Globalization: A Mathematical Biology & Topology Transformation

Author
Dr. Rojukurthi Sudhakar Rao
[Returning Scholar to self-directed Research in Graph Theory & Applied, India]
Designation
1. Ex-Junior Research Scholar {Council of Scientific & Industrial Research Junior Research Fellowship-New Delhi, Capital of India) (1980-1981) , Department of Applied Mathematics, Andhra University, Waltair, South India
2. Statistical Officer, Dena Bank, Government of India Enterprise, Mumbai , Western India. (1981---1997)
3. Manager --Middle Management Rank , Dena Bank , Government of India Enterprise , Mumbai- Western India. (1997-2013)
4. Currently, A Returning Scholar to self-directed Research in Graph Theory & Applied (2013-2014 continued)
Email: *1955sudhakar@gmail.com*

Abstract

"The secrets of Globalization lie in Mathematics" is what this Paper really targets.

Mathematicians like Abraham Robinson solved in 1960 the three hundred year old problem of infinitesimals in the belief that infinitesimals did not exist and should be avoided.

Infinitesimals have been used to express the idea of objects so small that there is no way to see them or to measure them. The insight with exploiting infinitesimals was that objects could still retain certain specific properties . even though these objects were quantitatively small. Infinitesimals are a basic building blocks just like use of the term global with an accompanying process of globalization isomorphic to an interesting degree with the evolution of the embryo at that critical early stage of an infinitesimal . Transformation and massive reorganization of the embryo from a simple spherical infinitesimal ball into a multi- development of human civilization are concomitant with an embryo .

Globalization might then be better understood as an evolution beyond spheroidal globality with the help of Topology in Mathematics   and   the ever-green mathematical biology from mathematician's perspective engrossed in making resolutions and applications to real-life worldly tensions and comforts falling in the category of a standard which is more of social   globalization and lesser scientific globalization. This Paper will certainly tilt the scales in favour of scientific globalization not letting those unaware of the secrets of globalization .

Key Words: *Secrets, Globalization, Embryo, Infinitesimal, Topology, Robinson Abraham, Human Brain*

Human Brain can be called evolutionary instrument for mathematics with modern-day mathematically modeled applications such as Net Works, connections, linkages and Globalization of the World besides external relations.

From the times of the primordial humans, solid objects of stones with sharp edges led to the first application of brain in humans for food and fire which marked the beginning of mathematical existence . Gradually, evolution accelerated itself probing and researching into working knowledge of Mathematics . Very much

influencing have been the results which paved the way to Globalization benefits *per se* and Globalization of Mathematics in current times such that the ethno-mathematical compartmentalization preventing the study of the mathematics of the universal globes such as our planet Earth down to top and across in all degrees and dimensions within the inaccessible Space has become a thing of disillusion .

This Paper brings out mathematical roots of Globalization with finding of existence of proxy Mathematics for Globalization within the set

theory or the set mathematics of the 20th century which precisely offered the scope of the Globalization with its comprehensive applications in consolidating the human efforts in the Universe of overall basic human endowment carried forward into the 21st Century with modern globalized world .

Exactly 144 years ago , that was in 1870s, the then Mathematician , Francis Guthrie , while attempting to color the map of England had a problem flashed across his mind which is known as Guthrie's Four- color-problem [G4CP] that 4 colors are sufficient to color any map on a sphere / plane. The G4CP-mathematical-expeditions made global explorations studying two regions with common boundary, two regions with common positions, all regions' connectedness, Empires of disconnected Countries, neighbours of a central region, a central country and a country and its colonies.

Advantage Flashback of G4CP is in its success of four-coloring the entire global-region that has been able to remove the local obstruction as well as global obstruction otherwise called non-four-coloring obstructions mathematically. Local obstruction and global obstruction conflict-resolution-mathematics applied in the G4CP has had the instant connectivity onto an important human trait, i.e., trading across ocean and an advantage per se. For example, the entire field of Imports & Exports of Commerce, Trade & Industry all over the Globe have grown out of it paving the way for Foreign Trade & Resources that created present Commercial World with Industry & Nature made Resources traded globally.

