Motto: " The science wouldn't be so good today,
if yesterday we hadn't thought about today"
Grigore C. Moisil

ECCENTRICITY,
SPACE BENDING, DIMMENSION

Marian Niţu, Florentin Smarandache, Mircea Eugen Şelariu

0.1. ABSTRACT

This work's central idea is to present new transformations, previously non-existant in Ordinary mathematics, named centric mathematics (**CM**) but that became possible due to new born eccentric mathematics, and, implicit, to supermathematics.

As shown in this work, the new geometric transformations, named conversion or transfiguration, wipes the boundaries between discrete and continueous geometric forms, showing that the first ones are also continueous, being just apparently discontinueous.

0.2 ABBREVIATIONS AND ANNOTATIONS

C → Circular and Centric, E→ Eccentric and Eccentrics, F→Function, M→Mathematics, Circular Eccentric →CE, FCE→FCE, centric M →CM, eccentric M → EM, Super M →SM, F CM →FCM, F EM→FEM, F SM → FSM

1. INTRODUCTION: CONVERSION or TRANSFIGURATION

In linguistics a **word** is the fundamental unit to communicate a meaning. It can be composed by one or more morphemes. Usually, a word is composed by a basic part, named root, where one can attach affixes. To define some concepts and to express the domain where they are available, sometimes more words are needed; two, in our case.

SUPERMATHEMATICAL CONVERSION

The concept is the easyest and methodical idea which reflect a finite of one or more/(a series)of attributes where these attributes are essentials.

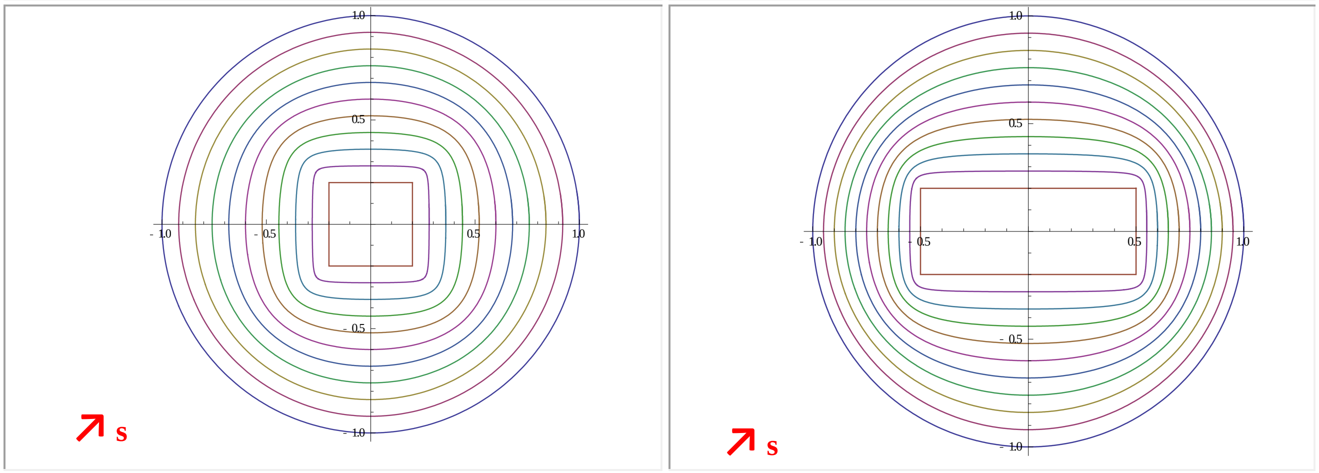
The concept is a minimal coherent and usable information, relative to an object, action, property or a defined event.

According the Explicatory Dictionary, **THE CONVERSION** is, among many other definitions / meanings, defined as " changing the nature of an object". Next, we will talk about this thing, about transforming / changing / converting, previously impossible in the ordinary classic mathematics, now named also **CENTRIC (CM)**, of some forms in others, and that became possible due to the new born mathematics, named **ECCENTRIC (EM)** and to the new built-in mathematical complements, named temporarly also **SUPERMATHEMATICS**

(SM). We talk about the conversion of a circle into a square, of a sphere into a cube, of a circle into a triangle, of a cone into a pyramid, of a cylinder into a prism, of a circular torus in section and shape into a square torus in section and/or form, etc. (**Fig. 1**).

ECCENTRIC TRANSFORMATION

ParametricPlot[Evaluate[Table[$\{(1-0.08s)\,\mathrm{Cos}[t]/\mathrm{Sqrt}[1-(s\mathrm{Sin}[t])^2],\ (1-0.08s)\,\mathrm{Sin}[t]/\mathrm{Sqrt}[1-(s\mathrm{Cos}[t])^2]\},\{s,0,1\}],\{t,0,2\mathrm{Pi}\}]]$	ParametricPlot[Evaluate[Table[$\{(1-0.05s)\,\mathrm{Cos}[t]/\mathrm{Sqrt}[1-(s\mathrm{Sin}[t])^2],\ (1-0.08s)\,\mathrm{Sin}[t]/\mathrm{Sqrt}[1-(s\mathrm{Cos}[t])^2]\},\{s,0,1\}],\{t,0,2\mathrm{Pi}\}]]$



s ∈ [0, 12]

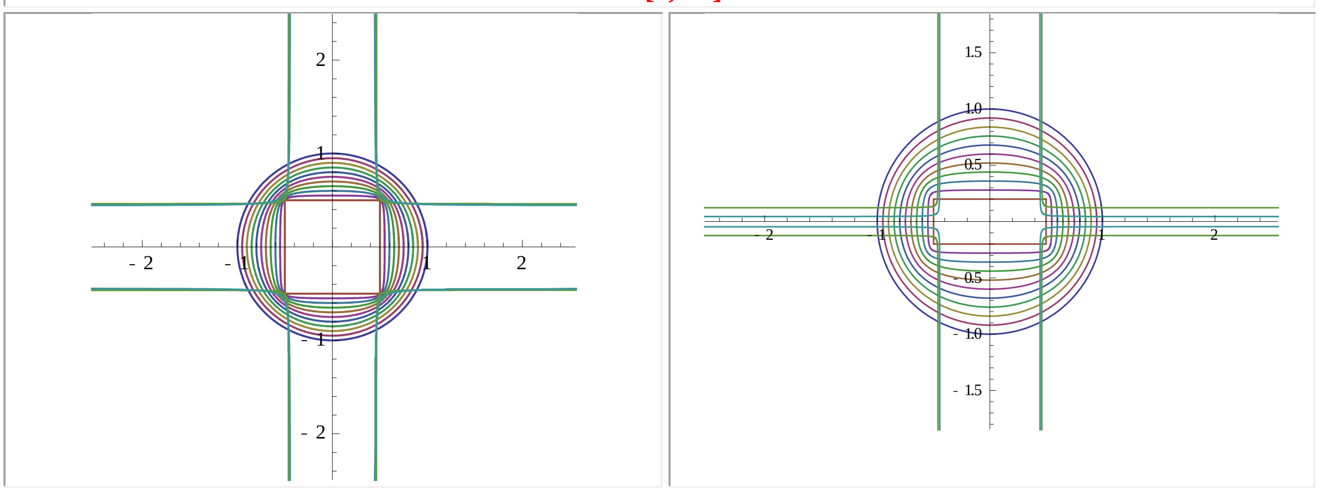


Fig.1,a Conversion or transfiguration in **2D** **of a circle into a square and/or into a rectangle → ECCENTRIC TRANSFORMATION**

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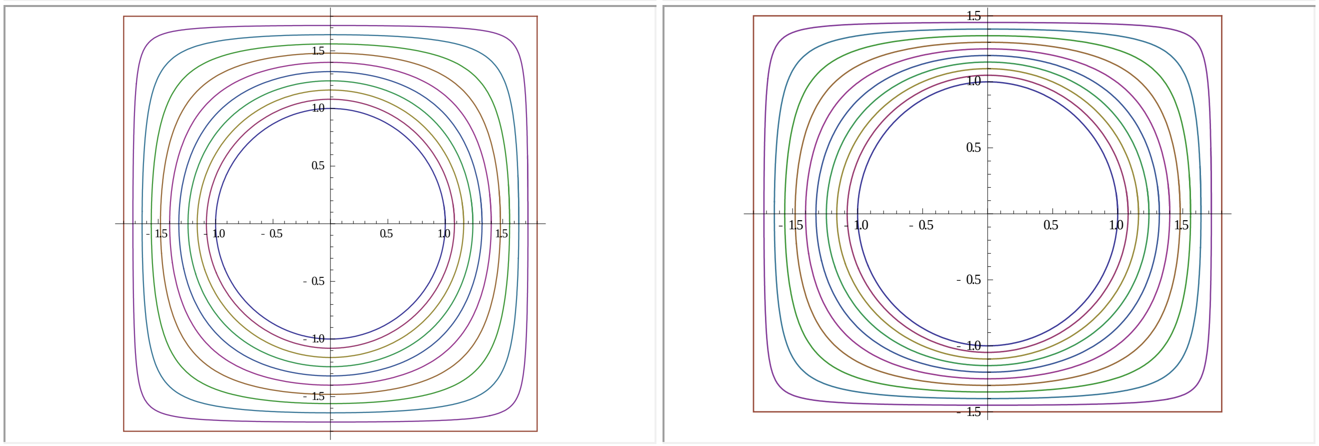
SUPERMATHEMATICAL CONVERSION (SMC) is an internal pry for the mathematical dictionary enrichment, which consist in building-up of a new denomition, with one or more new terms, two in our case, by assimilating some words from the current language in a specialized domain, as Mathematics, with the intention to name, adequate, the new operations that became possible only due to the new born eccentric mathematics, and implicit, to supermathematics. Because previously mentioned conversions could not be made until today, in **MC**, but only in **SM**, we need to call them **SUPERMATHEMATICAL conversion** (**SMC**)

In [14] work, the continueous transformation of a circle into a square was named also **eccentric transformation**, because, in that case, the linear numeric eccentricity s varies/grows from 0 to 1, being a slide from centric mathematics domain **MC** → s = 0 to the eccentric mathematics, **ME** ($s \neq 0$) → $s \in (0,1]$ where the circular form draws away more and more from the circular form until reach a perfect square ($s = \pm 1$).

