Srinivasa Ramanujan

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Ramanujan's life

Untrained; self-taught; genius- these are some of the adjectives that were used to describe Ramanujan's brief, but incredible life. Srinivasa Ramanujan was born December 22, 1887 in the city of Erode, in his grandmother's house. Outside of his life in mathematics, Ramanujan was a very religious person. He was a Hindu, and especially worshipped the Hindu god Narashima. Narashima is the fourth reincarnation of Lord Vishnu, the main god of the Hindu religion. Ramanujan's father was a textile clerk and his mother was a singer. His mother had two other children, however they died during industry. Just like his other two siblings, Srinivasa also almost lost his life at an early age. At the age of five, Ramanujan contracted smallpox. However, he was able to recover from the disease, considering his family had no money to spend on medical expenses. This was uncommon, since many of the children were also contracting smallpox and dying from it. This early disease may have weakened his body to fight disease, which may have been the reason why he died so early. It is interesting to note that Srinivasa means person who contains a particle of the god Rama, and his last name, Ramanujan, roughly means one who abides in wealth in English. Although Ramanujan's family was poor, they were respectable because of his grandmother, who was a minor official in a local court. This level of respect in the family is what allowed Ramanujan to attend school. What's more, Ramanujan's family used their house to room international students, which is how Ramanujan was introduced to higher-level mathematics at a young age when he received a mathematics book from one of the rooming students.

While at school, Ramanujan was considered a well-rounded student, able to excel in all subjects. This held true until his passion for mathematics took over. He would devote all of his time to this subject, and as a result he would fail his examinations at the end of the school year. As a result, he lost his scholarship to attend school, and needed to find a job. Fortunately, he was able to work for one of his previous professors as a postal clerk. Working with his old professor allowed Ramanujan to put more focus on mathematics and the book that was given to him by one of the rooming students, titled, "A Synopsis of Elementary Results in Pure and Applied Mathematics" by G.S. Carr. The book held five thousand high level mathematical theorems, most of which had no proofs. It was given to him at the age of sixteen, and even with all the time Ramanujan put on his mathematical work, he was still able to find a wife, due to the efforts of his mother in 1909. Her name was Janaki, and at the time of marriage she was only ten, while Ramanujan was twenty-two years old! However, he was content with his wife, and was upset at times with his mother when she would interfere with their relationship. During Srinivasa's time with his wife, he contracted hydrocele testis, which is the swelling of the membrane of the testicle. Again, Ramanujan did not have the money to pay for the surgery. Fortunately, from the charity of a surgeon, he was able to get the operation done for free.

Due the encouragement of fiends and colleagues he began sending his work to British mathematicians in 1913. His work and efforts eventually landed him as an apprentice to G.H. Hardy, one of if not the leading mathematician in Europe. However, working with Hardy meant going to England. Ramanujan was a devout Hindu and was not initially up for the idea of going to a foreign land; so on first request, he refused. His mother, Komalatammal, also did not approve. She did finally agree to allow Ramanujan to go to England, after she prayed to Namagiri and had a dream claiming to have seen Ramanujan with a halo above his head in conversion with other men. Ramanujan did great works with G.H. Hardy, and was eventually given a Bachelor of Science degree for his research at Cambridge. This Bachelor's would be later changed to a PhD. During Ramanujan's time in England, it was a challenge for him to conform to the British culture. The weather had a noticeable effect on Ramanujan, who was used to the tropical heat of his Erode, India. Because of his religion, Srivnivasa also did not eat much of the food in Britain (people who practice Hinduism do not eat meat that involved the killing of animals). He would have his friends and family send food to him, which became cumbersome during the winter-time.

The work Ramanujan did with Hardy abruptly came to an end when he contracted Tuberculosis. His health was already beginning to fail when he was going back and forth from England to India in the last two years of his life. He even dealt with depression, and once tried to kill himself by jumping in front of a train. However short Ramanujan's life may have been, it certainly was not unfulfilled, as he was able to conceive thousands of theorems and formulas over his thirty-two years of life. Srinivasa Ramanujan died April 26, 1920 of tuberculosis. Conversely, it was later concluded that Ramanujan was dealing with liver disease as well. It is interesting to note that years after the death of Ramanujan, many scholars believed that he may have had a form of autism, called Asperger's Syndrome. It is said that people with Asperger's are able to function in human society, but are lacking in the level of common sense. In addition to that, Ramanujan began speaking later than normal, and would talk at people instead of to them. Ramanujan's single-mindedness on just mathematics is another example that he may have lived with Asperger's Syndrome.

