Why Mathematics:

By Benjamin Wagener on November 28th 2013.

As been especially a Mathematician, this is a question that is so obvious for me that I did not really understand why it had not been raised and answered clearly earlier. I was then so embarrassed that it took me about two months in order to go back to this text and finish it. The question I would like to raise and answer briefly is about why a field as Mathematics is so efficient in dealing with so many and various questions and problems and giving to them so appropriate answers. This text if finally just a very few pages but I think that it gives it a good understanding.

There is first a false common misconception about Mathematics that I would like to adjust a little bit. Mathematics has somehow nothing to do with basic manipulation of numbers and basic geometrical considerations. This is something that many people may believe it is especially because they are learn so in school but when we look at what are really Mathematics today and till a long period of History now, Mathematics is more properly seen as a language. Manipulating numbers with their approximations may be more seen as an elementary technique and imagining geometric configurations may be closer to painting or to architecture than to Mathematics. Moreover Mathematics have never dealt truly with such questions as counting. Numbers by themselves, and I did a lot of Number Theory, have almost always been considered within Mathematics in an abstract and logically structured way that have nothing to do with the elementary counting that appears in many human activities. And Geometry within Mathematics is also something that has almost nothing to do with the common misconceptions that make it close to drawing or painting in the common belief.

In my opinion and as I personally do, Mathematics are properly seen as a language. As any language, Mathematics express relationships between things and the senses and meaning of those things. One of the most important characteristics of Mathematics is their accuracy. From the beginning of mathematical History, this field as been concerned with accuracy and exactness. This is seen in many ways, by example the laws of Arithmetic give by themselves access to exact results as well as Geometry has been known from its beginning for the surprisingly exact results that appear in geometric configurations but with the development of Mathematics a global logically structured scheme has emerged.

This may be a fundamental reason for explaining why Mathematics are so efficient in comparison to any other language or to any other explanation procedure. In the development of Mathematics there has been a period of time at the end of the 19th century when it has become clear that a global logical and structure framework was necessary to deal with the very hard questions that were appearing. Nowadays Mathematics are

extremely well founded and theoretically it is possible to express perfectly rigorously and with perfect accuracy the different things and phenomena that occur within Mathematics. As such it is incredibly better founded than any other kind of language known, either common languages or any programming languages. Indeed the last ones have been formulated using mathematical structures and appear to be very elementary with respect to the language of Mathematics.

On the other hand, there is another important reason for the efficiency of Mathematics; it is the fact that they are especially well suited to describe various aspects of reality. This is something that has appeared quite slowly in the History of Sciences and that has been pointed out especially from the appearance of Mathematics in Physics and broadly said Natural Sciences. The beginning of this may be dated from the 16^{th} century with Physicists like Galileo or Copernicus and that has been incredibly developed after the differential calculus invented mainly by Leibniz and Newton and strikingly implied by Newton for the description of physical phenomena by the way of Mechanics and Forces culminating with the description of the Gravitational Force. It was already a huge advance either from a Mathematical or from a Physical point of view that has still a lot of consequences in those fields today and in the way we conceptualize them. Before this period of Time when Mathematics were applied to the Physical Science, it was completely unclear if Mathematics may have any kind of application outside of its field and it has been a crucial point for the development of Mathematics and for the importance it now has in current Sciences.

The fact that Mathematics are especially well suited for the description of reality may have many reasons to sustain it. A special aspect is the objects that are dealt within this field. We could think of numbers on one side and on the geometrical objects on the other side but one already gets a better insight of this question when we take those objects in a common framework. Taken together we already have a good framework to describe the observable objects of reality and their relative organization. This may appear to be very elementary but this is a description of reality that is very rational because it is relieved of common psychological or sensual understanding or perception one may have from the outside reality. By itself it seems to be the only way to enter a clear perception of an exterior reality. Like this it is still a very rough description but at least it is a good frame to begin with and perhaps the only one reasonable. Moreover this description can be greatly enhanced by the possibility within Mathematics and for the description of this external reality to put a proper framework for an accurate and possibly exact description of the relations between those objects. This is one of the aspects of Galilean or Newtonian insights to have been able to put clear mathematical relations in between such view of reality.

There is moreover a very important particularity of the language of Mathematics that makes it so powerful. It is the flexibility of this language that permits to imagine and then build various rigorous and precise frames adapted to the situation to be dealt with. It is an important specificity of any language to have such flexibility that enables it to adapt to

various kinds of situations and to various kind of description. We can observe obviously in everyday life that the common languages we use are open to very broad situations and allow us to speak of almost anything that may be imaginable. This is also something that Mathematics are able of. But Mathematics are able to produce much more, they are able to produce a language that is both almost unlimited with respect to the situations it may deal with and that within this unlimited possibility of imagination and creativity may do an extremely logically sustained and accurate description.

This flexibility of Mathematics just speaks for itself in the way Mathematics are used and developed nowadays. In our current period of times there are Mathematicians in almost any field of Human activities that develop or try to develop a proper theoretical and/or a proper scheme of application. We hear by example a lot of those applications in Economy and Finance but there is actually in our days an explosion of the domains in which Mathematics and there efficiency are becoming available such as almost any field where some mathematical model may be useful or by example within Medicine or within all the aspect of Natural Sciences.

In conclusion, I keep in mind that as a language that describes things and their relations, Mathematics are from very far the most advanced language available. Its ability to apply to the description of almost anything imaginable with an extreme accuracy and very often with exactness as well for the description of the objects involved as for the description of the relations of those objects make Mathematics a perfect language. The only limitation of this language appears obviously from the own limitations of the person that uses it and from the limitations imposed by the historical development.