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Blaise Pascal

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Abstract

Blaise Pascal was a mathematician with a great impact. He began his mathematical journey from a young age, and, throughout his lifetime, made significant contributions in geometry, probability, philosophy and religion. Toward the end of his short life, Pascal became focused on his faith, which led to a change in his thoughts and has served as an example to Christian mathematicians ever since.

When examining a mathematician such as Blaise Pascal, writers are often faced with a difficult choice. That is, whether or not to discuss his faith, and, if so, in what light to view it. Some writers choose to provide a portrait of Pascal the mathematician who was destroyed by overzealous religion. Others praise the faith of Pascal, without ever starting a discourse on his contributions to the mathematical world. Regardless of one's choice, it is best to start, as all great stories do, at the beginning.

Blaise Pascal was born on June 19, 1623 in Clearmont-Ferrand in central France. His father was Etienne Pascal and his mother was named Antionette. Pascal also had two sisters, Gilberte and Jaqueline. Unfortunately, Pascal was very ill as a child, and he continued to suffer for the remainder of his life. According to Harry Sootin, "he was a sickly child and suffered from what may have been tuberculosis, or possibly rickets," (Sootin, 22). In 1626, the Pascal family was hit with tragedy, as it faced the death of Antionette. After this event, the family moved to Paris, where the young Blaise Pascal would begin his education.

Etienne Pascal did not believe in sending his son to a public school. "He saw no merit in conventional school methods which emphasized the memorizing of rules without giving the child an understanding of *why*," (Sootin, 23). Thus, Etienne Pascal took it upon himself to educate his children. He taught his son a variety of subjects, including science and philosophy. However, the young Pascal was not given an education in mathematics, as Etienne believed his son to be too sickly to attempt the strain such problems would cause, so Etienne chose not to introduce mathematics until Blaise Pascal reached the age of fifteen. But, because Pascal had the mind of a mathematician, he would not be satisfied without this knowledge, and, on his own, began to study geometry.

At the age of twelve, Pascal managed to find that the sum of the angles in a triangle is equal to 180° by inscribing an equilateral triangle in a circle. Interestingly, this is the focus of proposition thirty-two in book one of Euclid's *Elements*, which Pascal did not have access to. In fact, it is this very notion that caused controversy in the mathematical world. According to his sister, Gilberte, Pascal was able to rediscover all the first thirty-two propositions of Euclid. However, this claim "must be discredited, on the grounds that there is not enough logical dependence between [the thirty-two propositions] to allow the greatest mathematical genius in the world to 'rediscover' them for himself without some help," according to Colin Wilson (Colin Wilson, 180). Regardless, Pascal's achievement was incredible for a twelve-year-old with no formal education in the subject.

It was because of this very discovery that Pascal was invited accompany his father to the weekly meetings of the Academy of Science in Paris. In these meetings, Pascal had the ability to converse with great minds and develop an awareness for mathematics. Later, after leaving Paris, Pascal still corresponded with these great thinkers, and, because of this, later published his first work, *Essay on Conic Sections*, at the age of sixteen. In this paper, Pascal found a proof for what would come to be called "Pascal's Great Theorem." The statement of the theorem is as such: If a hexagon is inscribed in a conic section, then the points at which the pairs of sides intersect lie on a single line (Bell, 76). Pascal called the figure generated from this a "mystic hexagram," and it would be this figure that would cause quite a stir in the mathematical community (Bell, 78).

Then, when Pascal was nineteen, he devised another great feat in the field of mathematics and engineering. At this point, Pascal's father was working as a tax collector, and, as such, spent hours doing tedious calculations. Pascal came up with an idea for a calculating machine to help his father. Once he was successful, Pascal had fifty replicas of his machine built to try and sell

for commercial profit. Unfortunately, he was largely unsuccessful in this venture. While brilliant, Pascal's calculating machine, which he called the Pascaline, was prone to erroneous results. Recently, "mathematicians have observed that they do not work properly if not used with the utmost care. For instance, even lightly bumping into the machine will cause it to generate extra carries in certain digits of the accumulator," (H. W. Wilson).

After this, Pascal spent the next ten years of his life working in the field of science. During this time, Pascal worked with problems involving vacuums and atmospheric pressure. From this time came Pascal's Law, which states "the pressure applied to a confined fluid is transmitted undiminished to every portion of the fluid and walls of the containing vessel," (Sootin, 27).

One of the major and final mathematical contributions of Pascal was in the field of probability, which arose through a collaboration with Pierre de Fermat. This joint effort came about to answer a question, commonly called the "Problem of Points." In this problem, a situation is given in which two players are engaged in a game of points, where a certain number of points is required to win. The question then posed was, if the game stops before the end, who would be the winner, and how should the prize be allotted between the two players? To answer this, Pascal used a type of strategy called "combinational analysis," which is a method for "finding the number of ways in which a prescribed thing can be done or in which a completely specified event can happen," (Bell, 86). So, Pascal and Fermat looked at each stage in the game and found the chance of each player winning that one point, until a single winner could be determined.