Ramanujan's mathematical works

As for the work Ramanujan did during the time he was collaborating with Hardy on his own, it was equally if more ingenious. It was said by both Hardy and other mathematicians that Ramanujan's formulas and theorems held more than what was seen at first sight. He was interested in infinite series, such as pi, for example:

$$\frac{1}{\pi} = \frac{2\sqrt{2}}{9801}\left(\sum_{k=0}^{\infty}\right)\left(\frac{(4k)!(1103+26390k)}{((k!)^4)396^(4k)}\right)$$

This formula can accurately calculate pi up to an astounding nine decimal places. What is more, Ramanujan was able to create seventeen more formulas for pi:

$$f(q) = \sum_{n=0}^{\infty} \frac{q^{n^2}}{(1+q)^2(1+q^2)^2...(1+q^n)^2}$$

$$\phi(q) = \sum_{n=0}^{\infty} \frac{(q^{n^2}}{(1+q)^2(1+q^4)...(1+q^n)^2)}$$

$$\psi(q) = \sum_{n=1}^{\infty} \frac{q^{n^2}}{(1-q)(1-q^3)...(1-q^(2n-1))}$$

$$\chi(q) = \sum_{n=0}^{\infty} \frac{q^{n^2}}{(1-q+q^2)(1-q^2+q^4)...(1-q^n+q^(2n))}$$

$$\omega(q) = \sum_{n=0}^{\infty} \frac{q^{2n(n+1)}}{(1-q)^2(1-q^3)^2...(1-q^(2n+1)^2}$$

$$\nu(q) = \sum_{n=0}^{\infty} \frac{q^{n(n+1)}}{(1+q)(1+q^3)...(1+q^(2n+1))}$$

$$\rho(q) = \sum_{n=0}^{\infty} \frac{q^{2n(n+1)}}{(1+q+q^2)(1+q^3+q^6)...(1+q^(2n+1)+q^(4n+2))}$$

His ideas and they way he created his formulas and theorems were unfathomable. Ramanujan did not even know some of the high level mathematics he would be working with when dealing with doing his work, but his genius allowed him to overcome that and make amazing contributions to mathematics. You cannot forget, however, that when talking about Srinivasa Ramanujan and his mathematical work, you have to discuss his notebooks and his conjecture. During the time he was working on writing theorems for the problems from the mathematical book written by S.G Carr, he would write them down in his notebooks. Other times, he would write and prove his theorems on a slate, since he could not afford paper at the time. However, because he did not publicly display his proofs for his results, people believe that he was poor at doing so, or just saw the end result from the beginning. The mathematical subsets that Srinivasa Ramanujan liked to work in were limits in infinite series, and definite integrals. Something that is also important to note is the Ramanujan-conjecture, or Ramanujan-Petersson conjecture. It is shown as follows:

mathematics, the Ramanujan conjecture, due to Srinivasa Ramanujan(1916,p.176), states that Ramanujan's tau function given by the Fourier coefficients' (n)of the cusp form'(z)of weight 12

$$\Delta(z) = \sum_{n>0}$$

$$\tau(n)q^n = q\prod_{n>0}(1-q^n)^2 4 = q - 24q^2 + 252q^3 - 1472q^4 + 4830q^5 - \cdots ...,$$

