

Open Letter to the Marketing, Corporate, Cultural and Scientific Communities (version 3E)

Sóstenes Lins, Ph. D.

Subject: giant mathematical sculptures in steel

1 What is this about?

Dear readers,

This is version 3E of my Open Letter. It differs from version 3D containing some more photos and various improvements in the text.

In the last nine months I have been trying, without success, to get in touch and to sensitize the business and cultural communities to call their attention towards a new kind of art, UNIVs, that emanates from my scientific work on 3D-Universes (mathematically, on 3-manifolds). I have been trying funding editals, “Speak to us” sections in the corporate pages, museums, cultural centers, etc. So far, I heard only silence from these institutions. These communities are very closed and refratary to new ideas, as I discovered the hard way. Therefore, I decide to use the Internet power in an attempt to change things. I do have something different to treat, to display and to propose, Facebook.



Figure 1: UNIV GreenSun, behind the Convention Center/UFPE, in Recife, PE, Brazil. It is enlarged to reach 35m high. The shape is an example of Giant Mathematical Sculptures, in inox steel that are induced by the author's theoretical mathematical work about 3D-Universes (3-manifolds), performed in the last 35 years. The 3D-Universe induced by the UNIV above is the connected sum of the 3D-projective space and the lens space $L_{3,1}$.

I would like you to send copies of this e-mail and its attachemnt to all your friends and lists of friends in the social networks you are attached. Indeed, I would like a viral expansion so that they reach the maximum number of persons, and so, statisticly reach some with the power to help on my cruzade of making the mathematical science more visible.

2 Profile

Mathematician, Ph.D. in Combinatorics and Optimization, Waterloo, Canada, 1980. Full Member of the Brazilian Academy of Science, honour granted in the 2001 election. Currently is Full Professor in the Centro de Informatica da UFPE. Research area in the confluence of the more important sub-areas of Mathematics: Topology, Geometry, Algebra, Graph Theory (Combinatorics), and above all, Algorithms (Computer Science).

Has more than 50 scientific articles published in renown international journals, including a Research Monography in the Annals of Mathematical Studies (numbered 134), published in 1994 by the Princeton University Press, in the famous Orange Series. This work has proven its importance and relevance because it has more than 450 citations (many in famous articles) in the last 20 years. This number grows consistently attesting the perenity of its content.

Here is a link to the Research Monography published by Princeton. is more cited and appreciated by the physicists, because of the original algorithms it contains to concretely compute the quantum invariants of 3D-Universes (subject initiated by the physicist E. Witten, which produced many Field Medals — equivalent to the Nobel Prize in Mathematics). E. Witten is considered by many as the sucessor of Einstein.

The author is one of the two brazilians who ever published in the Orange Series. Many of the greatest mathematicians of the twentieth century, like Kurt Godel and John von Neumann have works in the Orange Series.

Last year, 2013, he discovered applications of the above publication (which can be considered by the layman as useless and esoteric) to a surprising area: the visual arts, inducing beautiful Mathematical Sculptures, named *UNIVs*. UNIV is a shortcut for 3D-Universe, since an UNIV contains the information to create, by a deterministic algorithm, a 3D-Universe. Examples of UNIVs are in the links below, numbered 1 ... 12.

3 Objective

The objective is to look for partinership, orders and sponsorship to make this art fully realizable. It is problably the first practical application of 3D-Universes: generation of BEAUTY in the shape of Artistic Emanations of the seventh dimension. This 7, is the minimal real dimension, \mathbb{R}^7 , in which a topological space built as a finite arbitrary union of tetrahedra can be realized as an embedding. A 3D-Universe is a particular case of such space. An UNIV, or **Mathematical Sculpture** is like a tridimensional shadow of such embeddings. It is a high quality cultural, scientific and artistic material, which also happens to be new in the world.

The author developed and dominates the technology to produce, in polished inox steel, these sculptures. He is particularly interested in construct giant works. From his **assembly maps** (produced by a software named BLINK, conceived and implemented in his son's Lauro Lins 2007 doctor thesis, under his supervision), a competent artisan can build the UNIV in an error free way. Lauro is currently Senior Researcher (aos 36 anos) na AT&T, New York, and won for AT&T the Gold Prize for the Edison (the one of the lamp) Award 2014, last April 30 in California in the segment of Business Optimization.