Approximately 100+ years later, the G4CP was solved by computer in the summer of 1976 , after many impressive models of dynamic Mathematicians exhausted since 1950s. The mysterious attacks and results produced brand-new computer programmings and mathematical models out of the power and freedom of thought disclosing that the presence of unsolved

problems is a good thing ! Otherwise, new ideas and novel approaches might not emerge or assume the proportion of a standard for attacking other problems such as the case in point of Fermat's Last Theorem , for example , that Mathematicians have verified that Fermat's 1670's assertion was correct for n=3,4,5,….up to n =25,000 or more but no one had been able to determine pucca till 1995 if Fermat was correct in his assertion for all n >2 . Likewise, there are dozens of Models of the G4CP. A model may be shifted , modified or abandoned for solution but this is not a disqualification that the Model cannot work. It may be that something is missing in the way the Model was used. Models hover uneasily between the real and the not-real . Their meanings do not reside in formal abstractions, but neither are they tangible. Their great strength lies in an unreal reality. This is a testimony to man's tremendous breadth and imagination in other far-fetched domains of intuition and reasoning – involoved conceived as problems shift from one area to another shedding light on difficulties with unfamiliar foreign- information –potential difficult to master at once. Hence, very many imaginative but tactful attempts lead people to greater depth of a difficult problem and thus deriving advantages of never-heard-before technologies (Computers/Internets/Satellites/ Space Stations) embedded in the applied sciences of the Matter & Mathematics. It has been professed that mathematically writing formal mathematics is like the grammar and prose – a matter of the correct application of domestic limits . Meaningful mathematics is like Journalism of interest and truth whereas the best mathematics is like literature bringing out a story to life before our eyes intellectually and emotionally mind-mapping the subscribers .

Emergence of Global Fundamental as Real Mathematical Roots :

It may also be learnt that in the time long past , especially before the end of the Western Roman Empire of A.D. 476, in ancient times of the Greeks or Romans , the Greeks believed in what is

called the classical " Golden Ratio" for carving out a Golden Rectangle. Fourteen centuries later in 1969, the G4CP gave birth to the " Golden Root " by an addition of simple " 1 " to the Golden Ratio of the Greeks. So, in the present Computer Age too, We are having the Golden Root .

Golden Root = Golden Ratio + 1.

Many of us are not even aware in our times of this golden one-up-man-ship of the G4CP , i.e.,
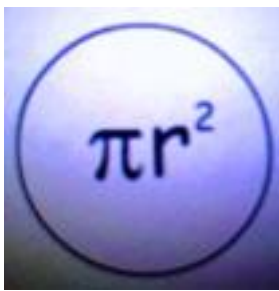
the Golden Root , let alone the Greeks' Golden Ratio .

The value of the Golden Ratio , statedly , is 1.6 ; the Golden Root becomes approximately 3, which is again the value of the ideal ratio of the Circle [circumference to diameter] , denoted by the 16th of the Greek alphabet , pi (π) , the key to the areas of circle and sphere as below.
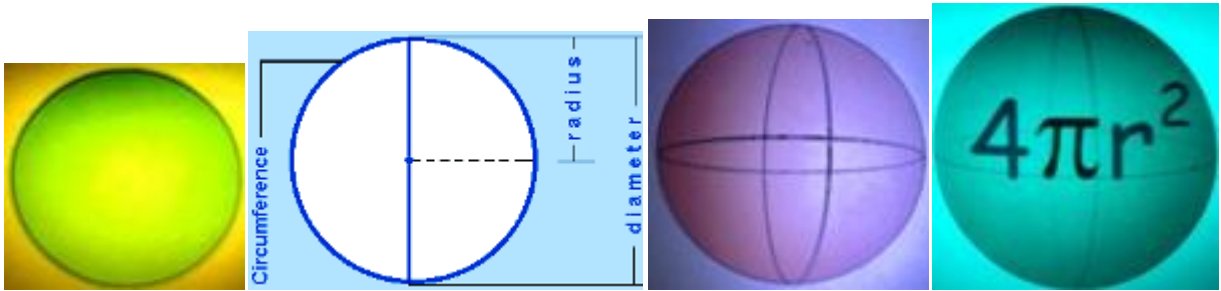
Circle Area = πr^2

Sphere area = $4\pi r^2$
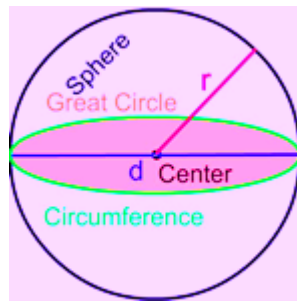
Circle : Sphere : :   1 : 4

Global is understood as the one based on a sphere derived geometrically by use of **pi** (π) with same sense of circle. Hence an association with pi. Circle to sphere generation is by turning a circle through a complete revolution about an axis, i.e., one of its diameters .The sphere is symmetrical about any plane that passes through its centre while the plane cross-sections of a sphere are all circles.

