrounding countryside an intense, unforgettable green. And that single fact, more than any other, made Ramanujans world what it was. Kumbakonam, his hometown, flanked by the Cauvery and one of its tributaries, lay in the heartland of staunchly traditional South India, 160 miles south of Madras, in the district then known as Tanjore. Half the districts thirty-seven hundred square miles, an area the size of the state of Delaware, was watered directly by the river, which fell gently, three feet per mile, to the sea, spreading its rich alluvial soil across the delta. The Cauvery conferred almost unalloyed blessing. Even back in 1853, when it flooded, covering the delta with water and causing immense damage, few lives were lost. More typically, the great river made the surrounding land immune to year-to-year variation in the monsoon, upon whose caprices most of the rest of India hung. In 1877, in the wake of two straight years of failed monsoons, South India had been visited by drought, leaving thousands dead. But Tanjore District, nourished by the unfailing Cauvery, had been scarcely touched; indeed, the rise in grain prices accompanying the famine had brought the delta unprecedented prosperity. No wonder that the Cauvery, like the Ganges a thousand miles north, was one of Indias sacred rivers. Indias legendary puranas told of a mortal known as Kavera-muni who adopted one of Brahmas daughters. In filial devotion to him, she turned herself into a river whose water would purify from all sin. Even the holy Ganges, it was said, periodically joined the Cauvery through some hidden underground link, so as to purge itself of pollution borne of sinners bathing in its waters. Dakshin Gange, the Cauvery was calledthe Ganges of the South. And it made the delta the most densely populated and richest region in all of South India. The whole edifice of the regions life, its wealth as well as the rich spiritual and intellectual lives its wealth encouraged, all depended on its waters. The Cauvery was a place for spiritual cleansing; for agricultural surfeit; for drawing water and bathing each morning; for cattle, led into its shallow waters by men in white dhotis and turbans, to drink; and always, for women, standing knee-deep in its waters, to let their snaking ribbons of cotton or silk drift out behind them into the gentle current, then gather them up into sodden clumps of cloth and slap them slowly, relentlessly, against the water-worn rocks. 2.SARANGAPANI SANNIDHI STREET In September 1887, two months before her child was due to be born, a nineteen-year-old Kumbakonam girl named Komalatammal traveled to Erode, her parental home, 150 miles upriver, to prepare for the birth of the child she carried. That a woman returned to her native home for the birth of her first child was a tradition so widely observed that officials charged with monitoring vital statistics made a point of allowing for it. Erode, a county seat home to about fifteen thousand people, was located at the confluence of the Cauvery and one of its tributaries, the Bhavani, about 250 miles southwest of Madras. At Erodethe word means wet skull, recalling a Hindu legend in which an enraged Siva tears off one of Brahmas five headsthe Cauvery is broad, its stream bed littered with great slabs of protruding rock. Not far from the river, in the fort, as the towns original trading area was known, was the little house, on Teppukulam Street, that belonged to Komalatammals father. It was here that a son was born to her and her husband Srinivasa, just after sunset on the ninth day of the Indian month of Margasirshaor Thursday, December 22, 1887. On his eleventh day of life, again in accordance with tradition, the child was formally named, and a year almost to the day after his birth, Srinivasa Ramanujan Iyengar and his mother returned to Kumbakonam, where he would spend most of the next twenty years of his life. Srinivasaits initial

syllable pronounced shriwas just his fathers name, automatically bestowed and rarely used; indeed, on formal documents, and when he signed his name, it usually atrophied into an initial S. Iyengar, meanwhile, was a caste name, referring to the particular branch of South Indian Brahmins to which he and his family belonged. Thus, with one name that of his father and another that of his caste, only Ramanujan was his alone. As he would later explain to a Westerner, I have no proper surname. His mother often called him Chinnaswami, or little lord. But otherwise he was, simply, Ramanujan. He got the name, by some accounts, because the Vaishnavite saint Ramanuja, who lived around A.D. 1100 and whose theological doctrines injected new spiritual vitality into a withered Hinduism, was also born on a Thursday and shared with him other astrological likenesses. Ramanujanpronounced Rah-MAH-na-jun, with only light stress on the second syllable, and the last syllable sometimes closer to jummeans younger brother (anuja) of Rama, that model of Indian manhood whose story has been handed down from generation to generation through the Ramayana, Indias national epic. Ramanujans mother, Komalatammal, sang bhajans, or devotional songs, at a nearby temple. Half the proceeds from her groups performances went to the temple, the other half to the singers. With her husband earning only about twenty rupees per month, the five or ten she earned this way mattered; never would she miss a rehearsal. Yet now, in December 1889, she was missing them, four or five in a row. So one day, the head of the singing group showed up at Komalatammals house to investigate. There she found, piled near the front door, leaves of the margosa tree; someone, it was plain to her, had smallpox. Stepping inside, she saw a small, dark figure lying atop a bed of margosa leaves. His mother, chanting all the while, dipped the leaves in water laced with ground turmeric, and gently scoured two-year-old Ramanujans pox-ridden bodyboth to relieve the infernal itching and, South Indian herbalists believed, subdue the fever. Ramanujan would bear the scars of his childhood smallpox all his life. But he recovered, and in that was fortunate. For in Tanjore District, around the time he was growing up, a bad year for smallpox meant four thousand deaths. Fewer than one person in five was vaccinated. A cholera epidemic when Ramanujan was ten killed fifteen thousand people. Three or four children in every ten died before theyd lived a year. Ramanujans family was a case study in the damning statistics. When he was a year and a half, his mother bore a son, Sadagopan. Three months later, Sadagopan was dead. When Ramanujan was almost four, in November 1891, a girl was born. By the following February, she, too, was dead. When Ramanujan was six and a half, his mother gave birth to yet another child, Seshanwho also died before the year was out. Much later, two brothers did surviveLakshmi Narasimhan, born in 1898, when Ramanujan was ten, and Tirunarayanan, born when he was seventeen. But the death of his infant brothers and sister during those early years meant that he grew up with the solicitous regard and central position of an only child. After the death of his paternal grandfather, who had suffered from leprosy, Ramanujan, seven at the time, broke out in a bad case of itching and boils. But this was not the first hint of a temperament inclined to extreme and unexpected reactions to stress. Indeed, Ramanujan was a sensitive, stubborn, andif a word more often reserved for adults in their prime can be applied to a little boyeccentric child. While yet an infant back in Erode, he wouldnt eat except at the temple. Later, in Kumbakonam, hed take all the brass and copper vessels in the house and line them up from one wall to the other. If he didnt get what he wanted to eat, he was known to roll in the mud in frustration. For Ramanujans first three years, he scarcely spoke. Perhaps, it is tempting to think, because he simply didnt choose to; he was an enormously self-willed child. It was common in those days for a young wife to shuttle back and forth between her husbands house and that of her parents, and Komalatammal, worried by her sons muteness, took Ramanujan to see her father, then living in Kanchipuram, near Madras. There, at the urging of an elderly friend of her fathers, Ramanujan began the ritual practice of Akshara Abhyasam: his hand, held and guided by his grandfather, was made to trace out Tamil characters in a thick bed of rice spread across the floor, as each character was spoken aloud. Soon fears of Ramanujans dumbness were dispelled and he began to learn the 12 vowels, 18 consonants, and 216 combined consonant-vowel forms of the Tamil alphabet. On October 1, 1892, the traditional opening day of school, known as Vijayathasami, he was enrolled, to the accompaniment of ancient Vedic chants, in the local pial school. A pial is the little porch in front of most South Indian houses; a pial school was just a teacher meeting there with half a dozen or so pupils. But five-year-old Ramanujan, disliking the teacher, bristled at attending. Even as a child, he was so self-directed that, it was fair to say, unless he was ready to do something on his own, in his own time, he was scarcely capable of doing it at all; school for him often meant not keys to knowledge but shackles to throw off. Quiet and contemplative, Ramanujan was fond of asking questions like, Who was the first man in the world? Or, How far is it between clouds? He liked to be by himself, a tendency abetted by parents who, when friends called, discouraged him from going out to play; so

