U I R A

o r b i t a l o l y m p i c v i l l a g e

e m a n u e l d i m a s d e m e l o p i m e n t a

title: **UIRA - Orbital Olympic Village**
author: Emanuel Dimas de Melo Pimenta

year: 20112
Architecture, space architecture, contemporary art, visual art, philosophy, technology

www.emanuelpimenta.net
www.Emanuelpimenta.net/uira.html

ISBN-13: 978-1478227496
ISBN-10: 1478227494

cover © Emanuel Dimas de Melo Pimenta

Disclaimer: all images in this book, when they are not prepared by the author, are present with the sole and exclusive educational function, with a historical and technical framework, aiming only and exclusively to enable the reader's knowledge when the subject is not evident or of broad public knowledge. Thus, all these images, including those developed by the author of this work, are copyrighted, when not in the public domain. All the images have reference source and the name of the author, when it is the case of it.

to everyone who loves freedom

in memory of

Eduardo Kneese de Mello
Roti Nielba Turin
Eduardo Corona
Maurício Nogueira Lima

four cardinal points to a new universe

The human being that will appear could only be a human being of becoming, and the human being of becoming cannot arise if he is not connected to others at the very moment of his action.

Or, today everything happens as if the great extension of our technical resources, where informatic explosion undoubtedly is the most spectacular, is accompanied by simultaneous, albeit quietly, aspiration to recover the original link. Not just adding something to what did not exist yet, but reactivating the creative instance that our ancestors started deploying in prehistorical caves to be in contact with earth through an almost magical or mystical operation of participation, and to which we were called to continue.

Over many centuries, it is through representation, in its broadest sense, that the content-support par excellence was manifested, with its own logic and coherence. Today, it no longer appears as a primitive data, but yes as a historical phenomenon, produced by a certain type of civilization based on the stability of the territory and on the stability of socio-cultural institutions.

With the technological explosion of our time it is the very model of representation that explodes. The space breaks with the traditional geometries to win, in the turns of fractals, the emergence of the unlimited. Time is freed from chronology to spread out, like a new big bang, in the turbulence of the immeasurable.

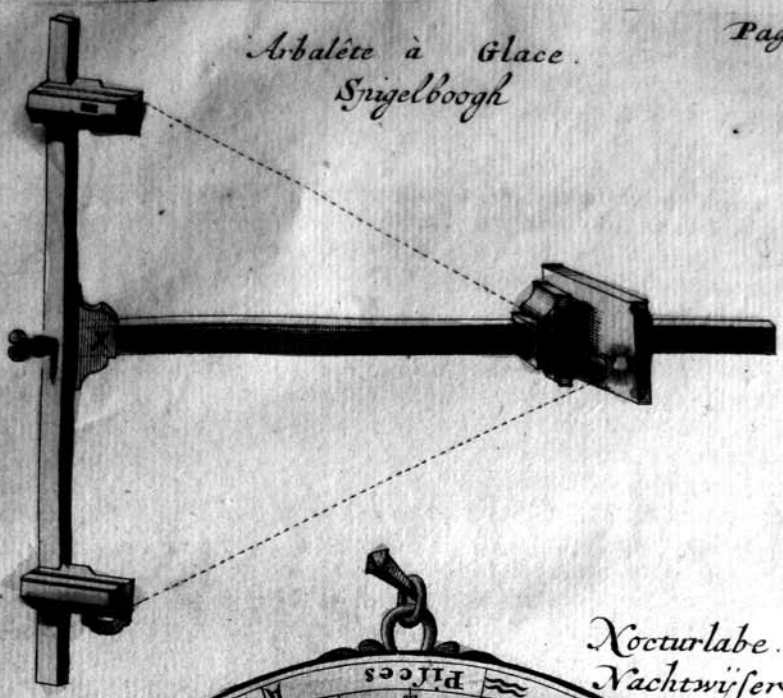
Slave for too long of greed and exploitation, earth recovers Gaia's and mother-goddesses' fertility.

A new stage of evolution is underway. Mirror, memory and history have been linked over the centuries.

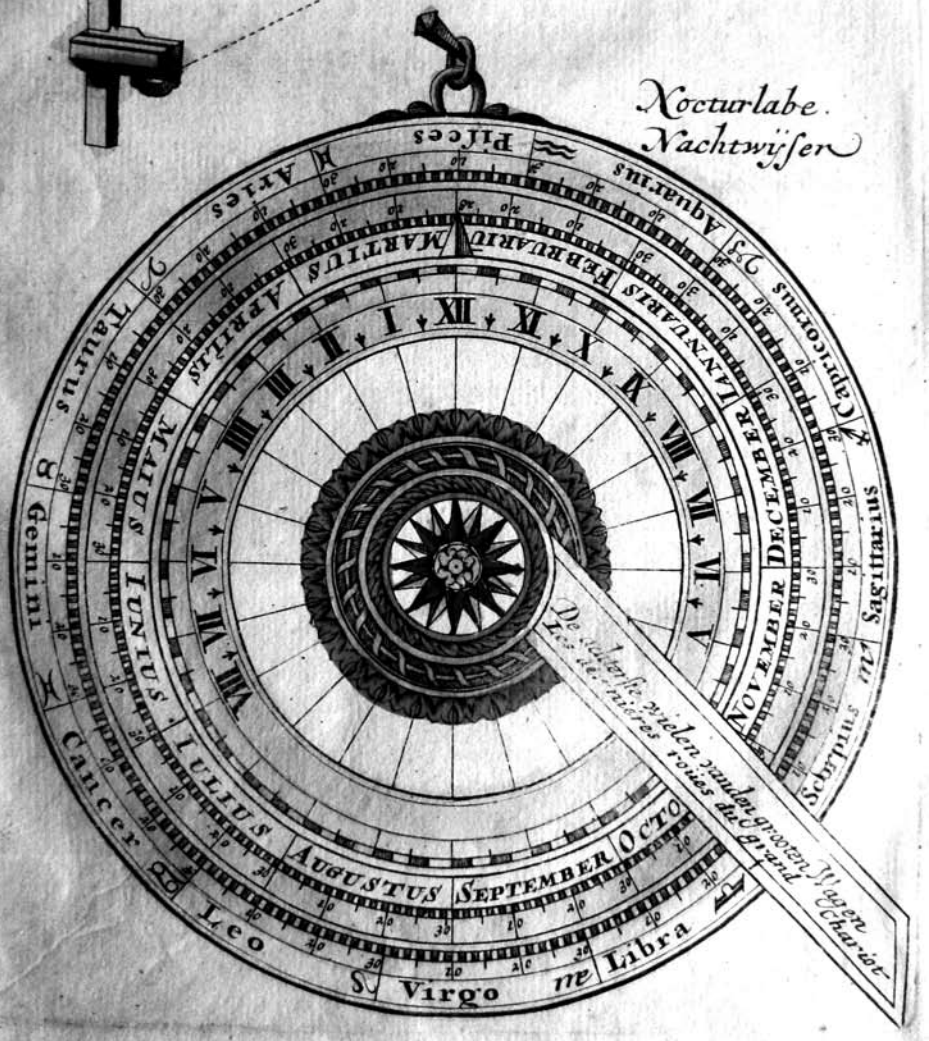
René Berger
Cybercarnets
2000

Nicolas Aubin, 1702. Private collection.

Arbalête à Glace.
Spigelboogh



Nocturlabe.
Nachtwijser



It is good to renew one's wonder, said the philosopher. Space travel has again made children of us all.

Ray Bradbury

To confine our attention to terrestrial matters would be to limit the human spirit.

Stephen Hawking

For the wise man looks into space and he knows there is no limited dimensions.

Lao-Tzu

all thanks to
Bruno Padovano and to Durval de Noronha Goyos

Towards a new Olympic Movement - now in space!

The brilliant Brazilian colleague Emanuel Dimas de Melo Pimenta, architect, urban designer and intermedia artist, cheers us with yet another impressive creation: an Orbital Olympic Village!

And, in addition to this, with a beautiful Indian name that seems to pay homage to his great-great-grandmother, native of the Brazilian forests, Bartira: UIRA, bird in Tupi.

In this precious book we can learn about the astonishing creation of UIRA, due to the fact that, although not focusing on construction details, Emanuel literally designs the spatial relations of the Village in ambitious proportions, which would allow for physical exercises and competitions at four hundred miles in space around Earth, in an orbital ship that would accompany the terrestrial orbit of KAIROS, his orbital station for eminently touristy use, previously proposed.

His investigations in outer space for a new possibility for Architecture (as art and technology) continue, therefore, allowing it to participate finally on the research that up to now have followed a more engineering and military axis, with the exciting however troublesome results that we acknowledge: Earth expanding outwards into space, the first manned flights, the conquest of the Moon, the first unmanned interplanetary missions, satellites and advanced telecommunication systems, new visions of the Universe from space telescopes, spacecrafts traveling towards the most distant planets in the Solar System and now, a growing layer of untreated space garbage, insustainability launched into space...

Human inventiveness and audacity don't seem to show limits even if, as the Universe is revealed to us - in view of our increasingly curious and penetration vision - in its awe-inspiring dimension, it seems to be challenging Humanity to advance progressively bolder steps in the search for its many mysteries and the one, amongst these, which troubles us the most: of its own creation.

As his research partner at USP, more specifically at its NUTAU - Nucleus of Research on Technology of Architecture and Urbanism, I can only celebrate the magnificence appearance of UIRA and wish Emanuel a new and successful space odyssey, towards his major desire: that his creation may, in some way, help humanity to meet the path for longstanding peace between the nations and people of our beloved planet Earth, the only one at our disposal as yet.

In this Brazil that will shortly house the 31st edition of the modern Olympic Games, initiated by the Baron of Coubertin in Athens in 1896, this ingenious project of enchanting creativity by Emanuel lifts off at an opportune moment, inspiring the Brazilian nation to look towards space, to reach a way beyond its many difficulties and backwardness, as a form of gaining courage to face and solve them, with sensitivity and intelligence.

I hope UIRA will inspire Brazilians to make the most defensible Games on the planet, the most peaceful, happy and affectionate of the entire history of the Olympic Movement. And inspire them to look more at the space, extending to a higher field of Architecture the same dream that one of his most illustrious sons, Santos Dumont, fed and held in the early years of last century: the rise of the spirit, beyond matter...

Congratulations Emanuel, for taking us back to the dream, a little more than a century after your most illustrious predecessor and compatriot have been the first human being to take off on an airplane!

Bruno Roberto Padovano
Associated Professor, FAU/USP - Faculty of Architecture and Urbanism
at the University of São Paulo
Scientific Coordinator, NUTAU/USP

U I R A

If there is to be peace in the world, There must be peace in the nations.
If there is to be peace in the nations, There must be peace in the cities.
If there is to be peace in the cities, There must be peace between neighbors.
If there is to be peace between neighbors, There must be peace in the home.
If there is to be peace in the home, There must be peace in the heart.

Lao Tzu (570-490 B.C.)

Early 2012. I was with a good and old friend in São Paulo: Durval de Noronha Goyos. We had had lunch in one of the excellent restaurants in town. It was an Italian restaurant. Not only one of the most brilliant lawyers and jurists around the world, Durval de Noronha also is a humanist and a great expert on *risotto*. He is arbitrate of the WTO World Trade Organization, was one of the designers of the legal structure of Mercosul, and has offices around the world. But he equally is passionate on philology, social issues and a great defender of individual liberties and human rights. The first time we met was more than twenty years ago, in the end of the 1980s, in Lisbon, when I still was living there.

I told him about the project *Kairos* - an architectural design for a building in Earth orbit. I also told him a little about the history of spacecrafts, how until then everything seemed to have always been strictly related to the cylindrical shape, the figure of the missile - as I explain in my book *Kairos: A Bird Orbiting Planet Earth*.

We talked at length about the impact that such a leap would represent to Humanity - a true civilizational metamorphosis. I told him about the amazing works by Buckminster Fuller and Paolo Soleri. Then, it appeared the idea of proposing that building as an essential element of the Olympic Games. But no! The best and most interesting would be to design a new building, specially created for the Olympic Games and open to other architects as well as to experts from various fields. Thus *UIRA* was born, name that means “bird” in Tupi Guarani.

Tupi is the language that dominated Brazil when Portuguese arrived in 1500.

I had just arrived from the Faculty of Architecture and Urbanism at the USP University of São Paulo, and more specifically, from NUTAU Technology Research Center of that Faculty, where I was with another dear friend - the architect Bruno Padovano.

All ideas immediately fell into place.

One never knows what will happen to an idea, to a project. But, I always have in mind what Leonardo da Vinci said: *once you have tasted flight, you will forever walk the earth with your eyes turned skyward, for there you have been, and there you will always long to return*.

Bruno Padovano is a rare person. His energy, light and culture are absolutely contagious. Much of the success of the first course for space architecture in Brazil, at the Faculty of Architecture and Urbanism of the University of São Paulo, is due to him. With great culture, MA at Harvard, and PhD at USP, Bruno immediately understood the civilizational impact represented by the space architecture. He immediately supported the project *Kairos*, and also *UIRA*, which also owes him, his volcanic generosity, its beginning - so, he also is one of the fathers of this project.

Here in this little book, we have just the theoretical element, the first studies, something to be explored further and developed, and perhaps one day be built.

Emanuel Dimas de Melo Pimenta
Paris 2012

Either war is obsolete or men are.

R. Buckminster Fuller

Peace is always beautiful.

Walt Whitman Leaves of Grass

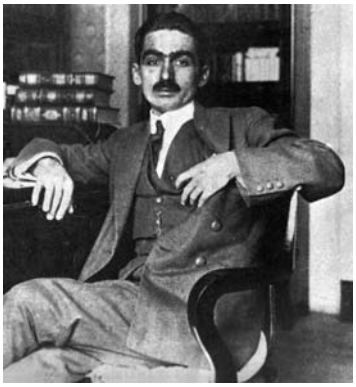
All we are saying is: give peace a chance.
John Lennon

Perhaps the deeper memory I have of the Olympic Games is the figure of Mark Spitz in the 1968 Olympics in Mexico. Peter Milko, who would become famous environmentalist, was my neighbor in São Paulo, Brazil. We were more than friends, brothers. In his bedroom, above the upright piano, it was a large poster with the photograph of Spitz, which quickly became our hero.

We followed the competitions of the great swimmer on the radio. In the next Olympics, Mark Spitz won many more medals. But his first two in that year were those that most marked me.

Then I was eleven years old and Mark Spitz was eighteen. Only seven years separated us. We were of the same nationality and we were in the same *place*, because we participated in the same planet.

It was in that moment, in 1968, when I actually understood the global dimension of the Olympic Games.



Monteiro Lobato, circa 1920, unknown photographer.

Only much later I would dive into the roots of those magical games, to understand that they had been created almost three thousand years earlier, in 776 BC in Olympia, ancient Greece.

At the time of its creation they were games that joined several city-states and what amazed me most was to know that wars were prohibited during its period of activity.

I do not know well why, but together with these mental images, through mysterious ways, immediately, the figure of Monteiro Lobato emerges in my mind - brilliant writer, not just for kids, unfortunately still unknown in great part of the world.

Monteiro Lobato told, in his charming book *History of the World for Kids*, written in 1933, that the Olympic Games "had enormous significance for the Greeks. The importance was such, that if by chance the countries were in war by the time of the games, the fights were interrupted. Only after the games had ended war could continue".

Generally, the games - which lasted only five days - had a four-year interval, which soon became known as the measure of one *olympic*.

The Olympic torch already existed and the winners were crowned with laurels.

Baron Pierre de Coubertin, in 1915.

Besides sport competitions, quickly, the Olympic Games also revealed themselves as moments of meetings for business and political negotiations.