The global sphere of our Earth-plane[t] is solid surface known as Earth's surface, 4 times to its circle spread exactly in 4 directions : NEWS { north, east, west, south } while the G4CP conforms to 4-color sufficiency because the Globe has overwritten the Planet . The latter is shrink-wrapped version of the longitudinally and latitudinally bounded grid work of globalization which is not something one can hold off or turn off but could be appreciated as drawn below to

project the longitude and latitude mathematically realizing that the Globe is no less a mathematical space than the Planet while the planetarity as a space not beyond reclamation and globalization in a broadening, deepening and speeding up of world-wide complete physical and mathematical massive connectedness. The global positioning systems mathematically platted have claimed the planet as a material containment and a process of reflexivity in a single global space and global spaceship Earth making it possible to map empirically patterns of world-wide links and limits across all key domains of land , oceans and mountains of global activity. Having sphere as a must and as an underlying pattern, the interesting additional is offered by universal, as in Catholic use of the term universal church -- the term catholic being derived from universal. Both may be understood as having that geometry. Indeed
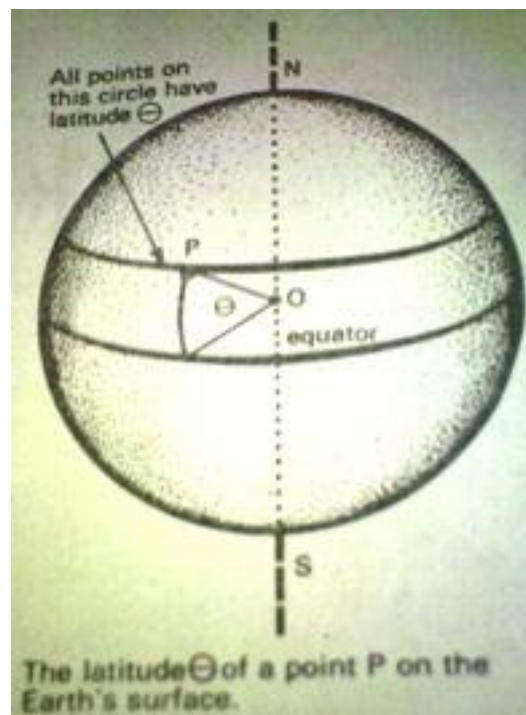
the sense in which these are related to the tangible physical world may be tenuous -- as with arguments for recognition of a biosphere, an infosphere and a noosphere with which people may variously identify. Finality and closure associated with globalization is otherwise true of the world in the sense in which people frame the

world in which they live irrespective of how this relates to the form of the planet. So, there is a plasticity to the sphere with which these constructs are implicitly associated and the spherical planet itself per se in the light of geometry.

The longitude Ø of a point P on the Earth's surface.
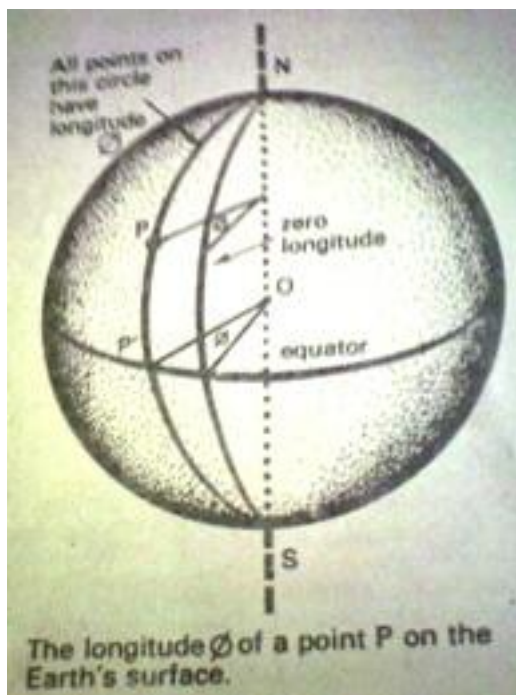
 The east-west position of a point on the Earth's surface measured as the angle in degrees from a standard meridian (taken as the Greenwich meridian).A meridian is a great circle that passes through North & South poles.The local meridian of a point is a great circle passing through that point & the two poles.

The latitude Θ of a point P on the Earth's surface.

The   distance of a point on the Earth's surface from the equator, measured as the angle in degrees between a plane through the equator (the equatorial plane) and the line from the point to the centre of the Earth . A point on the equator has a latitude of 0 degrees and the North pole has a latitude of 90 degrees.

Also, during 1974, the G4CP , just before its final solution arrived in 1976 ,delivered what is called the   " Silver Root ", with value 4 , called the Beraha   Number , justifying the G4CP , conclusively like a micro-fine filter ! That the Golden Ratio, the Golden Root , the Silver Root , the Circle and the Global Sphere themselves are the G4CP's   mathematical coefficients is per se the virtual enrichment of the whole of modern applied science in the wake of G4CP which

being not   trivial , not simple and not general from 1852 to 1976 but for ever is the emergence global fundamental . Also , Christian teaching as enunciated by Archbishop Ussher in the 17th century dated the creation   of the Earth as occurring in the year 4004 BC while the earliest known life forms, micro-fossils ,dated back to 3400 million years ago are spherical and   there are prevailing only 4 divisions : Cenozoic ,

Mesozoic , Palaeozoic and Proterozoic geologically of the World , the planetary sphere.

