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A Brief Review of Kalimuthu's Geometrical Publications

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Abstract. In 1931, the young Austrian mathematician that a formal mathematical system is either incomplete or inconsistent. To put it in another words that there statements in mathematics which are un decidable. An easy version of this is stated that in a non trivial mathematical system, there are propositions and its denials. The simple statement is that in a formal axiomatically mathematical system, we can construct a theorem which is neither true nor false. Recently Kalimuthu published four papers re confirming Gdel's incompleteness theorems by probing the parallel postulate of Euclidean geometry .

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1. ATTEMPTS TO PROVE EUCLID V

Geometers doubted the validity of the fifth postulate. Comparing with the first four postulates, it is neither brief nor simple or self evident or easy to carry out. The complex statement of Euclid V reveals that it is not an assumption but a theorem to be proved. Even Euclid was aware of this fact and did not content himself with this. Euclid himself tried his best to obtain a proof for the fifth postulate. Since he was not able to get a consistent result he was forced to abandon his efforts. Finally in order to avoid delay in the process and completion of his 'Elements' he had to apply this postulate from proposition 29 of The Elements I. After Euclid that is from 300 B.C. to 900 A.D. geometers have applied their great minds to establish the fifth Euclidean postulate from the first four postulates. But unfortunately even the genius mathematicians failed in their attempts. Their investigations and probes devoted to the parallel postulate resulted the birth of non-Euclidean geometries, nearly 25 equivalent propositions to the fifth postulate and a proof that it is not merely difficult but impossible to deduce Euclid V from Euclid I-IV. After Euclid, the great minds like Aristotle, Diodorus, Proclus, Pietro Antonio Cataldi, Girolamo Saccheri, Farkas Bolyai, Friedrich Ludwig Watcher, Gauss, Bernhard Friedrich Thibaut, Lobaschewsky, Ferdinand Karl Schweikark, Riemann, Schumacher, Klein, Henri Poincare, Wallis, Carnot, Lambert, Legendre, Cayley, Omar Khayyam, Playfair, Ward, Lagrange, Possidonious, Escher, Gersonides, Clavio Rome, Gersonides, Beltrami, Ramanujan, Geminus, Simplicius, an-Nairizi, Ablhiniathus, Pappus, Peithon, Nicomedes, Savile, Borelli, Bitonto, Kaestner, Klugel, Bernoulli, Witelo, Gerson, Alfonso, Vitale and others worked for 30 to 40 long years but miserably failed in their attempts (Eves 1976, Eves 1983, Klien 2004).

2. THE FAMOUS CLASSICAL MATHEMATICAL IMPOSSIBILITIES

Besides the parallel postulate problem, there are the well known mathematical impossibilities such as: 1. Trisection of the general angle by using ruler and compass only. 2. Squaring a circle. 3. Duplicating a cube. 4. To draw a regular septagon. 5. To find out the solution formula for fifth degree algebraic polynomial equation. 6. And the general formula for prime numbers. 7. There is no way to draw a straight line using only a compass and straight edge. 8. There is no way to draw a cube without poking a pencil through the paper. 9. It is not possible to prove the Pythagorian theorem if asked to do so on a test. 10. A circle has no sides or corners it also has infinitely many sides and corners this is clearly impossible, because one cannot count to zero. (Carrol 1973, Swetz 1996, Trudeau 1987). Most of the famous mathematicians worked on the above problems. The quest and search motivated for the parallel postulate problem gave birth to two types of non-Euclidean geometries with tremendous physical applications. On the contrary the studies of the above problems did not yield anything at all. At the latter half of the 19th century the application of abstract algebra established once for all that it is impossible to solve the above problems.