hed talk to them from the window overlooking the street. He lacked all interest in sports. And in a world where obesity was virtually unknown, where bones protruded from humans and animals alike, he was, first as a child and then for most of his life, fat. He used to saywhether as boast, joke, or lament remains unclearthat if he got into a fight with another boy he had only to fall on him to crush him to pieces. For about two years, Ramanujan was shuffled between schools. Beginning in March 1894, while still at his mothers parents house in Kanchipuram, he briefly attended a school in which the language of instruction was not his native Tamil but the related but distinct Telugu. There, sometimes punished by having to sit with his arms folded in front of him and one finger turned up to his lips in silence, he would at times stalk out of class in a huff. In a dispute over a loan, his grandfather quit his job and left Kanchipuram. Ramanujan and his mother returned to Kumbakonam, where he enrolled in the Kangayan Primary School. But when his other grandfather died, Ramanujan was bounced back to his maternal grandparents, who by now were in Madras. There he so fiercely fought attending school that the family enlisted a local constable to scare him back to class. By mid-1895, after an unhappy six months in Madras, Ramanujan was once more back in Kumbakonam. Kumbakonam was flanked by the Cauvery and the Arasalar, its tributary. Most streets ran parallel to these rivers or else marched straight down to their banks, perpendicular to the first set, making for a surprisingly regular grid system. And there, near the middle of this compact grid, on Sarangapani Sannidhi Street, a dirt road about thirty feet wide with squat little buildings close packed on either side, was Ramanujans house. The one-story structure, thatched with palm leaves, stood back about ten feet from the street, insulated, as it were, by its two-tiered, covered pial: it was a step or two up from the dusty (or muddy) street, another few up to the little porch. The stucco house faced the street with a twelve-foot-wide wall broken by a window to the left and a door to the right. A bystander in the street, peering through the open door and into the gloom of the interior, could sight all the way through to the back, where his gaze would be arrested by a splash of sunlight from the open rear court. The rest of the house, meanwhile, was offset to the left, behind the front window. Here was the main living area and, behind it, a small kitchen, redolent with years of cooking smells. South India was not always hot; but it was never cold. At a latitude of about eleven degrees north. Kumbakonam lay comfortably within the tropics; even on a January winters night, the thermometer dropped, on average, only to seventy degrees. And that climatological fact established an architectural fact, for it gave South Indian homes a kind of permeability; their interiors always savored a little of the outside (a feeling familiar to Americans with screened-in porches). Windows there were, but these were merely cutouts in the wall, perhaps with bars or shutters, never space-sealing panes of glass that left you conscious of being on one side or another. In the middle of most houses was a small courtyard, the muttam, open to the skylike a skylight but again without the glassthat brought rain into the center of the house, where it was funneled to a drain that led back outside. In Ramanujans house, smells from outside wafted inside. Lizards crawled, mosquitos flew unimpeded. The soft South Indian air, fragrant with roses, with incense, with cow dung burned as a fuel, wafted over everything. Just outside the door lay Kumbakonam, an ancient capital of the Chola Empire. The Cholas had reached their zenith around A.D. 1000, when Europe wallowed in the Dark Ages, and had ruled, along with northern Ceylon, most of what, during Ramanujans day, was known as the Madras Presidency (which, with those of Bombay and Calcutta, constituted the chief administrative and political units of British-ruled India). The dozen or so major temples dating from this period made Kumbakonam a magnet to pilgrims from throughout South India. Every twelve years, around February or March, they came for the Mahammakham festival, commemorating a legendary post-Deluge event in which the seeds of creation, drifting upon the waters in a sacred potor kumba, source of the towns namewas pierced by the god Sivas arrow. The nectar thus freed, it was said, had collected in the Mahammakham tank, the outdoor pool for ritual bathing that was part of every temple. At such timesas in 1897, when Ramanujan was ninethree-quarters of a million pilgrims might descend on the town. And the great tank, surrounded by picturesque mandapams, or halls, and covering an expanse of twenty acres, would be so filled with pilgrims that its water level was said to rise several inches. When not in use, temple tanks could seem anything but spiritually uplifting. Open, stone-lined reservoirs, sometimes stocked with fish, frequently green with algae, they often served as breeding grounds for malarial mosquitos. Situated on low ground between two rivers, Kumbakonam was notorious for its bad water, its mosquitos, and its filarial elephantiasis, a mosquito-borne disease that left its victims with grotesquely deformed limbs, sometimes with scrota the size of basketballs. When Ramanujan was six, the town completed a drainage system. But this was designed to carry off only surface water, not sewage, and most of the towns health problems continued unabated. Kumbakonam, a days train ride from Madras, which was almost 200 miles north and

the nearest real metropolis, had a seventy-two-bed hospital. It had four police stations, two lower secondary English schools, three conducting classes in Tamil, a high school of excellent reputation, and a college. Indeed, with a population during Ramanujans day of more than fifty thousand, it was no mere village, but a major town, sixth largest in the Madras Presidency. Just outside town and all through the surrounding districts ranged some of the richest cropland in all of India. Two-thirds of the populationincluding whole castes given over to agricultural labor alone, like the Paraiyans and the Pallansworked the land for a few annas a day. Silt carried down to the delta by the Cauvery made the use of expensive manure as fertilizer unnecessary. Narrow strips of land beside the river, annually submerged in the silt-laden water of monsoon-borne floods, were especially valued and used to raise bamboo, tobacco, or banana. Meanwhile, most of the rest of the deltas arable cropland, more than three-quarters of it, was given over to rice. In many parts of South India, the land was, for much of the year, a bleak brown. But here, midst the rice fields of the Cauvery, the landscape suddenly thickened with lush greenery in a rich palette of shades and textures. Farmers nursed delicate infant rice seedlings in small, specially watered plots whose rich velvety green stood out against neighboring fields. When, after thirty or forty days, the plants were healthy and strong, laborers individually scooped them out with their root pods and transplanted them to large, flooded fields; these made for a softer green. There the plants grew until a yellower hue signaled they were ready for harvest. Almost every square foot of the delta was under the plow, and had been since time immemorial. Cattle and sheep found little room in which to graze; the land was just too valuable. Forests were few, just isolated coconut, banyan, or fig trees and, toward the coast, palmyra palms and Alexandrian laurel. The 342 square miles of the taluk, or county, of which Kumbakonam was chief town, comprised just about that