Globality : An altogether new dimension

Credit goes to Francis Guthrie's brother since an historical account reported that the G4CP was not due to an individual's effort alone but said to have been truly dispatched by a fellow-being, none other but Francis Guthrie's brother, an exporter, in October of 1852 while its publicized reference surfaced first in print in 1878 in London of the then old England .

Globality , in numerous imaginative ways, produces a one-of-a kind of vision of scientific knowledge of present century fuming out of the G4CP , which has used modern information-technology like Computer to do the job. Following suit are the social , political, economic and legal formulations of the present century strengthening the globality to expanding processes of globalization in their respective logic, theory, calculations and even guided applications . Experience indicates that so far as variety of apparently unrelated ideas and unavoidable distributions of existences–links are concerned, the G4CP has brought out greater diversity of imagination ranging from loss of innocence to risk of error to price of knowledge . Thanks to the G4CP , a relativistic world-view of Globality [Grand Total] embedded in itself : geo-graphical , geo-metrical & geo-logical utility-trotting globally as global option .

G4CP's global theme of globalism:

 It is the mathematical -response to the relevant innovative methodologies in the realm of modern technology , for brevity. Globalism is the new domain expanding with the human mind despite a confrontational field of hard work, hard luck and endeavor . One would expect that problems of an abstract nature significant to man's logical global view of his thought processes and to his role globally will be formulated and solved. Man's imagination creates the globality within which , many significant things have emerged and from this approach the modern computer has dared mathematical thinking to function more and more helpfully evoking challenge providing quick and intensive analyses as we have learnt that the G4CP has been settled. Thus, the G4CP is a global theme. Globalization encompasses systems of almost any form would have become clear . It can be even called a Systems Theory , viz.. Applied Globalism . A precise grasping of Globalization occurs while understanding the already-in Globalism with globalized Establishments ensuring global achievement toward convergence of divergence-captive Civilizations . The theory of Globalization , satisfyingly precise and complete can be enlarged on a foundation of the technique of logical statements because it is the only one universal ' Entity ' : simple , absolute and ultimate to know about.

Applying the laws of logic that are traditionally considered to exemplify applied globalism mathematically in the above way we think , i.e., it is not arbitrary that one can say certain forms of reasoning are correct appreciated by the law of identity that if something is true , then it is true without recourse to the law of excluded middle path to sail between true and untrue somethings . Applied Globalism is not something both true and untrue , especially when it is realized that even mathematical processes are diverse exhibiting very similar properties .
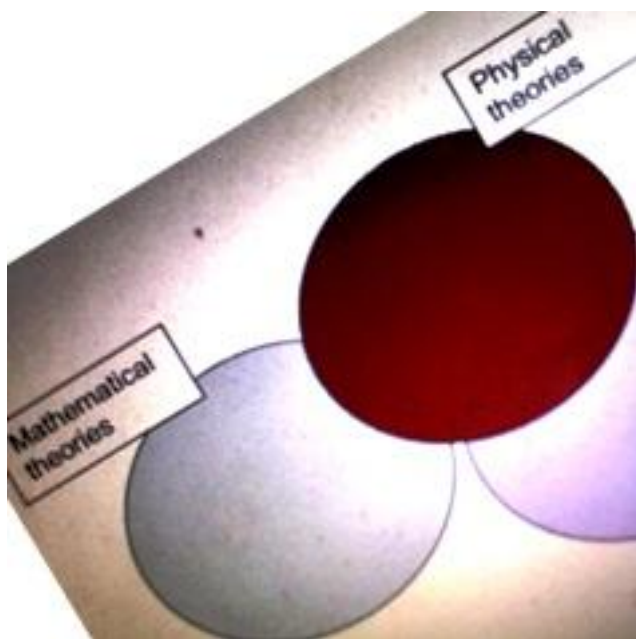
Globalization's proxy in the Set Mathematics :

The history of set theory is rather different from the history of most other areas of mathematics. For most areas a long process can usually be traced in which ideas evolve producing a

discovery of major importance. Set theory is creation of development of infinity out of deep thought from the time of Greeks . Zeno of Elea in 450 BC carried forward infinity with his problem thinking on the infinite while by middle ages discussions of the infinite led to comparison of infinite sets.

