Deriving Each Other to Madness

Hated by some and loathed by others, poor misunderstood calculus has certainly suffered its fair share of abuse by a perpetual cycle of ruthless high school students. If in fact calculus were a Christmas gift, rather than a Mathematical study of change, it would perhaps take the form of the unwelcome annual Satsuma. Everyone knows it is worthwhile, yet it still remains forsaken at the bottom of the metaphorical stocking of high school Maths. For those of you fortunate enough to have evaded the terrors of integration and differentiation (the basic tools of calculus), they are used, respectively, to calculate the gradient of a curve and the area under a curve. However, with applications in Science, Engineering and Economics, calculus is one of the most useful Mathematical fields ever invented and in the 17th century it was a source of a titanic dispute, which to this very day, remains largely unresolved.

If you are in fact familiar with calculus and wish to know whom to thank for enriching your life, then a quick Google search may turn up some interesting results. Isaac Newton and Gottfried Leibniz are both attributed to the invention of calculus, after each discovered it completely independently, using different methods, within a few years of the other. The question of who invented it first ignited a controversy at the end of the 17th century which is yet to be extinguished. Whilst anti-Leibniz advocators argue that Newton invented his calculus chronologically first, does this truly make him worthy of being the ‘father of calculus’ as he is so often labeled?

It’s an odd concept that two people could simultaneously and independently invent a complex field of Mathematics and thus, when Newton accused Leibniz of espionage and treachery it seemed most plausible. However, what Newton failed to mention when he was disseminating his poisonous accusations was that he regularly sent letters and manuscripts outlining his current work to Leibniz and vice versa. Newton and Leibniz willingly shared their research with each other for the progress of Science; a noble and selfless act. But, suddenly, when the whole of Europe was heralding the genius discovery of Mathematical pastures new, Newton, who had been Leibniz’s colleague, if not friend, pounced on him with allegations of plagiarism. This perfectly exemplifies Newton’s selfish nature and thirst for recognition. Leibniz completed his work for the good of scientific progress, which, in the eyes of anyone who lives a moral life, should make Leibniz infinitely more worthy of the credit.

Despite this, evidence of Newton’s form of calculus was found in journals he kept from his Physics research as early as 1666, years before Leibniz began to develop his calculus. However, in typical Newton fashion, he withheld from the public this groundbreaking research until more than twenty years later when he published The Philosophiae Naturalis Principia Mathematica in 1687, usually referred to as the Principia. Newton even had the gall to admit he had written the book in Latin “to avoid being baited by ‘little smatterers’ in Mathematics” (so that he couldn’t be corrected by other mathematicians of the time). If it hadn’t been for Newton’s selfishness, he may well have published the first calculus papers. However, Leibniz, who began developing his own calculus in 1674, published earlier papers in 1684 and 1686, which detailed differential (Differentiation) and integral (Integration) calculus respectively. Newton had effectively been sitting comfortably in first position in a marathon but, by failing to publish his work, essentially decelerated before the finish line. Leibniz may have started slower however, through perseverance and determination, published his work prior to Newton thus crossing the line first -meaning that he irrefutably had won the race. Who can deny Leibniz the recognition, when he was the first to share his findings with the world?

Alas, all too often injustices occur in this world and the power that the infamous Isaac Newton held within the scientific community far exceeded Gottfried Leibniz’s influence. After discovering gravity and inventing the Universal Law of Gravitation, the three Laws of Motion and Binomial Theorem, Newton became a celebrity among academics and, to some extent, throughout Europe. A merited knighthood for him was to follow. After the publishing of the Principia, the prestigious British Royal Society offered their support to Newton, who later became president of the society. Leibniz, meanwhile, was abandoned as his allies found themselves divided between their loyalty for him and the influence of the Royal Society. Soon his word became the only proof that he had not plagiarized Newton’s work, a worryingly weak piece of evidence despite its foundation in truth. Why should we be surprised that Leibniz was not accredited properly for his invention when all the academics of the time were trying to impress Newton and the Royal Society? Sadly, in the years to come, the Royal Society, under the ‘unbiased’ presidency of Sir Isaac Newton, deemed Sir Isaac Newton the one true inventor of calculus and found Gottfried Leibniz guilty of plagiarism. Clearly, the circumstances cast doubt on the impartiality of the procedure which selected Newton as the sole inventor of calculus over Leibniz.

Nevertheless, Isaac Newton had succeeded and with his extensive influence he began to pull apart what was left of Gottfried Leibniz’s tattered reputation like a rabid and unsatisfied dog. Even Leibniz’s death, which came only a year after the Royal Society’s accusations of plagiarism, left Newton’s sickening thirst for destruction unquenched and in an ultimate act of disrespect, Sir Isaac Newton, a Knight of the realm, discredited Leibniz’s work posthumously.

Time has shown that, in all likelihood, the two men came to their conclusions independently with no treachery involved. The strongest evidence being that Newton’s calculus was developed from the idea of the derivative (differential calculus) as a tool in Physics and Leibniz advanced his calculus with Mathematical Analysis. A variation in notation, namely Leibniz’s ‘summa’ and ‘differentia’ signs, meant Leibniz’s methods were far more efficient than anything Newton theorized. If Leibniz had been guilty of plagiarism (which today is considered unlikely), he had built upon Newton’s calculus and vastly improved it, which would strongly suggest that Leibniz’s grasp of calculus surpassed Newton’s.

Newton’s genius led him to conquer much of seventeenth century Physics and Mathematics leaving few treasures in these areas still to be discovered. He had a unique perspective that was centuries ahead of his time, accomplishing feats in Science that form the basis of everything we know about the world around us today. It is without question true that Newton did invent a form of calculus prior to Leibniz’s 1684 and 1686 papers. However, as much as we in Britain like to accredit every Scientific advance since the invention of the wheel to Newton, the development of calculus is not the work of one man. It is the work of a species. The Ancient Greeks started investigating the area under a curve and the basics of integral calculus approximately two thousand four hundred years ago and we’re still developing new areas of calculus today.

Fear not though dear reader, Leibniz will not be cheated of the credit he deserves, as he was three hundred years ago by Sir Isaac Newton. Although Newton was responsible for his own inelegant resemblance to modern calculus, it’s Gottfried Leibniz whose methods and notations of differentiation and integration are used around the world today. It is evident that Leibniz should be accredited as the true father of modern calculus and, more importantly, worthy of the title for standing up to the Scientific community when they refused to listen - putting him among other heroes of Science like Galileo. Ironically, Newton’s quest to discredit the life work of one of Europe’s greatest Mathematicians has tarnished his own reputation as one of the greatest Physicists of all time.

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