Soon, everything that was related to culture also found in the Olympic Games a formidable field of interaction. Finally, the Games have emerged as a meeting point of many enlightened faces of the human being. Thus, exhibitions of sculptures or even music or poetry meetings were common in the games.

At their beginning, they were strongly characterized by religion - where each athlete, poet or artist was *relinked*, in some way, to Nature. The overcoming of the limits established by the human body designated the boundaries with the gods.

After more than one thousand years of games, Theodosius I - the last emperor before the Roman Empire was split between East and West - eliminated the Olympics in the year 394, in order to definitively establish Christianity as the only religion, dominating the State.

After a long period of silence, more than fourteen hundred years later, the Olympic Games reappeared in Paris, initially with the French Revolution.

Only in 1894, Pierre de Frédy or Baron de Coubertin, would found the Olympic Games as we know them.

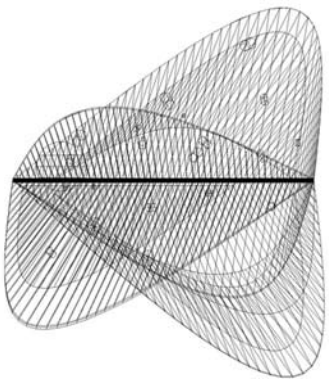
Illustrating his ideas about the Games, Pierre de Coubertin said “Wars break out because nations misunderstand each other. We shall no have peace until the prejudices which now separate the different races shall have been outlived. To attain this end, what better means than to bring the youth of all countries periodically together for amicable trials of muscular strength and agility?”.

Since then, gradually, the Olympics became an international event of great importance. More than that, it rapidly expanded on a global scale through the interactive hypercommunication universe of twentieth and twenty-first centuries.

The importance of the Olympic Games is increasingly critical, especially in a world that seems to be always imminently condemned to a fracture with incalculable consequences.

This importance would be present not only in the model that the Olympic Games have known after the French Revolution and, more especially after Baron de Coubertin’s invention.

Quite certainly, the greatest value will be in the rediscovery and recovery of its original design in the ancient world, establishing a dynamic and open dialogue between different nations, not only in terms of athletes, but also in terms of aesthetes.



Kairos, aerial view of one module, 2011.

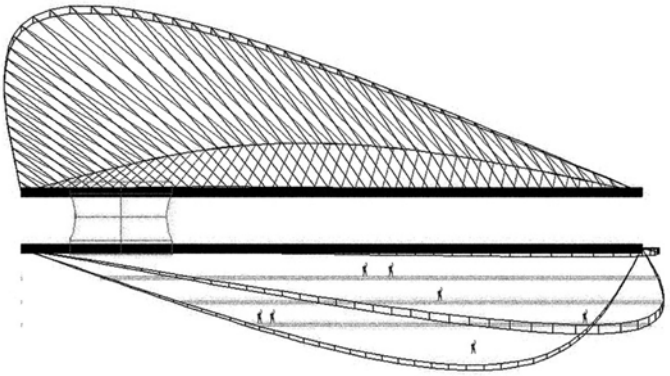
Thus, the old concept that generated the Olympic Games imposes itself to a new global reality, designed by the exponential increase in interpersonal communications.

Since 1920, with the exception of 1928, Brazil has participated in every Olympic Games. In 2016, Brazil will be the first South American country to host the Olympics, completing almost one hundred years of participation.

Gradually, Brazil has imposed itself on the international stage as a nation dedicated to the welfare, development, peace and social harmony. These were the original values of the ancient Olympic Games.

In 2011 I launched the Project *Kairos* - for a building in orbiting planet Earth. It is about a reflection not only on technical questions on principles of architecture and construction inside a microgravity environment, but also a reflection on the planetary changes in passage of the millennium.

Kairos was a great success. Apart from the book - in two editions, in Portuguese and English - exhibitions were held in several countries, like the Academy Holotopia at the Amalfi Coast in Italy, with my dear friend, physician, scientist and patron of the arts Alberto del Genio; another exhibition in Lisbon, at the cultural center Robotarium



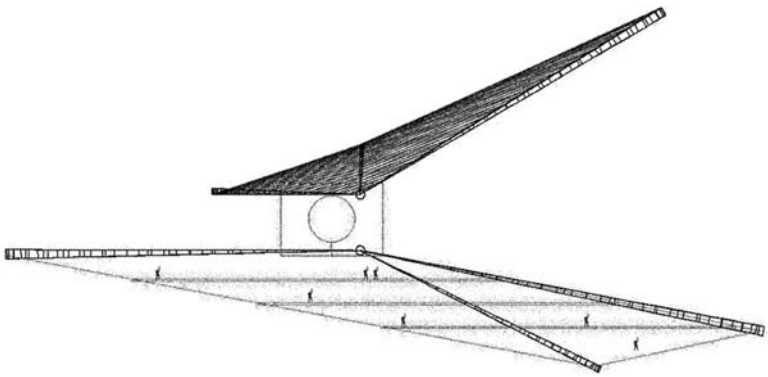
Kairos, lateral view of one module, 2011.

created by the artist and philosopher Leonel Moura, another great friend; a planetary exhibition through the Streaming Museum, based in New York City, with my always unforgettable friend Nina Colosi; or a meeting in the Casa das Rosas, in São Paulo, Brazil, directed by also a dear friend, Artur Matuck, as an event of the University of São Paulo. There I met personally - or virtually in a first moment - the architect Bruno Padovano, who immediately become another great friend.

It was that fabulous process of human relationships, interlacing many others, what unleashed the first course of space architecture in Brazil and the second in the world, held at the Faculty of Architecture and Urbanism at the USP University of São Paulo, conducted by myself and coordinated by Bruno Padovano.

In the end, I wondered about all that had happened. How an architectural design had put together so many friends from so many different places of the world?

Not only, during the exhibitions, books, courses and conferences, I received several messages from people I had never met before, from different places of the world, saying to be amazed at the possibility of going into space, delighted at the possibility of such a change on our planet, dazzled before the emergence of a possible dream, of a *concrete utopia*, as so wisely Joseph Beuys said.



Kairos, lateral view of one module, 2011.

Kairos was born as a theoretical project oriented to the reflection on architecture, but of course, it can be constructed in space. How could something purely theoretical, especially today, have attracted so many people?

The word *theory* appears from the contraction of two Greek words: *thea* and *horân*. The first word, *thea*, meant "action of contemplating" and "spectacle", "show", generating our word *theater*. And horân indicated the idea of *seeing*. These two ideas projected the idea of *theory* as the "observation of the act of contemplating", that is, as Plato said: *contemplation of the spirit*.

So when we create something at the theoretical level, we operate the imagination of each one of us.

What to me was a challenge in terms of architecture and the processes of human relations, unveiled to be an act of hope to many – and, in a sense, a surprise to me. I was not expecting to receive so many messages.

Kairos was also about the end of wars.

Stamp of the 1896 Olympic Games.

Since the appearance of human beings - if we consider the most recent phase about two hundred thousand years - Gaia, our planet, always had empty places, places that could be conquered, colonized.

This is the matrix of what we call *war*.

But today there are no more territories to conquer. This condition simply ended. We are present everywhere. The human being is scattered all over the planet for the first time since his appearance, millions of years ago - since the emergence of the first hominids.

When I was a child, I remember that it was still common in Brazil to see poor people simply occupying an “unowned” place. After a while, it became their property. It was the *adverse possession* – which in Latin is *usucapio* meaning “to acquire through use”. It was an old foundation of Roman Law, learned from the ancient Etruscans.

Such a reality quickly ceased to exist. Everything is of somebody. And if not, it is of the State. Nothing more is property of nobody.

Nothing more becomes property through use.

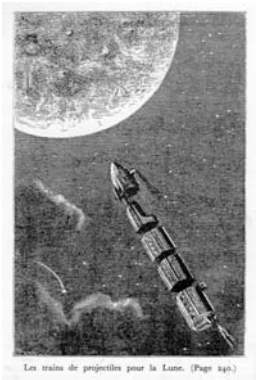


Illustration in Júlio Verne's book De la Terre à la Lune, of 1865.

The radical change, unique in all trajectory of humanity, happened suddenly - like a flood, like a phase shift in chemical and physical processes.

In this way, a new social approach emerges, where the old concept of war disappears and where humans are forced to build new principles of social relations, to avoid a catastrophe and possible extinction.

In early 2012, at Kairos' *eye of the cyclone* I visited São Paulo, where I was born, and had lunch with a dear old friend - Durval de Noronha Goyos, one of the leading lawyers of his time. In our lunches when we always discuss about the world and immerse ourselves in strategic matters - generally designed by social questions in their most profound dimensions.

Thus, analyzes and questions about education, culture, ethics, crime, politics, art and science immediately arise. Everything what defines the human being.

We talked about *Kairos*, and very fast the idea to make the first orbital Olympic Village of history arose – which should be launched during the Olympic Games in 2016.

After all, is not this the design of Brazil: to definitely throw itself as a reference of humanity in all senses and in historical terms?

Eduardo Kneese de Mello, in 1930 (in Aline Regino)

I was born in Brazil and it was there that I plunged into the mysteries of aborigines, where I found in myself the principle of *deprogrammability*. It was in Brazil that I studied with unforgettable masters. Beyond a master, Maurício Nogueira Lima was a great friend - Max Bill wrote that he was one of his major influences. Eduardo Kneese de Mello also was an unforgettable friend and master, chief architect of the construction of Brasília. I will never forget his description of when, accompanied by Mrs. Kneese, both were at Epidaurus, Villa-Lobos conducted the orchestra and all danced under the direction of the great composer. We were together for over twelve years. Or Eduardo Corona, with whom I studied during the period of one year Paolo Soleri's megastructures and oriental gardens. Or Nilcéia d'Orazio, enlightened master, who - when I was a boy - made me to dive into the mysterious paths of Mallarmé, John Cage, Norman McLaren or Stockhausen, among others. And Décio Pignatari – beyond master and friend, we were partners in a small book to Octavio Paz, we made together an opera, and we created a contemporary music radio program for five years. Haroldo and Augusto de Campos – this latter, beyond dear friend who I always admired so much, was responsible for my connection to John Cage. Roti Nielba Turin, a brilliant soul - also teacher of another dear friend, the poet Paulo Leminsky. Roti worked on de-automatization of thought. My great master Francisco Luiz Peixoto, Mr. Chico, with whom I learned so much in the Brazilian forests… or the brilliant compositor Hans Joachim Koellreutter, former teacher Luigi Nono and Tom Jobim, who was my teacher over years. The writer and poet Jorge Medauar, who taught me to write!… or John Cage, who I met at the Biennale of São Paulo Biennial. That all happened in Brazil – and much more.

Maurício Nogueira Lima, in 1977.
(in Ruptura)

It is also true that in some sense I grew up between Europe and Brazil, and I've been in America since 1979. But, my training took place in Brazil, and when I look into the past I immediately find a deep trace of humanity, of love that draws such huge country. A love sprout out throughout the world. One is never alone when there is love.

It is not difficult to discover the relations between the continental country of today and ancient Greece – just bear in mind Plato's *Theaetetus*.

Ornette Coleman has always insisted saying that he would love to meet me in Brazil. Indeed, Brazil was also his home when there, in the center of New York City, over several years, we've played together.

I often say that one of the greatest qualities of Brazil is on its non-nationalism. Sometimes people do not immediately understand what I say with it. But when any one goes to Brazil, even while still at the airport, it is automatically Brazilian. Unlike what happens in the United States and Europe, in Brazil there it is rare to find ghettos.

It is true that despite all these qualities the country still faces many problems. And, unfortunately, just a simple watch on television news is enough to be sure and about that and, dramatically, that also all over the world always faces many problems.

Roti Nielba Turin, photo by Emanuel Dimas de Melo Pimenta, São Paulo, 1982.

Although it is always essential to fight against poverty, through education and quality of life, the important thing right now is this mysterious spirit of unity and openness that has characterized the Brazilian spirit.

In that spirit may be the key to a new humanity, free of war and oppression.

The ancient Greek *Agora* is in the Brazilian beaches.

Thus, the Olympic Games in Brazil are, at their origin, characterized by a bond that transcends space and time.

In 2011 more than six hundred thousand objects were orbiting Earth.

That same year, almost all space activities were of a military nature or subjected to the domain of war. Practically all satellites were characterized by espionage, including those for communication.

Olympic Village in Baldwin Hills, Los Angeles
1932, first Olympic village of the modern times.

When we talk about a building in outer space, we are not referring to any “escape” of the human being from Earth, but yes an expansion of the planet.

And when we speak of an expansion of the planet, we are always referring to a metamorphosis, a change of scale - which transforms what we are, how we know ourselves.

It is, therefore, a civilizational mutation.

Everything changes with the expansion of Earth into outer space: we all start belonging to a single world, no longer fragmented in religions or ethnic groups; we start understanding that all gods are, in fact, the Universe; we change our relation with energy, with consumption, with knowledge - everything becomes, without intermediaries, to be our personal heritage.

But there are other equally important factors - we start understanding in more depth our thinking, our behavior, the functioning of our bodies, our muscles, and our perception.

To make interplanetary travels we must know even deeply our bodies.

Poster of 1896 Olympic Games.

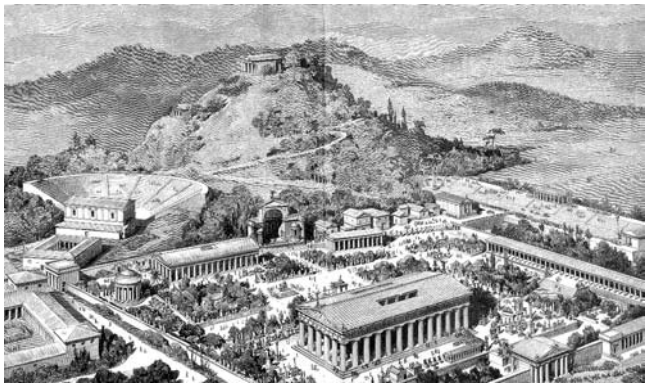
An orbital Olympic Village would be not only a fabulous laboratory for such knowledge – in the development of new games, in the observation of human body behavior taken to its limits - but also in the integration of diverse cultures in an environment of peace and aggregation.

Of course, the objective of this project is not, in principle, to construct such a building in short term. But its existence, even as a project, not only enables the expansion of the ideas contained therein, as also turns immediately possible a continuous and systematic work of research and study at a transdisciplinary level.

Thus, we rely on the interaction between architecture, physics, chemistry, the various areas of engineering, law, physical education, logic, communication sciences, mathematics, food engineering and nanotechnology among many others areas.

The name of this project is *UIRA* – a Tupi-Guarani word that means *bird*.

When the Portuguese arrived in Brazil in 1500, most Indian tribes they encountered spoke Tupi.



Olympia, in ancient Greece, illustration made in 1891.

