Perhaps the most underappreciated tool employed by mathematicians is nothing. Literally. While many may take the idea of 0 for granted, it is a concept far from trivial. 0 is amongst the most pivotal creations of mathematics, facilitating its rapid development and overarching contribution to essentially every field of study in the world.

How many cows do you own? A caveman with 2 would perhaps write || as scratches on the wall, while a roman could respond V or perhaps L if they are particularly bovine inclined. But what if they owned 5 billion cows? I doubt the caveman would want to make that many scratches and standard Roman numerals stop at 3999 (MMMCMXCIX). Additionally, if they didn’t own cows, they would have no way to convey that in writing. The beauty of 0 solves both things. In the base 10 system we are familiar with today (as well as any other base), 0 allows values to be left empty meaning we can express both infinitely small and massively large numbers in writing.

The beauty of 0 goes beyond this. When novelist Herman Wouk told physicist Richard Feynman that he had did not know calculus, physicist Richard Feynman responded “You had better learn it. It’s the language that God talks”. Calculus for a mathematician is more than just an artefact or a tool, it’s a language. As Herman Wouk may have manipulated the written word to express his thoughts, so too does a mathematician yield calculus to express the inner mechanics of the universe. Calculus was born when mathematicians learned how to express an instantaneous rate of change, a change over 0 time.

Zero as a concept highlights mathematicians’ ability to innovate and create. To push the boundaries of accepted knowledge at the time and to challenge those who’s mathematical imagination has stagnated. There is and always will be more to discover and learn for mathematicians.

Collaboration is a pillar of mathematics. Problems that seem impossible often require a different view for an elegant solution to emerge. Further, mathematics serves as a global language and transcends borders. To Europeans, zero was not even considered as an idea. Instead, they were introduced to it by Arab merchants after Muhammad ibn Musa al-Khwarizmi collated their understanding of it into his book “al-Jabr”, the origin of “algebra”. Mathematicians are constantly expanding on the work of others, and it is the pinnacle of human collaboration. Papers are peer reviewed, critiqued and refined, contributing to the global understanding of mathematics as we know it.

Mathematics serves as a foundation for other disciplines to build on, from physicists studying quantum mechanics to the harmonization of musicians to the calorie counting of nutritionists. Typing this on my computer which runs on a binary system of 0’s and 1’s, it is clear to me that without 0, and without the innovative nature of mathematicians, the world would be a very different place.