

## THE IMPORTANCE OF DIVERSITY TO MATHEMATICS

When we think of diversity, it is commonplace to associate it with our differences as a people. We see ourselves being different on the basis of race, skin color, religion, sexual orientation, economic status, political belief, and so on. However, I will try to make a case about how diversity in Mathematics as regards to the people that make and teach it has contributed to its growth, as well as how diversity in its content has also created this unique blend that is comprised of intertwined subject areas that range from number theory, differential equations, linear algebra and numerical mathematics to fields like mathematical modelling, operations research, and financial mathematics. Hence, we need to embrace this diversity that has made Mathematics flourish throughout this modern era.

From the earliest times in Egypt, ancient Greece, Persia, India, China, and the Middle East, to the medieval times, and then to the period dominated by English Mathematicians such as Sir Isaac Newton, mathematicians have developed mathematics as we know it today. Several of these men and women lived thousands of miles and many years apart and, for the most part, shared few similarities except for their passion for Mathematics. In the parlance of science, the 16<sup>th</sup> and 17<sup>th</sup> century is referred to as a watershed in world history because men like Nicholas Copernicus, a Polish astronomer (1473 – 1543), Rene Descartes, a French philosopher (1596 – 1650), and British mathematician Sir Isaac Newton (1642 – 1727) together reformed age long misconceptions in science, including astronomy and mathematics. These men were in some ways different, but their work and those of several others after them created scientific and mathematical breakthroughs that, several years later, culminated in putting men in space and now has driven the industrial and technological breakthroughs of our era. For instance, a moving car thrives on the works of several inventors and mathematicians. You can describe the position of the car using the coordinate plane system developed by Rene Descartes, or its velocity, which tells you how fast and in what direction the car is moving; this is understood from Calculus pioneered by Isaac Newton and German mathematician Gottfried Leibniz (1646 – 1716). You can also use the principle of hydraulic fluid pioneered by French mathematician Blaise Pascal (1623 – 1662) to understand how the car brake functions.

Over the years, several diverse fields of Mathematics have been created. The earliest being fields that were collectively termed pure mathematics and, later on,

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several other fields that were collectively named applied mathematics. In several ways, some of these subject areas of mathematics share little or no similarity, such as number theory and differential equations; however, in the big picture, all of these subject areas of mathematics can be viewed as pieces of a puzzle board that, when fit together correctly, can be interpreted as meaningful.

Nowadays, when we use the word diversity, usually we refer to under-represented groups who need a deliberate effort made by others to include them in the mainstream. Hence, I recognize that, without fellowships and scholarships like the Winifred O. Stone and Presidential Graduate Scholarship for Diversity Enhancement, several hardworking and deserving students might not get a chance to contribute to Mathematical learning and research. I believe Mathematics have profited from these efforts, as these deserving recipients reciprocate this gesture by working harder. To the universities, this means higher quality Mathematics. To the donors of these fellowships and scholarships, this means more motivation to continue the program.

I was born and raised in Nigeria and one of my favorite past times when I was growing up was reading stories, especially ones about other cultures. All I knew about the history and development of mathematics at that time could be attributed to the works of English mathematicians and several other American and European mathematicians. I thus formed the opinion that mathematics contributors could only be English, American, or European. Then I came upon a story about *Al-Khwārizmī*, a Persian mathematician who lived between 780 CE and 850 CE. The story says that *Al-Khwārizmī* was riding on his camel to the city of Mecca with some algebraic manuscripts when he came upon three young men crying at an oasis. He stopped to ask what the problem was and he learnt from them that their dead father had left them 17 camels and had instructed that one-half the number of his camels should belong to his eldest son, one-third of his camels to his second son, and one-ninth to his youngest son. However, they had learnt that 17 is a prime number divisible only by one and itself and so there was no way they could carry out the wishes of their father. *Al-Khwārizmī* thought for a while and asked if he could add his own camel to make a total of 18 camels. The boys loved the idea, and so, the eldest son got one-half of 18, or nine camels. The second got one-third of 18, or 6 camels, and the youngest son got one-ninth of 18, or 2 camels. After this

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division, one camel was left, *Al-Khwārizmī*'s camel. This was fascinating, but quite strange to me because he was neither English, American, nor European, and yet, he had mathematical skills. This discovery was very profound for me and it made me see mathematics as universal.

Several years later, after I had become a mathematics major, I tried to verify the story about *Al-Khwārizmī* and the camel; I found that mathematics professor Ian Stewart wrote about it in one of his lectures titled "The Riddle of the Vanishing Camel: From Puzzle to Number Theory." The story might not have been about *Al-Khwārizmī* or might have only been used as a mathematical puzzle over the years. Nevertheless, it is very true that *Al-Khwārizmī* was a mathematician and had made major contributions to algebra. In fact, some schools of thought considered him the "father of algebra".

Mathematics remains relevant today in our modern world largely because its content has been shaped by diverse men and women. In order for it to stay relevant, every group of people should have a chance not only to learn but to contribute. More importantly, efforts to reach out to under-represented groups should be sustained.