A *blink* is simply a plane finite graph with each edge painted red or green. There exists a deterministic algorithm which, given a blink, produces an UNIV with the same 3D-Universe as the one induced by the blink. Here is L. Lins' thesis: Lauro Lins' Thesis.

Vejam as figuras finais contendo a classificação topológica de 3D-Universos, via BLINKs. See the final figures containing the topological classification of 3D-Universes, via blinks. The thesis is a "tour de force" in Software Engineering that conducted Lauro to AT&T.

The larger goal of the GemBlinks/UNIVs project is to promote Mathematics, which makes possible the existence of such beautiful sculptures. The unveil of this hidden beauty after 34 years of theoretical

research was very gratifying.

The discover in 2013 of the application of Pure Math to artistic objects that enchant and amaze of senses resembles the discovery in 1977 of the application of prime numbers (very Pure Math) to Criptography which became ubiquitously present in every bank transaction, particularly in the Internet. Few know this application because most mathematicians are not interested in propagandize the Mathematical feats. The author is not one of them. He loves Mathematics very much and because of this, he also want all to know its power.

The medium person is afraid of speak or write wrongly; he does not want to be called ignorant. However, strangely enough, he has some kind of proud in saying that he knows no Mathematics. That is, they declare themseves *innumerate*. This is unfair to Mathematics and harmful to society when the majority of its people thinks like this. By all these reasons, the author would like its pledge be taken not bureaucratically as it has, but with the respect that a serious scientist deserves.