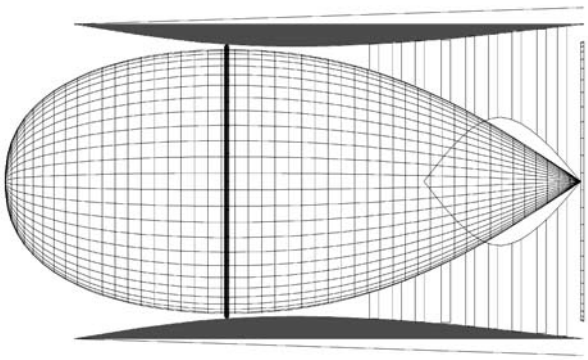
Interestingly, one of my ancestors, through part of my family called Ramalho, was an important Tupi Indian leader. The *Wikipedia* account details: Tibiriçá (c. 1440 - São Paulo, December 25, 1562) was the first Indian to be catechized by Father José de Anchieta. He was converted and baptized by the Jesuits José de Anchieta and Leonardo Nunes. His Christian name of baptism was Martim Afonso, named after the founder of the city of St. Vincent. His birth date is calculated in 1440. His remains lie in the crypt of the Se Cathedral, in the city of São Paulo. Tibiriçá means 'ruler' or 'land surveillance' in the Tupi language, but the interpretations of historians diverge at this point. He was head of a part of the Indian nation established in the fields of Piratininga, with headquarters in the village of Inhampuambuçu. He was brother of Piquerobi and Caiubi, Indians who stood out during the colonization of Brazil: the first, as an enemy and the second major contributor to the Jesuits. He had many children. With India Potira he had Italo, Arah, Pirijá, Arata, Toruí and Bartira. This latter was married to João Ramalho, who was a great friend of Tibiriçá and from his request defended the Portuguese when they arrived in St. Vincent. (...) Tibiriçá died on December 25, 1562, as evidenced by José de Anchieta in his letter to P. Diogo Laines, due to a plague that swept through the village". One of my ancestors is João Ramalho.

Kairos is an orbital building in microgravity, therefore, without artificial gravity. The absence of gravity, or of a microgravity environment, represents a strong biological wear level for humans, such as a decrease in muscle mass and the onset of osteoporosis among other problems. Because of this, it was determined that in that building the orbital periods of stay for the general public should not exceed fifteen days.

But a building for an Olympic Village, like *UIRA*, cannot be restricted to a microgravity environment, or to an environment without the force of gravity.

Not only people will spend more time in it as the wear of sporting activities would be huge if the microgravity environment was continuous. Thus, from the beginning, I imagined a building dual, working simultaneously with artificial gravity and microgravity - depending on its sectors.

In this way, both visitors and athletes - as well as coaches, doctors and specialists in several areas - could be inside microgravity environments during certain periods and inside other environments with gravity equal to Earth in other periods. This combination would allow large periods inside environments with gravity equivalent to Earth's, and the use of non-gravity would involve a major factor of efficiency - because after workouts, athletes could be evaluated and make their recovery in an environment with gravity.



UIRA, lateral view.

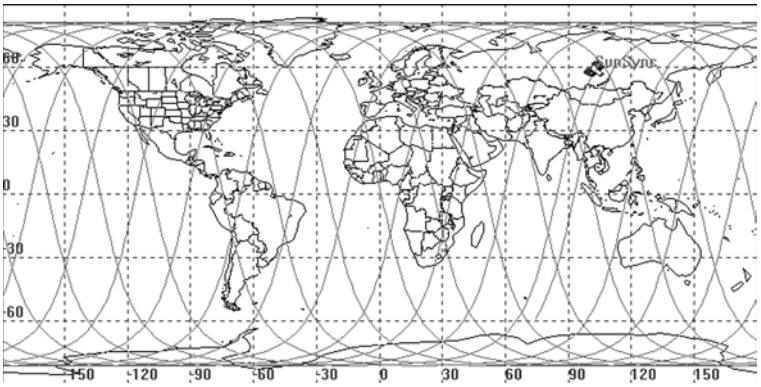
The concept started to be developed from a continually rotating cylindrical figure. But, unlike the tradition of engineering space design - always using the cylinder and the shape of the missile - here the large-scale radically transforms the perception of architectural space. What apparently is a cylinder simply ceases to be it due to the scale.

It is not a cylinder in the scale of a rocket or of a space station like the ISS International Space Station, but in a sense, it almost is a Moebius strip, where the floor seems to have no end, where the interior space is a great *continuum*.

Now, imagine a cylinder with a radius of 1200 feet and a width of about 3900 feet - that is, measuring almost one mile. The perimeter of such a cylinder is of about 7500 feet. The slight curvature is due to the large radius, which means that one does not see the end of the plan. The person has an area of about twenty-seven million square feet to walk.

In its length, this cylinder - which is always stable base floor, keeping a gravity of 1G - has variable height, a curve that reaches its apex at 130 feet tall.

The total area with the use of airspace, can reach seventy million to one hundred million square meters, representing a universe of twenty thousand visitors, about five thousand square feet per person.



SSO Sun Synchronous Orbit. Ground track of Sun-synchronous Orbit. In LEO Communications Satellites: The IRIDIUM Constellation, by DeAnn Redlin, 2000.

The floor – which also is lateral wall of the cylinder - is built entirely on ballistic fabric, containing a large waterbed: reservoir, endothermic element, and important factor for air filtering as well as effective protection against solar and cosmic rays.

The continuous circular motion ensures, by the centrifugal force, the maintenance of a stable gravity.

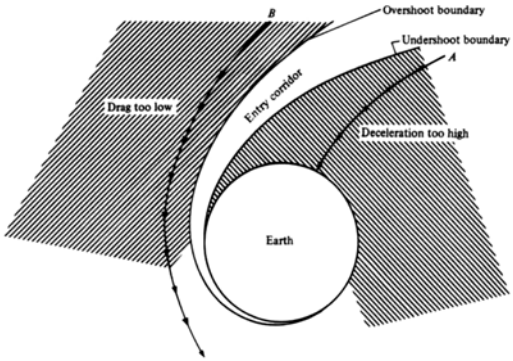
If below the floor structure of the external cylinder, the material is ballistic fabric, above it the material is transparent.

The entire project is of a deprogrammable nature. Thus, under the base floor, there is another floor reserved for the supply of energy and information.

One of the important issues in a space project is related to extreme temperature ranges, with dramatic differences.

Like in *Kairos*, *UIRA* also obeys to a static orbit in relation to the Sun. That is: it is a *SSO – Sun Synchronous Orbit*. This allows a continuous power supply and a trajectory that turn the building virtually near of all cities in the world.

Set at an altitude similar to *Kairos*, *UIRA* will be, at each twenty-one hours, only about four hundred miles away from any city on Earth.



Boundaries defining a typical spacecraft re-entry corridor.

Under the second wall of ballistic fabric there is a large conic panel which angulation enables the capture the sun's rays which are reflected to the ballistic fabric and therefore to the cylindrical system. This process of thermal accumulation is regulated according to the reflectance index of the large panel.

Thus, a stable temperature inside the building is always assured, also provided by the fact that the walls are filled with water.

The walls of ballistic fabric are constructed in way to minimize the effects of a collision with suspended particles in the outer space, as it was also predicted in *Kairos*.

Even so, and because it is about a large public building, the conic panel also serves as additional protection against the impact of space debris, cosmic particles and meteorites.

On the other hand, the conical opening is small as to not accumulate energy in excess, which could result in disturbance of the orbital flow.

The conical surface also works as a sort of landing strip for spacecrafts and as support for emergency spheres, which are something like lifeboats.

Like the cylinder, the large conic panel also is in continuous rotation.

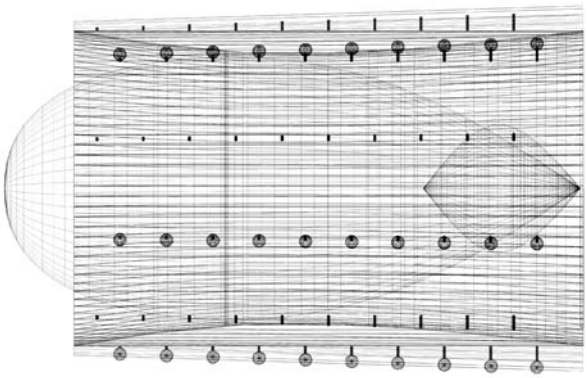
The distribution of emergency spheres throughout the panel enables rapid access to them by a large number of people. In the case of a serious accident, the spheres are discharged upon the Earth at the correct angle of entry into the atmosphere, and have the impact reduced by the use of large parachutes.

Distributed in an intercalary way with the emergency spheres there are the docking tubes for spaceships carrying visitors. They are designed so that the visitor arrives at the Olympic Village with gravity almost equal to G1.

Thus, between the cylindrical structure and the protection panels there are the tubes connecting the emergency spheres and the docking tubes for transport vehicles to and from Earth. These tubular elements are distributed homogeneously over the entire surface of the protection panels, so that there is no differenced *arrows*, that is, all points related to the tubes are equal in terms of *movement*, all act synergistically on the cylindrical figure.

If we look at Earth taking North Pole as “above”, our planet rotates in a counterclockwise direction. The large cylinder of *UIRA* rotates in the opposite sense, and is located on an axis perpendicular to Earth, synchronized with the movement of the Sun.

This turns possible the launch of the emergency spheres with less energy to fix the path of entry into the atmosphere as they have more time to perform the re-entry on the planet.



UIRA, Lateral view with emercency spheres.

On the other hand, such circular movement turns easier the arrival of spaceships, which generally are launched counter the rotation movement of Earth.

The direction of rotation of the large cylindrical structure and its possible *moments* - in terms of dynamic and resistance of materials - suggests the use of different metal alloys or other materials to one and other side of the movement, being traction or compression.

The large cylinder rotates by inertia, correcting its speed and any distortion of the center of gravity, due to the possible displacement of people, through thrusters coupled on the conical protection structure.

In the center of the cylindrical structure there a large ellipsoid structure, non-rotating - therefore free from the artificial gravity force - which is oriented for the games.

This large, gigantic structure is transparent. From it one can see people in the cylinder, spinning – as the people in the cylinder see, through their transparent roof, the transparent surface of the huge ellipsoid structure: the big stadium.

In one of the sides of both structures, there is the vision of the always-illuminated planet Earth.

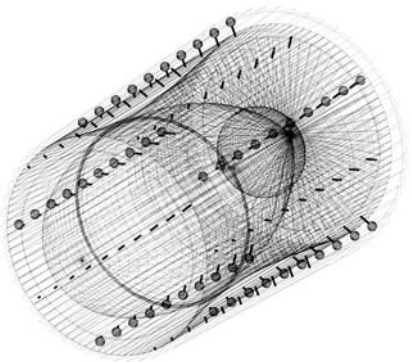
In fact, there are three ellipsoidal structures, one inside the other, dramatically increasing the strength and structural stability, and allowing the existence of a system for rapid evacuation of people, individually or not. It is the big stadium, where several other structures will be developed for different types of sports.

A first access from the large cylinder to this structure of the huge stadium happens through a circular system of transition. In it, people enter inside capsules, still in G1, which will decelerate until reach the ellipsoidal structure in microgravity. They are a kind of horizontal elevators.

In the region opposite to the large ellipsoid shape there are “disks” of interaction with the rotating cylinder. Access to them is also operated through circular systems of transitions - horizontal elevators - so that people can easily move from a microgravity to a G1 gravity condition.

The function of these spaces established by the “disks”, with about thirty feet between walls, which translate our usual concept of “headroom”, is also of a deprogrammable nature, with functions to be set depending on the needs and with spaces designed by different architects.

These walls of the disks, in contrast to what happens with the ellipsoid structure, are not transparent but made of ballistic fabric similar to the “floor” of the cylindrical structure. Also here, the walls are filled with water layers, in order to provide an excellent shield against cosmic and solar rays.



UIRA, perspective.

The dynamic shape of the cylindrical system also serves as protection against solar and cosmic rays.

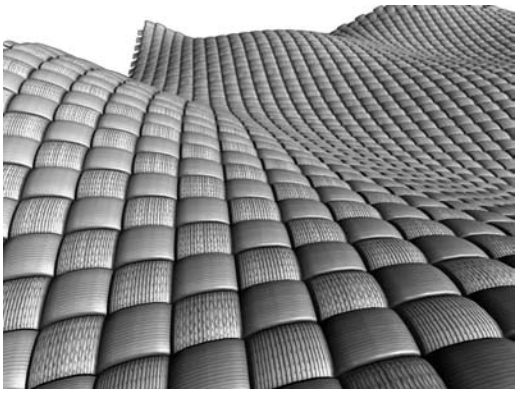
The base of the ellipsoid structure is a place central for a center to computers and electronic systems, since it is protected from radiation and therefore against the so-called *single event effects* - damage caused by radioactive particles.

At the base of the structure - comprising the cylindrical system and the ellipsoid shape - there is a large circular shield, permanently appointed to the Sun, consisting of solar panels.

This large shield has an area of about 2,800,000 square feet. The constant flow of solar energy in Earth's orbit is of 1,360 Watts per ten square feet. Thus, *UIRA*'s energetic capacity will be of about 350 million Watts. The technology applied to solar panels in 2012 allowed a collection of about 100 Watts per ten square feet each hour. Thus, with such technology, the building would have about 25.7 million Watts.

With a population of the building estimated in twenty thousand people, each person would be able to immediately consume about 1,300 Watts.

The building is almost completely transparent in its interior. The only grand opening is facing Earth. Earth's albedo, its reflectance index, determines much of the natural light of the building.



High Density Vectran (HD-V Guard) is a puncture resistant system also used by Schwalbe in the production of pneumatics for competition bicycles.

The sectors of the cylinder that are faced to Earth may be used for the construction of gardens - in order to establish a biological balance inside the building.

The volume of the cylindrical system is enormous, constituting about 2.11888×10^9 cubic feet.

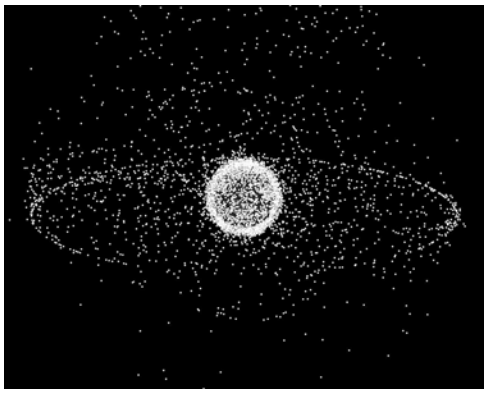
The volume of the ellipsoid figure is much larger, with nearly $9.53496001 \times 10^{10.}$

The water in the building, considering a thickness of about one inch of water depth only in the walls of the cylindrical system, would be about twenty million gallons, distributed over about two million and seven thousand cubic feet.

The United Nations recommend a daily use of water of about thirty gallons per person. The building would have, therefore, about one thousand gallons *per capita*, which is equivalent to thirty-four days of continuous consumption, without consideration to recycling and regeneration processes.

Of course, when considering the water treating processes the availability grows exponentially.

A computer-generated image of objects in Earth orbit that are currently being tracked. Approximately 95% of the objects in this illustration are orbital debris, i.e., not functional satellites. The dots represent the current location of each item. The orbital debris dots are scaled according to the image size of the graphic to optimize their visibility and are not scaled to Earth. These images provide a good visualization of where the greatest orbital debris populations exist. Below are the graphics generated from different observation points. The GEO images are images generated from a distant oblique vantage point to provide a good view of the object population in the geosynchronous region (around 35,785 km altitude). Note the larger population of objects over the northern hemisphere is due mostly to Russian objects in high-inclination, high-eccentricity orbits. NASA.



The displacement of thousands of people to a large building in Earth orbit implies the questioning of habits and human artifacts hitherto automatically taken as safe and guaranteed.

A building permanently aligned on an Earth-Sun axis has a static temperature and is free of light fluctuations - both essential factors for the balance of the circadian rhythm and life, as we know on Earth's surface.

Architects and experts from various fields will have to ponder on this question, proposing solutions for the circadian rhythm not be broken.

We are used to change clothes every day. But that would be disastrous in a building in orbit. Imagine the need to wash clothes every day for twenty thousand people in space! In 2012, the international company MM - headed by Marianela Mirpuri, Vic Fernandes, Paulo Gomes and Ana Guimarães - develops applications for smart fabrics that can self clean, eliminate odors, and can establish a stable thermal comfort among many other possibilities.

Likewise, we have been used to generate a huge amount of garbage every day - which would also be a disaster for such a building.

Georges Méliès, Voyage dans la Lune, 1902.