Bolzano was a philosopher and mathematician of great depth of thought in 1847 when he gave a practically relevant and realistic meaning to Sets stating that Sets are an embodiment of an idea into a concept which populations and World conceive regarding the arrangement of its parts as a matter of indifference .Thus the mystical world view with the anti-science and anti-intellectual embodiment suffered dilution and further weakened the ethnomathematical practices producing the global in concept and practice as new embodiment . Thus , from the pre-modern, through to the early modern (1500-1800), modern (19th to early 20th century) and to the contemporary period, distinctive mathematical patterns in respect of their different systemic features - uneven as they often came up . These patterns constituted distinctive forms in mathematical globalizations .

By comparing and contrasting these changing forms, it is possible to identify more precisely the present. Accordingly, to advance an account of mathematical globalization it is necessary to turn from a general mathematical concern with its ancient conceptualizations to an examination of mathematical activity and interaction in and through which mathematical processes evolved making globalization not only mathematical but also natural . At the same time , it is also natural to say that one can speak of the set of people living on our planetary Globe at a given time by themselves disregarding their charecteristics . The idea of the set is one of the primitive mathematical ideas and cab be thus explained by means of an analogy intuitively . We can call people on our planet a global set in the context . Properties of the global set do matter and their study leads to a common property or more . That itself discloses globally valid property pointing to globalisedness or uniformisedness or stability reflecting a featured globalization for the global set , by the global set and of the global set . In a way , it could be self-aware globalization with respect to the tradition to know thyself. The challenge in the adequacy of conventional explanations is supported by visual or other renderings attentive to the challenge of comprehension. Hence the inspiration of the forms and processes of the globe embedded in the dynamics of globalization representative of global .

> Bolzano of 1781 to 1848 .

The Set Mathematics facilitates and enables Globalization to be understood as a facsimile of general facts of populations and global existences just like mathematical existence depending on a satisfactory answer of freedom from contradiction necessiated by the construction of set of postulates from which whole of

mathematics could be deduced by purely formal reasoning supported by the constructed set of postulates which will never lead to a contradiction owing to the constructed postulates at the root of the Set Theory being consistent . In some way or the other, openly or hidden , even under the most uncompromising formalistic, logical and postulational aspect , constructive intuition always is the vital centre in mathematics or for that matter , mathematics of globalization per se with the mutual facsimile property between Set Mathematics and Globalization.

Globalization and Set Theory have revealed that the Global as a mathematical intuition arises from the local (like zero) tending to the global (like infinity) as there are no local infinity and global zero . Global is understood as nonlocal in mathematics.

1 . Globalization of Intutionistic Set Theory says that global concepts are expressible through an Intutionistic Set Theory .

2. Globalization in Mathematics essentially is due to Geometry and Topology .

In the eighteenth century two very different conceptions of geometry fought for prominence in Germany and Europe. The first of them relied on the classical definition of geometry as a science of continuous magnitudes and figures, a science of triangles and squares, circles and conic sections, parallel lines and obtuse angles; this conception of geometry was as old as Aristotle and Euclid, and was maintained by mathematicians and philosophers in the whole of Antiquity, in the Islamic Middle Ages, in the Italian *Quattrocento*and in the late European Renaissance from Clavius to Newton.

But then, however, a second concept of geometry of the idea that geometry could be the science of *space itself*, and that space is endowed with a geometrical structure more fundamental than a triangle. In this new theory, space did not anymore constitute an amorphous background field, a sort of conceptual or imaginary arena in which geometry takes the form of a geometrical object itself with properties but an important event in the gradual transformation of classical geometry into a modern theory of spaces.

In 1872 Felix Klein formulated geometry as the study of the properties of a space that are invariant under a group of transformations. Thus there is a geometry corresponding to every group of transformations acting on a space.

>>> Felix Klein

Euclid <<<

The basics are group and space . In a certain sense the group of projective collineations is the most encompassing group and projective geometry occupies a dominant position and we do need a whole space to piece the neighborhoods together. This is achieved by topology. The first mathematical formulation of a topological manifold arrived in 1902. On the topological side "neighborhood" became the basic concept in topology. Another fundamental notion is curvature. Its simplest manifestation is the circle in plane Euclidean geometry. But , the circle is also the force of a physical system . Geometrically torus is closely related to the sphere. Hence , of globe and globalizIng .