same number of villages. Most were little more than tiny inhabited islands midst a sea of waving cropsa couple of dozen thatched-roof huts and a few hundred inhabitants, half-hidden by coconut palms, sitting on cramped little sites a few feet above the neighboring rice fields. And yet, whatever their debt to the land, Ramanujans family was not of the land. They were townspeople. They were poor, but they were urban poor; they inhabited not just the ground on which they lived but a wider world of the mind and spirit. The Cauvery freed the town from undue preoccupation with the days weather and the seasons crops, bestowing upon it a measure of wealth. And Ramanujans family was among the many who, indirectly, lived off its bounty. Like the American city of Des Moines, with its similar relationship to the corn-rich countryside of Iowa, Kumbakonam was more cosmopolitan than its surroundings, was a center for the work of eye, hand, and brain, which needs a degree of leisure to pursue. A census taken around the time Ramanujan was growing up found it had a higher proportion of professionals than anywhere in the presidency but Madras itself. The crafts were especially strong. One specialty was fine metalwork; Kumbakonam craftsmen, six hundred of them, it was estimated, kept European markets stocked with deities of the Hindu pantheon executed in copper, silver, and brass. Another specialty was silk saris, the product of two thousand small looms manned by three thousand people. No place in South India was better known for its fine silk saris, dazzling in bright colors, embroidered in silver stripes, fringed with gold, than Kumbakonam and neighboring Tanjore. Saris woven in Kumbakonam could cost as much as a hundred rupeesa years income to many poor families. Bountiful harvests made the delta home to many wealthy farmers, and the marriage of one of their daughters might mean the purchase of a dozen or more saris. Before the wedding, the whole family would troop into town, make their selections, only later to be billed for what they took away; the merchants were happy to extend credit to such well-heeled customers. Otherwise, though, it was normally the husbands who did the buying, worried lest their wives, as one Kumbakonam sari weaver and shop owner told an English visitor around this time, spent too much. Srinivasa Iyengar, twenty-four at his son Ramanujans birth and about five years older than his wife, was a clerk in one such shop, just as his own father, Kupuswamy, had been. Normally, such a clerk remained one all his lifewaiting on customers, taking orders, performing routine paperwork, perhaps traveling to nearby villages to collect bills. Occasionally a clerk might be taken into the business or would go off to start his own. But that required some special drive or entrepreneurial temperament. Apparently Srinivasa was good at appraising fabrics, a skill upon which his employer relied; but beyond that, whatever it took to step to a better job he could never muster. Clerks like Srinivasa reported to work at eight or so in the morning and didnt get home till long after dark (which, so close to the equator, varied little across the year from about 6:00 P.M.). Sometimes they would return home at midday for lunch, though more likely their wives packed food in small metal cannisters for them to eat at the shop. Because certain months were deemed unpropitious, weddings would often stack up in months reckoned as lucky, making business quite seasonal and leaving clerks to sit idle for long periods. At such times, Srinivasa might

well have been found asleep in the shop in the middle of the day. Day after day, year after year, he was at the shop, largely absent from Ramanujans early life. Indian society generally left the father little role to play at home, casting him as an aloof, physically undemonstrative, even unwelcoming figure whose relationship with his children was largely formal. Srinivasa was almost invisible, his name largely absent from family accounts. Very quiet, a boyhood friend of Ramanujan called him. Someone else would resort to the word weightless. But even had he been otherwise, he could scarcely have competed with Komalatammal as an influence on their son. Years later, while away in England, and with at least one letter to his father confined to reminders to keep up the house and not let the gutter run over, Ramanujan wrote his mother about the titanic struggle unleashed in Europe with the onset of the Great War, down to details of the number of men fighting, the width of the battle fronts, the use of airplanes in combat, and the contribution of Indian rajas to the British war effort. He must have known such an account would interest her. He and his mother understood each other. They talked the same language, enjoyed one anothers intelligent company, shared the same intensity of feeling. When he was young, the two of them dueled at Goats and Tigers, played with pebbles, on a grid resembling a perspective view of railroad tracks receding to the horizon, crossed by other tracks perpendicular to them. Three tigers sought to kill fifteen goats by jumping them, as in checkers, while the goats tried to encircle the tigers, immobilizing them. The game demanded logic, strategy, and fierce, chesslike concentration. The two of them reveled in it. Komalatammal, whom Ramanujan resembled physically, was, in the words of one account, a shrewd and cultured lady. Her family could claim Sanskrit scholars in its line, scholars upon whom local kings had bestowed gifts. She was the daughter of Narayana Iyengar, well known in Erode as amin, an official in the district court charged with calling witnesses, taking court notes, and conferring with lawyers. When Ramanujan was about four, her father offended some higher-up and lost his job. It was then that he and his wife, Rangammal, moved to Kanchipuram, the temple city near Madras. There he managed a choultry, a temple annex where marriages are held and pilgrims put up. A picture of Komalatammal survives, probably taken in her forties or fifties. It shows a woman whose corpulence even nine yards of sari cannot hide. Only her hands, resting lightly over the arms of her chair, suggest ease. The whole rest of her body conveys raw intensity: head cocked to one side, eyes alive, almost glaring, mouth set, leaning a little forward in the chair, only the balls of her bare feet touching the floor, poised as if ready to spring. The overall impression is one of great personal force only barely contained within her body. She was an intense, even obsessive woman, never shy about thrusting her powerful personality onto objects of her interest. And her primary object all the years he was growing up was her son, Chinnaswami. In India, strong ties between son and mother are legendary; close indeed must have been the relationship between Ramanujan and his mother that even his Indian biographers invariably saw fit to comment upon it. Komalatammal fed him his yogurt and rice, his spicy, pickled fruits and vegetables, his lentil soup. She combed his hair and coiled it into the traditional tuft, sometimes placing in it a flower. She tied his dhoti (or, as it was known in Tamil, veshti), the long piece of cloth wrapped around the waist and pulled up between the legs that all but the most Westernized men wore. She applied the namam, the powdery caste mark, to his forehead. She walked him to school; before going, Ramanujan would touch her feet in the traditional Indian sign of respect and secure her blessing. She monitored his friends and his time, made his decisions. Later, when Ramanujan didnt get the treatment at school she thought he deserved, she stormed into the principals office and protested. And when she decided he ought to marry, she found him a wife and arranged for the weddingall without bothering to consult her husband. She poured prodigious energy into her spiritual life. In Hindu families, the women were apt to be more pious, and more scrupulous about observing tradition, than the men. So it had been in her own family; her mother was said to have gone into hypnotic trances that placed her in communion with the gods. And so it was in Ramanujans family. Komalatammal was fiercely devout, held prayer meetings at her home, sang at the temple, pursued astrology and palmistry. Always, the name of their family deity, the Goddess Namagiri of Namakkal, was on her lips. An exceptionally gifted lady with psychic powers and a remarkable imagination was how one friend of the family described her. She had a remarkable repertoire of mythological stories and used to tell me stories from [the] ancient Mahabharata and Ramayana to [the] later Vikramaditya legends. Any pause in the telling was cause for yet another murmured appeal to Namagiri. From his mother, Ramanujan absorbed tradition, mastered the doctrines of caste, learned the puranas. He learned to sing religious songs, to attend pujas, or devotions, at the temple, to eat the right foods and forswear the wrong oneslearned, in short, what he must do, and what he must never do, in order to be a good Brahmin boy. 3.A BRAHMIN BOYHOOD For thousands of years Brahmins had been the learned men, teachers, and interpreters of Hindu life. Brahmins