Another key issue is related to conflicts. We all watched, sometimes shocked, the clashes between supporters of sports clubs, which even generate deaths. One can easily imagine the serious consequences if a clash happens in the outer space.

When we are in high altitudes, we lose part of our gustative faculty. Thus, a new cuisine should be developed, emphasizing stronger flavors, producing unusual combinations, with different consistencies and textures.

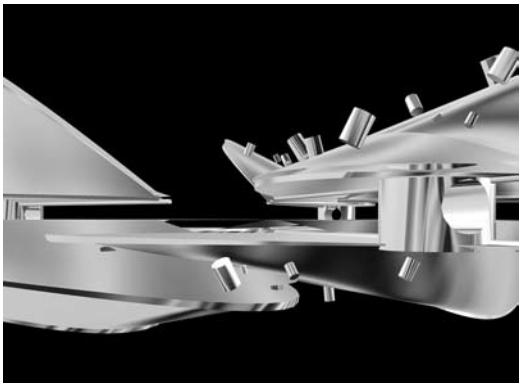
If the large cylinder has gravity equivalent to that of Earth's surface, the center of the building, oriented for sports competitions, is in a microgravity environment.

The maximum height in the cylindrical system is of about one hundred and thirty feet, roughly equivalent to a thirteen floors building. But we do not have in the outer space, the strength of the firm floor found on Earth. Thus, all constructions inside the cylinder will be required to obligatorily follow the principles of tension and tensegrity.

On the other hand, the development of spaces inside the ellipsoid structure is free of gravity, imposing new architectural principles – as I'd said in *Kairos*.

In both cases - in microgravity or in artificial gravity - the architects will work on almost urban spaces, given the large scale.

Thus, beyond a simple architectural design, *UIRA* incorporates the urban universe, constituting a megastructure orbiting Earth.



Kairos, detail, 2011.

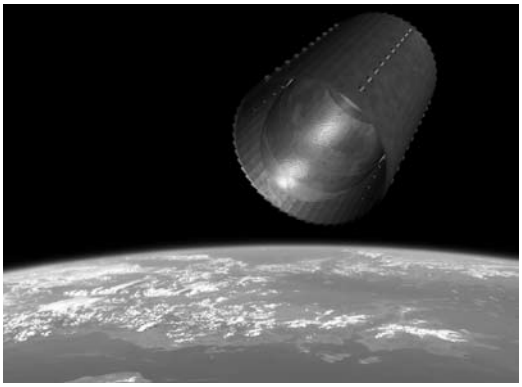
The importance of sports activities in microgravity environments is indisputable. They will dramatically increase the knowledge on the human body, essential for long trips - such as to Mars, for example.

But, it is necessary to have in mind – as it happened with architecture since its beginning - that all categories of sport as we know today, in all their forms, were designed for environments with gravity.

One can imagine a new type of swimming, using adherent, flexible and transparent layers through which the athlete moves in space; or even a new kind of football or handball, a *spaceball*, whose field is no longer the quadrilateral plan but a three-dimensional spherical space where players move, sometimes at great speed, and the ball - free from gravity or friction - runs surprising trajectories.

We can also imagine the spectators distributed on the inner surface of a spherical structure, attached to a device that substitutes what we know as seat.

There's a world of elaboration behind UIRA - a world that involves the work of architects, physicists, chemists, specialists on physical education, physicians, engineers, specialists on communication, lawyers, sociologists, and more.



UIRA, 2012.

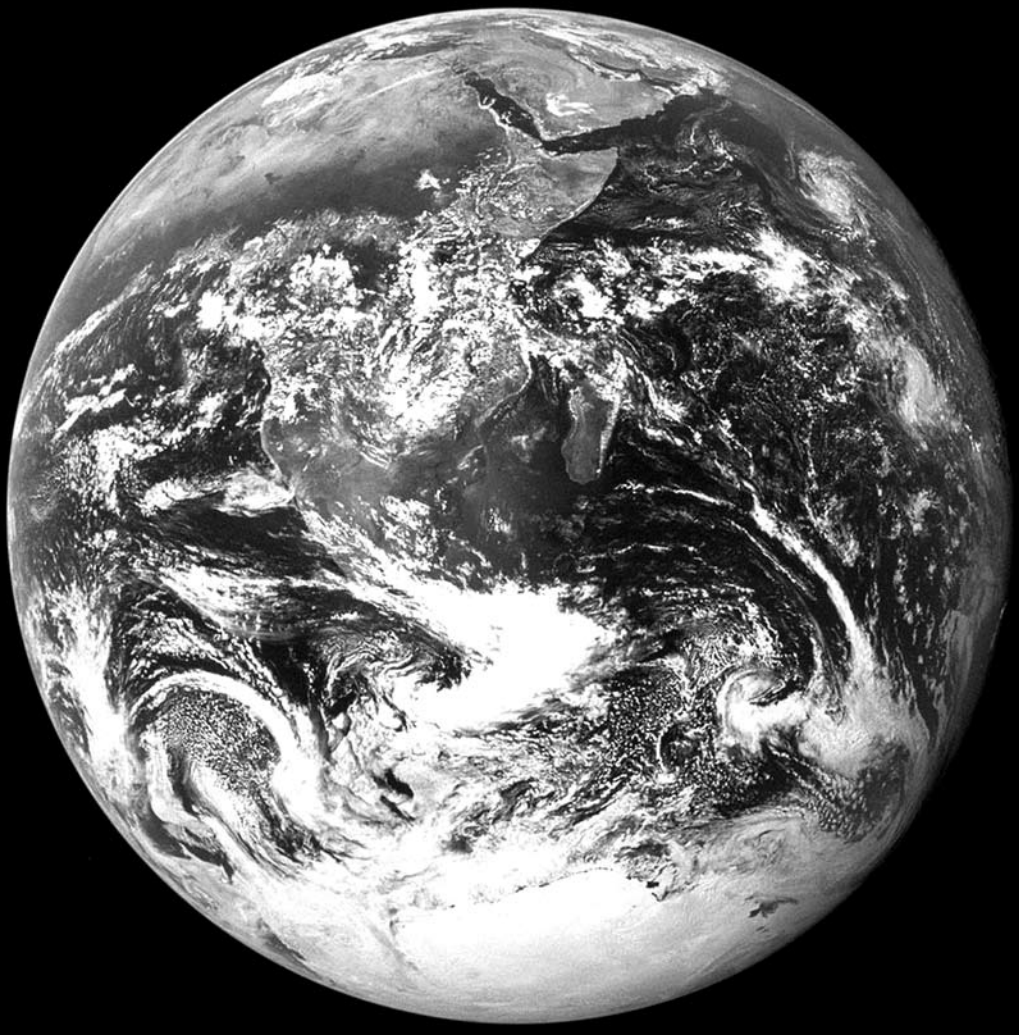
Thus, an orbital Olympic Village is in fact more than just a *village*.

The word *village* comes from the Latin *villa*, which indicated a rural property, and also a "country house".

The first "Olympic villages" were places rented to accommodate the selection of athletes. Later, they passed to be constructed with the same purpose.

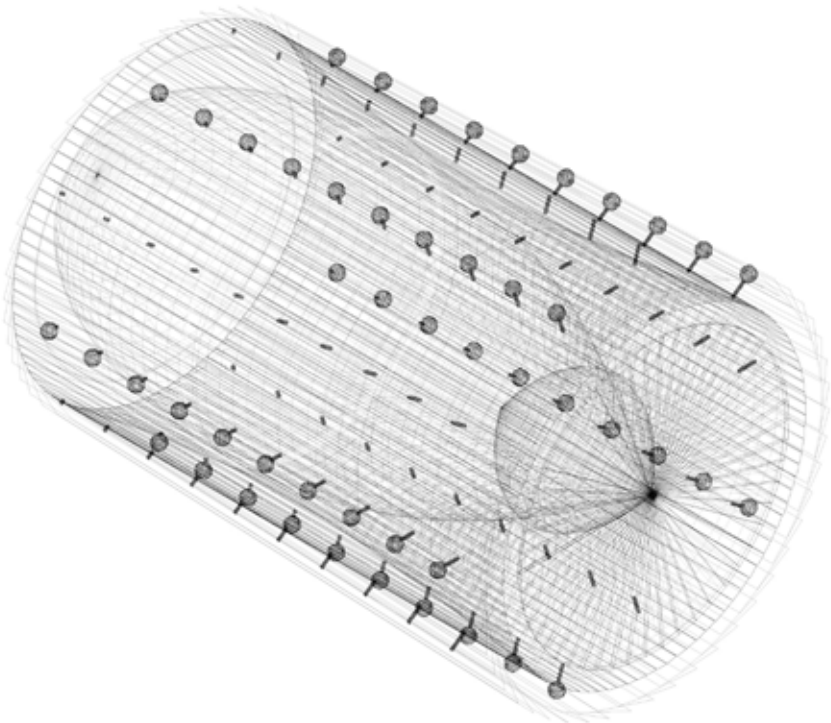
When thinking on a large orbital building, we incorporate not only the selection of athletes, but also a part of the audience. Thus, not only commercial functions emerge, but also the cultural ones, recovering something of the ancient Olympic Games of the classical world and establishing new parameters for the idea *urbis*, in a planet populated by megacities.

All leading us to what Buddha said: *Better than a thousand hollow words, is one word that brings peace*.

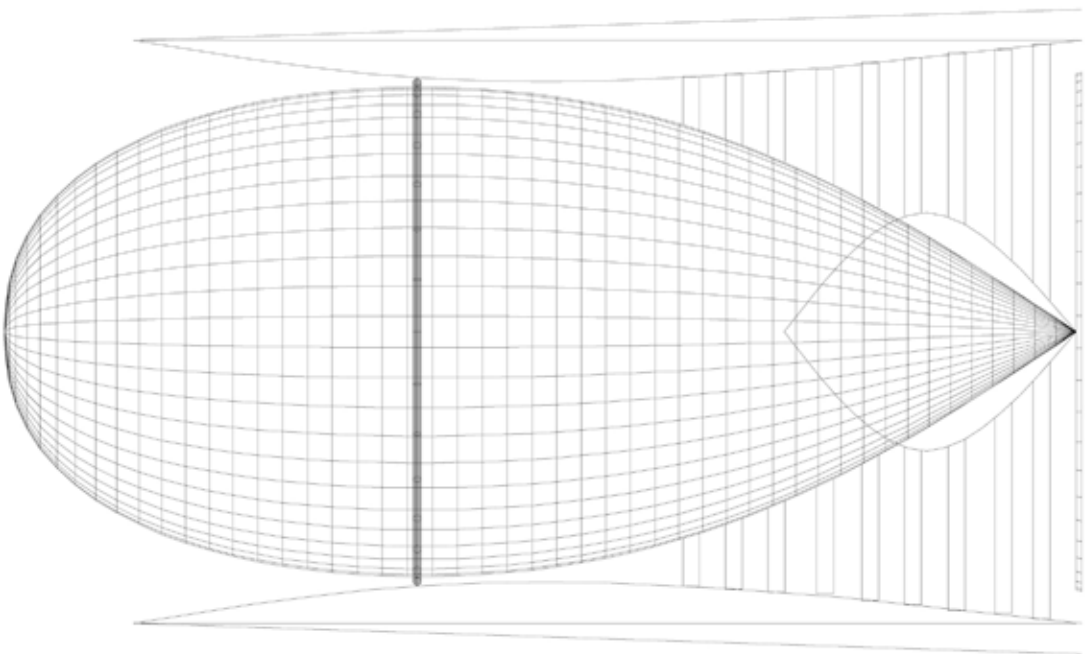


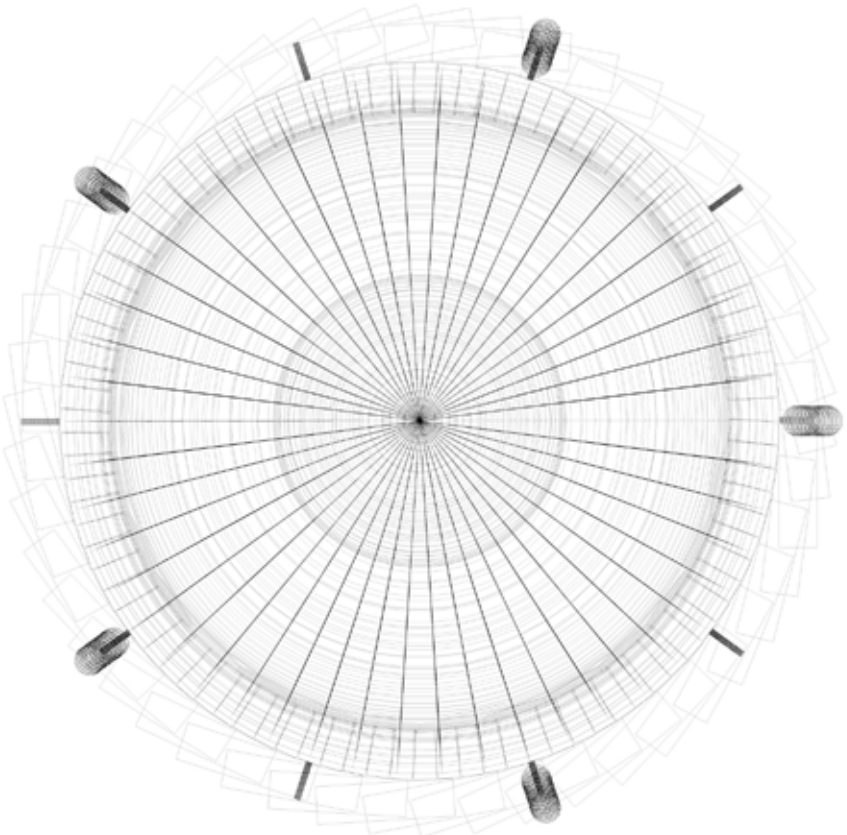
"The Blue Marble" is a famous photograph of the Earth taken on December 7, 1972 by the crew of the Apollo 17 spacecraft en route to the Moon at a distance of about 29,000 kilometers (18,000 statute miles). It shows Africa, Antarctica, and the Arabian Peninsula, NASA.