CENTERING TRANSFORMATION

ParametricPlot[Evaluate[Table[{(1 + 0.08*s*) Cos[*t*]/Sqrt[1 − (*s*Sin[*t*])²], (1+ 0.08*s*) Sin[*t*]/Sqrt[1 − (*s*Cos[*t*])²]}, {*s*, 0,1}], {*t*, 0,2.05Pi}]]	ParametricPlot[Evaluate[Table[{(1 + 0.08*s*) Cos[*t*]/Sqrt[1 − (*s*Sin[*t*])²], (1+ 0.05*s*) Sin[*t*]/Sqrt[1 − (*s*Cos[*t*])²]}, {*s*, 0,1}], {*t*, 0,2.05Pi}]]



s ∈ [0, 12]

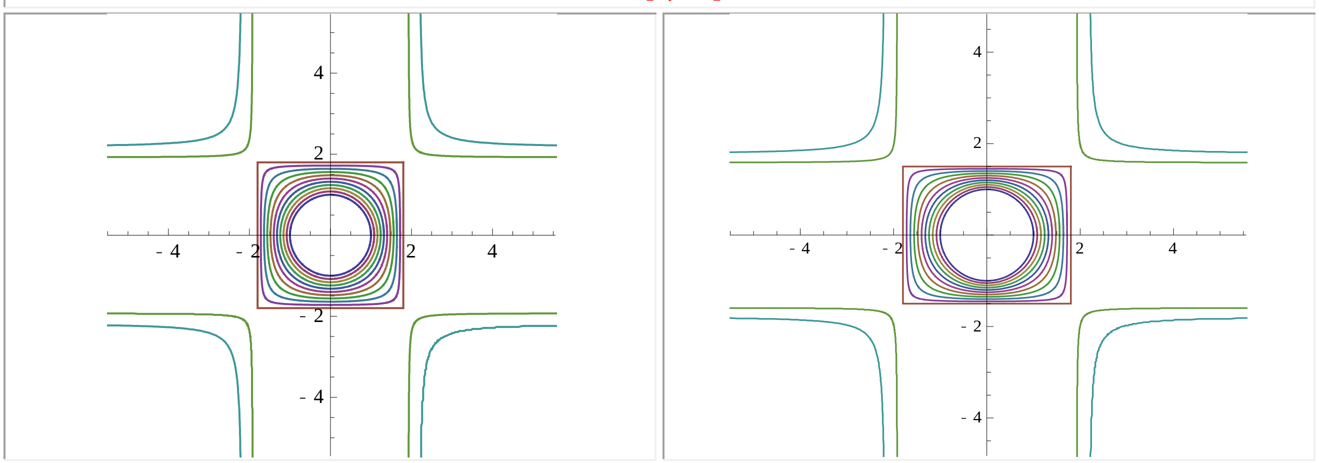


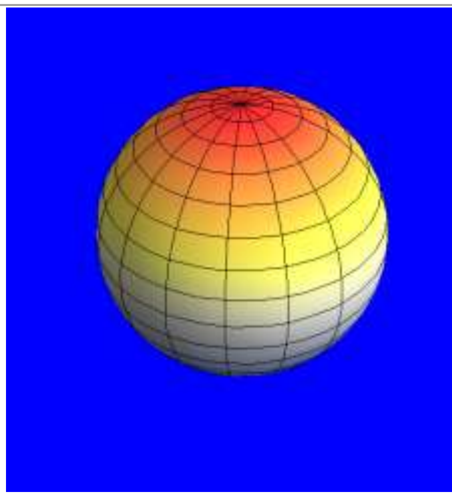
Fig.1,b Conversion or transfiguration in 2D **of a square and/or a rectangle into a circle**
→ CENTERING TRANSFORMATION

In the same work, the reverse transformation, of a square into a circle, was named as **centering transformation**, by easy to understand means. Same remarks are valid also for transforming a circle into a rectangle and a rectangle into a circle (**Fig. 1**).

Most modern physicists and mathematicians consider that the numbers represent the reality's language. The truth is that the forms are those who generate all physical laws.

$S(s = 0, \varepsilon = 0), R = 1$

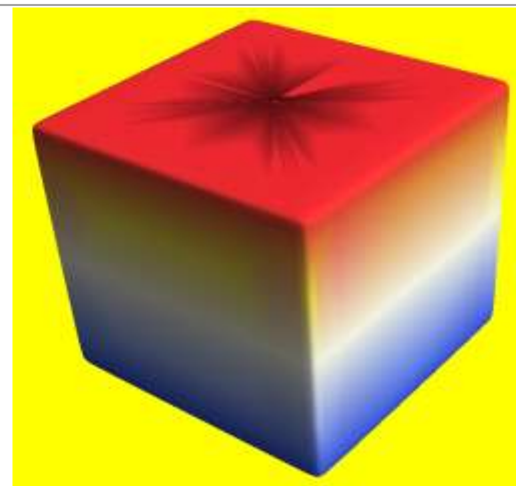
ParametricPlot3D[{Cos[u]Cos[v],Sin[u]Cos[v], Sin[v]},{u,0,2Pi},{v,$-\mathrm{Pi}/2$,$\mathrm{Pi}/2$}]



CSM
S→C

$S(s = \pm 1, \varepsilon = 0), R = 1$

ParametricPlot3D[{{Cos[t] Cos[u]/(Sqrt[1−(Sin[t])^2] Sqrt[1−(Sin[u])^2]) Sin[t] Cos[u]/(Sqrt[1−(Cos[t])²]Sqrt[1−(Sin[u])²]), Sin[u]/Sqrt[1−(Cos[u])^2]}},{t,0,2Pi},{u,−Pi,Pi}



s = 0 ▲ 0,4 ▲ 0,7 ▲ ▲ ε = 0

Fig.2,a The conversion of a **sphere** into a **cube**

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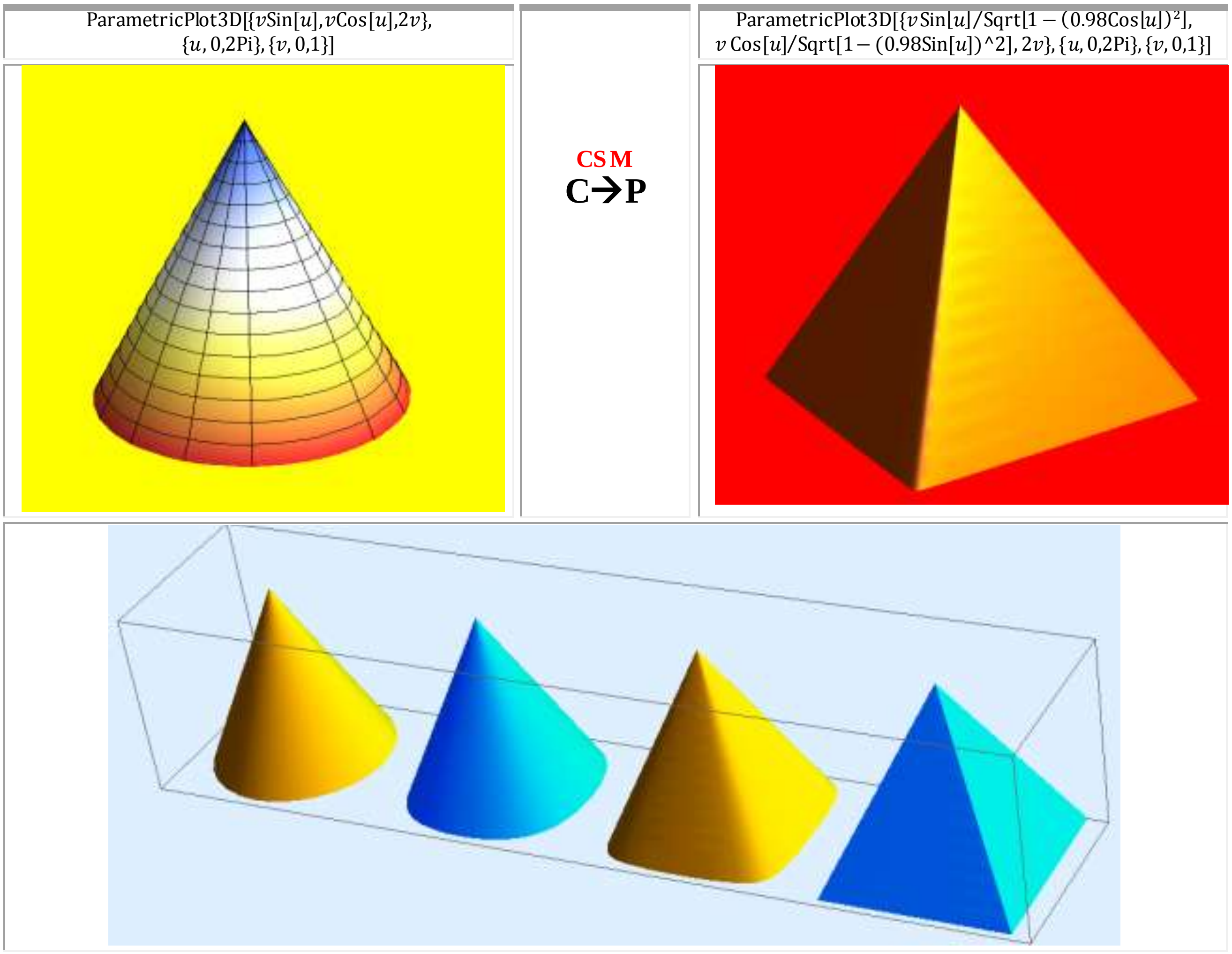