During the process of solving this problem, Pascal made use of a known arithmetic triangle. In this triangle, the first row contains the number 1, and the second row contains the

number 1 repeated twice. Then, the "numbers from any row after the first two rows are obtained by copying down the terminal 1's and adding together the successive pairs of numbers from left to right to give the new row," (Bell, 88). Therefore, row three is the sequence of numbers 1,2,1 and row four the sequence 1,3,3,1, and so on. To the modern mathematician, this is recognizable as "Pascal's Triangle," but, the triangle was not actually created by Pascal. Instead, the triangle is commonly referred to as such in recognition of Pascal's ingenious use of it in the mathematics of probability.

Over time, Pascal had become involved with a religious group called the Jansenists. "This group within the Roman Church… stressed divine grace and election in redemption," (Turner, 149). From this point forward, Pascal began to focus more and more on God and religion. One thing remarkable about Pascal's faith was his belief in the Bible alone as the foundation for the Christian faith, and that no authoritative view should be contrary to the Bible. Pascal said, "He who will give the meaning of Scripture, and does not take it from Scripture, is an enemy of Scripture," (Turner, 150).

Then, in 1654, Pascal experience a radical encounter. As he was reading in the book of John one night, God appeared to Pascal as a flaming presence, leaving no room for doubt. As a result of this experience, Pascal fundamentally changed his life, choosing to no longer seek recognition, or even mathematical discoveries. He took on the guise of Monsieur de Mons and went to live with a colony of Jansenists in Port-Royal, where his sister, Jaqueline, was already residing. Pascal wrote down his encounter, saying, "Fire, God of Abraham, God of Isaac, God of Jacob… 'Thy God shall be my God,'" which he then kept sewn on the interior of his jacket as a reminder (Turner, 147). To some, this experience is viewed as a horrible waste of genius, while, to others, it is an example of the power of the Lord God Almighty.

After this, Pascal went on to write what is regarded as his most philosophical work, *Pensees.* In this work, Pascal developed an argument, using principles of probability, for his faith, which came to be called Pascal's Wager. In this argument, a person is given two choices: Either God is or He is not. If He is, then a believer has everything to gain and nothing to lose, while a non-believer has nothing to gain, but everything to lose. On the other side, if He is not, then a believer neither gains nor loses anything as does a non-believer. Clearly, in this situation, the only way of gaining a reward is through belief, and the only way to lose is through non-belief. Thus, belief in the Creator is the logical choice (Turner, 152).

"Toward the end of his life, Pascal once again began to contemplate mathematical problems; through deep concentration on these problems he was able to find some relief from intense pain caused by a malignant ulcer in his stomach," (H. W. Wilson). By this point in his life, Pascal dealt with acute dyspepsia, which "made his days a torment," and chronic insomnia, making "his nights half-waking nightmares," (Bell, 79). Pascal died on August 19, 1662 due to medical complications, at the age of thirty-nine.

If one thing can be taken away from the life of Blaise Pascal, it is that he had two major passions, mathematics and God. He devoted the two significant portions of his life to the subjects. But, Pascal did not keep the two separate. Instead, he combined the two in his life to provide an even stronger foundation for his faith, as can be seen from Pascal's Wager. For me, this serves as an inspiration for my future as a Christian mathematician, for that is what I strive to be, not just a Christian, nor simply a mathematician, but, instead a coalition of the two.

My faith has always been the foundations on which I build my life, and, as a foundation, it must be strong. I cannot be who I am if I do not have my faith in Jesus Christ, my Savior. As such, every aspect of my life is affected by my beliefs. Therefore, as a mathematician, I shall

work to bring glory to God in any way I can. In my life, this will be evident through my path as an educator. I strive to be able to influence my students' lives for the better in the future. In my opinion, this means encouraging them and showing the love of Christ, alongside revealing the beauty of mathematics. And, even stronger than my faith in my work, is my faith in my everyday life. This means all my actions should be a reflection of the perfect and holy Creator God. Thus, I should pray to my Father daily, thanking Him for His blessings, and ask Him to guide me to better serve His purpose. Also, I must work to show love and compassion to those around me, as Jesus did in His life. If I become a mother, it will be my duty to raise a family devoted to God, and to bring my children to their heavenly Father. Altogether, I must work to serve my God on high, and give my all to Him, for it is through His grace alone that I can have salvation.

Works Cited

Harry Sootin, *12 Pioneers of Science*, New York: The Vanguard Press, Inc., 1960, (22-27)

Charles Turner, *Chosen Vessels: Portraits of Ten Outstanding Christian Men*, Ann Arbor: Servant Publications, 1985, (147-152)

Colin Wilson, *Religion and the Rebel*, Boston: Houghton Mifflin Company, 1957, (179-180)

E.T. Bell, *Men of Mathematics*, New York: Simon and Schuster Inc., 1937, (76-88)

H. W. Wilson, "Pascal, Blaise", *Leaders of the Information Age (Bio Ref Bank)*, no. 1