Where

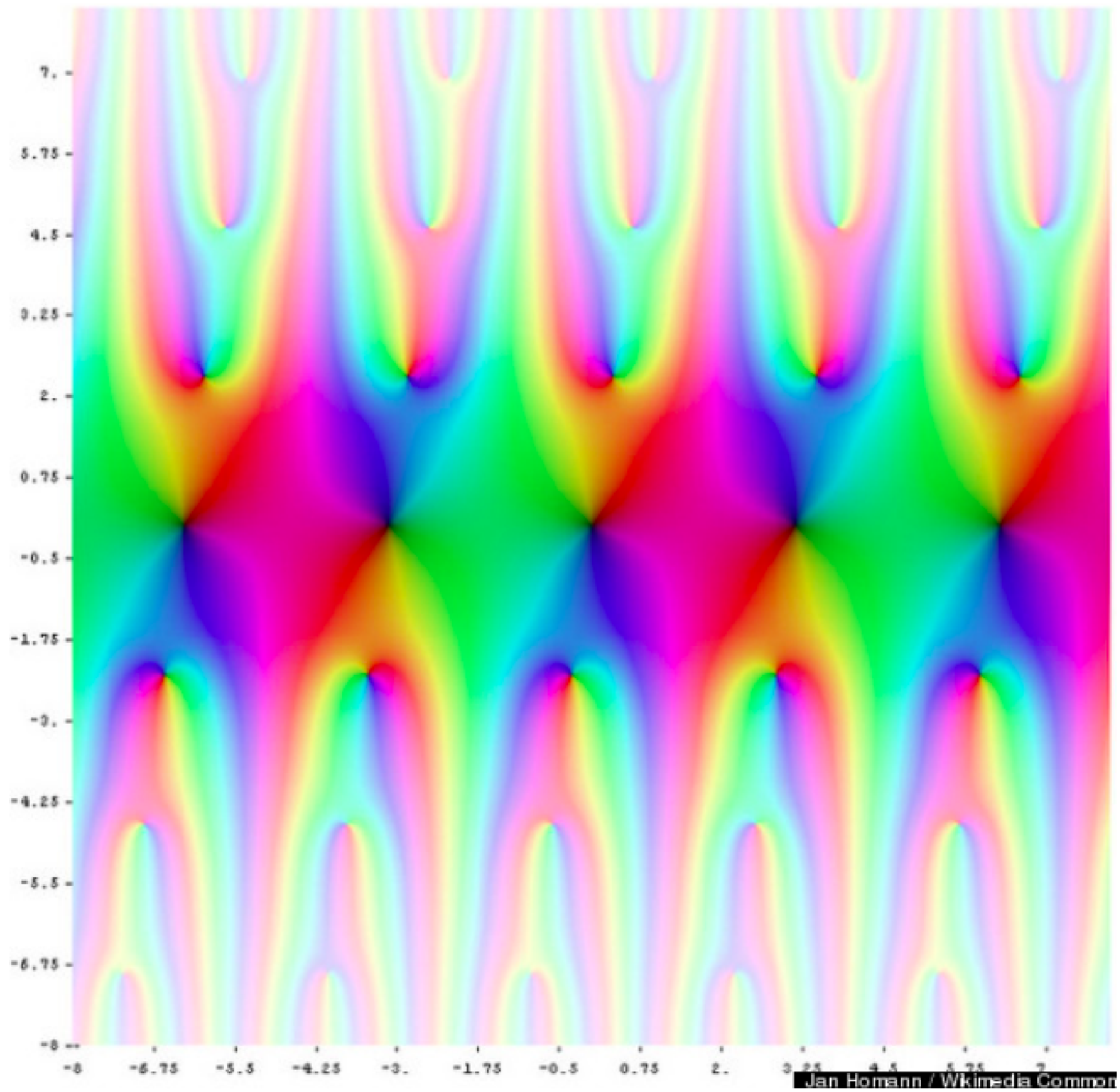
$$q = e^{2\pi iz}$$

satisfies

$$|\tau(p)| \leq 2p^{\frac{11}{2}}$$

This conjecture deals with L-functions, Ramanujan's tau functions, modular forms, and a number of different others that would be too complex to explain in a few sentences, much less ten pages.

Another, equally important work done by Ramanujan were the about the mock modular forms. Literally on his deathbed, Ramanujan sent a letter to his mentor and collaborator, G.H Hardy describing these functions. He said that he had gotten these functions in a dream from the Hindu goddess Namagiri. They were theta functions that imitated modular forms. These ”mock modular forms” were similar in pattern to both sine and cosine functions, but much more complex. If the mathematical function Mobius transformation were applied to them, they would turn in on themselves because they are extremely symmetric.



These functions could also, as it turns out, be applied to string theory. These are just some examples of the functions Ramanujan discovered. It turns out that years later the functions were able to be applied to physics topics such as entropy and black holes, after they were proven to be true. These functions were decades ahead of his time, which provides more evidence to the justification that Srinivasa was a mathematical genius.

Both during and after the time of his death, Srinivasa Ramanujan had a number of different conjectures, graphs, formulas, etc., that were contributed to him. His work touched over a number of different fields within mathematics that have shaped mathematics of the 21 century.