s = 0 ▲ 0,4 ▲ 0,7 ▲ 1 ▲ ε = 0

Fig.2,b The Conversion of a cone into a pyramid

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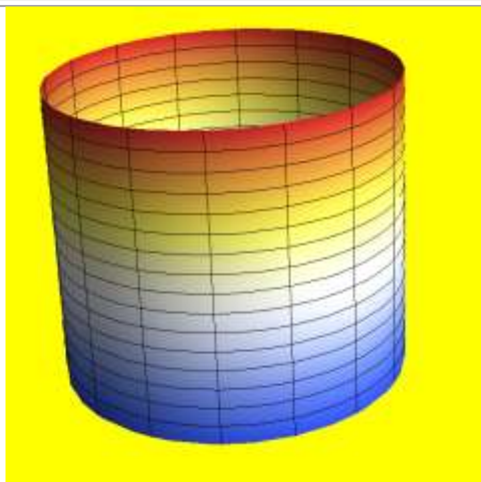
Look what the famous romanian physicist **Prof. Dr. Fiz. Liviu Sofonea** în "**REPRESENTATIVE GEOMETRIES AND PHYSICAL THEORIES"**, Ed.Dacia, Cluj-Napoca, pag. 24, in 1984, in the chapter named "**MATHEMATICAL GEOMETRY AND PHYSICAL GEOMETRY"** wrote:

"Trough ***geometrization*** we look for (deliberately and by sui generis) exactly the ordering directions (detailed, fundamentals, even the supreme, the *unique-unifier*) thinking about the pre-established (relating to physical theory undertaking) from the "geometrical worlds" built and moved after disciplined canons in *more geometrico* style (logical derivability and structure, geometrically proved, where it's done), an extension with the purpose if "it works" also "*physicaly*", and as we see that we have reasons to say "it really works", we bargain on a methodological-operant gain, euristical, but even gnoseological. But never ***geometrical*** pre-norming can not be fully functional; it can be only (inherent) partial, limited, often a simple boundary marking, a suggestion, an incitement, a scheme, sometimes too dummy, but we use it like a scaffold, to rise up, as we can, to a more adequate description or even more understanding”

In the **centric mathematical geometry** one is doing what can be done, how can be done, with what can be done, and in **supermathematical geometry** we can do what must be done, with what must be done, as we will proceed.

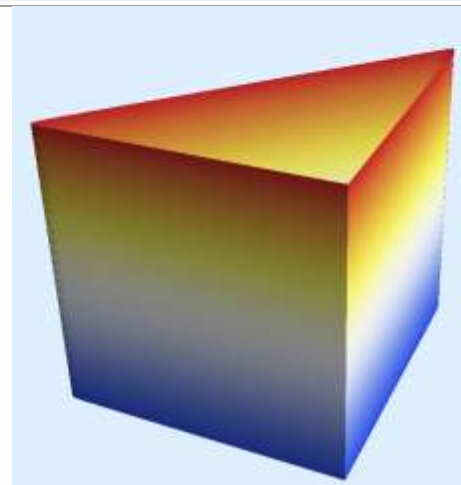
In the **supermathematical geometry**, between the elements of the “**CM** scaffold”, one can introduce as many other constructive elements we want, which will give an infinitely denser scaffold structure, much more durable and, consequently, higher, able to offer an unseen high level and an extremely deep description and gravity.

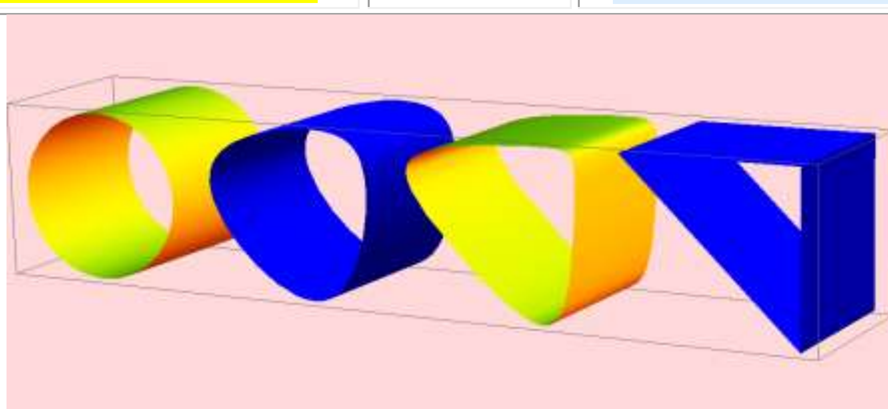
ParametricPlot3D[{Sin[u],Cos[u],0.5v}, {u, 0,2Pi}, {v, 0, Pi}]



CSM
C → P

ParametricPlot3D[{Cos[$u-$ ArcSin[0.98Sin[u]]], Cos[$u-$ Pi/2 + ArcSin[0.98Sin[$-$Pi/2]]],2v}, {u, 0,2Pi}, {v, 0,1}]





s = 0 ▲ 0,4 ▲ 0,7 ▲ 1 ▲ ε = 0

Fig.2,c The Conversion or transfiguration of a **cylinder** into a **prism**

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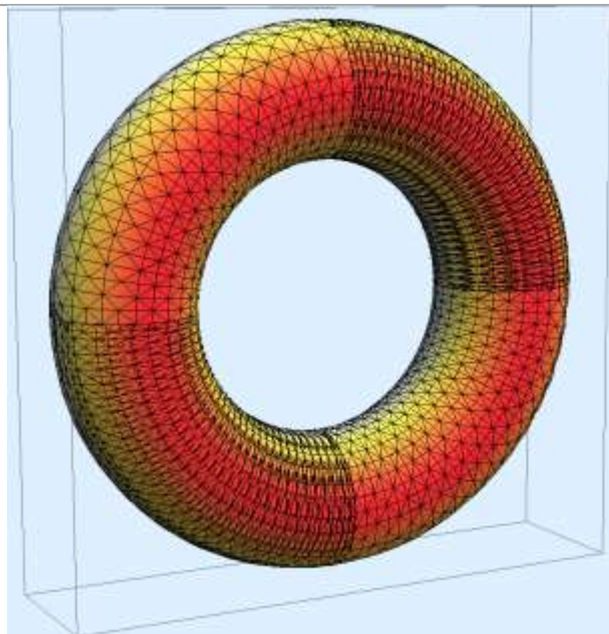
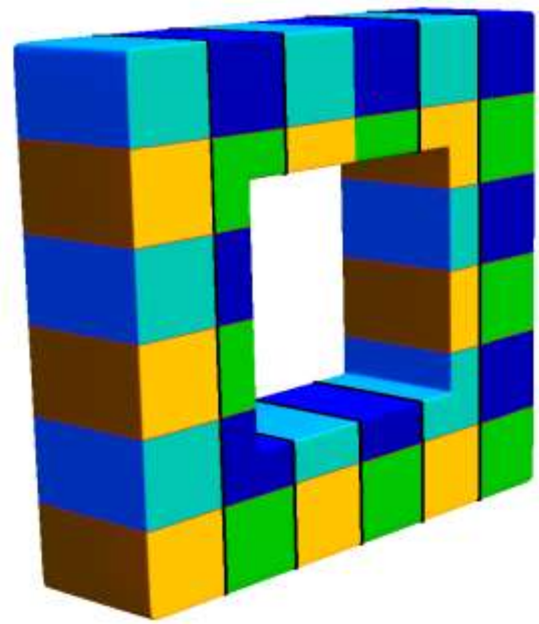
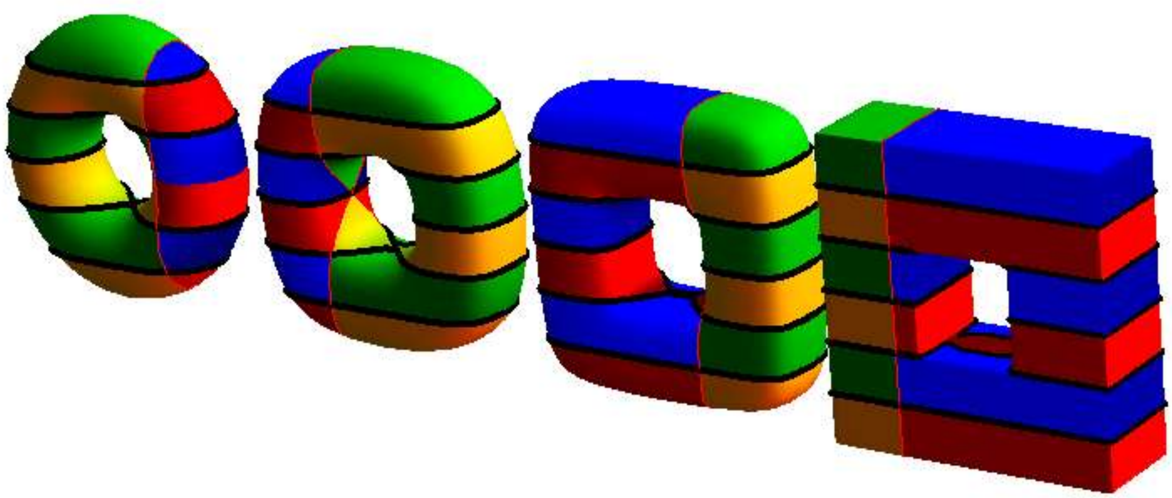
ParametricPlot3D[{(3 + Cos[v])Cos[u], (3 + Cos[v])Sin[u], Sin[v]}, {u, 0,2Pi}, {v, 0,2Pi}	ParametricPlot3D[{ (3 + Cos[v]/Sqrt[1 − (Sin[v])²])Cos[u]/Sqrt[1 − (Sin[u])²], , (3+ Cos[v]/Sqrt[1 − (Sin[v])²])Sin[u]/Sqrt[1 − (Cos[u])²], Sin[v]/Sqrt[1 − (Cos[v])^2]}, {u, 0,2Pi}, {v, 0,2Pi}]
	



s = 0 ▲ **0,4** ▲ **0,7** ▲ **1** ▲ **ε = 0**

Fig.**2,d The conversion** or transfiguration of the **circular thorus** into a **square thorus,** both in form and in section

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The fundamental principles of the geometry are, according their topological dimmensions: the **corp** (3) the **line** (2) and the **point** (0)

The elementary principles of geometry are the point, the line, the space, the curve, the plane, geometrical figures (segment, triangle, square, rectangle, rhombus, the polygons, the polyhedrons, etc, the arcs, circle, ellipse, hyperbola, the scroll, the helix, etc) both in 2D and in 3D spaces.