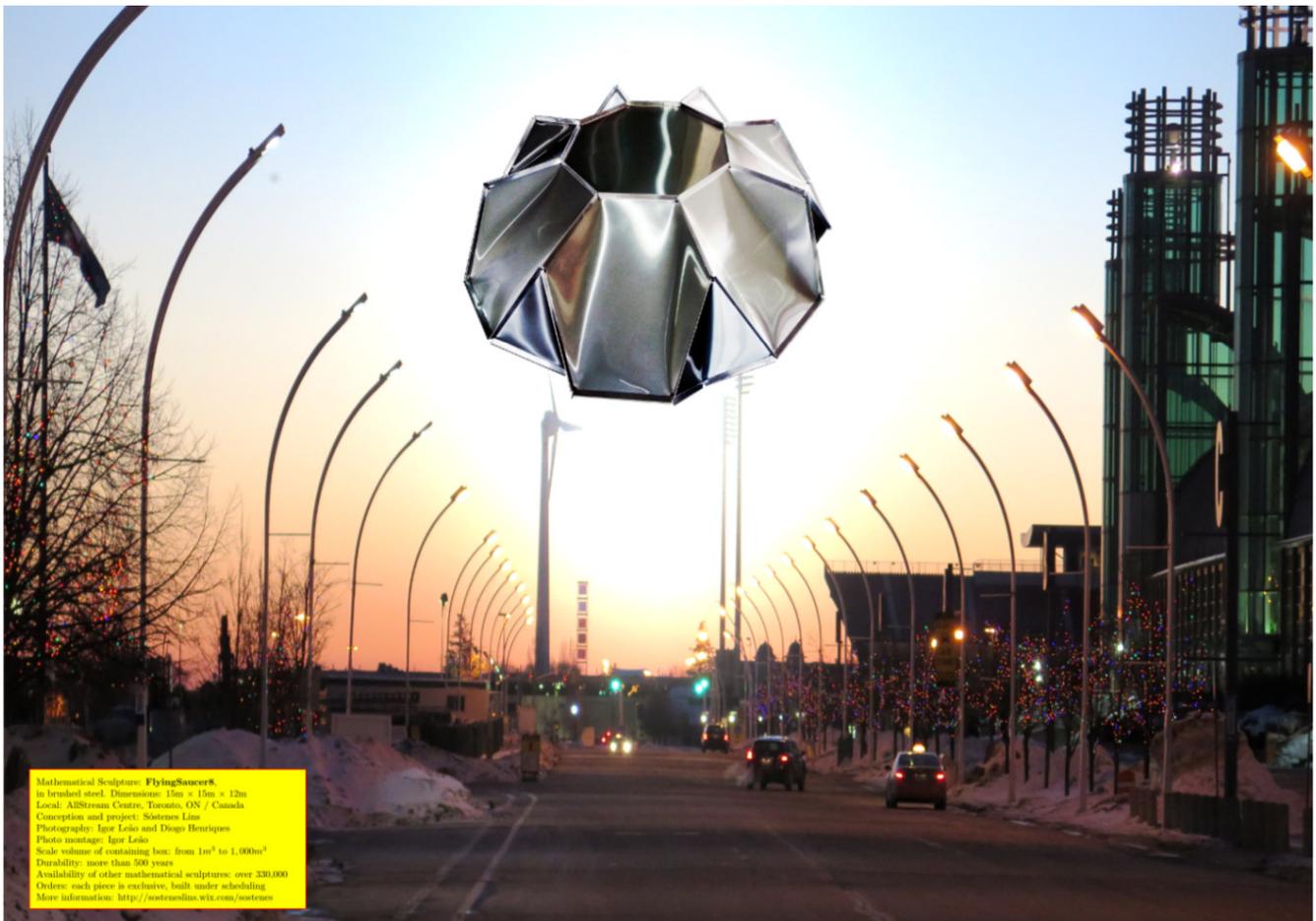


Figure 2: The UNIV *FlyingSaucer8*, positioned at the sunset in a street of Toronto, Canada. This UNIV is induced by a 3D-UNiverse discovered in 1981, which generalizes lens spaces. It is a polyhedron in brushed inox steel with curved faces, which produces dazzling luminous effects. It has 48 vértices, 72 edges, 8 square faces, 16 hexagonal faces and 2 octogonal faces.

4 Video from Rede Globo and Giant UNIVs

There is a video about UNIVs made by Rede Globo on May 29, 2014. The 3-minute video gives only a glympse of 35 years of resarch in a basic structure of nature: the shape of space! Here is the video (in Portuguese): Vídeo by Rede Globo.

There are links for other videos and photos of UNIVs in his web page, <http://sosteneslins.wix.com/sostenes>.

The text in the link below is an attempt to describe for the laymen from where these objects come from (from the Mathematics of 30-Universes!) Initially the text was witten for an Exposition about UNIVs starting on 30 September 2013. The local has transformed itself into the **Space Galery-Workshop GemBlinks**. It is a room at the entrance of the CCEN/UFPE library where practical

research is performed by using plastic models. It also supply labor force for the dozens tasks related with the constructions is steel. This space is open to public visitation. Here is the link for the explicative text: Sóstenes Lins's Web Page.

Below there are twelve selected links to giant sculptures. One of them puts (virtually) o UNIV "Green Sun" in the British Country Club, Recife.