Collaboration with other Scholars

Before Ramanujan became an internationally renown mathematician, he was a school boy learning high level mathematics. Once he was given the book titled, "A Synopsis of Elementary Results in Pure and Applied Mathematics" by G.S. Carr, his mathematical passion grew exponentially. He was solving these theorems that in a book that was supposed to be used by students looking to study for the exams to get into mathematics at Cambridge University. What is even more astounding is that Ramanujan was both understanding and solving these equations at such a young age. After some encouragement from his friends, he sent G.H. Hardy a number of theorems and his work on those theorems. Once Hardy validated his work, the two began working together, created astounding theorems together. One famous work Ramanujan did while working with Hardy is the taxi number. The creation of this occurred when Hardy was visiting Ramanujan in the Hospital for some sort of illness. He made mention of the number of the taxi that he was in, stating that it was such an uninteresting number. Ramanujan, in turn, replied that the taxi number 1729, was the smallest number that can be shown as the sum of two cubes two different ways:

1,729 is the smallest number which can be represented in two different ways as the sum of two cubes:

$$1729 = 1^3 + 12^3$$
$$= 9^3 + 10^3$$

It is also incidentally the product of 3 prime numbers:

$$1729 = 7 * 13 * 19$$

A larger known similar number is:

$$885623890831 = 7511^3 + 7730^3$$
$$= 8759^3 + 5978^3$$
$$= 3943 \cdot 14737 \cdot 15241$$

This is now considered the Ramanujan-Hardy number. As of today, there is a whole new study of work involving finding more 'taxi cab' numbers. There are only six "taxicab" numbers that are known, with the largest one having twenty-three numbers in it. Finding these other taxicab numbers were not done simply by hand, however. It took the work of a supercomputer to discover such other types of numbers, which occurred in the late 20th, early 21st century. The number has made an appearance in a number of different places, such as in the movie *Proof* and in an episode of *Futurama*.

In order to understand collaboration between two people, one must know both sides- like the head and tails of a coin. Godfrey Harold Harvey was a mathematical genius in his own right. In fact, he was considered a mathematical prodigy at a young age. Mathematics was Hardy's world, as he would attend Cambridge University, and stay and continue to work for the rest of his mathematics career. He was known for his number theory and mathematical analysis, and claimed to have proved the Reinman Hypothesis just prior to the First World War It is also important to note that Hardy was very public against his distain for war, and was at time strictly reprimanded for his views. When Hardy first came in contact with Ramanujan's work to some of the theorems in the book. It took him two hours to decipher as to whether or not the work was done by a crank or an absolute genius. The latter was chosen, of course. One of the most known quotes that Hardy stated in regards to Ramanujan and his initial look at his work was that it "must be true, because, if they were not true, no one would have the imagination to invent them". With Hardy's stamp of approval, he requested that Srinivasa come to England to work with him. Once he finally arrived the two immediately went to work, and over the course of three years, Ramanujan and Hardy collaborated on over half a dozen-research papers. They implemented new methods, like the circle method, in order to find a certain set of numbers in what is called the partition function. The work these two mathematicians did on the subject is considered the most notable of their work together. Not only did Hardy and Ramanujan make contributions to the math world, they also created a whole new field of mathematics, called probabilistic number theory. This new field in mathematics came about some time after the two publishes a paper now titled the normal order method. The method "analyses the behavior of additive arithmetical functions". An example of this method is shown as follows:

Let f be a function on the natural numbers. We say that g is a **normal order** of f if for every $\varepsilon > 0$, the inequalities

$$(1-\varepsilon)g(n) \leq f(n) \leq (1+\varepsilon)g(n)$$

hold for *almost all* n: that is, if the proportion of $n \leq x$ for which this does not hold tends to 0 as x tends to infinity.

The Ramanujan-Hardy paper introduced probabilistic number theory, but it really took off and expanded by P. Edros, M. Kac and J. Kubilius.

Historical events that marked Ramanujan's life.

The connection between mathematics and its development are quite clear to be seen. For example, in the First World War, we can see that the style of warfare changed drastically. It ceased to be men on horseback, cannons, and low-accuracy shot guns. The development of mathematics meant more advanced weaponry. Cannons turned into tanks, and shot guns turned into machine guns. There was even the use of grenades and airborne dogfights. Moreover, the mathematics in aircraft was prevalent with the first controllable aircraft in 1902. The Wright brothers crafted his homemade airplane with extensive precision and data collected from their own wind tunnel. However, one cannot forget about the world famous Albert Einstein and his theory of relativity. In Einstein's discussion of relativity he proposes the mass-energy equivalence, $E = mc^2$. This single most known equation is considered be the most famous equation ever conceived. During the time that Ramanujan was alive, there were a myriad of events that occurred around his geological area. One of such events was the creation of the Indian Mathematical Society. Started in 1909, this Society (originally called the Indian Mathematical Club) was created because of all the Indian mathematicians going over to Britain and their Universities to learn and be trained in the field. IMS wanted to keep Indian mathematicians in India. The founder of the group was V. Ramaswamy Iyer, an aficionado of the field. At one point in time, Ramanujan was a part of the Indian Mathematical Society. His involvement with the Society at the time of Ramanujan's mathematical fame, this also brought recognition to IMS as well.