With the fundamental geometrical elements are defined and built all the forms and geometrical structures of the objects:

- Discrete forms, or discontinueous, statical, directly, starting from a finite set (discrete) of points, statically bonded with lines and planes.
- Continueous forms, or dynamical, mechanical, starting from a single point and considerring it's motion, therefore the **time ,** and obtaining in this way continueous forms of curves, as trajectories of points or curves traces, in the plane (2D) or in the space (3D)

Consequently, one has considered, and still is considerring, the existence of two geometries: the geometry of discontinuum, or discrete geometry, and the geometry of the continuum.

As, both the objects limited by plane surfaces (cube, pyramid, prism), apparently discontinueous, as those limited by different kinds of of continueous surfaces (sphere, cone, cylinder) can be described with the same parametric equations, the first ones for numerical eccentricity **s = ± 1** and the last ones for s=0 , it results that in **SM** exists only one geometry, the geometry of the continuum.

In other words, the **SM** erases the boundaries between continueous and discontinueous, as **SM** erased the boundaries between **linear** and **nonlinear**, between **centric** and **eccentric**, between ideal/perfection and real, between circular and hyperbolic, between circular and elliptic, etc.

Between the values of numerical eccentricity of **s=0** and **s = ±1,** exists an infinity of values, and for each value, an infinity of geometrical objects, which, all of them, has the right to a geometrical existence.

If the geometrical mathematical objects for s ∈ [**0** V ±1] belongs to **the centric ordinary mathematics (CM)** (circle→ square, sphere→ cube, cylinder→ prism, etc), those for s ∈ (**0 ,** ±1) has forms, equations and denominations unknown in this **centric mathematics (CM)**

They belongs to the new mathematics, the **eccentric mathematics (EM)**, and, implicit, to the **supermathematics (SM)** which is a reunion of the two mathematics: **centric** and **eccentric**, that means **SM** = **MC** ∪ **ME**

By erasing the boundaries between centric and eccentric, the **SM** implicitly dissolved the boundaries between **linear** and **nonlinear**, the linear being the appanage of **CM** and the nonlinear of the **EM** one, and introduced a disjunction between the centric geometrical entities and the eccentric ones. By this way, all the entities of **centric mathematics** in 2 D was named **centrics** (circular centrics, square centrics, triangular centrics, elliptical centrics, hyperbolic centrics, etc) and those of **eccentyric mathematics** was named as **eccentrics** (circular eccentrics, elliptic eccentrics, hyperbolic eccentrics, parabolic eccentrics, spiral eccentrics, cycloid eccentrics, etc)

If the 2D **centric** entrities can remain to the actual denominations (circle, square, ellypse, spiral, etc) at the **eccentric** ones one have to specify also the teh denomination of **eccentrics**. The same thing is available for 3D entities: **the centric** ones (sphere, ellypsoid, cube, paraboloid, etc) can carry, further, the old denominations, and for the new ones, the **eccentric** ones, it is necessaary to specify that they are **eccentric**. That means: eccentric sphere, eccentric ellypsoid, eccentric cube, eccentric paraboloid, etc

With the new SM functions, like eccentric amplitude aex**θ** şi Aexα, of eccentric variable **θ** and, respectively, centric α, beta eccentric bex **θ** şi Bexα , radial eccentric rex and REX, eccentric derived dex **θ** and Dexα, etc, which having no equivalents in **centric / (CM)**, doesn't need other denominations for determining the mathematical domain where they belongs.

By way of exception are the last two **FSM-CE,** rex**α** şi dex**α**, (**θ = α**), to which ones are discovered, later, equivalents in **centrics**: the **centric radial** function **radα,** which is the direction fazor α and the **centric derived derα,** which is the direction fazor α + $\frac{\pi}{2}$, fazors reciprocal perpendiculars.

SUPERMATHEMATICAL HYBRIDIZATION AND METAMORPHOSIS THE CONSEQUENCES OF THE NEW SPACE DIMMENSIONS

The space is an abstract entity which reflects an objective form of matter's existance. It shows like a generalization and abstactization of the parameters assembly through which is achieved the **distinction between different systems** that forms a condition of the Universe.

It is an objective and universal form of matter's existency, inseparable from the matter, which has the aspect of a tri-dimmensional continuum and expresses the order of the real world's objects coexistance, their position, distance, size, form and extension.

In conclusion, one can say that the space appears like a synthesis, like a generalization and abstractization of the observations about a condition, in a certain moment, of the Universe.
Within the classical mechanics, the notion of space is that of the tridimmensional euclidian space (E3), homogenuos, isotropic, infinite.

When one discuss about the space, the first thought is dirrected to the position, that means the notion of position is dirrectly associated with that of the notion of space. The **position** is expressed in terms of a reference system, or shortly, by a coordinate system.

A tridimmensional object has in the E^3 6 variances, made of the 3 translations, on **X**, Y and Z directions and of the **3 rotations,** around the axis **X**, Y and Z, noted, respectively, by **θ, φ, ψ** in Mathematics and in Mechanics and with **A, B** and **C** in technology and in robotics.

An object can be "created", or more specifically, its image can be reproduced in the virtual space, when appears in the 3D space, on the display of a computer, by using some tecnical programs (CAD) or commercial mathematical programs (MATHEMATICA, MATLAB, MATHCAD, MAPLE, DERIVE, etc.), or special ones, which use **Eccentric-FSM, Elevated** and/or **Exotic -** for objects describing, as at **SM-CAD-CAM**.

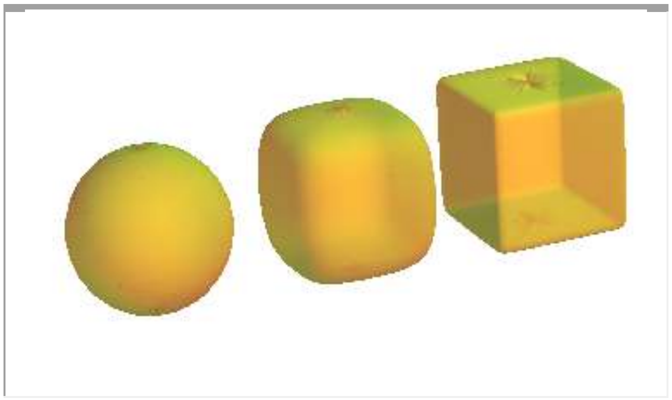
By modifying the eccentricity, the known and formed objects in the centric domain of the supermathematics (**SM**), that means, in centric mathematics (**MC**), can be deformed in the eccentric domain of the **SM,** therefore, in the eccentric mathematics (**ME**) and transformed, initially, in hybrid objects, proper to **ME**, and after that, to be re-transformed in other kind of objects, known in **MC.** As an example, by deforming a perfect **cone** (s = 0) into a **cono-pyramid** [**s** ∈ (0, 1)] with the base a perfect square and conical tip, which constitutes hybrid objects, placed between a cone and a pyramid, up to transforming it into a perfect **pyramid** (**s** = ± 1) with a perfect square base (Fig 3). In the fact, the object can be achieved by different machine works (see **Mircea Şelariu**, Cap.17 **Dispozitive de prelucrare**, PROIECTAREA DISPOZITIVELOR, EDP, Bucureşti, 1982, coordonator **Sanda-Vasii Roşculeţ**], by forming, (casting, syntering), deforming (at worm and cold), dislocation (cutting, chipping, erosion, grinding) and by aggregation (weldind and binding).

In both cases, **movements** of the tool and/or of the piece are needed, respectively, of the bright spot which delimitates a pixel on the screen and passes from a pixel to another.

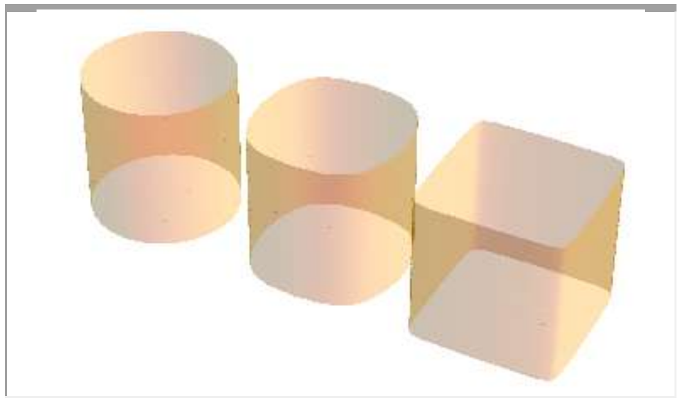
The movement is strongly linked to space and time.