- 1- UNIV SLinX at the entrance of the Physics Department / UFPE, Recife: SLinX, Física/UFPE.
- 2- UNIV TibetanTemplo in the gardens of Instituto Ricardo Brennand, Várzea/Recife. TibetanTemplo at Ricardo Brennand Institute/Recife.
- 3- UNIV flyingSaucer8 transmuted into an antigravitational capsule with the author as its pilot. The UNIVs GreenSun e SLinX appear brough magically from nowhere, below, at right. The Wooden Palace is real and is located near Moscow. The fantasy is a recurrent dream since childhood: smoothly flying by annyhilating gravity. A Child's Dream.
- 4- UNIV Lauro3 embedded in the swimming pool of the building the author lives. Lauro3 in the Swimming Pool.
- 5- UNIV GreenSun, virtually positioned in the British Country Club, Recife. GreenSun in Country Club.
- 6- UNIV GreenSun in a scale that measures 35m high, virtually positioned behind the Convention Center of UFPE, Recife. GreenSun Behind UFPE's Theater.
- 7- Detail of his fantasy-flight near the Wooden Palace in the surroundings of Moscow. FlyingSaucer8 Near Moscow.
- 8- UNIV Poincaré virtually positionned in an aquarium in a wall of the living room of his residence. Poincaré in an Aquarium.
- 9- UNIV TibetanTemplo in front of the Teatro Santa Isabel, Recife. TibetanTemplo, Republic Square, in Recife.
- 10- UNIV TibetanTemplo in the Center of Mark Zero, Recife, PE, Brazil. TibetanTemplo in Zero Mark, Recife.
- 11- UNIV Portal of Infinity in 1:1 scale, the beginning of the biggest sculpture in the world, profile and front. See more explanation below in the next Section. Below at right is the UNIV TibetanTemplo which is amalgamated with one more cube to become the UNIV FiveCubes, with a tetrahedral symmetry. The Portal of Infinite is a ring with 6 FiveCubes. It resembles a bezene molecule. UNIV Portal do Infinito, in Front of UFPE Theater.
- 12- UNIV Meteorite75432. This is the biggest UNIV produced in inox steel. Currently it is exposed in the Entrance of Reitoria/UFPE, Recife, PE, Brazil. This UNIV is special because it seems to have the largest volume among more than 300,000 UNIVs in our data basis. This set of UNIVs was used to close the topological classification of the 3D-Universes induced by blinks up to 9 edges contained in Lauro's Thesis. UNIV Meteorite75432 at UFPE's Reitoria.

OBS. The UNIVs are real, constructed in inox stell. They are, in principle, viable to produce in any scale including in the huge scales displayed.

In his web page, Sóstenes Lins' Web Page, there are links to various videos, which he avoids directly linking to shorten this text already lengthy.

5 The world's biggest and dazzling beautiful steel sculpture

In May, 2014 he enabled, in practice, the possibility of construction of a family of arbrtrarily large, dazzling beautiful steel sculptures ever produced, baptized UNIVs INFINITES.

They are based in incremental sculptures made solely of regular quadrilaterals, hexagons and octagons. The first step is an sculpture named *Portal of Infinite*, linked and shown below: Portal do Infinito.

It is a ring of 6 FiveCubes to be constructed in polished inox steel with almost 4m of diameter. The above photo is a model (enlarged to the true size). By indefinitely attaching handles this UNIV becomes assymptotically the universal recovering of the GEM r_2^{24} discovered in 1980. This GEM is the superatrator for the tridimensional toro $S^1 \times S^1 \times S^1$, fact proved in 1988.

What enables the periodicity was the discovery of a substructure baptized *octaloid*. An octaloid is composed by six octogons adequately welded forming a topological 2-spher with four hexagonal holes. The octaloids are the white pieces of the above model.



Figure 3: UNIV Portal of Infinite, to be made in polished inox steel, profile and front, already enlarged 4.3 times. This sculpture can grow indefinitely by attaching handles, increasing the genus of the defining surface. It is a surface of genus 1: we have 36 square faces, 18 hexagonal faces and 36 octagonal faces, a total of 90 faces. It has 180 vertices and 270 edges.

Thanks to the octoloids and their tetrahedral symmetry deformable into an octahedral symmetry, the PORTAL DO INFINITO can be indefinitely enlarged by curved handles formed by four octaloids, each handle with about 2.8 m. After about 100 addition the piece becomes larger than each steel sculpture in the world.

There is a superstage in this construction, the UNIV named *CENTER OF INFINITE*, whose plastic model is also ready, see below.



Figure 4: UNIV Center of Infinite, to be made in polished inox steel and enlarged 4.3 times. This sculpture is a *voxel* in the sense that copies of its convex closure completely fill the 3D-space. It forms a surface of genus 13. It has 600 vertices, 900 edges and 324 faces. Of these 72 are square, 108 are hexagonal and 144 are octagonal faces. The art-work uses 2700 male-female revits.

UNIV Center of Infinite. The actual height of the Center of Infinite, to be built in polished inox steel, exceeds 5m. Copies of this Center occupies completely our 3D-space.

Depending on which superstages are constructed the resulting sculpture can simulate any form, because the centers play a role of *voxels*, that is, tridimensional pixels.