3. A topological space has a property locally if and only if its every point has a neighbourhood with the similar property and which then is called a local property of that topological space. If the space itself has similar property , then it is called a global property of that space or that space has the property globally. Since any space is a neighbourhood of each of its points , it is obvious that if a space has a certain property globally, then it has that property locally . The theorems called Globalization Theorems are known as Uniformisation Theorem proved by mathematician, Witold Hurewicz in study of globalization of local to global theorems in mathematics

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>> Witold Hurewicz

4. Mathematics of ' Global Maximum & Global Minimum ' in domain of Relations is shown graphically below.
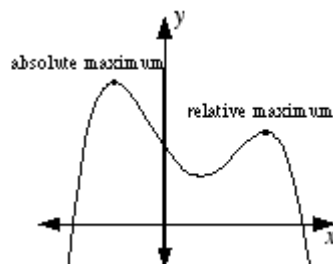
Highest point over the entire domain of relation

Lowest point over entire domain of relation

Applying the laws of logic that are traditionally considered to exemplify applied globalism mathematically in the above way we think , i.e., it is not arbitrary that one can say certain forms of reasoning are correct appreciated by the law of identity that if something is true , then it is true without recourse to the law of excluded middle path to sail between true and untrue somethings. Applied Globalism is not something both true and untrue , especially when it is realized that even mathematical processes are diverse exhibiting very similar properties

5. Globalization is understood as a topological process of morphogenesis in Mathematical Biology.

From the viewpoint of mathematical topology, use of the term global and an associated process of globalization is isomorphic to the evolution of the embryo at early stage. Membrane systems in intact living cells can be described as closed and orientable surfaces, i.e., as surfaces with two sides and no boundary lines so that an 'inside' and an 'outside' can be distinguished. The biomembranes represent topological spheres often one embedded in another one and morphological complexity during metazoan development studied using concepts from mathematical topology and topological transitions that appear to be relevant in development and evolution consistent with the topology of the embryological development from a spherical (global) form to a torus. Hence the name spheroidal globality as envisaged below.
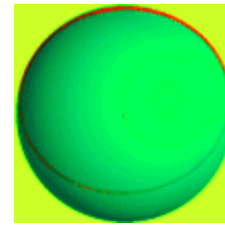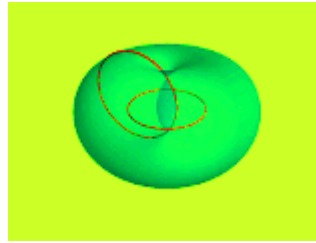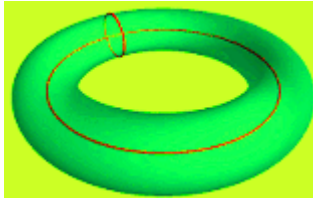
The transformation into a torus and back points to a possibility of cycling through a pattern of geometric forms variously supporting understandings of globality **.**

Conclusion: Expression of Globalization via the Mathematical Media of Venn Diagrams:

In the world of mathematics , it is greatly known that analyzing difficult concepts is a matter of mathematical value with the help of observed properties taken as a Set and drawn as separate encircled diagrams. In short, such diagrams do the explaining suitably. With visual trespassing, common –portion- areas are shared and labeled wherever necessary in short. This technique is given   firstly by the Swedish mathematician Leonhard Euler (1707-1783) which was later improved upon by the British mathematician , John Venn , named after them as the Venn-Euler Diagrams and many times as the Venn Diagrams of 3-variable Sets   since 1960. Studied   and .

practised in Set Theory as the Modern Mathematics of the 20th Century onwards , the Venn Diagrams   command immense value derived from nut-shell-conceptual - clarity and applied to other areas of Mathematics , Economics besides   Psychology,   Sociology,   Human Resources Development, International Relations and a variety of disciplines like the present one in this Paper on secrets of Globalization which embraces to increase the convergence properties drawn   towards   Globalization   in theory and practice in the real world   mathematical and operational research of commercial, economical, technological, medical and monetary divides in the present 21st Century with   the experimental space   missions