The mechanical movement can be **of the:**

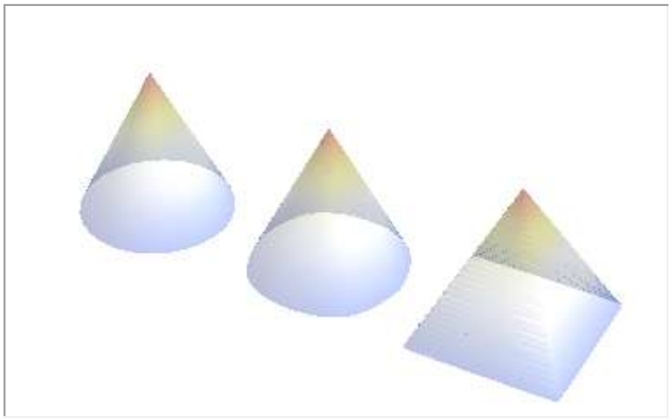
- corps, and implicit, objects **forming** in time ;
- objects **position changing** in time, or of its parts, named corps, in relation to other corps, chosen as referentials.
- corps **form changing** in time, and implicit, of the objects form, by **deforming** them.



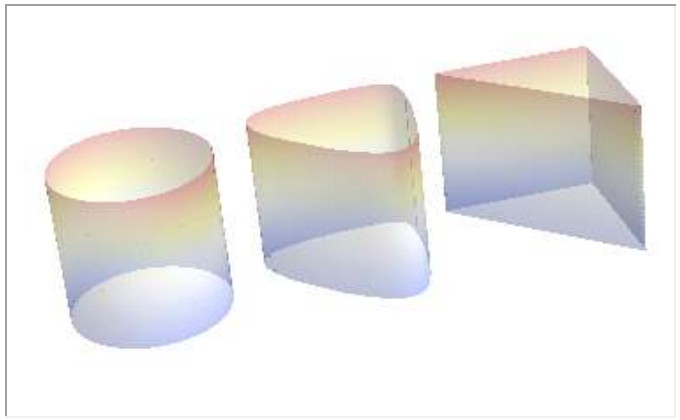
Transforming a sphere into a cube



Transforming a circular cylinder into a square cylinder



Transforming a cone into a pyramid



Transforming a a cylinder into a prism

Fig. 3 Metamorphosis of centric mathematical objects **or mathematical hybridation**

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The Space reflects the coexistance relationship between objects and events, or parts of them, by indicating:

- their **expansion**/bigness, named **gage dimmension**;
- the objects **position**, through **linear coordinates X, Y, Z,** in 3D space, named **localization dimmensions;**
- the objects **orientation,** in 3D space, through the **angular coordinates** ψ, φ, θ, or A, B, C, named **orientation dimmensions**.
- the relative posititions or distances between the objects, named positioning dimmensions, if reffers to the absolute and/or relative orientation and localization of the objects, and if it reffers to parts of them, named corps, then they are named **coordination dimmensions**;
- the form of the objects and, respectively, the phenomena evolution, named **forming dimmensions**, which defines, at the same time, the objects defining equations;
- the deformation of the objects and phenomena evolution changing, named **dimmensions deformation** or **eccentricities.**

- The last space dimmension, **eccentricity**, by making possible the apparition of **eccentric mathematics** (**EM**) and by making the pass through from centric mathematics domain to the eccentric mathematics one, as well as the leap from a single mathematical entity, existant in Mathematics and in the **centric** domain, to an infinity of entities, of same kind, but more and more deformed, once the numerical's eccentricity value s is growing, up to their transformation in other kind of objects, also existent in the centric domain. An example, became already classical, is the continueous deforming of a sphere until it is transformed into a cube (**Fig. 3**), by using the same **formation dimmensions** (parametric equations), both for the sphere and for the cube, by changing only the eccentricity: being **s** = **e** = 0 for the sphere of radius R and **s**= ± 1, or e = R, for the cube of leg L = 2R.
- For **s** ∈ [(-1, 1) \ 0] one obtain **hybrid objects** , proper for eccentric mathematics (**EM**), previously non-existant in mathematics, or, more specific, in Centric Mathematics (**CM**)
- As shown before, the **straight line** is an unidimmensional space, and, concurrently, in **Supermathematics (SM)**, **a bent** of zero eccentricity [8].

By increasing the eccentricity, from zero to one, it transforms the straight line into o broken line, both existing and known in **Centric Mathematics**, but not the rest of the bents, which are proper to **Eccentric** Mathematics, being generated by **FSM-CE** eccentric amplitude. In this way, the straight line with angular coefficient m = tanα = tan$\frac{\pi}{4}$ = 1 which pass through the point P(2, 3) has the equation

(1) $y - 3 = x - 2$,

and the bents family, from the same family with the straight line, has the equation

(2) $y\,[x, S(s, \varepsilon)] - y_0 = m\,\{aex\,[\theta, S(s, \varepsilon)] - x_0\}$,

(3) $y - y_0 = m\{\theta - \arcsin[s.\sin(\theta - \varepsilon)]\} - x_0$, $m = \tan\alpha$,

in eccentric coordinates θ and, in centric coordinates α, the equation is

(4) $y[x, S(s, \varepsilon)] - y_0 = m\,(Aex\,[\theta, S(s, \varepsilon)] - x_0)$,

(5) $y - y_0 = m\,\{\alpha + \arcsin\frac{s.\sin(\propto - \varepsilon)}{Rex\alpha} - x_0\}$, $m = \tan\alpha$,

(6) $y - y_0 = m\,\{\propto + arcsin\frac{s.\sin(\propto - \varepsilon)}{\sqrt{1+s^2-2s.\cos(\propto - \varepsilon)}} - x_0\}$.

- The difference, for the two types of bents, of θ and of α, is that the θ ones are continueous only for the numerical eccentricity from the domain s ∈ [-1, 1], while the α ones are continueous for all the values possible for s, it means s ∈ [-∞ , +∞].
- The broken line in known in Centric Mathematics (**CM**), but without knowing their equations! That in not the case anymore in **SM** and, obviously, in **EM** where it is obtained for the value **s** = 1 of the **numerical eccentricity s**.
- A similar phenomenon of mathematical metamorphosis, through which from **CM** a known object pass through the eccentric mathematics **(EM)** taking hybrid forms and returns in the centric mathematics **(CM) ,** as another type of object (**Fig.3**), is considerred to take place also in physics: from vacuum continuously appears particles and they return back into to vacuum. Are they the same or are they other ones?
- The cosmology has a theory which applies to the whole universe, enounced by Einstein in 1916: the General Relativity. It says that the gravitational force, which acts on the objects, acts also on the structure of space, which loses its rigid and immutable frame, becoming flexible and curved, depending of the contained matter or energy. In other words, **the space is deforming**.

  The space-time continuum, of general relativity, is not conceived without a content, so it not admits the vacuum! As Einstein said to the journalists that beg him to resume his theory: "Before, **one believed** that, if all the things would disappear from the Universe, the space and time will still be here, whatever. In the theory of general relativity, the time and space disappears, together with the disappearance of the other things from the Universe."

- As one said before, **s** = **e** = 0 is the world of CM, of the liniarity, of perfect, ideal entities, as long as the infinite possible values referable to the eccentrities **s** and **e**, give birth to **EM** and, at the same time, to worlds that belongs to to the reality, to the imperfect world, which are farther of the ideal world as s and e are farther from zero.
- What happens if **e** = s → 0 ? The real world, as **EM** too, disappears, and because an ideal world cannot exist, everything disappears!
- As shown in the author's theory from SUPERMATEMATICA. Fundamente, Vol. I, Editura POLITEHNICA, Timişoara, Cap. 1 INTRODUCERE [23], [24], the expansion of the Universe is a process of developing the order into absolute chaos , a progressive passing-through of the chaotic space in a more and more pronounced order.
- As a conclusion, the space, and also the time, is **forming and deforming**, it means that the space eccentricity, of a certain value, takes to a space **forming**, and than, by modifying it's value, the space **deforms**/modifies itself.
- The modified form of the the space is depending on the value of the eccentricity, which becomes o new space dimmension: the deformation dimmension.

Installing an object for machining in the working space of a modern machine tool, with computer numerical control (CNC) is very similar with "installing" a mathematical object in the R^3 tridimmensional euclidian space. Therefore, we will further use some notions from technological domain.

In technology, **installing** is the operation that precedes machining; only an installed object / piece can be machined. This involves the next phases or technological operations, in this sequence / order; only achieving one phase makes possible to pass to the next phase:

1. **ORIENTATION,** is the action or the operation where the object's geometrical elements, which are orientation technological referential bases, shortly, orientation bases **(OB),** accept a well determined direction, regarding to the directions of a referential. In technology, this is regarding to the main and/or secondary working movements, and/or regarding the directions of dimmensional arrangement movements of the technological system.

As **orientation bases (OB)** one can use:

a) A plane of the object, respectively a flat surface of the piece, if it exists; in that case, this surface, determined by three contact points between the object and the device, is named emplacement of orientation technological referential base (**EOB**), or shortly, emplacement base (**EB**), being theoretically determined by the three mutual contact points of the piece with the device, which has the task to achieve the piece installing on the working machine. As **EB**, virtually, the most extended surface of the piece is chosen, if other positioning restrictions are not imposed, or that one from where the resulting surface after machining has the highest imposed precision, or parallelism constraints with **EB**.