Figure 5: Plastic models of UNIVs *Meteorite 437*, *Portal of Infinite* and *Centro of Infinite*, to be made in polished inox steel augmented 4.3 times. The last sculpture is a *voxel*, that is, copies of its convex closure fills completely our 3D-Universe. The Meteorite has been already made in polished inox steel, see picture below.



Figure 6: UNIV *Meteorite 437*, giving an idea of the giant scale to be used in producing the Portal and the Center of Infinite.

The asymptotic sculpture INFINITE was partially inspired by a 1952 lithography of M. C. Escher, *Cubic Space Division*, available in the internet, Escher's Lithography. An important difference is that the role of the cubes in Escher's is replaced by truncated octahedra and the bars forming the edges by topological cylinders formed by 3 hexagons, proportionally much shorter. With these replacements the resulting structure is much more dense with the volume of empty space substantially diminished. The visual effect of any PARTIAL INFINITE sculpture will be dazzling. Asymptotically it is formed only by regular hexagons and octagons. The square will be lost, if there are infinite handles.

A PARTIAL INFINITE sculpture will be, as the American Richard Serra, considered these days as the greatest steel sculptor in the world, **impossible of being photographed**. So we can create a family of artistic pieces each unique and indivisible, great impulsive tourism, because to see it in its totality one has to visit it.

These developments were possible with the **discovery of the octaloid**, in May 2014, proportioning to him great and perennial pleasure. The symmetry properties of the octaloid guarantees the impossibility with a mathematical certainty: the sculpture will be simply too big and no photo can unveil all its beauty.

The incremental process can take years, but is entirely feasible in practice. He estimates the cost of the of the Portal of Infinite to be about US\$ 20,000 and the one of each increment of about US\$13,000. We need six increments to reach the first voxel, in the shape of the Center of Infinite. He needs to call the attention of people with financial power which are DARING and VISIONARY. In his field of expertise he is daring and visionary: **these feelings, he believes, are what makes life worth to live!**

It would be fantastic, as tribute to Mathematics, if in about ten years a city, which supports the initiative, could be proud of possess **the biggest steel sculpture in the world, with dazzling beauty**. In his city, Recife, Brazil he even suggest a place to put the sculpture: the garden in front of the Convention Center of UFPE (the same scenario of the first two photos of this document).

On the contrary of another monumental works the result would be always available to be seen: starting with the Portal of Infinite (which is a finished job), the sculpture evolves with small increments being always exposed to the public, except for a few hours to receive an increment. At each such increment the UNIV becomes more beautiful. Finally note that the durability of good quality inox steel is know to be of milleniums: **it would be a work lasting forever!**

6 Conclusion

The author hopes, with this e-mail, to reach and sensibelize the Corporate World, Museums, Cultural Parks, etc, to finantially support the Project GemBlinks/UNIVs. The Mathematics say thanks because the initiative will increase its visibility for the laymen, diminishing the innumeracy. He dreams that his cruzade will help his countrymen to see this science with the respect and admiration.

Do not think that there are exaggeration in the above ideas. Everything is supported by a solid and mature Mathematics. It is the fruit of a life devoted to the Matehematical Science (theory and practice) and the legacy he dreams to leave for posterity.

7 Contacts and Lectures

Visits to his Atelier in Ed. Engenho do Prata, where most of the collection of UNIVs are permanently exposed, could be scheduled by e-mail: sostenes.lins@gmail.com. The atelier address is Rua Irmã Lúcia 112/401, 52070-030

Invitation for lectures for tecnicl and scientific explanation to clarify doubts about the UNIVs and their construction on polished inox steel are welcome. These lectures could be ministrated to the marketing department or to the directory of any corporation, in Brazil or in the world. These personal contacts are possible once he has all the expenses paid and a pro-labore of US\$ 1,000 for day spent in the event. Last but not least: giant steel made UNIVs are a wonderful media to anounce products and institutions. He thanks each one of you in advance and awaits feedback with consequences of this e-mail.

Sincerely yours, Sóstenes Lins Ph. D., Professor Titular
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