with heads so shaved in front that they looked prematurely bald, prominent caste marks of dried, colored paste upon their foreheads, locks of hair in the back like little ponytails, and thin, white, knotted threads worn diagonally across their bare chests, were an everyday sight on the streets of Kumbakonam and within its temples. Kumbakonam was a bedrock of Brahminism, the traditional Hinduism associated with its highest, priestly caste. Four percent of the South Indian population, Brahmins were to most Hindus objects of veneration and respect; in pre-British India, at least, wealthy patrons acquired religious merit and washed away sins by giving them land, houses, gold. Brahmins were the temple priests, the astrologers, the gurus, the pandits specializing in sacred law and Vedic exegesis, indispensable at every wedding and funeral, occupying the most exalted niche in the Indian caste system. Books about India by British writers around this time seemed to delight in regaling their readers with the horrors of the caste systemof men and women punished for sins committed in past lives by being consigned in this one to low and pitiable stations. There were four castes, these accounts recorded: Brahmins, at the top of the heap; Kshatriyas, or warriors; Vaisyas, or merchants and traders; and Sudras, or menials. A fifth group, the untouchables, lay properly outside the caste system. The first three castes were entitled to wear the sacred thread that affirmed them twice-born. The Sudras could not, but could enter the temples. The untouchables could not even do that. Nor could they draw water from the village well. Nor, traditionally, could even their shadows cross the path of a Brahmin without his having to undergo a purification ritual. Even this rudimentary breakdown, based on caste law first set down in the Institutes of Manu, a Sanskrit work dating to the third century, didnt quite apply in South India; for the Kshatriyas went largely unrepresented in the South. But more, it omitted the reality of Indias several thousand self-governing subcastes, each with rules as to who could eat with whom, and whom one could marry. Most were originally, and often still, rooted in occupational categories. Thus, there were castes of agricultural workers, barbers, weavers, carpenters. It was these subcastes, or jatis, to which one really belonged. One simply was a Vanniar, or a Chettiar. Or, as in Ramanujans case, a Vaishnavite Brahmin; his very name, Iyengar, labeled him one. From the Hindu pantheon of Brahma, Vishnu, and Siva, Vaishnavitesabout one Brahmin in foursingled out Vishnu as object of special devotion. Further theological nuancesfor example, over just how much human effort was needed to secure divine gracelay in the split between its Tengalai and Vedagalai, or northern and southern, branches. Such distinctions were not unlike those marking off, first, Christians from Jews, then Protestants from Roman Catholics, and finally, Lutherans from Methodists. And like their Western counterparts, the differences were often as much matters of style, tone, ritual emphasis, and historical accident as theological doctrine. All Hindus believed in reincarnation and karma, heard the same tellings of the great Indian epics, shared certain sensibilities, values, and beliefs. But Vaishnavite Brahmins, as a rule, simply did not marry Shaivite Brahmins, those devoted to Siva. Each group had its own temples, shrines, and centers of religious teaching. Ramanujan wore a caste mark on his foreheadthe namam, a broad white U intersected by a red vertical slashwholly distinct from the three white horizontal stripes worn by Shaivites. Caste barriers rose highest at mealtime. A Brahmin ate only with other Brahmins, could be served only by other Brahmins. In the cities, restaurants and hotels employing Brahmin chefs prominently advertised that fact. A Brahmin away from home went to elaborate pains to verify the source of food he ate. Brahmin families on pilgrimages to distant shrines would pull over to the side of the road to eat what theyd brought with them rather than chance food prepared by who-knew-whom. Most often, it was a Brahmin males wife who prepared and served his meals. But he never ate with heranother example of heathen ways the English cited as repugnant to proper Christians: women prepared the meals of the men and children of the household, serving them from vessels of silver, copper, and brass (not china, which was deemed insufficiently clean), and hovering over them during mealtime to dispense fresh helpings. The men would eat, largely oblivious to them, then rise together at meals end. Only then, once having cleaned up, would the women retreat to the kitchen and eat whatever remained. Ramanujan ate while seated on the floor, from a round metal tray or, more often, banana leaves set before him and later discarded, like paper plates. He ate with his hands. This did not mean using bread to scoop or sop up food. The staple food up North was wheat, that of the South rice; bread played little role in its diet. So Ramanujan ate precisely as every Western toddler learns not to eatwith his fingers. Into the center of the banana leaf would be ladled a helping of rice. Toward the periphery of the leafabout the size of a place mat in a Western household and still green and fresh, with a thick, muscular rib running down the middlewould go dollops of sharply pickled fruits or vegetables, like mangos, onions, or oranges; spiced fruit chutneys; sambhar, a thick lentil soup stocked with potatoes; and yogurt. Sometimes just a few selections, sometimes, for a festive meal, as many as a dozen. With the fingers of his right hand (and only his right hand), Ramanujan would

mix rice with one or several other foods. Then, with four fingers and thumb formed into a pincer, hed shape some of the loose mixture into a pasty ball and plop it onto his tongue. South Indian cuisine was tasty and nutritious, if not always subtle. It was never bland; the curried dishes were sharp and spicy, the others almost maddeningly sweet. Rice and yogurt, beyond their nutritive value, softened and blunted the bite of the spices themselves. Coconuts and bananas (or actually plantains, a shorter, stubbier variety, tasting much the same) were the main fruits, along with mango and guava. That Ramanujan never ate meat, then, was no act of painful self-denial. Like virtually all Brahmins, he was a strict vegetarian. And yet to say meat was prohibited to him subtly misses the point. It scarcely needed to be prohibited, and for the same simple, invisible reason an orthodox Jew or Muslim neednt be told not to eat pork: you just didnt do it. Others ate meat; he didnt. He would have gagged at the thought. Some of his friends even avoided ingredients, like beetroot, that gave food a reddish cast reminiscent of blood. Ramanujan absorbed such dos and donts of Brahmin life as naturally as he learned to walk and talk. As the child learned to accept responsibility for its own bodily cleanliness, it was also taught the importance of avoiding the invisible pollution conferred by the touch of members of the lowest castes, is how one scholar, G. Morris Carstairs, would later depict the Indian socializing process at work. The mother or grandmother would call him in and make him bathe and change his clothes if this should happen, until his repugnance for a low caste persons touch became as involuntary as his disgust for the smell and touch of feces. Every morning a Hindu male underwent an elaborate cleansing ritual. He defecated, using his left hand only to clean himself with water. Then he bathed, preferably in a holy river like the Cauvery, but always paying special heed to ears, eyes, and nostrils. In drinking, he never brought a cup to his lips but rather spilled water from it into his mouth. After a meal, he got up, left the eating area, and ceremoniously poured water over his hands. For all the dirt and lack of modern sanitary facilities which so bothered English visitors, there was a fastidiousness about Hindu life that no one observed more scrupulously than orthodox Brahmins. Though sometimes scorned as haughty, Brahmins felt pride that, in their own estimation, even the poorest among them were cleaner and purer than others; that the least educated Brahmin knew some Sanskrit, the ancient language of Hinduisms sacred texts; that normally they were accorded deference and respect by others; that educationally and professionally, they excelled. All this contributed to a sense almost universal among themand nothing suggests Ramanujan failed to share itthat Brahmins were, in a real sense, chosen. 