By imposing the condition of mutual piece/device contact on **EB**, the object/piece loses 3 degrees of freedom, among them, a translation on the direction, let's name it **Z**, perpendicular on **EB** (a plane) and two rotations: around the **X** axis, noted in technology with **A**, and around the **Y** axis, noted in technology with **B**.

The object/piece can also be rotated around the **Z** axis, totation noted with C and can be translated on **EB** on **X** and **Y** directions, by permanently keeping contact with **EB**.

From this surface is established, in technology, the **z** coordinate, by example, as a distance between **EOB** and the machining technological base **(MTB**), or shortly, machining base (**MB**), that means the plane generated on the piece by the machining tool. In a surface is totally machined (by milling, as example, with large milling machines, for a single passage), then the other coordinates y and x can be established with a very large approximation, because they did not influence the plane surface precision achievement, at **z** distance of **EB**, resulted after piece machining and named **MTP** or shortly, MP, whose technological demand is to be parallel to **EOB** and to be located at **z** distance from it.

The **z** dimmension, being, in this case, a **forming dimmension** of the piece, on the one hand and on the other hand also a **coordinating dimmension** for tool/piece relative position, and from technological point of view, one of the **dimmensional alignment dimmensions** of the technological system **MDPT** (**M**achine-**D**evice-**P**iece-**T**ool). Mathematically speaking, it's about two surfaces situated at **z** distance, it means parallel planes.

b) A straight line belonging to the object, if it exists, as axes on/or edges, as intersection of plane surfaces in Mathematics.

In Techology, the edges are avoided, because their irregularities, in other words because the deviations from semifabricates linear geometrical shape, ond of the pieces too, after machining their semifabricates.

In Technology, this straight line is determined by the two points from a piece surface, other than **EB,** common to the piece and the device, which achieve the piece and device orientation base, as heteronymous elements, a straight line named conducting orientation base (**COB**) or shortly, conducting base (**CB**), name derived from the fact that these two conducting elements, conducts/guides the movement of the object/piece for its localization, if the contact piece/device is permanently maintaned during the movement. In this way, the **CB** takes over two degrees of freedom of the object: the translation on a direction perpendicular on the straight line determined by the two contact points between piece/device that materializes **CB**, ytanslation on Y axis, as example, if **CB** is always parallel, with the **EB** from **XOY** pane, and the rotation around **Z** axis, noted in technology with C.

As **COB** is chosen, on principle, it's easy to understand why, by aiming the guiding precision, the longest surface of the piece, if other reasons are not imposed by the execution drawing.

From **COB** can be established/measured the level/dimmension y, parallel to **EOB** and perpendicular on **COB**, as example, perpendicular on **z**, because **COB** is parallel with **EOB**.

Therefore, if the two points belongs to a parallelipipedical object, so bounded by plane surfaces, and **COB** is parallel with **EOB**, by mainatinining the contact between piece/device on the two bases, by a translation movement, the piece can only be translated, in the device, on **X** direction, until it comes into collision with a **localization element.**

1) from this one, named localization element, namely **localization technological base** (**LTB**), or shortly, **localization base (LB)** can be established the **x** coordinate/dimmension perpendicular simultaneously on **y** and **z**. But without being coordinates/dimmensions/concurrent segments in a common point **O(x,y,z)** as in mathematics, only if **COB** and **LTB** drops to the level **EOB**, and, in addition, **LTB** moves toward **COB** and will be contained in it, both going to be contained in **EOB**, so the point **O(x, y,z),** as **LTB** will be a tip of the parallelipipedical piece, contained simultaneously in the **EOB** plane, the **CB** straight line in **LB** point, resulting, in this case, that **O(x,y,z) ≡ BL**

If the localization is achieved by a translation movement, as previously assumed, it is also named **translation localization (TL).**

If the localization is achieved through a rotational movement of the object, it is named **rotational localization (RL).** In this case, **CB** can be, or is, usually, a symmetry plane of the piece, by example a cylindric one, a plane named **semicentering orientation base (SCOB**), in the case of a semicentering, or an axis of a rotational surface (cylindrical or spherical) of the object, named **Centering orientation base (COB)**, around whom the object rotates antil another corp of the piece come into collision with the rotation localization element. Or, until a locator gets into a muzzle perpendicular on **COB** or into a channel parallel with **COB**.

The objects which did not bring out **elements/orientation bases**, like the sphere in mathematics or the balls for ball bearings in technology, as example, are non-orientational objects.

1. **LOCALIZATION,** is the operation or the action to establish the place, in E^3 tridimmensional euclidian space, of an O(x,y,z) point, characteristic for the object, which belongs to a orientating referential element

of this one, from whic one are established the coordinates/linear dimmensions x,y,z regarding a given referential system, or in technology, regarding the machining tool.

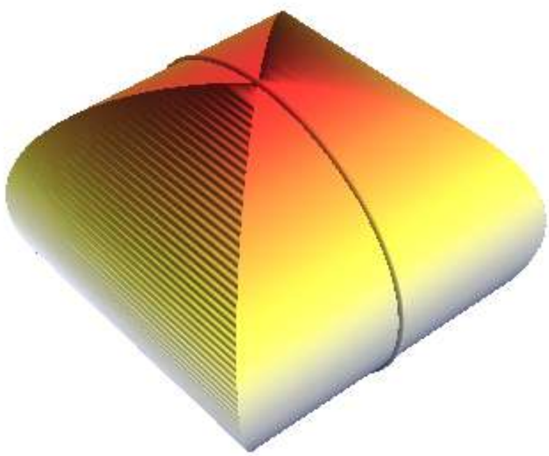
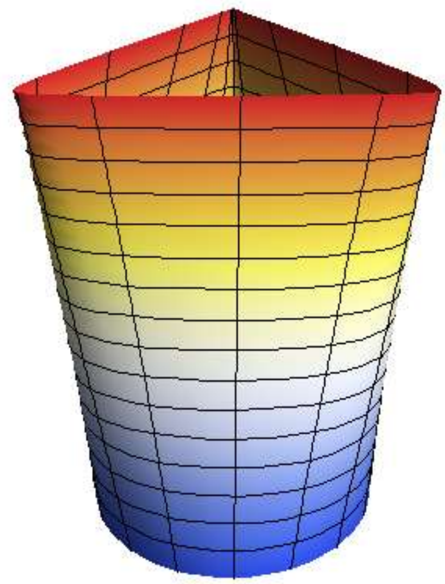
Conopyramid	Cylinder C/S
	
Spherocube	Cylinder C/T

Fig.4 Hybrid mathematical objects

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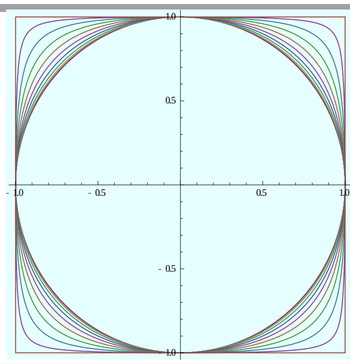
The **O(x,y,z)** point of the **non-orientational** objects is the symmetry center of them, and of the **orientational** objects, like the parallelipipedical ones, in Technology, as example, the **O(x,y,z)** point is disseminated in three distinctive points, for each coordinate apart, **Ox ⊂ LB** for **x** , **Oy ⊂ CB** for **y** şi **Oz ⊂ EB** for **z**, as explained before.

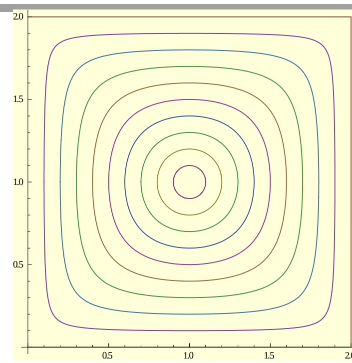
In the Technology, the succession orientation → localization is compulsory; only an oriented object can be then located. Beside this, as in mathematics. First, one chose a reference system unitive with the **O(x,y,z)** object, and after that, an invariant one **(O, X, Y, Z)** which one, initially, coincide with the other one, in 3D space or in the E^3 tridimmensional one, and then are operated various translation and/or rotation transformations.

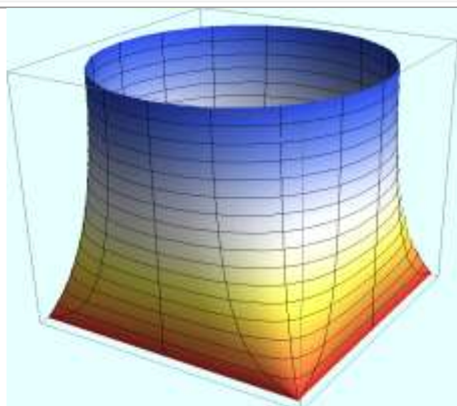
The union between orientation and localization represents the most important technological action/operation, named **pozitioning,** namely **orientation** ∪ **localization** = **pozitioning**

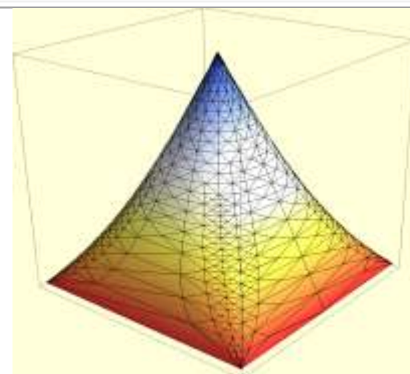
If the object **pozitioning** is achieved/ finished/ fulfilled, then the relative position piece/device can be maintained by the operation of **anchorage** of the piece in the device.