In addition to the creation of the Indian Mathematical Society, the British East India Company was making its presence known in the area. Eventually the Company began amassing its own private armies, enforcing their own personal rules over the area they controlled. The Indian textiles could not compete with the British East India Company and their mass production of cheap goods. It's also important to note that India was still an agriculture society even late into the 19th century. The fact that the legislation put in place to give all the power to the British did not sit well with the citizens of India. In consequence some of the people held a protest against this legislation at Jallianwalla Bagh Square in 1919. The general at the time, general Reginald Dyer, did not approve of this. He told his men to open fire on the protesters. Hundreds were killed and hundreds were wounded. This event was called the Amristar massacre. Because of all of the segregation between the Indians and the British in India, there needed to be change.

Fortunately, Mohandas Karamchand Gandhi was the person that led the movement to get the British out of the country. Ghandi sought a non-violent protest of the British textile goods and schools in the area. Although his message was non-violent, the British still imprisoned him for two years. He sought that his followers boycott the purchase of British goods and the attendance of British schooling. He even led a salt march on the British salt tax in March of 1930, where thousand of people joined him in their march to the sea, where they collected their own, untaxed salt. Another geological event that occurred during the lifetime of Srinivasa Ramanujan was the beginning of the Muslim League in 1906. The Muslim League was apart of the partition of India from the great British Empire. Both the Indian Muslim League and Ghandi worked together for a this common goal, despite the fact that they disagreed on how it should be done. As a result of this cooperation between Gandhi and the Indian Muslim League, India was able to declare its independence from Great Britain on August 15th, 1947.

Significant historical events around the world during Ramanujan's life

These are not the only events going on during Srinivasa Ramanujan's lifetime. One such event was World War I. This War started just prior to Ramanujan making his first visit to England. The War started due to a collection of animosity between the neighboring European countries. This ”power-keg” was finally set off when the archduke of Austria-Hungary was assassinated. It lasted four years, from July 28, 1914 to November 11, 1918. War was not only war between European countries- both Japan and the United States became involved in the War. Empires ceased to exist, and new borderlines for countries were created. The War weakened the forces of Great Britain. However, Great Britain was still able to hold on to its control of India through the British East India Company and private armies; until of course, the Indian people drove them out of their country.

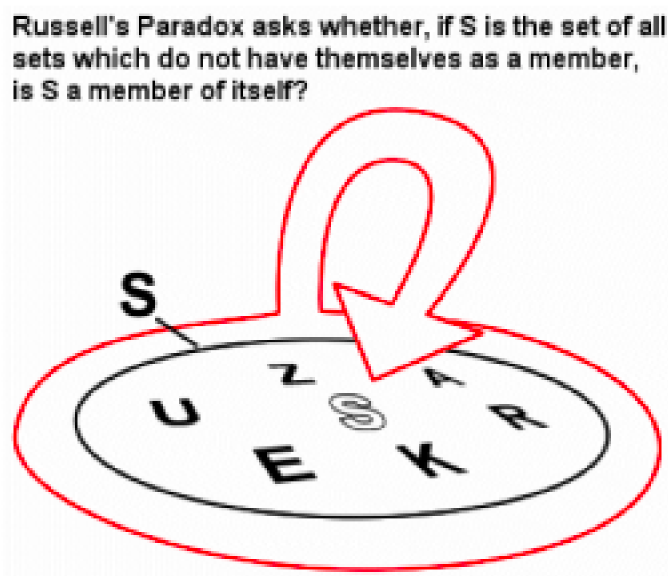
Another worldwide event that occurred during the life of Ramanujan was the sinking of the Titanic in 1912. The boat was built in Belfast, United Kingdom. This ship was considered both the largest and most unsinkable ship on the sea. It was given its name *Titanic*, because the word means having enormous strength and size. The Titanic also had two sister ships called the Olympic and the Britannic, which were under the British shipping company White Star Line. The ship gained international fame for it being the "unsinkable ship". The ship took sail in April of 1912, with the wealthiest of bankers to the poorest of immigrants. Imagine the level of excitement one must have felt on board a ship that was deemed unsinkable. The journey started in Southhampton, and was to end at New York. But, as one already knows the story, the Titanic never made it to New York. The unsinkable ship ran into, and hit an iceberg. Needless to say, it sank. There were 2208 passengers on the boat- only 705 passengers made it out alive. It is remarkable to note that where you were on the Titanic was based on your wealth. The richest were on top, and the poorest were on bottom. When the boat began to sink, the ones at the bottom of the Titanic were the last considered for rescue in a lifeboat, if any made out the bottom deck at all. As of today, there are no more living survivors of this tragic event. The last living survivor died in 2009 at the age of 97. Here name was Millvina Dean from England, and she was only nine weeks old as a passenger on the Titanic, making her the youngest person on board. This historical event was eventually made into a movie.