3. HYPERBOLIC GEOMETRY

Gauss, the famous German mathematician realized that Euclid's fifth postulate cannot be proved as a theorem. Gauss came to formulate that to a given straight line it is possible to construct a number of parallels through a given point not lying on the given straight line. In this new type of geometry the lines curve away from each other increasing in distance as one moves further from the points of intersection with the common perpendicular: These lines are often called ultra parallels. But afraid of being ridiculed Gauss did not disclose his historical break through. The Hungarian mathematician Bolyai also came to Gauss's conclusion. Before this realization, Bolyai found several non-Euclidean theorems. But Bolyai was not aware of the importance of his findings. The Russian mathematician Lobachevsky also independently invented his non-Euclidean idea and published his paper. Since his work openly challenged Kant's view of space he was dismissed in 1846 from his university post. His contemporary mathematicians did not accept his result. On the other hand, they made fun of him. Due to this discouragement Lobachevsky became mad and blind. He died in sorrow. After 75 long years, Einstein used the principles of Lobachevsky's geometry in his special and general relativistic theories. Hyperbolic geometry is the another name for Lobachevskiian geometry. According to hyperbolic geometry, the space is not positively curved. Also, the formulae of hyperbolic geometry is widely applied to study the properties of sub atomic particles in quantum physics. Klein, Beltrami and Poincare contributed a lot for the development of hyperbolic geometry (Anderson 1999).Neither Bolyai nor Lobachevsky had shown the logical consistency of hyperbolic geometry. What they contributed was to find a foundation for hyperbolic geometry. In 1868, Beltrami showed the consistency of the hyperbolic geometry. In 1871, Klein also gave another proof for the consistency of hyperbolic geometry. This was followed by Hilbert and Poincare (Marvin 1994). Gauss (1777-1858) attempted to prove the fifth Euclidean postulate when he was only 15 years old. From 1792 A.D. to 1817 A.D, he worked more than 25 long years on this problem. In 1817 Gauss was convinced that the parallel postulate was quite independent of the other four and had covertly begun his table in hyperbolic geometry, although he fought shy of announcing his discoveries that he would be labeled a maverick. Gauss slept on his decision for seven years. In 1824 he wrote to his friend Taurinus that he had constructed a non-Euclidean model of geometry but did not publish. Also, Gauss communicated this to his fellow mathematicians Bolyai, Olbers, Schumacher, Gerling and Bessel. Gauss asked these mathematicians not to disclose this information to anybody. Latter historians pointed out that Gauss's concept was too radical for acceptance by mathematicians at that time. Since this was the case, probably it was correct that the two founders of non-Euclidean geometry Bolyai and Lobachevsky did not receive any attention or approval until after their deaths. Bolyai did get non-Euclidean result in 1825 but it appeared only in 1832. But Lobachevsky published his non-Euclidean work in 1829. Lobachevsky's new model of geometry was denied publication. He was able to get his new findings published in Kazan University News letter in 1829. He republished this work only in 1840. From 1829 to 1915, that is more than 86 years, Lobachevski's revolutionary and consistent non-Euclidean theory was not approved by the scientific community. After these 86 years, Einstein applied Lobachevski's non-Euclidean idea for his geometrical interpretation of gravity in his general relativity theory. To conclude, Gauss got the hyperbolic idea in 1817, Bolyai in 1825 and Lobachevsky in 1829. That is why hyperbolic geometry is also called Gauss-Bolyai-Lobachevsky geometry (Marvin 1994).

4. ELLIPTIC GEOMETRY

In 1854, Riemann developed elliptic geometry which is the second model of non-Euclidean geometry. In this Elliptic geometry the lines curve towards each other and eventually intersect. In Elliptic geometry there are no parallels to a given line through an external point P. And the sum of the angles of an elliptic triangle is greater than 180 . Another property is that a line in the plane described by this geometry has no point at infinity, where parallels may intersect it, just as an ellipse has no asymptotes. The spherical geometry is a special case of elliptic geometry. Einstein used the fundamentals of the Riemannian geometry to formulate his general theory of relativity. As per the elliptic geometric predictions the curvature of space is positive. Klein named the following: Euclidean geometry as parabolic geometry. Lobachevskii geometry as hyperbolic geometry. Riemannian geometry as elliptic geometry. Kalimuthu writes: ”Hyperbolic geometry was the first non-Euclidean geometry to be developed. Although it is difficult to visualize in spacial terms, hyperbolic geometry operates according to a simple premise. There can be an infinite number of parallel lines through a point adjacent to a single line, with the direct consequences being the three angles of a triangle must add up to less than 180 . Elliptic geometry can be considered the inverse of hyperbolic geometry. Much easier to visualize, elliptic geometry can be interpreted as pasting classical Euclidean shapes on to the surface of a sphere. In elliptic geometry it is not possible to draw even a single parallel line through a point adjacent to a line, with the consequence that the angles of a triangle add up to more than 180 . Non-Euclidean geometries are not just theoretical. Amazingly, both hyperbolic and elliptic geometries apply to the four dimensional space time of Einstein’s relativity theory. Applying Elliptic geometry matter curves the space surrounding it, and applying hyperbolic geometry it describes the expansion of the universe. In fact, if mathematicians had not developed non-Euclidean geometries decades before, it was unlikely that Einstein would have invented relativity theories.”