People who think the   People who understand
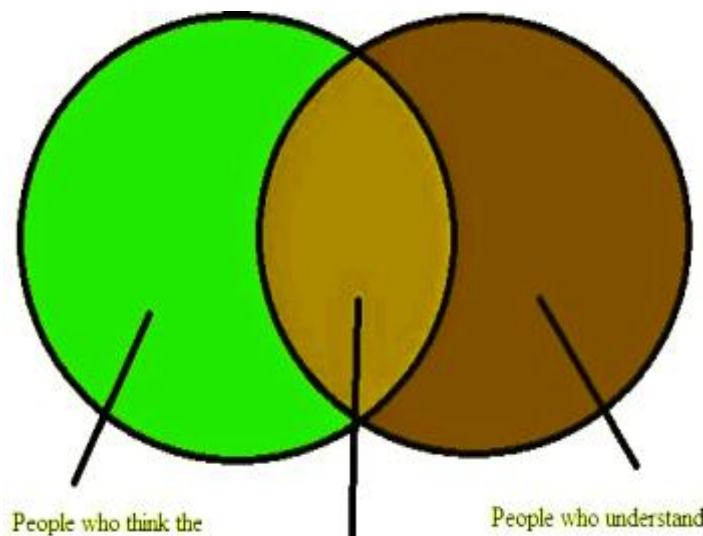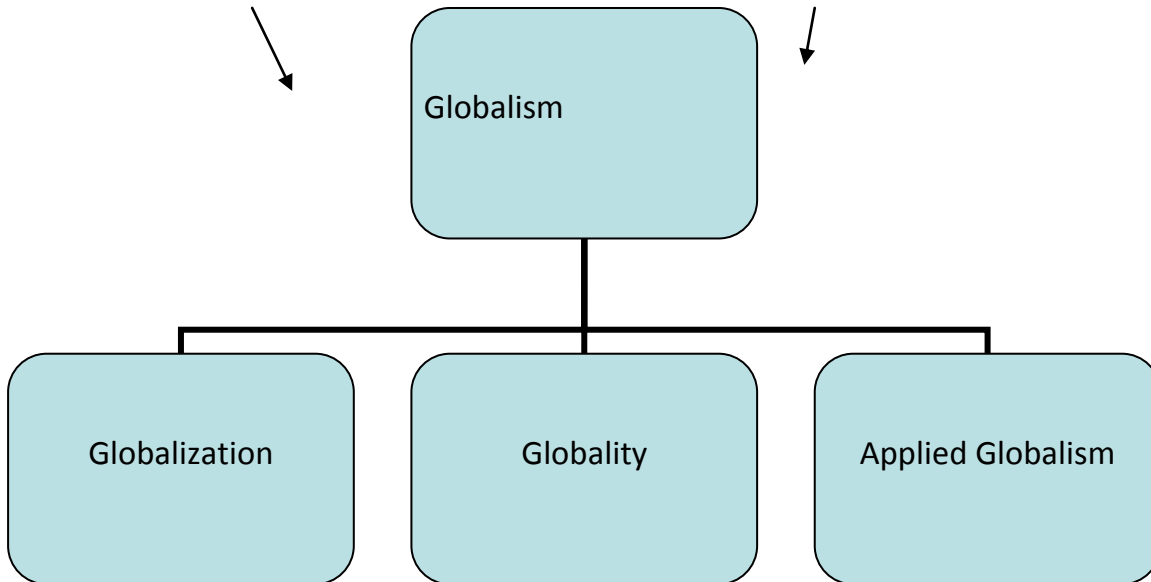
There is the use of global in different sectors, especially in the case of universal of special pragmatism that associates it with growth leading to an assumption that, globalization involves expansion -- as might be projected with a continuing increase in the diameter of the planet besides appreciated as understood in socio-economic parameters .
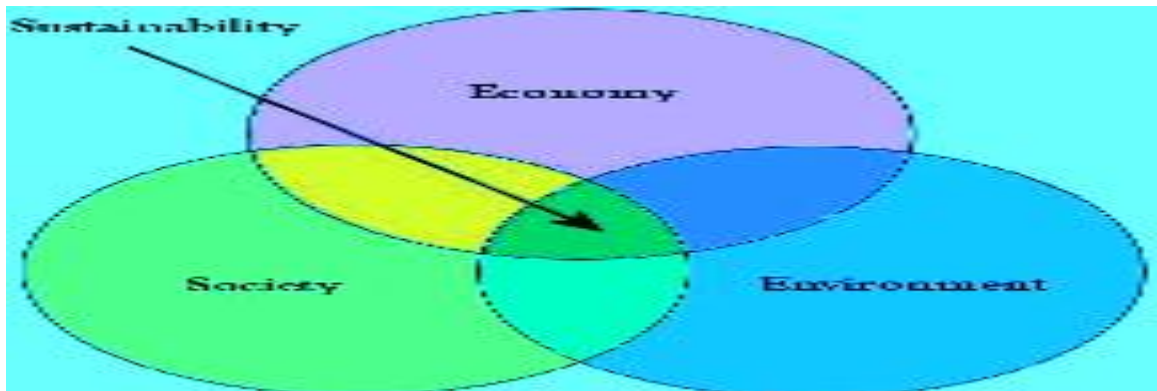