One must recognize that Srinivasa Ramanujan lived in the late 19th, and early 20th centuries. While this may have been good times for some, it was not good for others. The situation I am talking about is African Americans in America. During this time, African Americans were being lynched and segregated against with Jim Crow laws, even after the abolition of slavery. The time came to make steps to improve the current situation of the African Americans that lived during those time periods. W.E.B DuBois, a civil rights activist, author, and other things. He, along with Ida B. Wells, Mary Church Terrell, and many more, signed the call to birth the NAACP (National Association for the Advancement of Colored People). It began in 1909, and became America"s largest and oldest civil rights organization. First and foremost, the NAACP's main objective is, "ensure the political, educational, social and economic equality of minority group citizens of United States and eliminate race prejudice". This was done with the collaboration of both white and black Americans. During that time and even now, there were whites that did want equality and disapproved of segregation and lynching and the like. So the NAACP had to utilize all of its resources to make progressive steps towards equality. This was doubly impertinent when the civil right era came into effect in the 1950s.

The NAACP also directly worked with Dr. Martin Luther King Jr., who became the face of the Civil Rights movement with his nonviolent protests (as a side note, Dr. Martin Luther King Jr.'s idea to implement non-violent protests actually came from Gandhi, the activist for Indian rights from the British). At each and every pivotal point in the Civil Rights movement, the NAACP was there in each instance, doing whatever it took to reach proper equality. They were in the South, getting African-Americans to vote in the most segregated area of the country-they were there when those nine black children were attempting to attend previously segregated, all white school 8 in Little Rock, Arkansas. However, being a part of the NAACP was very dangerous. The majority of white America did African Americans to be equal to them, and have the same opportunities that they did. They were considered an inferior race, one that could never accomplish anything on the same level they could do. Although most of the achievement and progress of the NAACP came after the death of Srinivasa Ramanujan, it was important to note this historical event going on in the world.

Significant mathematical progress during the Ramanujan's lifetime

At the time of Srinivasa Ramanujan's life, there were was more progressive progress in mathematics from the late 19th to the early 20th centuries. In addition, there were brand new fields of mathematics being introduced, such as topology, and set theory, for example. With the way that mathematics was progressing, it became more of a profession than a hobby, or something done on the side. People were starting to receive Ph.D.'s and teach at colleges and universities. It was also during the lifetime of Srinivasa Ramanujan that the twenty-three greatest unsolved mathematical problems of the time were introduced. The man who brought these problems to life was the young German mathematician David Hilbert. Some of these problems were straightforward, while others dealt with giving extremely complex proofs. As of today only ten of them have been solved, and the other thirteen are either unsolved, or too loosely proven. Some other people that made progress in the early 20th century were Bertrand Russell and Alfred North Whitehead. Both were British mathematicians, who made major contributions to the mathematical fields of logic and set theory. Whitehead was an all-around mathematician, who worked at Cambridge, and also became Russell's tutor. He collaborated with Russell on the mathematical work titled, "Principia Mathematica"; but because his pacifist activities during the first World War, and living in the shadow of his ex-student, Whitehead went to prison, and went to live the out the rest his days in the United States in 1920. Russell was born into wealth, however his parents died at a young age, and it was said that his love of mathematics kept him from committing suicide due to his depression. Russell did not only make contribute to mathematics- he also wrote on almost every major area of philosophy as well. The mathematics that Russell was interested in was set theory and logicism. He also introduced a paradox based on the works of Frege and his initial set theory. "Russell's paradox" as is the name, can be described as a set containing sets that are not members of themselves:



Even in the importance of this paradox, there was an even greater work that Russell and Whitehead collaborated on, the famous "Principa Mathematica". It was published in three volumes in the years of 1910, 1912, and 1913. Although this was considered a collaboration, Whitehead only wrote a part of the first volume, whereas the other volumes were written exclusively by Russell. The three volumes of work were an attempt 9 to use logical axioms to derive all of mathematics. They avoided paradoxes, and used a theory of 'sets' in order to prevent loops. This proved to be troublesome, as it turned out that there needed to be three more axioms, such as the axiom of infinity and the axiom of choice. Continual drafts of the Principia had to be written and re-written because of Russell?s re-thinking of the structure of the Principia. The perfect draft was never found, and because no commercial publisher would touch the volumes, they had to publish it on their own. One of the works within the Principia Mathematica was proving the function $1 + 1 = 2$. It took over 360 pages to definitively prove this:

$$*54{\cdot}43.\quad \vdash :. \alpha, \beta \in 1 . \supset : \alpha \cap \beta = \Lambda . \equiv . \alpha \cup \beta \in 2$$

Dem.

$$\vdash . *54{\cdot}26 . \supset \vdash :. \alpha = \iota^{\prime}x . \beta = \iota^{\prime}y . \supset : \alpha \cup \beta \in 2 . \equiv . x \neq y .$$

$$[*51{\cdot}231] \qquad \equiv . \iota^{\prime}x \cap \iota^{\prime}y = \Lambda .$$

$$[*13{\cdot}12] \qquad \equiv . \alpha \cap \beta = \Lambda \qquad (1)$$

$$\vdash . (1) . *11{\cdot}11{\cdot}35 . \supset$$

$$\vdash :. (\exists x, y) . \alpha = \iota^{\prime}x . \beta = \iota^{\prime}y . \supset : \alpha \cup \beta \in 2 . \equiv . \alpha \cap \beta = \Lambda \qquad (2)$$

$$\vdash . (2) . *11{\cdot}54 . *52{\cdot}1 . \supset \vdash . \text{Prop}$$

From this proposition it will follow, when arithmetical addition has been defined, that $1 + 1 = 2$.

The work that Bertrand Russell and Alfred North Whitehead did with these volumes gained them international fame. Because of Russell's flamboyant personality, he overshadowed the reserved Whitehead, who eventually emigrated to the United States in the 1920s.

Connections between history and the development of mathematics

The connection between mathematics and its development are quite clear to be seen. For example, in the First World War, one can see that the style of warfare changed drastically. It ceased to be men on horseback, cannons, and low-accuracy shot guns. The development of mathematics meant more advanced weaponry. Cannons turned into tanks, and shot guns turned into automatic machine guns. There was even the use of grenades and airborne dogfights. In addition, there was also the use of submarines and water warfare. Mathematics was even used to secure communications between allied forces. Adolf Hitler and the Nazi party crafted what was called the Enigma machine, which was considered to be an unbreakable code in order to communicate to other Nazi controlled areas. The machine was invented by German engineer Arthur Scherbius. Nations such as the Polish and the French made the initial breakthroughs in understanding the code and messages, however the Nazi/German army had taken over their armies, forcing them to flee to other lands. The person that really did the most significant work in breaking the code was British cryptologist Alan Turing. It is interesting to note that this situation of breaking the Enigma machine was made into a movie that was watched for class. It was also during this war that chemical warfare was being used more frequently, with different variations such as poison gas, mustard gas, etc.

As the war neared its end, it was the Americans who officially ended the war, with the dropping of the atomic bomb on Hiroshima and Nagasaki. The group that oversaw the bomb being made was called the Manhattan project. The bomb was created on the basis of nuclear fission and reactions. Even Einstein's famous equation $E = mc^2$ was references in the notes of the creation of the bomb. The were actually two bombs that were dropped, one was called "Little Boy" and the other "Fat Man". Both bombs were dropped three days apart from each other, one on August 6th and the other on the 9th.

Moreover, the mathematics in aircraft was evident with the first motor powered aircraft, which flew in 1903. The Wright brothers crafted his homemade airplane with extensive precision and data collected from their own wind tunnel. The first flight covered 120 feet in 12 seconds. Orville and Wilbur Wright were names of the brothers that created such a groundbreaking craft. It was not their initial goal to create a flying aircraft, as they originally worked in their with motors, printing presses, and especially bicycles. However, the brothers became interesting in creating a flying craft after reading about the flights of German glider Otto Lilienthal. Orville and Wilbur Wright started with mastering gliding before considering any motor powered flight. As they progressed with their designs, Wilbur observed that birds changed direction left or right, with the changing of the angle of the end wings. They also believed that the pilot of these flying machines should have complete control over the direction and steering of the flying craft. As I stated before, the Wright brothers experimented with different designs for their flying machine, from various sizes in wingspan, to a process called wing warping, which was used to provide more lift for the craft. Of course when the brothers were attempting to achieve this flight, they used a myriad of data and equations, such as the lift equation, which can be seen as:

$$L = kSV^2C_L$$

Where: L is lift in pounds k is coefficient of air pressure S istotal areas of lifting in square feet (headwind plus ground speed) V isvelocity in miles per hour C_L is coefficient of life (varies with wing shape)

After many attempts, failures and obstacles, the Wilbur and Orville Wright finally made the first motor-powered flight on December 14, 1903. This innovation led to commercial air flights, private jets, which ultimately led to rockets and spacecraft.