Further, one can establish the distances/dimmensions between the tool and the piece, so one can obtain the piece of dimmensions and precizions imposed by the piece work drawing . This technological operation is named **dimmensional adjustment**. With this, the installing process is finished, and the machining of the piece can be started





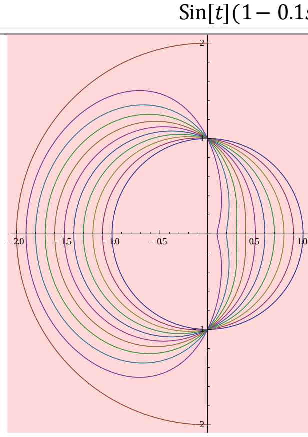


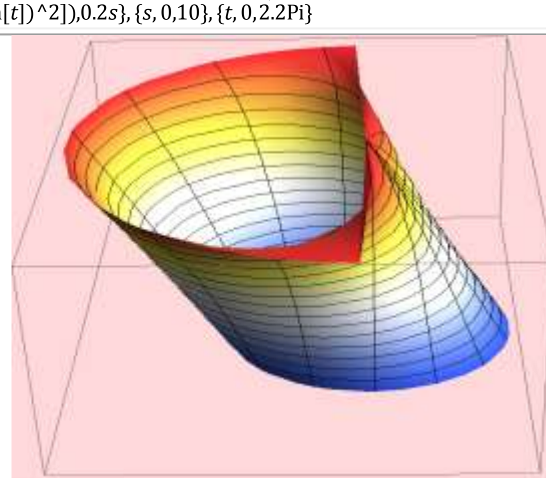


a) $\begin{cases} x = R.coq\theta \\ y = R.siq\theta \\ z = s \end{cases}$, R = u = 1

b) $\begin{cases} x = R.dex\theta \\ y = R.dex\left(\theta - \frac{\pi}{2}\right) \\ z = s \end{cases}$

ParametricPlot3D[{Cos[t](1 − 0.1s Cos[t]/Sqrt[1 − (0.1sSin[t])²]), Sin[t](1 − 0.1s Cos[t]/Sqrt[1 − (0.1sSin[t])^2]),0.2s},{s,0,10},{t,0,2.2Pi}]





c) $\begin{cases} x = R.dex\theta.cos\theta \\ y = R.dex\theta.sin\theta \\ z = s \end{cases}$, $R = 1$; s∈[0,1]

▲ TRANSFORMING THE CIRCLE **C**$_1$[O$_C$(0, 0), R = 1]] INTO THE SEMI-CIRCLE **SC [O$_{SC}$(-1, 0), R = 2]**

Fig.5 Connected hybrid mathematical objects

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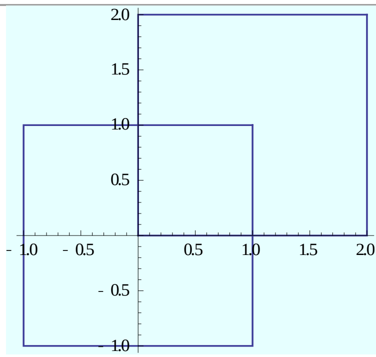
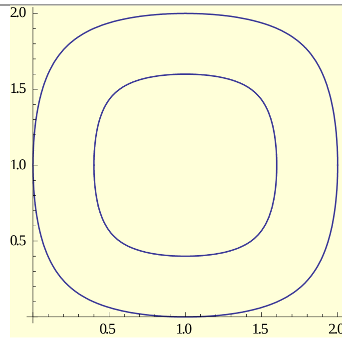
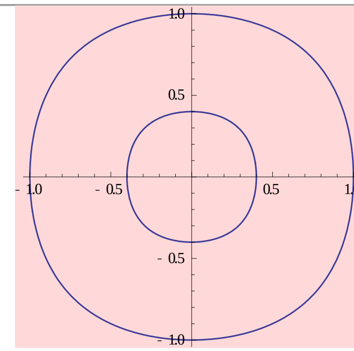
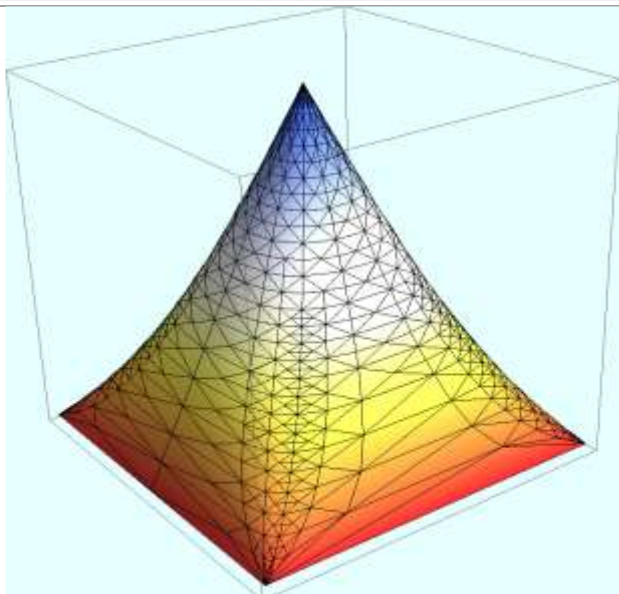
s = 1, $C_1 \neq C_2$	s = 0,8; $C_1 \equiv C_2$ (1,1)	s = 0,6 ; $C_1 \equiv C_2$ (0,0)

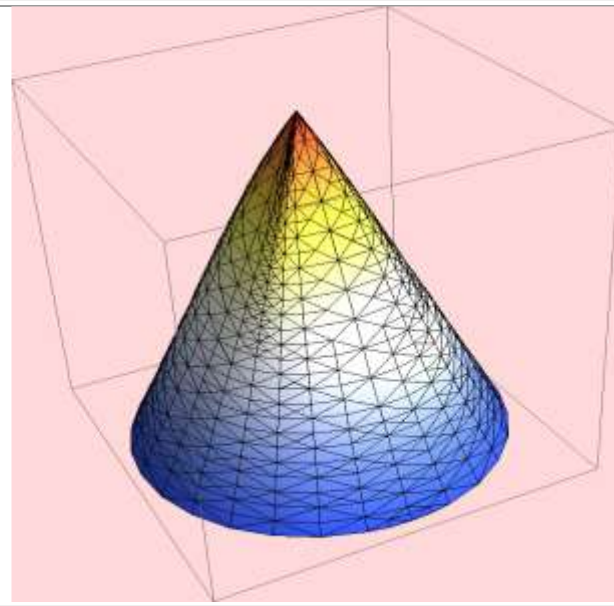






R = s – 1	R = 1– s





PYRAMIDO-CONE ◄ $\begin{cases} x = R.coq\theta \\ y = R.siq\theta, S(s\in[0,1]) \\ z = s \end{cases}$ ► **CONO-PYRAMID**

Fig.**6** The contrasts between **connected hybrid** mathematical objects

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Reductively, installing an object is an union of positioning with anchorage and dimmensional adjustment of the technological system, namely:

installing = pozitioning ∪ anchorage ∪ adjustment (dimmensional)

In Technology, **the adjustment** can be achieved by (fixing) **force** or by **form** (which blocks the piece displacement during the machining). In Mathematics, the anchorage is "achieved" by **convention.**

By telling that the **(O, x,y,z)** system is linked to the piece, it cannot move anymore relative to the piece, but only together with the object, so they are "bonded" each other. Therefore, in Mathematics, the anchorage of the elements relative to the reference systems, is a matter of course, it doesn't exist anymore, because in mathematics doesn't exist "mathematical forces". These belonging to the Mechanics, namely it's dynamics , also in mathematics doesn't exist machining tools, neither various coordinating dimmensions, dimmensional adjustments, dimmensional machining, etc.

Therefore, in Centric mathematics **(CM),** only 3 **x, y and z** linear dimmensions exists, which are, at the same time, forming dimmensions of the 3D objects, by their parametric equations, by example.

Reductively, in this Centric mathematics **(CM),** entities as straight line, the square, the circle, the sphere, the cube e.a., are uniques, while in the Eccentric Mathematics (**EM**), and implicit, in Supermathematics (**SM**), they are infinitely multiplied through **hybridation**, a hybridation possible by introducing of a new space dimmension, the **eccentricity**.

The supermathematical Hybridation can be defined as the mathematical process of **"cross-breeding"** of two mathematical entities from **CM** (the circle, and the square, the sphere and the cube, the cone and the pyramid) and obtaining of a supermathematical new entity in **EM**, which is unknown/non-existant in **CM** (by example: cono-pyramid).

Through **metamorphosis** one understand a continuous passing from from a certain entity, existing in **CM**, to another entity, also existing in CM, through an infinity of hybrid entities, appropriates only to **EM**. In other words, transforming a centric mathematical entity into another centric mathematical entity, an action that became possible inside the **Eccentric mathematics (EM)** , by using **supermathematical** functions.

By **metamorphosis** one obtain new entities, previously non-existant in **CM**, named **hybrid entities,** and also **eccentric** entities, or **supermathematical (SM)**, to differ the centric ones, also by name, because **by form**, they are essentially different.