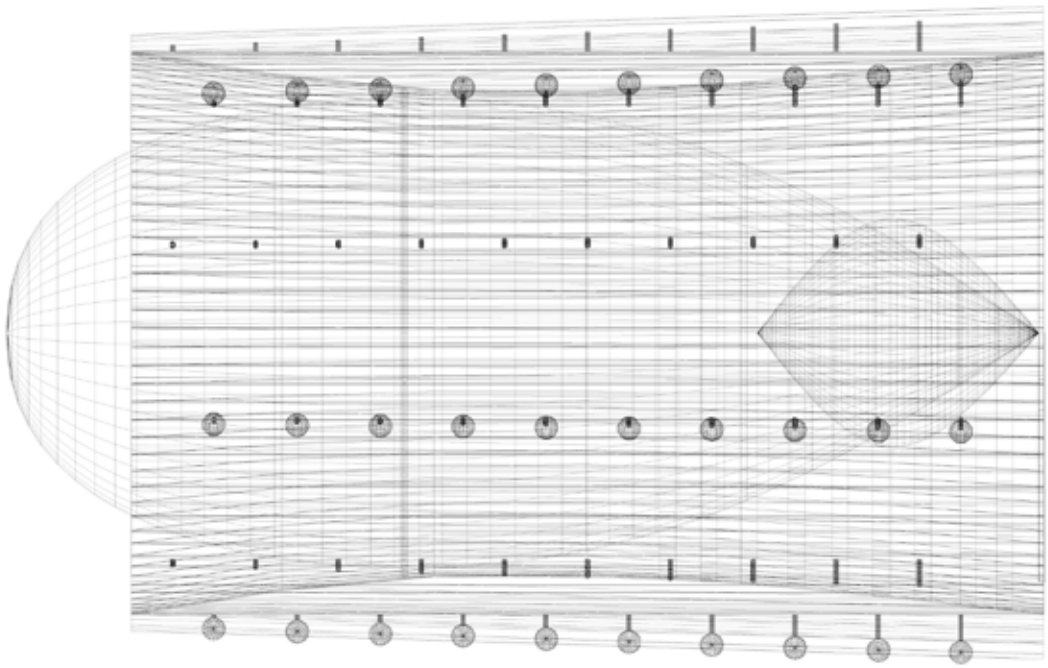
some drawings

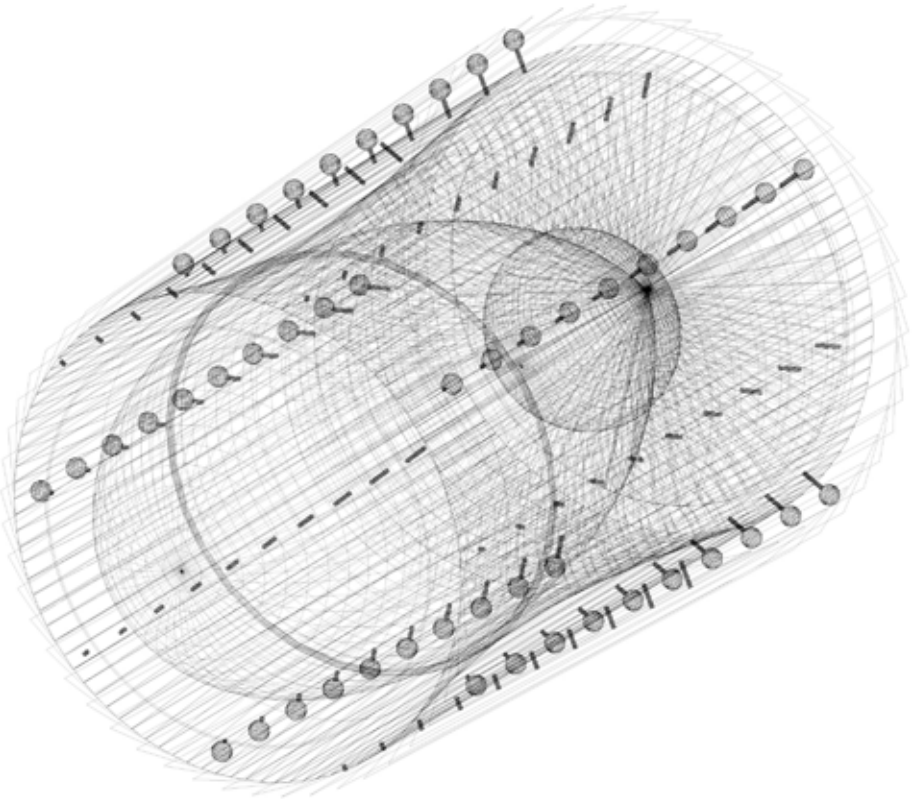


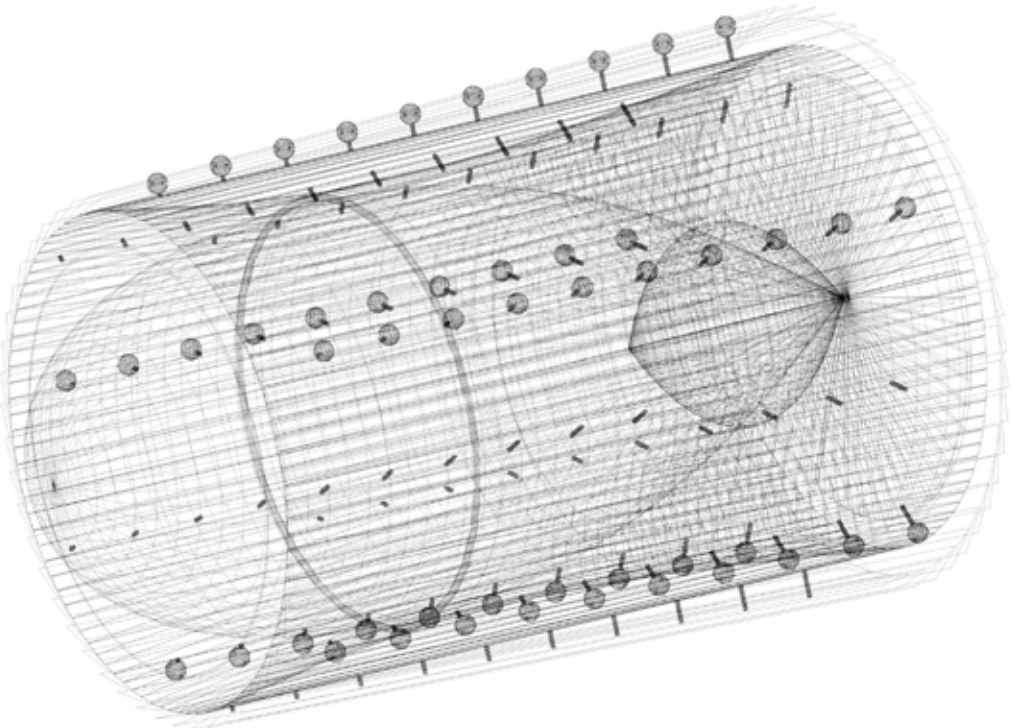
U I R A
orbital olympic village
emanuel dimas de melo pimenta



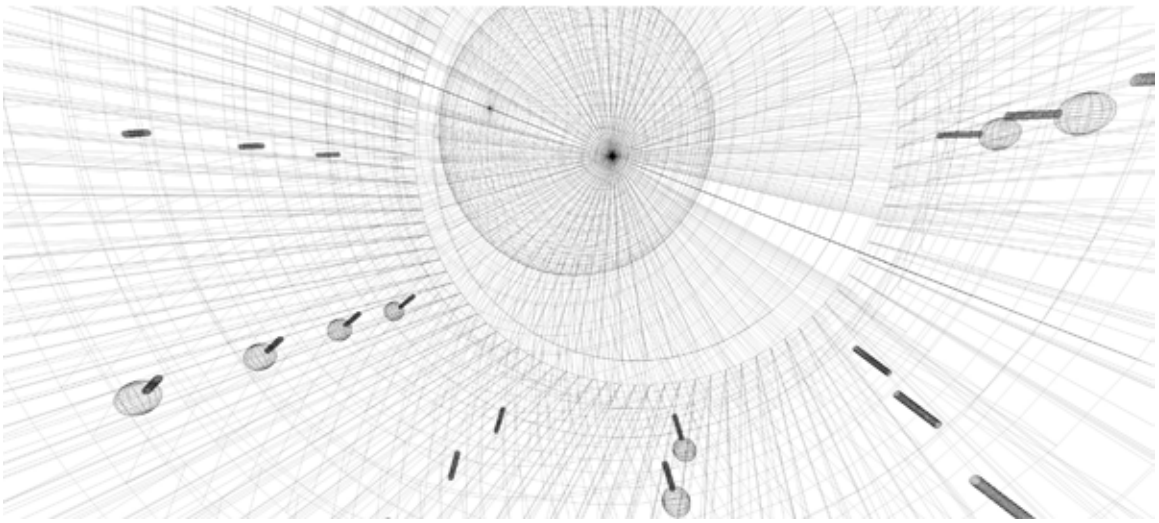




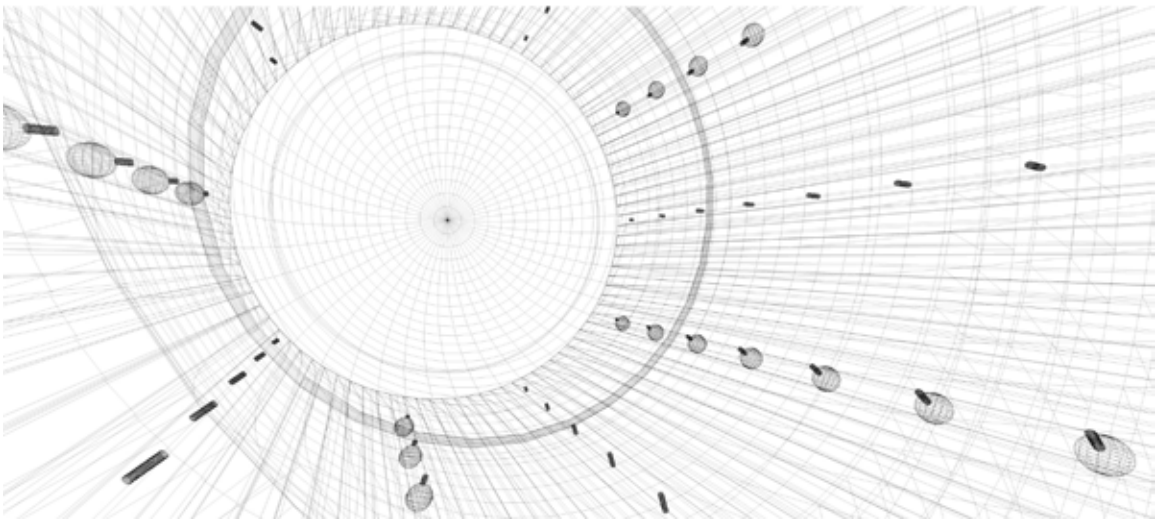




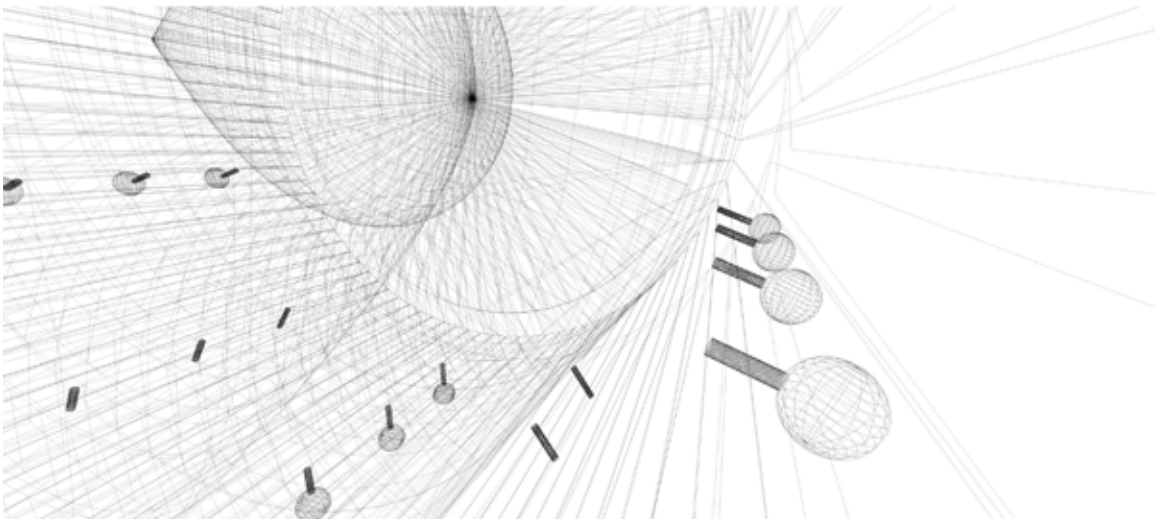
U I R A
orbital olympic village
emanuel dimas de melo pimenta



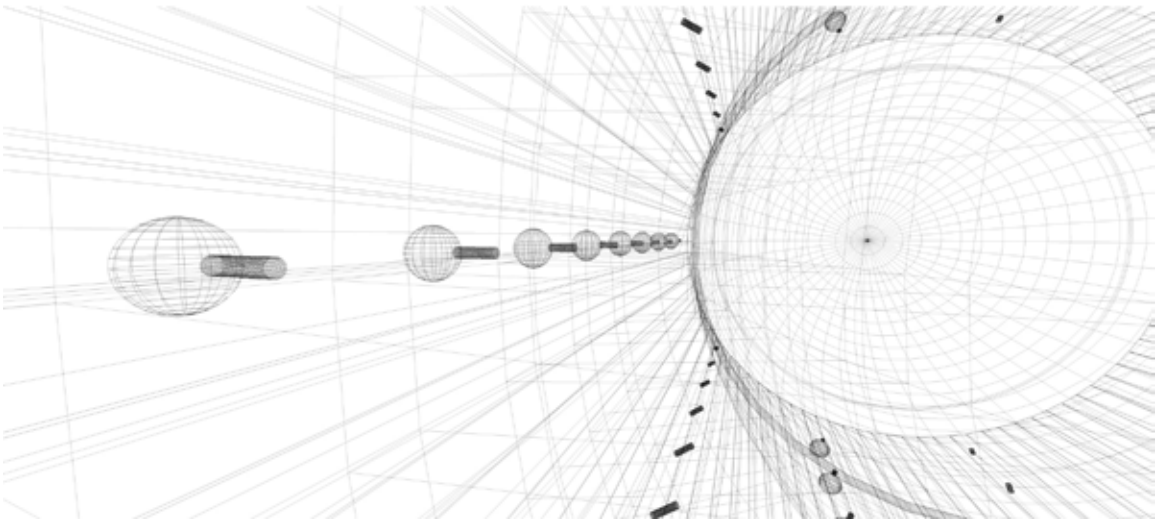
U I R A
orbital olympic village
emanuel dimas de melo pimenta



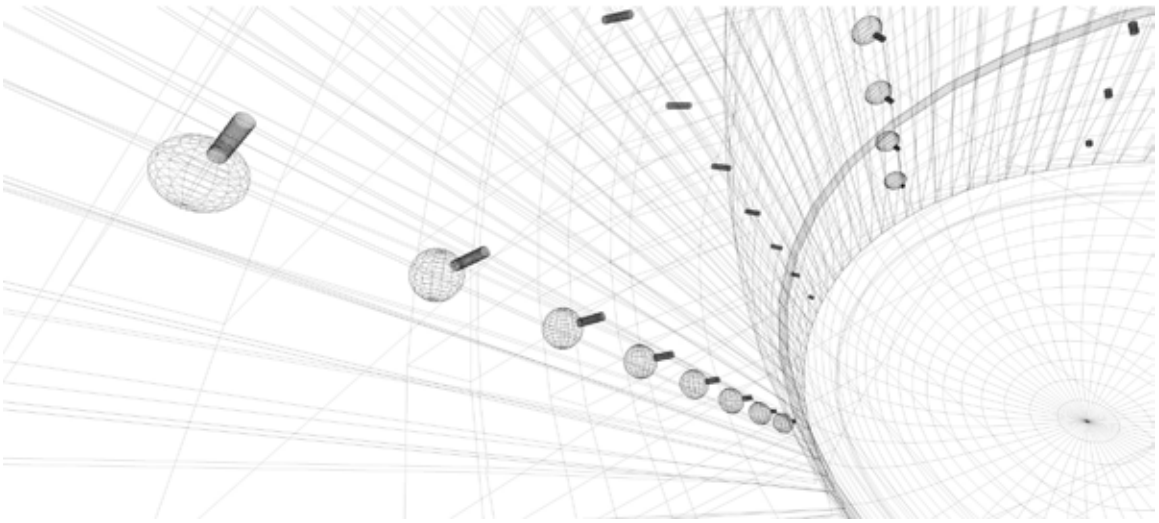
U I R A
orbital olympic village
emanuel dimas de melo pimenta