 Euler's <diagrams>Venn's <
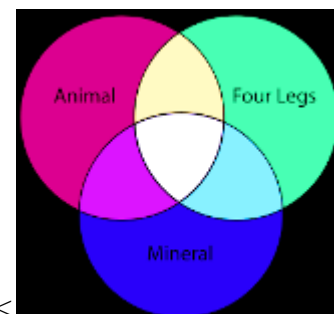
In logical setting, one models Euler diagrams within a universe of discourse . In the models above, the Euler diagram depicts that the sets *Animal* and *Mineral* are disjoint since the corresponding curves are disjoint with the set *Four Legs* as subset of the set of *Animal*s. The Venn diagram, which uses the same categories of *Animal*, *Mineral*, and *Four Legs*, does not

encapsulate these relationships. Traditionally the *emptiness* of a set in Venn diagrams is depicted by shading in the region. Euler diagrams represent *emptiness* either by shading or by the use of a missing region. If conditions are imposed; these are topological or geometric constraints imposed on the structure of the diagram. For example, the universal set is shown as a rectangle while connectedness of zones might be enforced

or concurrency of curves or multiple points might be banned, as might tangential intersection of curves. In the diagram to the right, Euler diagrams on the left are transformed into Venn diagrams by concurrency of curves. In other words , inside the rectangular universal set other sets are shown as circles. Intersecting or overlapping circles are intersecting sets.
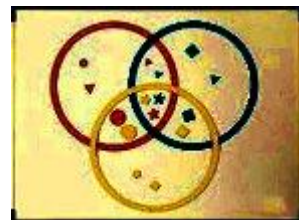
Separate circles are sets that have no intersection but with a circle inside another being treated as a subset constituting particular defined relationship or function shaded for indicating. In modern usage, the Venn diagram includes rectangular box that surrounds all the circles called the universe of discourse or the domain of discourse. Having to digest the global edibility of spread of universalism in the recognized form of Universal Set enunciated in Mathematics of Set Theory due to and complemented by the

biophysical conditions of the Universe, an intersection between non-human- remote-controlled universalization and monitored World of human-controlled understanding, capacity, willingness and physically possible meaning with sense-making universality can be aptly defined as a Global Product of Globalization that permits mathematically and more so scientifically Globalization advantages. The Venn diagrams are helpful tool to highlight.this.


In terms of the partition of sets studied with De Morgan's Laws of Negations on the union and intersection of sets via their complements

discloses that in propositional logic, a pair of transformation rules valid of inference allowing expression of conjunctions and disjunctions purely

in terms of each other via negation is pinpointed by the British mathematician, William de Morgan (18o6- 1871). The negation of a conjunction is the disjunction of the negations and the negation of a disjunction is the conjunction of the negations according to De Morgan. This is named after De Morgan (1806–1871) .
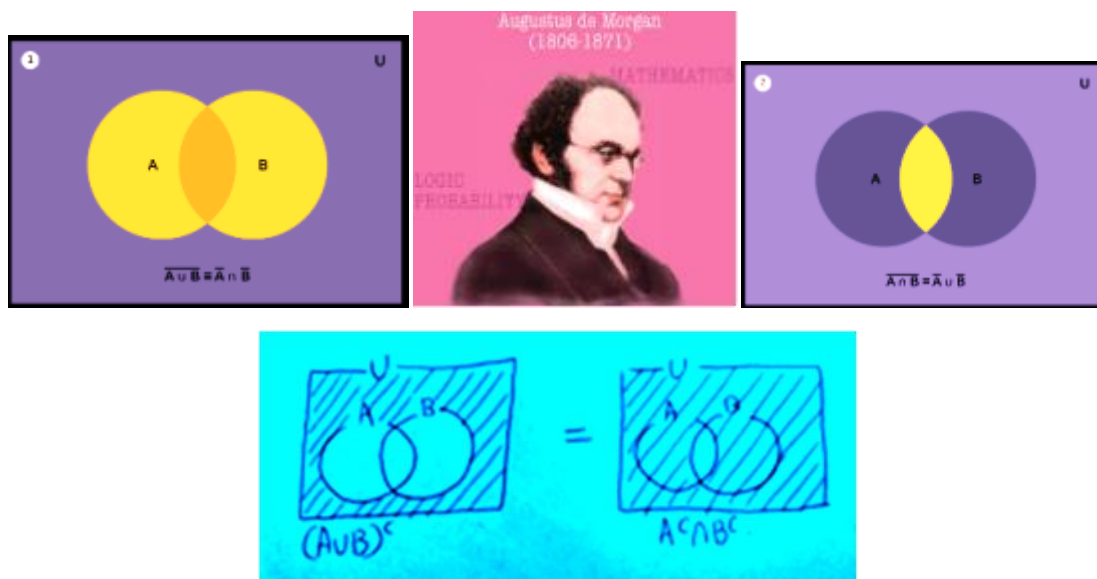
>> Venn diagram for the complement of union is equal to the intersection of the individual complements in the set mathematics. The relevance here is whether human civilization is to be considered as being at a critical point of its embryonic development into whatever it has the potential to grow. Civilization has arrived at such a singularity of every kind just as with an embryo of transformation to enable development and survival globally

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