The first object obtained through **mathematical hybridation** was the **cono-pyramid**: a supermathematical corp with the square base of a pyramid and the tip of a circular cone, resulting from the transformation of the unity square of L=2 into the unity circle of R=1 and/or viceversa (Fig. 4). The parametric equations of the cono-pyramid are obtained from the parametric equations of right circular cone, where the FCC are changed/converted with the correponding quadrilobe supermathematical functions **(FSM-Q).**

$$\begin{cases} x = u.coq\theta = u.\dfrac{cos\theta}{\sqrt{1-s^2.sin^2\theta}} \\ y = u.siq\theta = u.\dfrac{sin\theta}{\sqrt{1-s^2.cos^2\theta}}, \\ z = u \end{cases} \quad for \quad \begin{cases} u = 1-s, & s \in [0,\ 1] \blacktriangleright CONO-PIRAMID\breve{A} \\ u = s-1, & s \in [0,\ 1] \blacktriangleright PIRAMIDO-CON \\ u = 1; & s = 1 \blacktriangleright \text{PĂTRAT};\ \mathbf{L = 2} \\ u = 1; & s = 0 \blacktriangleright CERC;\ \boldsymbol{R = 1} \\ u = 1; & s \in [0,\ 1] \blacktriangleright \textbf{CILINDRU C/P} \end{cases}$$

(**Fig. 1, Fig. 3** şi **Fig. 5,a**), because **FSM-Q** can achieve the contiuous transformation of the circle into a square and viceversa, also as **FSM-CE** eccentric derivate **$dex_{1,2}\theta$**

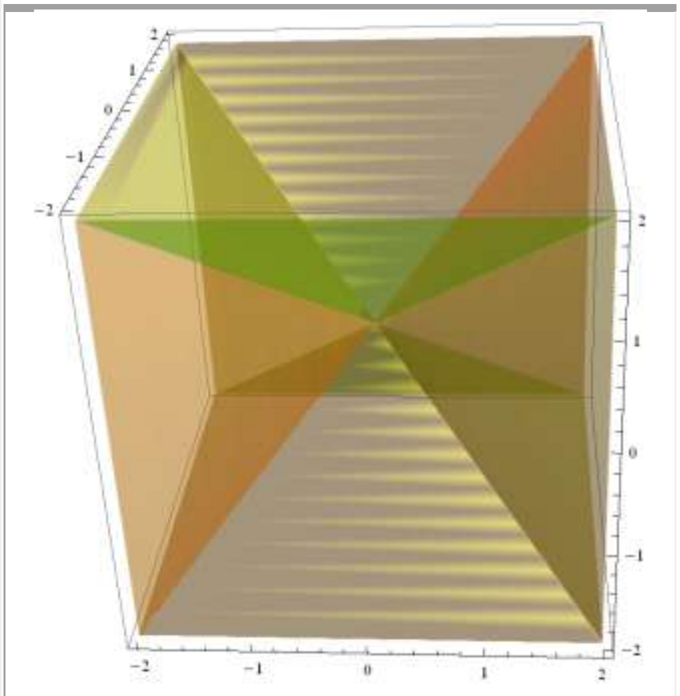
$$(7)\qquad \begin{cases} x = u.dex\theta = u[1-\dfrac{s.\cos(\theta-\varepsilon)}{\sqrt{1-s^2sin^2(\theta-\varepsilon)}}] \\ y = u.dex\left(\theta-\frac{\pi}{2}\right) = u[1-\dfrac{s.\cos\left(\theta-\varepsilon-\frac{\pi}{2}\right)}{\sqrt{1-s^2sin^2\left(\theta-\varepsilon-\frac{\pi}{2}\right)}}], \\ z = u \end{cases} pentru \begin{cases} u = 1;\ s = 0 \blacktriangleright CON \\ u = 1,\ s = 1 \blacktriangleright PIRAMID\breve{A} \\ u = s \in [0,\ 1] \blacktriangleright CONOPIRAMID\breve{A} \\ u = 1;\ s \in [0,\ 1] \blacktriangleright \text{Fig } \mathbf{5, c} \end{cases}$$

(**Fig. 4** şi **Fig. 5,b şi Fig. 5,c**).

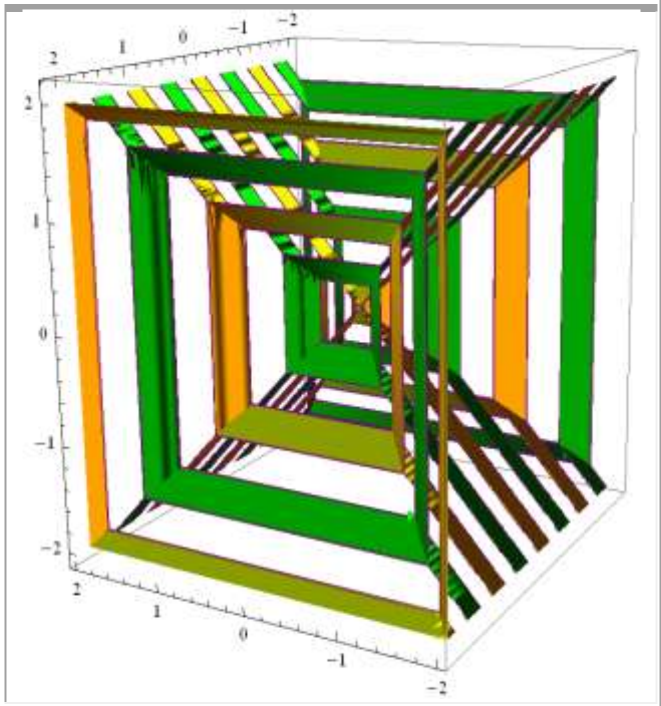
The relations (7) are expressed with the help of quadrilobes **FSM-Q,** introduced in Mathematics since 2005, in the work [19], quadrilobe cosine **coqθ** and quadrilobe sine **siqθ**.

The (7) and (8) equations express the same forms, but with following remarks:

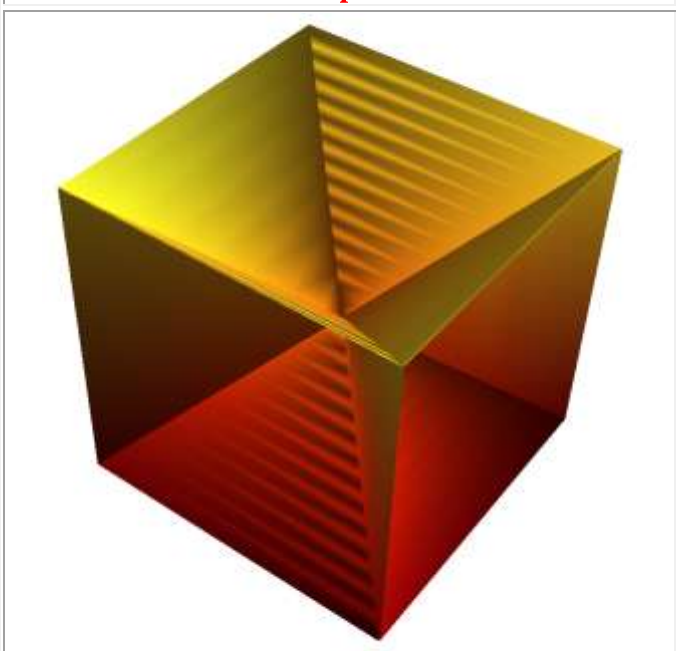
- Of a **circle** only for an eccenter S(s = 0, ε = 0), with the difference that the first one (7) has the radius R = 1, and the other one (8) has the radius R = 0, **Fig. 6**, up ▲;
- Of a **square** for an eccenter S (s = 1, ε = 0), of the same dimmensions L = 2R, as one can see in the figure **6**., but centered in different points; one is centered in the origin O(0, 0), the one expressed by the



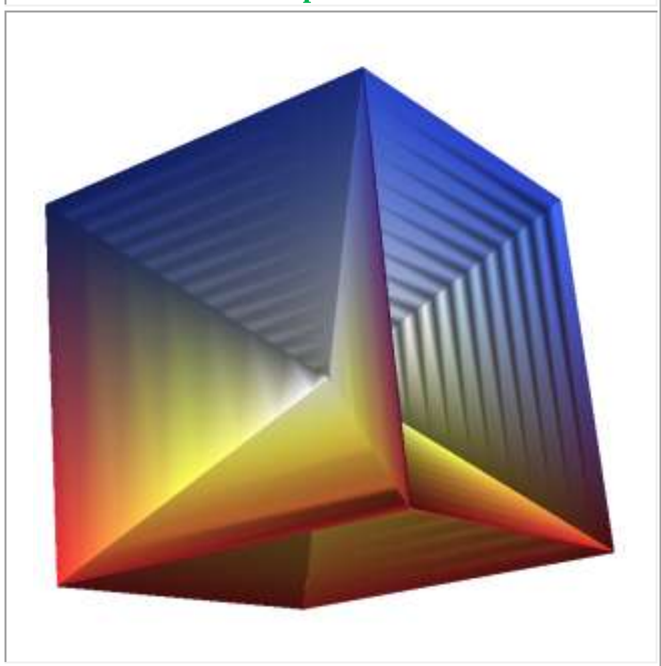
Semitransparent RC



Transparent RC



Opaque RC



Tricolor RC

Fig. 7 The ROMANIAN Cube (RC), the lightest cube in the world, of V = 0 volume

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- relations (7), and the other one is ex-centered, centered eccentrical relative to the origin O(0, 0)- in the point C(1,1);
- Of a **quadrilobe** (neither circle and neither square, namely an infinity of hybrid forms, between circle and square). For the same numarical eccentricity **s ∈ (0, 1)**, which caracterizes the **matematical excenter** (**ME**) domain, they has the same forms, but are of different dimmensions; the first one, having higher dimmensions then those expressed with dexθ function, what can be concluded also from the **figure 5,b** from 2D.

  One can see that the dimmension of the quadrilobes expressed by the relation (8) by dexθ decrease as eccentricity increase.

The romanian cube from the **Fig 7**, "**the lightest cube of the world**", is the cube with zero volume, obtained from 6 pyramids, without their square base surfaces, with the common tip in the cube's symmetry center.

In this case, the pyramid was expressed through the relations (7), by quadrilobe functions of s=1.

As a conclusion, **supermatematics** offer multiple possibilities to express different mathematical entities from **center mathematics (CM),** and, at the same time, an infinity of hybrid entities from the **eccentric mathematics (EM).**

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