5. **ABSOLUTE GEOMETRY**

The first 28 propositions of Elements I do not use the parallel postulate. i.e. Euclid’s fifth postulate application is not required to prove these propositions. These 28 propositions are applicable/ acceptable both in Lobacheskian and Riemannian non-Euclidean geometries. That is why mathematicians named these 28 theorems as absolute geometry. Also, this is called as neutral geometry (Marvin 1994).

6. **KALIMUTHU’S ALGEBRAIC RESULT**

Interpretation of [1] For fifteen years Kalimuthu tried his best to transform the interior angle sum property of a number of triangles into algebraic equations. After this task Kalimuthu has carried out algebraic manipulation and analysis for ten long years. After twenty five years of study Kalimuthu obtained Equation (5.22) mentioned above. ”There are two triangles with equal angles” is one of the famous equivalent propositions to the fifth postulate. But Kalimuthu is not content with this result. He has attempted to modify the construction to show that the sum of the interior angles of triangle ABF is equal to two right angles. Throughout this work, Kalimuthu never uses any obvious hypothesis. He has derived the Equation (5.8) to Equation (5.19) by applying the addition and multiplication operations of number theory (Kalimuthu 2009).

Interpretation of [2] There is an algebraic proof for the sum of the interior angles of the given triangle. This proof is based on the constant hypothesis. The constant hypothesis states that the interior angle sum of all triangles is a constant. By applying this hypothesis it has been found that the sum of the interior angles of the given triangle is equal to two right angles. But latter it was proved that this constant hypothesis is equivalent to the parallel postulate. In the above findings Kalimuthu tacitly avoided this hypothesis and introduced positive and real quantities such as k, n, o and r. In the algebraic analysis these four proposed quantities naturally vanished and only the four other quantities e, w, g and s remained. The quantities e, w, g and s refer to the sum of the interior angles of proper triangles. The net result of this work is that the algebraic operations do not accept the four quantities put up by Kalimuthu. The predictions of special relativity rely on the applications of geometry and algebra. But the outcome of general relativity is due to the application of non-Euclidean geometries and tensors. Consequently these two applications produced the ten famous field equations of general relativity. These non linear partial differential equations revealed the above mentioned general relativity predictions. But Einstein was not satisfied with the domination of differential equations in theoretical physics. Einstein repeatedly requested the research community to replace differential equations by algebra. Verily speaking this appeal of Einstein made a profound impact on Kalimuthu.

The contemplation over Einstein proposal finally gave this result to Kalimuthu. Such an algebraic assumption and application is the first effort in geometry (Kalimuthu 2009). As mentioned in [1] and [2] above, Kalimuthu applies the of classical algebraic application and established the sum of the interior angle sum of a triangle is neither greater than a straight angle nor less than equal to two right angles[3]. In [4] Kalimuthu proved the following theorems: (1) In sphere, there are triangles whose interior angle sum is equal to 360 degrees (2) It is possible to construct a spherical triangle whose interior angle sum is 540 degrees. In [4] also, Kalimuthu applied the laws of classical Algebra to formulate the above two theorems.