4.OFF-SCALE Among Brahmins, traditionally, a sanyasi, or itinerant beggar who gave up worldly interests for spiritual, was not deemed a failure. An ascetic streak ran through Brahmin culture. As Sanskrit scholar Daniel Ingalls has written in an essay, The Brahmin Tradition, Asceticism and mysticism have been, for many centuries now, to the respectable Indian classes what art has been for the last century and a half to the bourgeoisie of Western Europesomething to which, whether aspiring to it themselves or not, they at least gave lip service, and respected. This tradition lifted an eyebrow toward any too-fevered a rush toward worldly success, lauded a life rich in mind and spirit, bereft though it might be of physical comfort. Even wealthy Brahmin families often kept homes that, both by Western standards and those of other well-off Indians, were conspicuous by their simplicity and spartan grace, with bare floors, the meanest of furniture. Simple living and high thinking, is how one South Indian Brahmin would, years later, characterize the tradition. But in the years Ramanujan was growing up, things were changing. Brahmins were still the priests and gurus, the logicians and poets, the Sanskrit scholars and sanyasis of Hindu life. But now the old contemplative bent was taking new form; the spiritual was being transmuted into the secular. Like Jews in Europe and America at about the same time (with whom South Indian Brahmins would, almost a century later, routinely compare themselves), they were becoming professionals. The census following Ramanujans birth noted that of South Indias six hundred thousand male Brahmins, some 15 percentan extraordinarily high numberheld positions in the civil service, the learned professions, and minor professional fields. They already dominated the ranks of the college educated, and within a generation, by 1914, of 650 graduates of the University of Madras no fewer than 452 would be Brahminsmore than ten times their proportion of the population. The old middle class of traders and barristers had traditionally been drawn from their own distinct castes. But the British had helped build a new middle class of brokers, agents, teachers, civil servants, journalists, writers, and government clerks. And these positions Brahmins now began to fill. In Brahminically steeped Kumbakonam, one in five adult males could read and write, more than anywhere else in South India with the possible exception of Tanjore, the district seat, and Madras itself. Kumbakonam Brahmins had a taste for philosophical and intellectual inquiry, a delight in mental exercise, that led one English observer to pronounce them proverbial for ability and subtlety. Ramanujans parents, when not mired in outright poverty, clung to the nethermost reaches of the

middle class and were illiterate in English, though not in their native Tamil; his friends, however, mostly came from better-off families and were bound for positions as lawyers, engineers, and government officials. In doing so, they trod career paths with one thing in common: the way was always marked in English. Ramanujans native language was Tamil, one of a family of Dravidian languages that includes Malayalam, Canarese, and the musical-sounding Telugu. European scholars acclaimed Tamil for its clear-cut logic; a language made by lawyers and grammarians, someone once called it. Spoken from just north of Madras within a broad, kidney-shaped region west to the Nilgiri Hills and south to Cape Comorin at the tip of the subcontinent, as well as in northern Ceylon, Tamil represented no out-of-the-way linguistic outpost. It had its own rich literature, distinct from the Hindi of the north, going back to the fifth century B.C., boasted a verse form reminiscent of ancient Greek, and was spoken by almost twenty million people. But in the early 1900s, as now, English was ascendant in India. It was the language of the countrys rulers. It fueled the machinery of government. It was the lingua franca to which Indians, who spoke more than a dozen distinct languages, turned when they did not otherwise understand one another. Among Indians as a whole, to be sure, the proportion who spoke English was small. Even among relatively well-educated Tamil Brahmin males, only about 11 percent were (in 1911) literate in it. So, those who did speak and read it were, in obedience to the law of supply and demand, propelled onto the fast track. As a clerk, even a smattering of it got you an extra few rupees pay. It was the ticket of admission to the professions. While a pupil at Kangayan Primary School, Ramanujan studied English from an early age, and in November 1897, just shy of ten, he passed his primary examinationsin English, Tamil, arithmetic, and geographyscoring first in the district. The following January, he enrolled in the English language high school, Town High. Town High School had its origins in 1864 in two houses on Big Street, a main thoroughfare near the heart of town. When, some years later, the local college dropped its lower classes, a group of public-spirited citizens rushed to fill the vacant academic niche from below, through an expanded Town High. They would tear down the old buildings, erect a new one on the existing site... No, pronounced Thambuswami Mudaliar, a magnificently mustachioed eminence on the schools managing committee, better to start afresh. And for the schools new campus, he offered seven prime acres then harboring a banana orchard. There, he personally supervised construction of the first buildings. Today, Town Highs cluster of handsome white buildings occupies an oasis of tropical charm insulated from the noisy street out front by a sandy field shaded by tall margosa trees. At the time Ramanujan attended, however, the first block of classrooms, with its roof of densely layered red clay tiles and porch overhangs of palm leaf thatching, had gone up just a few years before. Its classrooms were laid end-to-end, making for a building one room wide, with windows on both sides to catch any hint of breeze. The windows would have caught any adolescent clamor, too, but there was probably little to carry. Years later an alumnus would recall the long coats and turbans of the teachers and the respect they commanded among the students. Headmaster during Ramanujans time, and for twenty-two years in all, was S. Krishnaswami Iyer, a severe-faced man partial to impromptu strolls between classes. The tapping of his walking stick would alert both teachers and students to his coming. Sometimes hed step into a class, take over from the teacher, question students, and teach the rest of the classwith enough flair, it seems, that when he taught Greys Eton College one student imagined little Town High as Eton, the irrigation ditch crossing the campus as the Thames. The school, which stood about a five-minute walk from Ramanujans house, drew the cream of Kumbakonam youth and launched them into college and career. Alumni would later recall it with genuine fondness. And it nourished Ramanujan for six years, bringing him as close as hed ever come to a satisfying academic experience. Even allowing for the retrospective halo that sees in every schoolboy exploit of the famous a harbinger of future greatness, its plain that Ramanujans gifts became apparent early. Ramanujan entered Town Highs first form at the age of ten, corresponding to about an American seventh grade. And already while he was in the second form, his classmates were coming to him for help with mathematics problems. Soon, certainly by the third form, he was challenging his teachers. One day, the math teacher pointed out that anything divided by itself was one: Divide three fruits among three people, he was saying, and each would get one. Divide a thousand fruits among a thousand people, and each would get one. So Ramanujan piped up: But is zero divided by zero also one? If no fruits are divided among no one, will each still get one? Ramanujans family, always strapped for cash, often took in boarders. Around the time he was eleven, there were two of them, Brahmin boys, one from the neighboring district of Trichinopoly, one from Tirunelveli far to the south, studying at the nearby Government College. Noticing Ramanujans interest in mathematics, they fed it with whatever they knew. Within months he had exhausted their knowledge and was pestering them for math texts from the college library. Among those they brought to him was an 1893