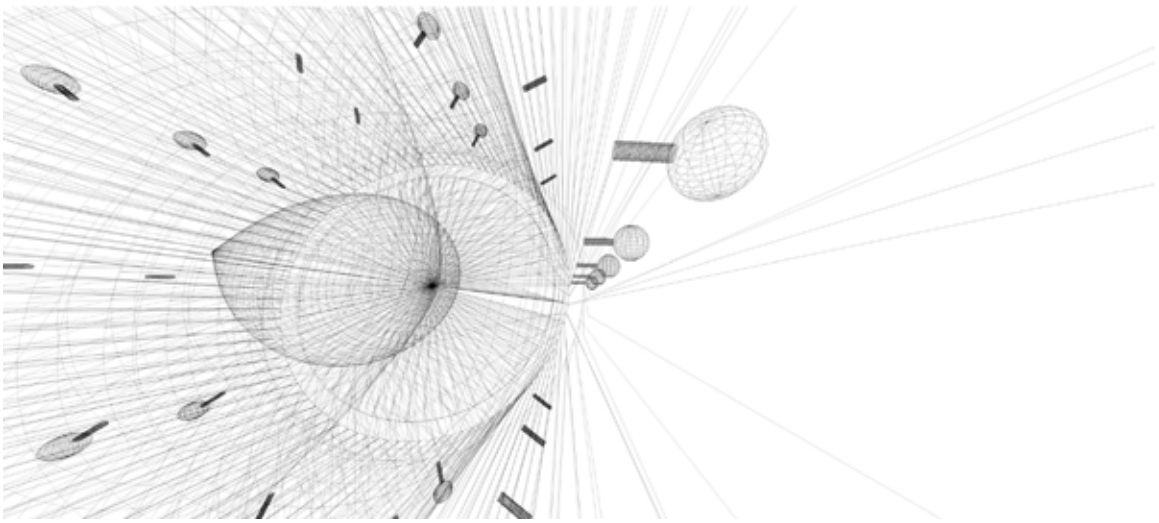
U I R A
orbital olympic village
emanuel dimas de melo pimenta

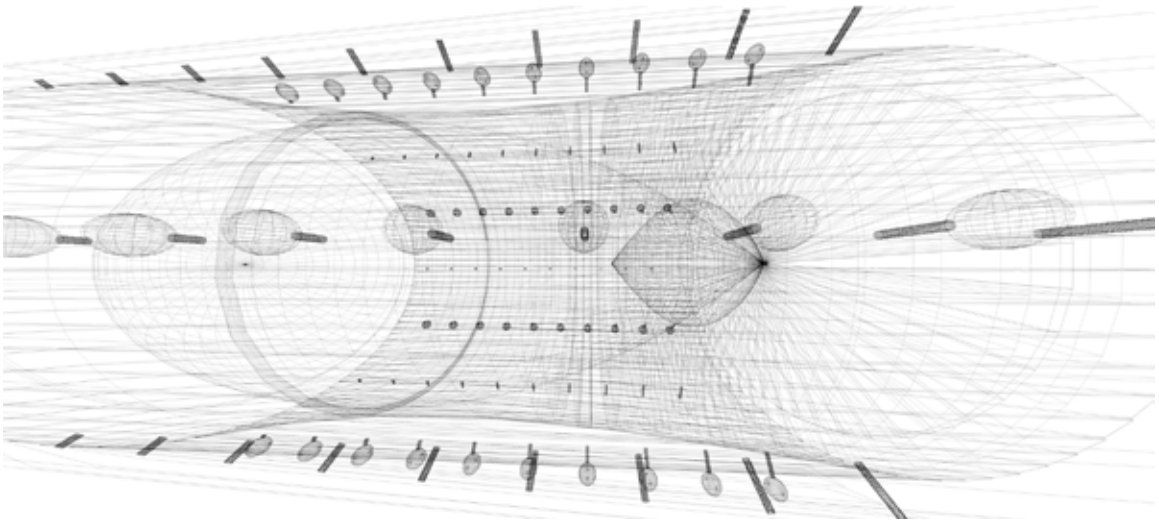


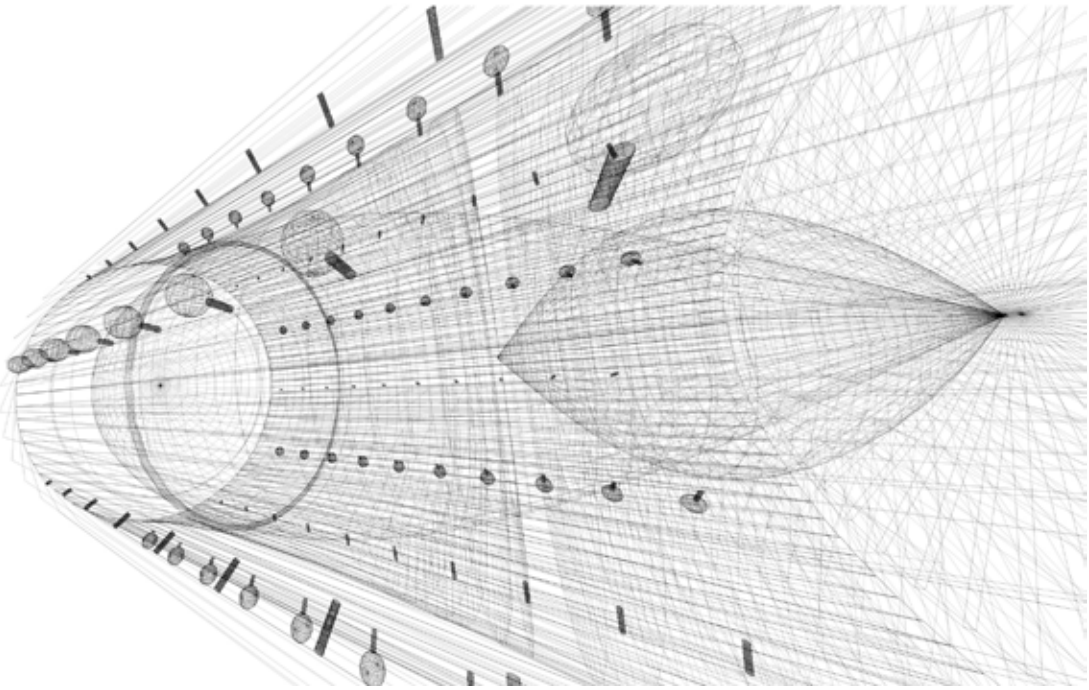
U I R A
orbital olympic village
emanuel dimas de melo pimenta



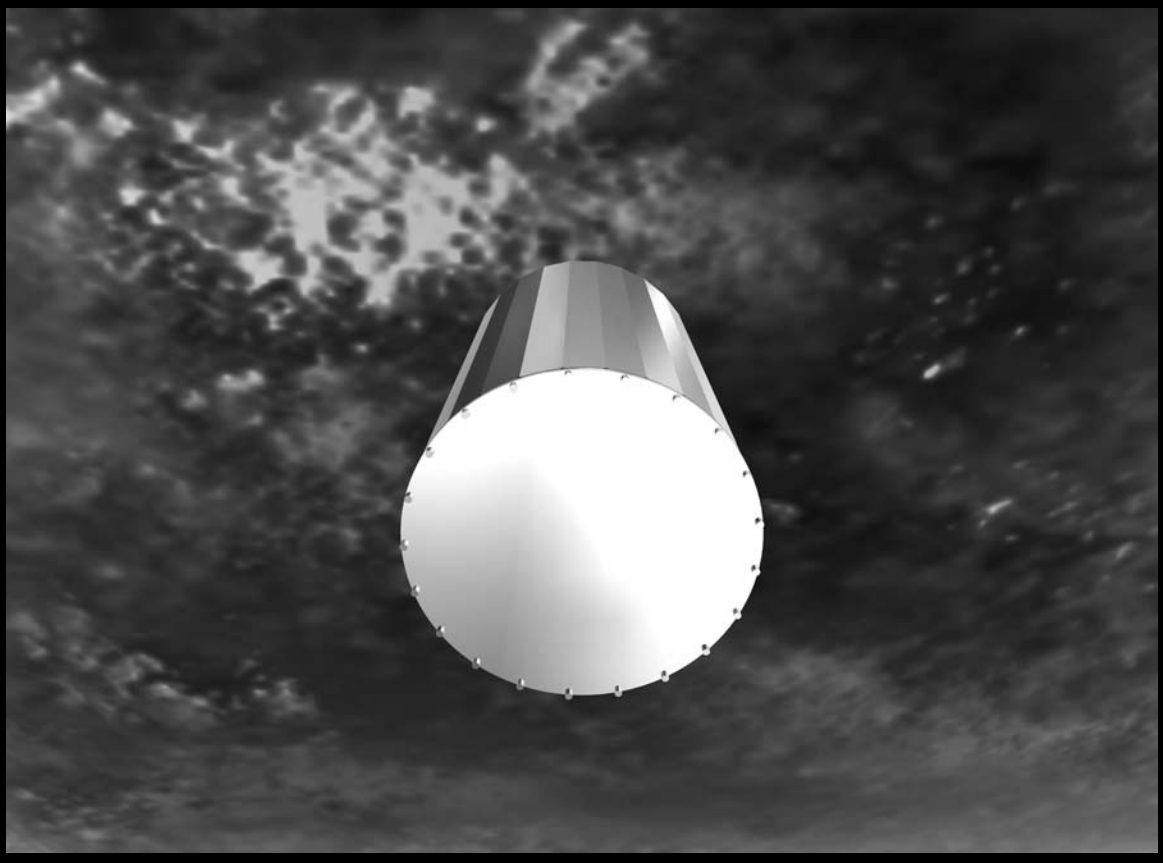
U I R A
orbital olympic village
emanuel dimas de melo pimenta