7. ON GODEL'S INCOMPLETENESS THEOREMS

Kurt Gdel (1906-1978) changed some of the mathematics theorem. At the age of 25 he had produced what is considered by many to be one of the most important discoveries of 20th century mathematics, viz., his "incompleteness theorem". The publication of Gdel's "incompleteness theorem": in 1931 effectively proved that the efforts undertaken by some of the world's greatest mathematicians to establish that mathematics was ultimately a complete system of formal theorems, could not succeed. In the wake of Gdel, mathematics became part of the description of a new perception of reality, a non-mechanistic universe, whose inherent complexity was mirrored by new insights in physics (Berto 2010, Franzen 2005). Kurt Gdel's Incompleteness Theorem states that any formal mathematical theory powerful enough to express arithmetical statements is either incomplete or inconsistent. One of the equal propositions to this theorem is that in a formal mathematical system there are statements with their denials. This can be formulated in other words that in a mathematical model we can construct statements which are neither true nor false. In the literature, there are a number of proofs for Gdel's incompleteness theorems but nobody has proved the equivalent theorem stated above In Euclidean geometry, Euclid assumed five postulates. The first postulate states that we can join two points. This may be put in other words that from one point to another point a straight can be drawn. This is obvious and true. But there is no mathematical and logical proof for this. The second postulate expresses that a straight line can be extended in both ends. This is true but there is no consistent proof for this also. The third postulate rules that with center O and radius r, we can describe a circle. Needless to say, this holds hood but is not possible to establish this. This is applicable to the fourth and fifth postulate also. Gdel's incompleteness theorem forbids the physical theory of everything and the Turing Machine. Gdel's is a scientific discovery. Gdel's incompleteness theorems reflect in theoretical and experimental physics. One of the main quantum behaviors is that the electron of an atom sometimes behaves like a particle and at other time acts as a wave. For several decades scientists probe their minds to find the reason for this peculiarity. It was the Russian physicists who concluded that this is the law of Nature. Another important thing is that according to general relativity theory, a black hole never splits into two but two black holes can combine into one black hole. But the quantum theory does not accept this. Quantum mechanics asserts that a black hole can split into two. The foundations of relativistic and quantum mechanical theories have been experimentally tested and verified a number of times. These two rival branches of physics are consistent. Another important fact is that Einstein's variance of mass with velocity equation categorically denies both the consistent and generation of superluminal phenomena. But recently the scientists of OPERA experiment at CERN in Switzerland have found that the accelerated neutrinos travel faster than light. This was theoretically predicted by the author and his co-worker three years ago. One more CERN invention is that the space is not empty. It has full of energy and photons. Einstein postulated that the velocity of light is constant and the space is empty. On this foundation Einstein deduced his four famous equations of special relativity theory. Einstein's theoretical results have been experimentally established a number of times at several stages. The author's mentor evidently expressed this before CERN discovery. In 2009 the author and his co-worker have published an article which concluded that the moving mass of an object gets additional energy from its surrounding space. Further support was found by CERN scientists through their detection of new particles. All our physical phenomena expressed above establish once and for all that not only in mathematics, but also in physics also it can be constructed and confirmed statements and their negation. Furthermore it has been found that in our universe there are two stars whose distance is millions of billions of trillions of light years. Is it possible for one to join these two space points in one's life time?. The answer should be no. This is the fate of the first Euclidean postulate. A logical and its rejection in mathematics and an occurrence and its objection in physics confirms Gdel's incompleteness theorems.

8. **Discussion**

In the closing years of the 19th century, the top mathematicians Beltrami, Klein, Poincare and others established once and for all that it is not merely difficult but impossible to prove Euclid's fifth postulate as a theorem. It is impossible to deduce Euclid V from Euclid I to IV. [Beltrami , Klein and others] It is possible to deduce Euclid V from Euclid I to IV [Kalimuthu's theorems [1-3]]. Gdel simply showed that in a formal axiomatic mathematical system, there are statements which are not decidable. The above two propositions once again re establish Gdel's theorems[5]. Kalimuthu's finding is a great leap in the mathematical logic and mathematical development. Also, this is the first mathematical phenomenon. No previous researchers have found such an inspiring and ground breaking results.

9. CONCLUSION

The Studies related to the parallel postulate has given birth to hyperbolic non-Euclidean geometry and elliptic non-Euclidean geometry. Had not Lobachevski and Riemann formulated non-Euclidean geometries it would have been highly impossible for Einstein to complete his special and general relativity theories. All the experimental verifications of Einstein have established the theoretical predictions of relativity. There are many burning issues and problems in quantum mechanics. The challenging problem is that the Newtonian mechanics does not hold good in quantum physics. Einstein's relativistic mechanics face severe drawbacks in quantum theory. It has been already noted that the history and development of classical mechanics relied on the Euclidean geometry only. Einstein's relativity theory is the non-Euclidean geometric interpretation. It has been widely accepted by the scientific community that in order to answer the quantum mysteries, a new type of geometric tool is required. Without this, further progress and development of quantum physics becomes difficult. Also, the recent trends and findings of postulate geometry are the starting points for the search of the third non-Euclidean geometry. The researcher sincerely hopes that the new findings in this field will fill up some of the gaps in quantum mechanics which will open up new vistas for further research.

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