English textbook popular in South Indian colleges and English preparatory schools, S. L. Loneys Trigonometry, which actually ranged into more advanced realms. By the time Ramanujan was thirteen, he had mastered it. Ramanujan learned from an older boy how to solve cubic equations. He came to understand trigonometric functions not as the ratios of the sides in a right triangle, as usually taught in school, but as far more sophisticated concepts involving infinite series. Hed rattle off the numerical values of and e, transcendental numbers appearing frequently in higher mathematics, to any number of decimal places. Hed take exams and finish in half the allotted time. Classmates two years ahead would hand him problems they thought difficult, only to watch him solve them at a glance. Occasionally, his powers were put to good use. Some twelve hundred students attended the school and each had to be assigned to classrooms, and to the schools three dozen or so teachers, while satisfying any special circumstances peculiar to particular students. At Town High, the senior math teacher, Ganapathi Subbier, was regularly shackled with the maddening joband he would give it to Ramanujan. By the time he was fourteen and in the fourth form, some of his classmates had begun to write Ramanujan off as someone off in the clouds with whom they could scarcely hope to communicate. We, including teachers, rarely understood him, remembered one of his contemporaries half a century later. Some of his teachers may already have felt uncomfortable in the face of his powers. But most of the school apparently stood in something like respectful awe of him, whether they knew what he was talking about or not. He became something of a minor celebrity. All through his school years, he walked off with merit certificates and volumes of English poetry as scholastic prizes. Finally, at a ceremony in 1904, when Ramanujan was being awarded the K. Ranganatha Rao prize for mathematics, headmaster Krishnaswami Iyer introduced him to the audience as a student who, were it possible, deserved higher than the maximum possible marks. An A-plus, or 100 percent, wouldnt do to rate him. Ramanujan, he was saying, was off-scale. Still, during most of his time in school, Ramanujans life remained in rough balance. At graduation, he was his mothers son, motivated and successful in school, getting set to enroll the following year, with a scholarship, in the Government College at the other end of town, looking ahead to academic achievement, a career, marriage... But soon, very soon, that uneasy balance would be destroyed, and Ramanujan would be led out into a new, mentally unsettling realm of intellectual passion and fierce, unbending intensity that would rule the rest of his life. For beside the reasoned, rational side of Ramanujan lay an intuitive, even irrational streak that most of his Western friends later could never understandbut with which he was at ease, and to which he happily surrendered himself. 5.THE GODDESS OF NAMAKKAL It would take a few minutes for his eyes to adjust to the shadows. There, in the Sarangapani temples outer hall, it seemed gloomy after the bright sun outside. What light there was swept in from the side, softly modeling the intricate sculpted shapes, the lions and geometrically cut stone, of the halls closely spaced columns. Away further from the light, nestled among the columns, were areas favored by bats for nesting. Sometimes Ramanujan could hear the quick, nervous swatting of their wings. Or even see them hanging from the ceiling, chirping away, then abruptly fluttering into flight. Unlike Western churches which, architecturally, drew you higher and higher, here the devout were pulled, as it were, inner and inner. Within the high stone walls of the temple complex stood a broad court, open to the sky and, within that, the roofed columned area. In further yet, you came to the great chariot, its enormous wheels, several feet in diameter, drawn by sculpted horses and elephants. Within the building-within-a-building that was the chariot stood, in a dark stone cell where a lamp burned night and day, the sanctum sanctorum, the primary deity himselfthe great god Vishnu, rising up from his slumber beside the many-headed serpent representing Eternity. Always the temple stirred with little bright devotional fires, the chanting of mantras, the smell of incense in small shrines and dark niches devoted to secondary deities. The closer one approached to the central shrine itself, the darker it grewmore mysterious, more intimately scaled, progressively smaller, tighter, closer. What from the noisy street beyond the temple walls might have seemed a fit site for great public spectacles, here, inside, within stone grottos blackened by centuries of ritual fire presided over by bare-chested Brahmin priests, was a place for one man and his gods. From the outside, the gopuram, or entrance tower, of this great temple built by Nayak kings sometime before A.D. 1350 was a massive twelve-story trapezoid of intricately sculpted figures, 90 feet across at its base and rising 146 into the sky. It was so high you could scarcely discern the images at the top, much less the facial expressions upon which their sculptors had lavished attention. There were figures clothed and naked, figures sitting and standing, with human shapes and animal, realistic and utterly fantastic. There were figures dancing, on horseback, making love, strumming instrumentsa full panoply of human activity, densely realized in stone. To Ramanujan, growing up within sight of the temple, these were not neutral images. Each represented legends onto which, since his earliest

childhood, layers of imagery and significance had been heaped upscenes and stories he had heard at his mothers knee, stories from the great epics, the Ramayana and the Mahabharata, stories meant to edify, or amuse. Every Hindu child learned of mischievous little Krishnaa child now, not yet a godcoming upon a group of women bathing, stealing their saris, and escaping up a tree with them, the women frantically imploring him for their return. Here, Ramanujan had only to lift his gaze to the wall of the gopuram to see Krishna perched in the legendary tree. All his life, for festivals, or devotions, or just to pass the time, with his family or by himself, Ramanujan came to the temple. Hed grown up virtually in its shadow. Stepping out of his little house, he had but to turn his head to see, at the head of the street, close enough that he could make out the larger figures, the great gopuram. Indeed, the very street on which he lived bore the temples name. It was Sarangapani Sannidhi Street; sannidhi meant entrance or procession way. There was no special premium on silence within the temple; it was natural for Ramanujan to strike up conversations there. But the prevailing feeling was that of quiet and calm, a stone oasis of serenity, while outside all India clamored with boisterous life. Here, to the sheltered columned coolness, Ramanujan would come. Here, away from the family, protected from the high hot sun outside, he would sometimes fall asleep in the middle of the day, his notebook, with its pages of mathematical scrawl, tucked beneath his arm, the stone slabs of the floor around him blanketed with equations inscribed in chalk. More than a dozen major temples studded the town and nearby villages, some devoted to Lord Siva, some to Lord Vishnu. Each had its prominent gopurams, its columned halls, its dark inner sanctums, its tanks, or large, ritual purifying pools. The town fairly exuded spirituality. That once every twelve years the great Mahammakham tank received water from the Gangesfrom which geography books showed it hopelessly remotewas, in Kumbakonam, a truth stated not with apology to secular sensibilities, or qualifiers like tradition has it, or according to legend, but simply, baldly, as fact. It was a world in which the spiritual, the mystical, and the metaphysical werent consigned to the fringes of life, but lay near its center. Ramanujan had but to step outside his house, wander along the street, or loll about the temple, to find someone eager to listen to a monologue on the traits of this or that deity, or the mystic qualities of the number 7, or mans duties as set forth in the Bhagavad-Gita. Not that practical matters were dismissed in the high-caste Brahmin