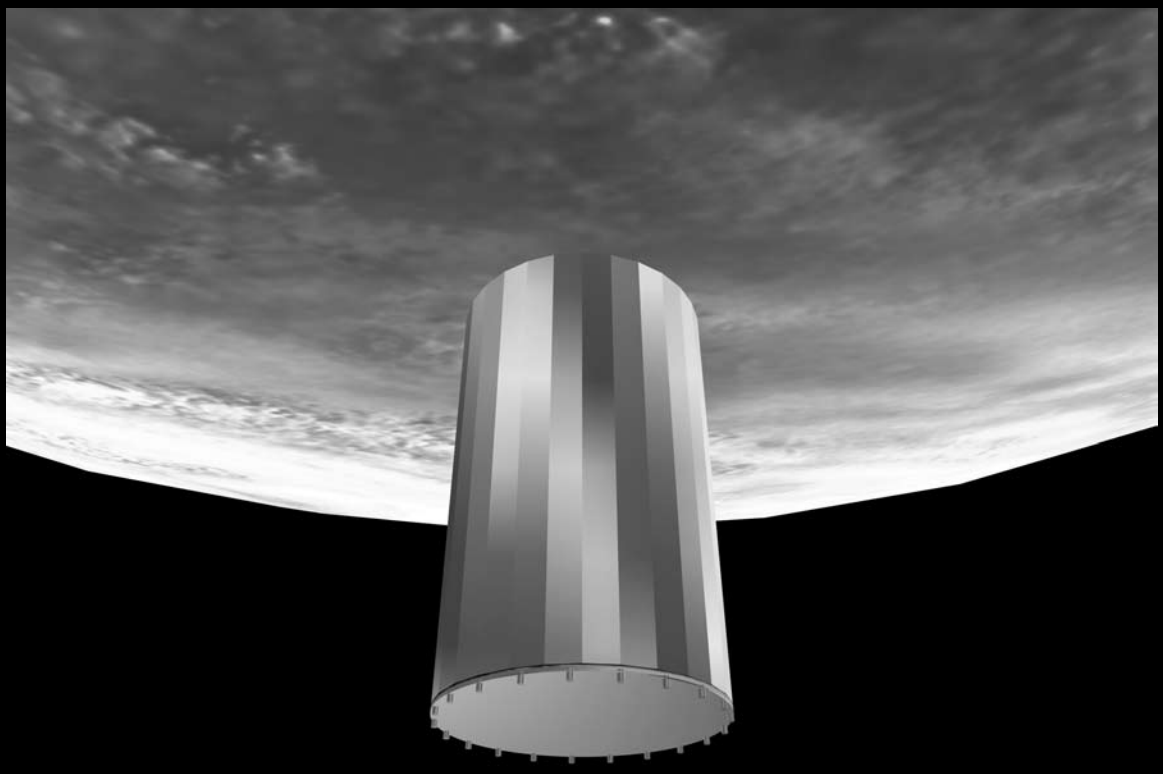


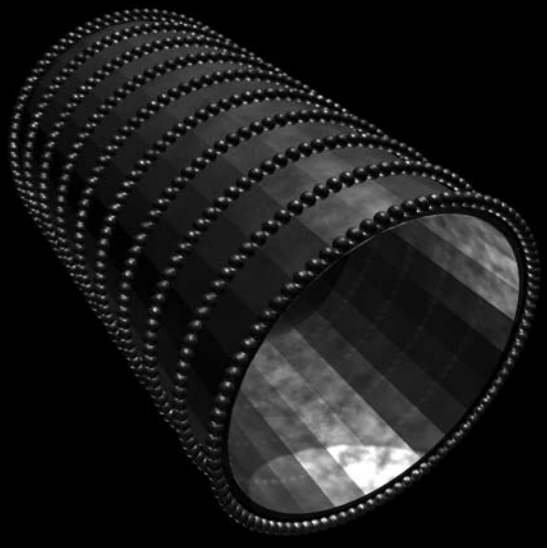


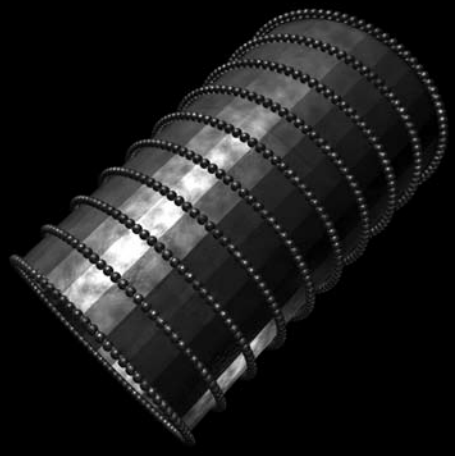


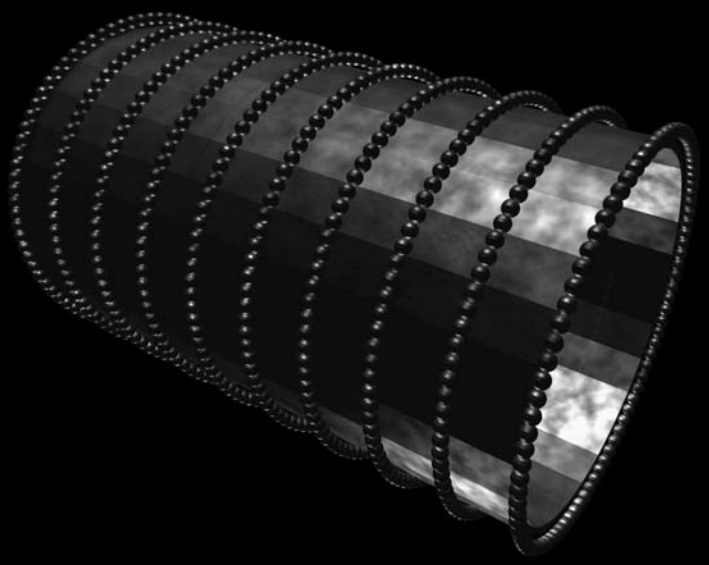
some digital images

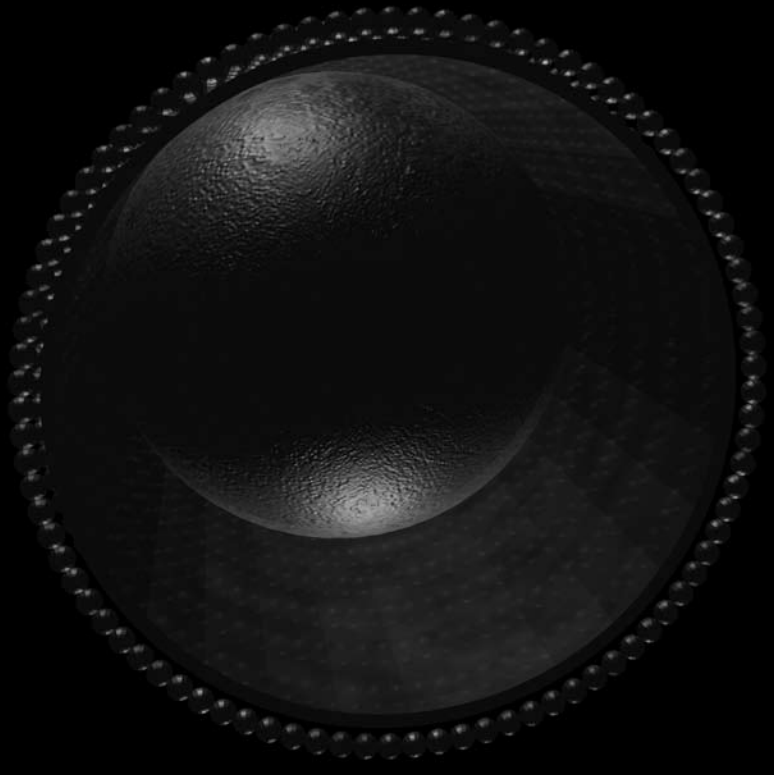


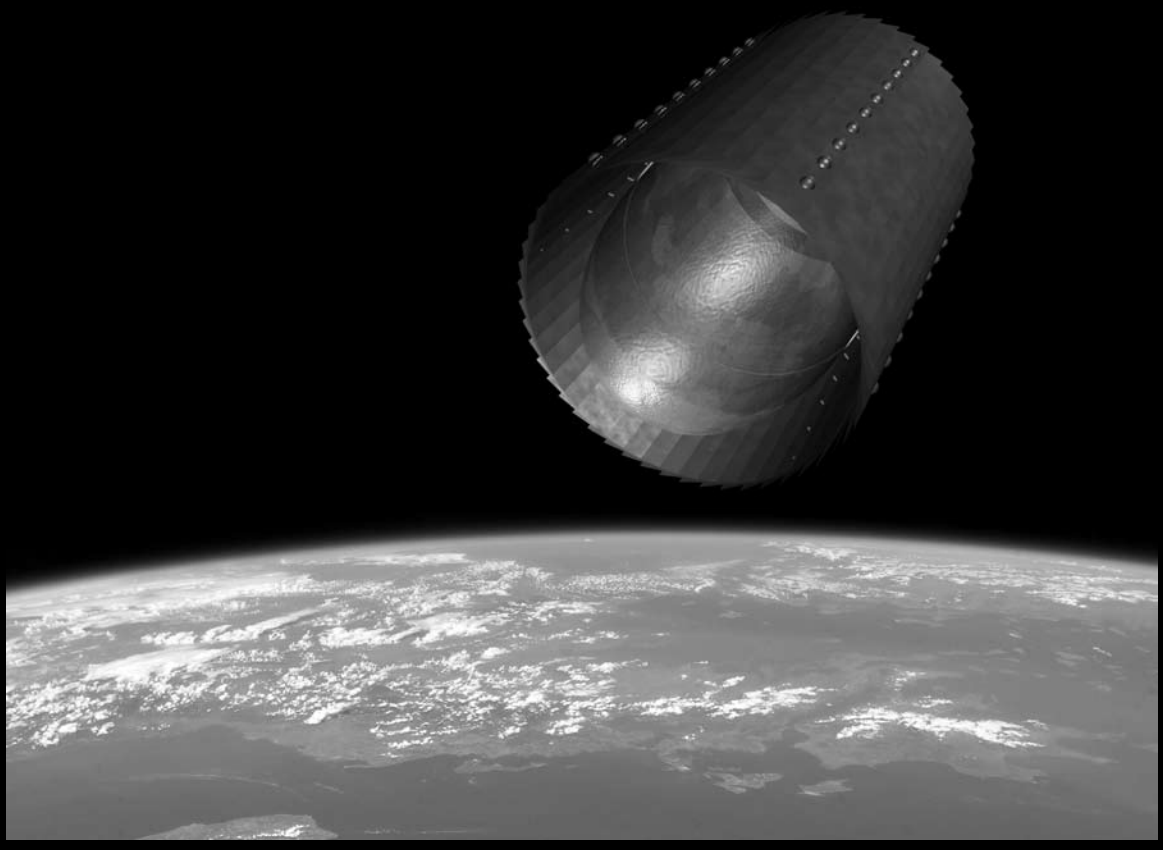


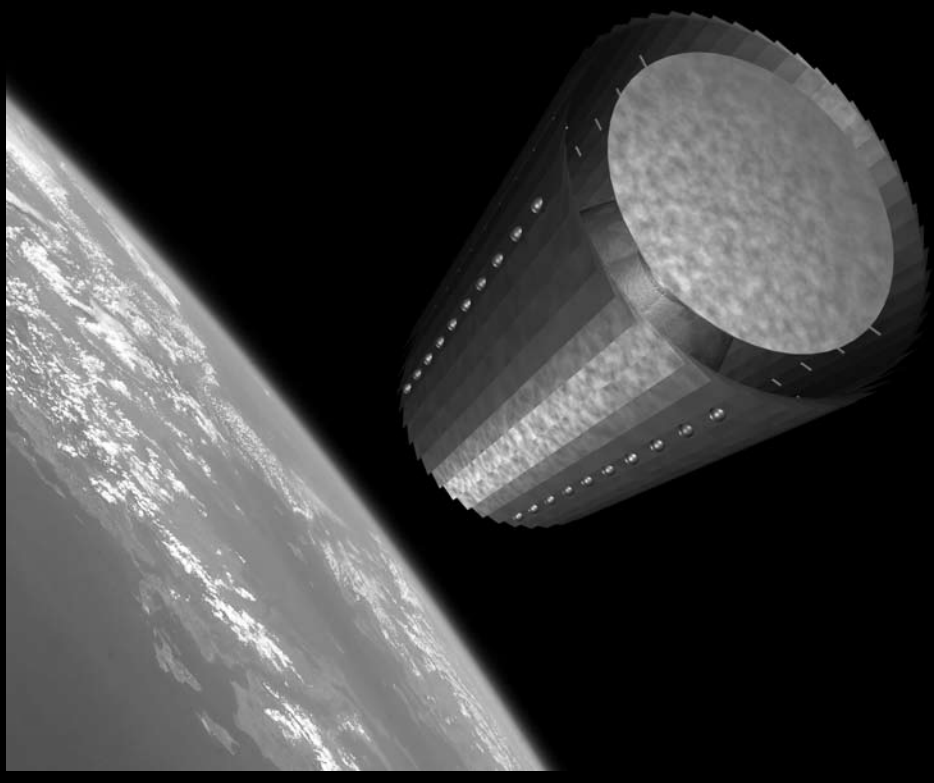


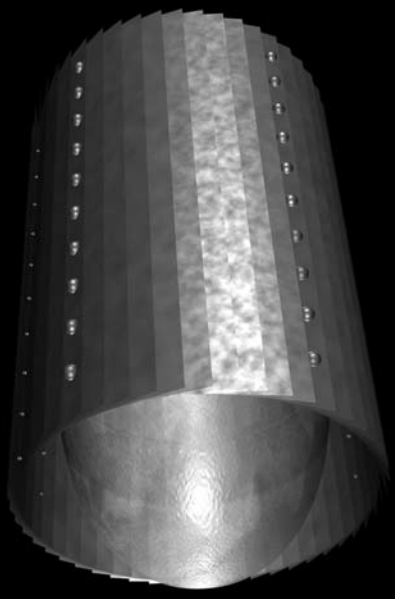


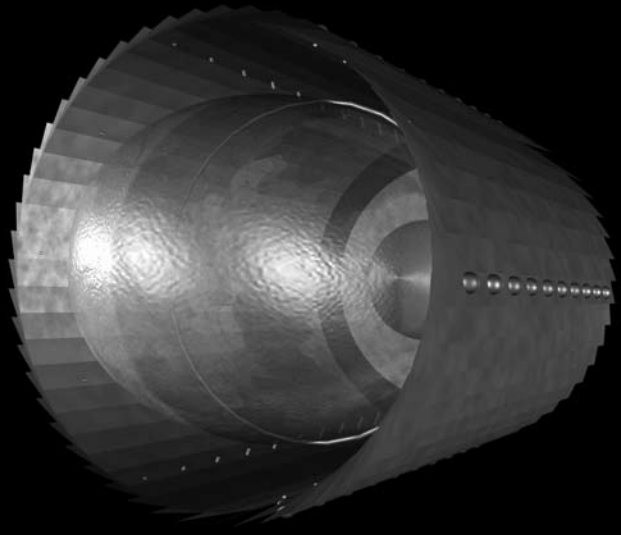


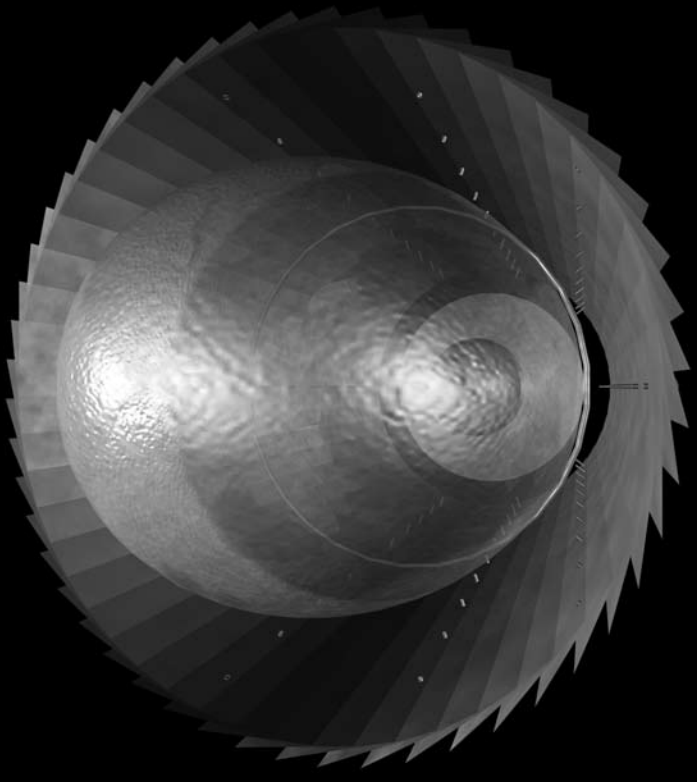


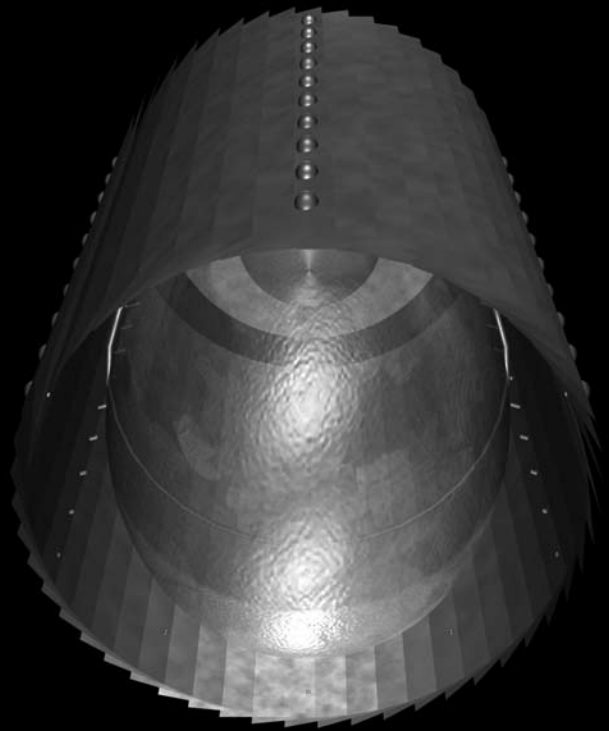


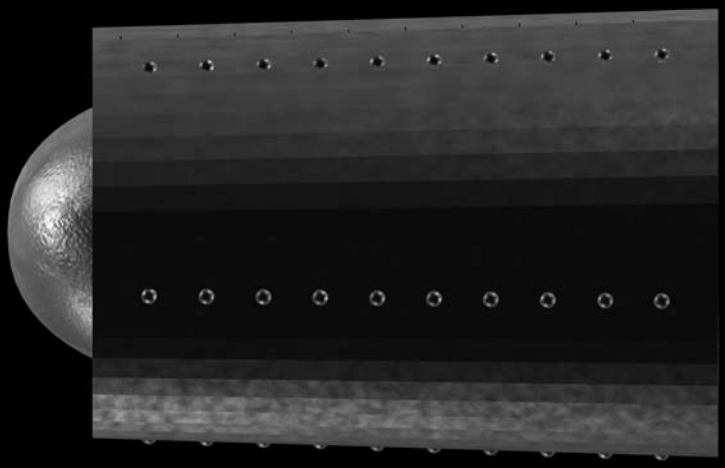












U I R A
orbital olympic village
emanuel dimas de melo pimenta

On Architecture

Emanuel Dimas de Melo Pimenta

I elaborated the concept of *virtual architecture* in the early 1980s, when I still was studying architecture and urbanism in São Paulo.

In 1979 I visited the Brazilian Indian tribes of Tapirapé and Karajá, in the south of the Amazon rainforest. Besides photography, another key objective of this trip was to study and understand the structure of space-time among the aboriginal populations.

The space elaborated by those tribes revealed some fascinating elements. Everything was flexible there. The functionality of the space was defined by *virtual areas*, such as kinds of functional boundaries. Then, everything was deprogrammable.

Practically everything was suspended, so the structure of the buildings was used to support all types of objects. It was something like an *aerial architecture*. That space was created by light – everything made of shadows, textures and colors.

In one of the Karajá houses, I noticed that a family organized the definition of territorial fields in a very subtle way. When I entered the room, my presence caused a sudden imbalance, causing people to move quickly, designing new territorial spaces, like a dissipative thermodynamic system. At first I was very upset – because to my way of seeing the world, bring about a so strong change was to be extremely uncomfortable for those people. But for them it was something perfectly natural.

I began to question whether, ultimately, all we are not, after all, a bit like that, naturally flexible. If this premise is true, what's the point of designing rigid walls, static buildings prisoners of a single program?

The principle of deprogrammability is one of the aspects immediately included in the concept of *virtual architecture*.

Space and time have always been key elements in my work.

In early 1980, I was deeply involved in the ideas of Antonin Artaud - who was widely recognized in Brazil. In his book *Le Théâtre et Son Double*, Artaud was the first to use the idea of *virtual reality*, in the 1930s! For Artaud, the scenic stage was a kind of virtual reality of life.

The etymological root of the word *virtual* is the Latin *virtus*, which means potentiality.

Virtual is not absence, but potentiality.

At that time I also studied the process of the unconscious. If, in fact, the *word* is an essential element to project what we call *consciousness*, strengthening the sedimentation of long-term memory, nonverbal systems are the very structure of what we call the *unconscious*. Of course, the *word* – as well as any other language system – also participates in the unconscious, and the fascinating work of Lacan shows how this works. But nonverbal systems, incorporating the invisible face of the verbal, reveal the great structure of the unconscious in space and in time.

Thus, architecture is nonverbal expression par excellence of space-time. Architecture is not only space, and it is not just visual. In fact, space itself is also time. One can observe a static three-dimensional image, such as a photograph of a large room, for example, but it will not be space.