However, one cannot forget about the world famous Albert Einstein and his theory of relativity. In Einstein's discussion of relativity he proposes the mass-energy equivalence which is $E = mc^2$. In words, the equation means energy equals mass times the speed of light squared, with E being equals energy, m that being mass and c being speed of light (the speed of light is a constant of $3 * 10^8 m/s$). It was introduced on September 27th, 1905, in his series of four papers titled "Does the Inertia of a Body Depend Upon Its Energy Content?". The equation brought the seemingly unrelated topics of time, mass, and energy together. The equation itself was founded on the electromagnetic radiation and mechanics. Einstein's equation basically allows people to understand the massive amount of energy in something as small as the atom, or as large as a human being. With this equation you can find out how much energy would be produced from a certain mass. Take the mass of say, an 86 kilogram person. If you apply this to $E = mc^2$, the result would would come to 7.8 septillion joules of energy, which is equivalent to 1.86 million Kilotons of TNT. An interesting note is that the atom bomb had only 21 kilotons of TNT. So in fact, as adults peoples' bodies have thousands of times of more energy than the atom bomb. Understanding this, and the theory behind this equation took some time. However, one it was understood, it was the mother that gave birth to the atom bomb, which was used by the Americans in World War II that killed hundreds of thousands of Japanese citizens in Nagasaki and Hiroshima.The equation for this is considered be the most famous equation ever conceived. Einstein also did research dealing with string theory and black holes, something that Ramanujan indirectly worked on as well.

Remarks

Srinivasa Ramanujan's life was indeed short lived. However, it was filled with important, groundbreaking events from beginning to end. It is said that in all writings of Ramanujan that he was deeply religious in Hindu. It is interesting to state that he looked to the Hindu goddesses Narashima and Namagiri for insight on the mathematical work he conducted. In Ramanujan's own words he states that:

"An equation for me has no meaning, unless it represents a thought of God."

He stated that he would have visions or dreams, where scrolls would be shown to him with amazing mathematical functions before his eyes. I thought it very interesting an article would say something to this effect. I say this because when I first heard of Ramanujan, it was from the history channel show titled, "Ancient Aliens". It talks about Ramanujan and his apparent visions of amazing mathematical equations from the goddess he worshipped. They pose the idea that the goddess was purposely giving these equations to Ramanujan in order to impact humanity. The work of Ramanujan, wherever he came up with the formulas and proofs that he made, were nonetheless created by a genius. Even his mentor, G.H. Hardy, could compare him to no one other than Euclid or Jacobi.

Ramanujan was not your normal mathematician. One could say that Ramanujan experienced some luck in his life, as he was able to live off the generosity of those around him, from being able to work extensively on his mathematical work while at the postal office, to be given a surgical procedure free of charge. It is amazing to think that Ramanujan was able to create and achieve so much in his short lifetime. From his humble beginnings as a mathematics hungry teen, to become one of the greatest mathematicians of his time. He was able to collaborate with the best, as well as come up with his own discoveries. His work allowed him to become the second India to become a fellow of the Royal Society in 1917, and became the first Indian to become a fellow of Trinity College, Cambridge in 1918.

Even with all of his success, Ramanujan did suffer from depression and attempted to commit suicide at one point in time during his life. His health is what ultimately led to his early death, due partly of him being a strict vegetarian, and not wanting to assimilate into the British culture. Even as a child, he had health problems, which could have led to Srinivasa having a weak immune system as he aged. However, Ramanujan did marry, but did not have any biological children. The generosity that Ramanujan was shown as he pursued his mathematics gave him the ability to excel the way that he did. His genius was unparalleled at the time, and his brilliance was confirmed by many. What maybe even more remarkable than the work he did when he was alive, is the impact that his discoveries made after his death. Mathematics, physics, it did not matter the subject. There is even a movie about him, and a number of mathematicians that credit him for their inspiration for going into this field. His story truly had the feel of one who went from rags to mathematical riches.

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