world in which Ramanujan grew up; money, comfort, and security had their place. But so did Vishnu and his incarnations, and what they meant, and how they might be propitiated, and upcoming festivals, and the proper form for devotions. These were not mere distractions or diversions from the business of everyday life. They were integral to it, as central to most South Indians as afternoon tea and cricket were to upper-class Englishmen, or free enterprise and their automobiles to Americans. Years later, after he was dead, some of his Western friends who thought they knew him would say that Ramanujan was not really religious, that his mind was indistinguishable from any brilliant Westerners, that he was a Hindu only by mechanical observance, or for forms sake alone. They were wrong. All the years he was growing up, he lived the life of a traditional Hindu Brahmin. He wore the kutumi, the topknot. His forehead was shaved. He was rigidly vegetarian. He frequented local temples. He participated in ceremonies and rituals at home. He traveled all over South India for pilgrimages. He regularly invoked the name of his family deity, the goddess Namagiri of Namakkal, and based his actions on what he took to be her wishes. He attributed to the gods his ability to navigate through the shoals of mathematical texts written in foreign languages. He could recite from the Vedas, the Upanishads, and other Hindu scriptures. He had a penchant for interpreting dreams, a taste for occult phenomena, and a mystical bent upon which his Indian friends unfailingly commented. Once a year during the years he was growing up in Kumbakonam, he would set out along the road heading east past the railroad station. Outside of town, the mud houses with their thatched roofs hugging the side of the road thinned out. He could see bullocks tied to stakes beside the road, goats wandering in and out of houses, little roadside shrines, trails leading off the road and into the flat, green countryside. About four miles from Kumbakonam, hed reach a broad looping curve in the road where the town of Thirunageswaram began, and where the ancient Uppiliapan Koil temple stood. Here Ramanujan came every year, at the time of the full moon, in the month of Sravana (around August) to renew his sacred thread. When he was five years old, participating in a time-honored ceremony of fire and chanting that typically lasted four days, Ramanujan had been invested with the sacred threadthree intertwined strands of cotton thread draped across the bare chest, from the left shoulder diagonally down to the right hip, like a bandolier. The upanayanam ceremony solemnized his twice-born status as a Brahmin; the first birth, said the ancient lawgiver Manu, is from the mother, the second from the taking of the sacred thread. Thenceforth, he could read the sacred Vedas and perform the rites of his caste. And each year during Sravanam, midst food offerings and sacred fires and worship, he renewed it in the company of other

Brahmins at the Uppiliapan temple. One time, a friend recalled later, he and Ramanujan walked through the moonlight the six miles to the nearby town of Nachiarkovil, site of a Vishnu temple, to witness a religious festival. All the while, Ramanujan recited passages from the Vedas and the Shastras, ancient Sanskrit tomes, and gave running commentaries on their meaning. Another time, when he was twenty-one, he showed up at the house of a teacher, got drawn into conversation, and soon was expatiating on the ties he saw between God, zero, and infinitykeeping everyone spellbound till two in the morning. It was that way often for Ramanujan. Losing himself in philosophical and mystical monologues, hed make bizarre, fanciful leaps of the imagination that his friends did not understand but found fascinating anyway. So absorbed would they become that later all they could recall was the penetrating set of his eyes. Immensely devout, R. Radhakrishna Iyer, a classmate of his, would later term him. A true mystic... intensely religious, recalled R. Srinivasan, a former professor of mathematics. Toward the end of his life, influenced by the West, Ramanujan may have edged toward more secular, narrowly rational values. But that came much later. And growing up midst the dense and ubiquitous spirituality of South India, he could scarcely have come away untouched by iteven if only in rebellion. Ramanujan never did rebel. He did not deny the unseen realm of spirit, nor even hold it at arms length; rather, he embraced it. His was not a life set in tension with the South India from which he came, but rather one resonating to its rhythms. South India was a world apart. All across Indias northern plains, the centuries had brought invasion, war, turmoil, and change. Around 1500 B.C. light-skinned Aryans swept in through mountain passes from the north. For eight centuries, Buddhism competed with traditional Brahminism, before at last being overpowered by it. Beginning in the tenth century, it was the Muslims who invaded, ultimately establishing their own Moghul Empire. One empire gave way to another, the races mingled, religions competed, men fought. And yet by all this, the South remained largely untouched, safe behind its shield of mountains, rivers, and miles. North of what would become the modern city of Bombay, stretching across the western edge of the subcontinent at roughly the latitude of the Tropic of Cancer, loomed the Vindhya mountains, a broken chain of rugged hills rising as high as three thousand feet and reaching inland almost seven hundred miles. At their base lay further obstacles to movement south into the tapering Indian peninsulathe Narbada and Tapti rivers, flowing west into the Arabian Sea, and the Mahanadi River, flowing into the Bay of Bengal on the east. These, together with sheer distance, exhausted most invaders before they reached very far south. Thus, spared both the fury of the North and the fresh cultural winds forever sweeping through it, the South remained a place unto itself, remarkably pure. No part of India was more homogenous. Racially, the South was populated mostly by indigenous Dravidian peoples with black, often curly hair, broad noses, and skin almost as dark as native Africans; even the Brahmins, thought to be derived from Aryan stock, were not so light-skinned as those seen up North. Linguistically, North and South were divided, too. Tamil and the other Dravidian languages bore few ties to Hindi and the other Sanskrit-based languages of the North. Religiously, the South was more purely Hindu than any other part of India; nine in ten of those in Ramanujans Tanjore District, for example, were Hindu, only about 5 percent Muslim. So special and distinct was the South in the minds of its inhabitants that in writing overseas they were apt to make South India part of the return address. On the political map, no such place existed; yet it expressed a profound cultural truth. In South India an undiluted spirituality had had a chance to blossom. If the North was like Europe during the Enlightenment, the South was, religiously, still rooted in the Middle Ages. If Bombay was known for commerce, and Calcutta for politics, Madras was the most single-mindedly religious. It was a place where there was less, as it were, to distract youjust rice fields, temples, and hidden gods. Here, in this setting, with the secular world held at bay, within a traditional culture always willing to see mystical and magical forces at work, Ramanujans belief in the unseen workings of gods and goddesses, his supreme comfort with a mental universe tied together by invisible threads, came as naturally as breath itself. All through South India, every village of a few dozen huts had a shrine to Mariamma or Iyenar, Seliamma or Angalammagods and goddesses whose origins went back to the very dawn of agricultural communities. These deities represented powers which villagers hoped to propitiate, like smallpox, cholera, and cattle plague. Most were reckoned as female. A few were recent, incorporating the spirits of murder victims or women who had died in childbirth. In 1904, some boys thought they heard trumpets coming from an anthill, and soon the deity of the anthill was attracting thousands of people from nearby villages, who would lie prostrate on their faces, rapt in adoration. Grama devata, or village gods, these deities were called, and they had virtually nothing to do with the formal Brahminic Hinduism a student of comparative religion might learn about in college. The villagers might give lip service to Vishnu and Siva, the two pillars of orthodox worship. But at time of pestilence or famine, they

were apt to turn back to their little shrinesperhaps a brick building three or four feet high, or a small enclosure with a few rude stones in the middlewhere guardianship of their village lay. Mere idol worship? No more than a primitive, aboriginal animism? So some critics of Hinduism argued. And to the extent that these Dravidian gods were part of Hinduism, one could argue, the critics werent far off. But the Hinduism of which Kumbakonam was such a stronghold, and in which Ramanujan was steeped, was a world apart from all this. In Tanjore District, one English observer would note, Brahminical Hinduism is here a living reality and not the neglected cult, shouldered out by the worship of aboriginal godlings, demons and devils which it so often is in other districts. The great temples of the South fairly shouted out the difference. Temples in Kumbakonam, in Kanchipuram, in Tanjore, Madurai, and Rameswaram, were, as one authority put it, as superior to more famous ones in the North, say, as Westminster Abbey and St. Pauls are to the other churches of London. One at Rameswaram, to which Ramanujan and his father, mother, and baby brother went on a pilgrimage in 1901, built over a hundred-year span during the seventeenth century on an island off the coast opposite Ceylon, was 1000 feet long and 650 feet across, built with gopurams 100 feet high on each face, with almost 4000 feet of corridors rich in extravagantly sculpted detail. A Western observer to such a temple might still be brought up short by the bewildering variety of deities hed find theresculpted figures, statues large and small, in wood and stone, sometimes garlanded with flowers, even dressed in rude clothing. But in mainstream Hinduism, these could all be seen as part of a grand edifice of belief vastly more sophisticated than the religion of the villages. The three chief deities in the Hindu pantheon, Brahma, Siva, and Vishnu, were traditionally represented as, respectively, the universes creative, destructive, and preserving forces. In practice, however, Brahma, once having fashioned the world, was seen as cold and aloof, and tended to be ignored. So the two great branches of Brahminic Hinduism became Shaivism and Vaishnavism. Shaivism had a kind of demonic streak, a fierceness, a malignity, a raw sexual energy embodied in the stylized phallic symbol known as a lingam that was the centerpiece of every Shaivite temple. Think of sweeping change, of cataclysmic destruction, and you invoked Lord Siva. Vaishnavism, befitting its identification with the conserving god Vishnu, had more placid connotations. One contemporary English account likened it to the Spirit of Mana distinctly gentler idea. Figuring largely in Vaishnavism were Rama and Krishna, heroes of Indian legend, and two of the incarnations, or avatars, in which Vishnu appears. In Hindu lore, each of the three primal gods appeared in many forms. Siva could be Parmeswara. Vishnu could be Narasimha or Venkatarama. They had consorts and relatives, each of whom themselves had, over the centuries, become the objects of worship, the centers of their own cults. Vishnu, for example, was worshipped in the form of his consort Lakshmi, and as the monkey god, Hanuman. Each was endowed with distinct personalities; each gained its own adherents. Some worshippers, certainly, construed those stone figures literally, viewed them as gods, pure and simple, in a way not so different from the grama devata worship of the villages. Indeed, one history of South India spoke of a fusion of village deities and Vedic Brahminical deities going back to around the beginning of the Christian era that had brought a comingling of different forms of worship. But sophisticated Hindus, at least, understood that these stone deities merely represented forms or facets of a single godhead; in contemplating them, you were reawakened to the Oneness of all things. For those whose worship remained primitive, meanwhile, the garish stone figures could be seen as hooks by which to snare the spiritually unsophisticated and direct them toward something higher and finer. The genius of Hinduism, then, was that it left room for everyone. It was a profoundly tolerant religion. It denied no other faiths. It set out no single path. It prescribed no one canon of worship and belief. It embraced everything and everyone. Whatever your personality there was a god or goddess, an incarnation, a figure, a deity, with which to identify, from which to draw comfort, to rouse you to a higher or deeper spirituality. There were gods for every purpose, to suit any frame of mind, any mood, any psyche, any stage or station of life. In taking on different forms, God became formless; in different names, nameless. Among the thousands of deities, most South Indian families tended to invest special powers in a particular onewhich became as much part of the familys heritage as stories passed down through the generations, or its treasured jewelry. This kula devata became the focal point of the familys supplications in time of trouble, much as some Roman Catholics invoke a particular patron saint. Things would go wrong, and youd propitiate your family deity before you would any other. In South India, many a well-traveled Brahmin with wide knowledge of the worldperhaps a scholar, a professional, fluent in English, well-read in Sanskrit, who could intelligently discuss Indian nationalism, Tamil poetry, or mathematicsroutinely and ardently prayed before the shrine of his family deity. In Ramanujans family, the family deity was the goddess Namagiri, consort of the lion-god Narasimha. Her shrine at Namakkal was about a hundred miles

from Kumbakonam, about three-quarters of the way to Erode, near where Komalatammals family came from. It was Namagiri whose name was always on his mothers lips, who was the object of those first devotions, whose assumed views on matters great and small were taken with the utmost seriousness. It had been Namagiri to whom Ramanujans mother and father, childless for some years after they married, had prayed for a child. Ramanujans maternal grandmother, Rangammal, was a devotee of Namagiri and was said to enter a trance to speak to her. One time, a vision of Namagiri warned her of a bizarre murder plot involving teachers at the local school. Another time, many years earlier, before Ramanujans birth, Namagiri revealed to her that the goddess would one day speak through her daughters son. Ramanujan grew up hearing this story. And he, too, would utter Namagiris name all his life, invoke her blessings, seek her counsel. It was goddess Namagiri, he would tell friends, to whom he owed his mathematical gifts. Namagiri would write the equations on his tongue. Namagiri would bestow mathematical insights in his dreams. So he told his friends. Did he believe it? His grandmother did, and so did his mother. Her sons birth, after long prayer to Namagiri, had only intensified her devotion, made her more fervent in her belief. Thats how Komalatammal was: Why, she had practically willed herself a child. The whole force of her personality, her ferocious will, surged through all she did. Ramanujan absorbed that from her; she never had to teach it to him, because it was imprinted in the example of her life. He learned from her to heed the voice within himself and to exert the will to act on it. His father was mired in the day-to-day, a slave to its routines, preoccupied with rupees and annas; he would want Ramanujan married off, bringing money into the family, well settled. But Komalatammal gave herself over to deeper forces, dwelt in a rich, inner worldand pulled Ramanujan into it with her. So that when a powerful new influence on Ramanujans young life came along, he had his mothers sanction to embrace it, to give his life over to it, to follow it with abandon.Prsentation de l'diteurIn 1913, a young unschooled Indian clerk wrote a letter to G H Hardy, begging the pre-eminent English mathematician's opinion on several ideas he had about numbers. Realising the letter was the work of a genius, Hardy arranged for Srinivasa Ramanujan to come to England. Thus began one of the most improbable and productive collaborations ever chronicled.With a passion for rich and evocative detail, Robert Kanigel takes us from the temples and slums of Madras to the courts and chapels of Cambridge University, where the devout Hindu Ramanujan, 'the Prince of Intuition,' tested his brilliant theories alongside the sophisticated and eccentric Hardy, 'the Apostle of Proof'. In time, Ramanujan's creative intensity took its toll: he died at the age of thirty-two and left behind a magical and inspired legacy that is still being plumbed for its secrets today.