Space implies time, like a continuous trip, permanent reconnaissance flight. Like Thoreau's walking.

Architecture is the design of space-time.

And being trans-sensory par excellence, architecture works the uncon-

scious redesigning space-time. For this reason, when you move from one space to another, as when we move house or a country, much of our relationship with the world is changed.

Thus, architecture also is design of thought.

If architecture is the design of space-time, there must be four-dimensional resources of design, not just the old two-dimensional sheet of paper!

I still did not have computer graphics at that time, but I figured that the use of digital systems, of artificial intelligence, super telecommunications systems, real time and also the phenomenon of *immersion*, would imply a new method of approach to architecture: a *virtual architecture*.

In the same way the incorporation of transparent paper on the drawing board of the architect of the nineteenth century produced an increase in open spaces and the increased use of glass in buildings, the use of a dynamic system of space-time in a parallel reality, a virtual reality, could generate a *virtual architecture* – not to illustrate anything, but while process.

When I proposed this concept in the early 1980s, many people had great difficulty understanding. In 1983 I wrote *Architecture and the Unconscious*, and in 1984 *TAPAS - Architecture and the Unconscious*. But at that time it was thought, in general, that the use of computers in architecture would be a simple way to replace draftsmen and easily duplicate modules.

Even when, ten years later, in 1991, I launched my book *Virtual Architecture* in England people still have not understood the profound impact of changes in the design of space-time in a virtual world. Interestingly, three people who were not architects perfectly understood this stunning metamorphosis: John Cage, René Berger and John Archibald Wheeler.

They were three very important people in my life.

But a different approach also implies a different method – which is nothing but

a clear understanding of that approach. Thus, in those early years of the 1980s I wrote the essence of the concept of *virtual architecture*:

- Architecture is the projection of space and of time.
- The computer, or any other instrument, is not a simple replacement of the drawing board. It is another dimension of thought.
- The word *virtual* comes from the Latin word *virtus* – meaning *potentiality*, and not the absence or reduction of means. Each element of architecture and of the architectonic process should be considered as a potential singularity.
- Method is essential: only through method we can criticize our work and ourselves.
- The basic strategy of an architectural design should be determined by the *crossing-over* of a large amount of metabolic structures – such as water, light, landscape, communication flows, wind, images, sounds, plants, soil, sun, culture, history and so on.
- Architecture as projection of space-time is also a structural dimension of our thinking, of our unconscious – thus, architecture is about projection of thought.
- The architectural design should provide logical references unrelated to the purpose of the project. They can be natural or mathematical phenomena. These strange structural references make the counterpoint to the architectural language, projecting differential moments – or *logical traps* – and, thus, projecting the conscious, *illumination*, discovery, because only difference produces consciousness.

- In space, difference is fundamental – because only difference produces consciousness. But, on the other hand, only monotony, redundancy, provokes emotions.

- The architect should always be attentive to the unity of the project – the sense of unity is the essential element in communication.

- Architecture is the result of its time, its historical time. But in the virtual world everybody belongs to all traditions, all the time, not as content but as metabolism. In the virtual world the past is present - not as a symbol but as a process. East and West, North and South become our common heritage, of all times.

- Architecture, like art, should be the criticism of culture, not as content but in its *modus operandi*.

- Architecture is not a symbolic element and, therefore, it is not a degenerate relation of signs – but a process designed by the flow of everything that passes through the human, like a nervous system.

- The computer or any other kinds of sensory extension or prosthesis sensory aren't devices to make easier the act of drawing. They are part of the drawing in itself, as a process.

- In architectural design, like what happened in its modern movement, no structural element should be hidden. Nothing should be hidden.

- Each new architectural design should be a new invention – because it will always be a different moment in time, to different people and, therefore, a different environment. People are always changing.

- Space-time design is the design of our *sensory palette* – each of our senses is a different logical complex. *Sensory design* is to create logical complexes, to design thought.

- In each virtual architectural design all *paradigms* are transformed into *sintagmas*, questioning the nature of ceiling and walls, doors and windows, tension and pressure, load and support, and so on.

- Each architectural design must be characterized under a desprogrammable approach. A space-time complex must be easily deprogrammable and reprogrammable, because each person is always changing, all the time.

- Architecture is made for people, not to be pictures in catalogs – sit must be experienced by all our senses, including smell, touch, and others.

While the old architect envisions space-time from the abstraction of the two-dimensional surface of the paper, the virtual architect jumps to a new dimension of imagination, living in a parallel reality and projecting relations that were impossible before.

Until the mid-1990s I was also involved in construction. But then I became aware that a terrible bureaucracy had furiously invaded our cities as something extremely destructive. New ideas would have been killed in the world of bureaucracy – including mental bureaucracy – and of corruption, which continues growing a little everywhere.

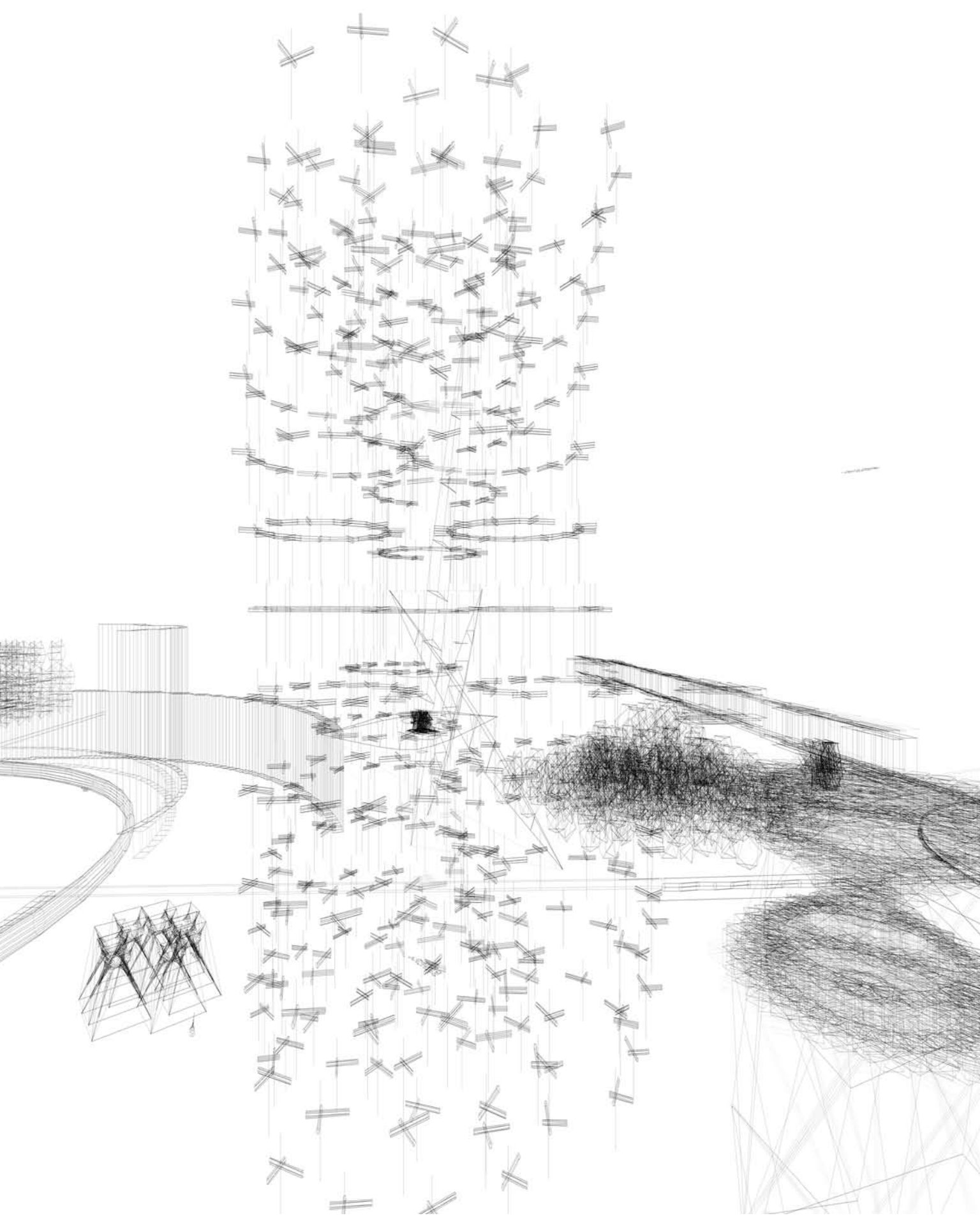
So, I decided to dedicate myself to the development of architecture in its deepest sense – taking it as a form of art.

Even if many of my architectural projects are still reserved for the virtual world, they are all made for humans.

Perhaps I'll construct again tomorrow, next month, next year or in the next life.

What matters is that my design must be free.

Right page: WOIKSED, first virtual planet of the world, designed by Emanuel Pimenta, after 1981. Image of 1989.



breve bio

Emanuel Dimas de Melo Pimenta (1957) has been considered by many as one of the most interesting architect, musician, photographer and intermedia artist at the beginning of the third millennium – according to statements written by like John Cage, Ornette Coleman, Lucrezia De Domizio, Merce Cunningham, John Archibald Wheeler, René Berger, Dove Bradshaw, Daniel Charles, Phill Niblock or William Anastasi among others.

His works are included in some of the most important art collections and world-wide recognized institutions like the Whitney Museum of New York, the ARS AEVI Contemporary Art Museum in Sarajevo, the Biennale of Venice, the Cyber Art Museum of Seattle, the Kunsthaus of Zurich, the Durini Contemporary Art Collection, the Bibliotèque Nationale of Paris and the MART - Modern Art Museum of Rovereto and Trento among others.

He has developed architecture, urban projects and music using Virtual Reality and cyberspace technologies and neurosciences.

His works are included in the *Universalis Encyclopaedia* (Britannica Encyclopedia) since 1991; in the *Sloninsky Baker's Music Dictionary* (Berkeley); the *Charles Hall's Chronology of the Western Classical Music*; in the *All Music Guide – The Expert's Guide to the Best Cds;* the *Wikipedia* and in the *Babylon* among others. Articles on his works have regularly appeared in different newspapers and magazines, like *The Wire*, *Ear*, *New York Times*, *Le Monde*, *Le Parisien*, *Liberation*, *O Estado de Sao Paulo*, *O Expresso*, and *O Globo*, *Il Sole 24 Ore* and *la Reppublica*, among others.

In the early 1980s Emanuel Pimenta coined the concept "virtual architecture", later largely used as specific discipline in universities all over the world. Among his challenging architectural designs, there is the famous floating island for Lisbon, Portugal; an experimental floating island for the Lake Maggiore in Switzerland; the Symmetrion building in Budapest, Hungary; and the Time Design Museum building, in Trancoso, Portugal.

In the end of 1980s he published in England the first book of the world on virtual architecture.

In 1981 he started elaborating *Woiksed* - the first virtual planet of the world, anticipating *Second Life* in about twenty years. In 1994 he received an important European Prize for that project.

In the 1990s he was the curator of the first exhibitions of virtual architecture all over the world. One of these exhibitions was at the Biennale of São Paulo, in 1999 and 2000.

As a musician, since the end of the 1970s, he has developed graphical musical notations inside virtual environments.

His concerts integrating visual art have been performed in various countries in the last thirty years. One of the most important moments was his famous concert at the Biennale of Sao Paulo, for four large orchestras, in 1985, side by side with John Cage, Robert Rauschenberg, Nan June Paik and Bill Viola among others. In 2008 he created the first opera on Dante Alighieri's *Divine Comedy* in the history of music, with the world première at the Abstracta Festival, in Rome, Italy. In 2009, his concert *CANTO6409*, created in partnership with the Italian movie director Dino Viani, who was responsible for the film, has its world première at the International Film festival of Cannes, in France.

Legendary musicians like John Cage, David Tudor, Takehisa Kosugi, John Tilbury, Christian Wolff, Martha Mooke, John DS Adams, Maurizio Barbetti, Michael Pugliese, Umberto Petrin, Susie Georgetis, Audrey Riley and the Manhattan Quartet among others have performed his compositions.

He collaborated with John Cage, as commissioned composer for Merce Cunningham, from 1985 until his death in 1992. He remained commissioned composer for Merce Cunningham in New York City until his disappearance in 2009.

His concerts have been performed in some of the most prestigious theatres all over the world, like the *Lincoln Center* and *The Kitchen* in New York; the *Opera Garnier* or the *Theatre de La Ville* in Paris; the *Shinjuku Bunka Center* in Tokyo, the Montpellier Municipal Theatre, the Festival of Aix en Provence, the Modern Art Museum MASP in Sao Paulo, *La Fenice* in Venice, and the Biennales of Venice and São Paulo among others.

Since 1989, he has regularly collaborated with Lucrezia De Domizio, the Baroness Durini, with countless contemporary art projects, concerts, exhibitions and publications – especially on Joseph Beuys – in several countries.

In 1987 he started a regular collaboration with the legendary Swiss art philosopher René Berger in numerous projects especially in Switzerland – with Nan June Paik, Bill Viola, Edgar Morin, Pierre Levy and Basarab Nicolescu – until his death in 2008.

With more than four hundred musical compositions already recorded, twenty-five published compact discs, four cd-roms, he has wrote and published more than fifty books, great part of them individually, several papers and a great quantity of electronic books. His works have been regularly published in England, the United States, Japan, the Netherlands, Portugal, Brazil, Germany, Canada, Switzerland, Hungary, Italy and Spain.

He has also been curator for various institutions, like the Biennale of Sao Paulo, in Brazil; the Calouste Gulbenkian Foundation and the Belem Cultural Center, in Lisbon, among others.

In the 1980s and 1990s Emanuel Pimenta founded and directed companies in Europe, oriented to architecture, art and new technologies – one of them was responsible for the distribution of computers especially created to architecture design.

Over the last thirty years, Pimenta has also been responsible for new concepts like the *hyperurban*, *sensorial design*, *nanodecision systems*, and *neognostics* among others.

He won the National Marketing Prize in 1977 by the Brazilian Association of Marketing; the APCA Prize in 1986 by the Art Critics Association of Sao Paulo (AICA Section in São Paulo); and the Lac Maggiore Prize in 1994 by UNESCO, AICA International Association of Art Critics, the Council of Europe and the Lombardia Regional Government. In 1993 his works were selected by UNESCO, in Paris, as one of the most representative intermedia researchers of the world.

He is member of the *SACD – Societè des Autheurs et Compositeurs Dramatiques* in Paris since 1991. He also is an active member of the *European Environmental Tribunal*, in London, where he has been member of the board since 1995.

He is an active member of the *New York Academy of Sciences*; of the *American Association for the Advancement of Science* in Washington DC; of the *ASMP - American Society of Media Photographers*; of the *CREA Brazilian Council of Architects and Engineers*; and of the *OA Portuguese Order of Architects* among others. He is member and advisor of the *AIVAC – Association Internationale pour la Video dans les Arts et la Culture*, in Locarno, Switzerland. He was a founding member of the *International Society for the Interdisciplinary Study of Symmetry – ISIS Symmetry* and of ISA *International Symmetry Association*, both in Budapest.

He is member of the jury of the *BES Fellowship* (*Experimental Intermedia Foundation* in New York City, the *Luso American Foundation* and the *Calouste Gulbenkian Foundation*, in Portugal), since 1995.

He was Editorial Director of the art and culture magazine *RISK Arte Oggi*, in Milan, founded and directed by Lucrezia De Domizio, Baroness Durini, from 1995 to 2005. He was also member of the Advisory Editorial Board of the art and science magazine *Forma*, in Tokyo, Japan; and he is member of the Editorial Council of the art and philosophy magazine *TechnoEtic Arts*, in Bristol, England, founded and directed by Roy Ascott.

On architecture, he studied with Eduardo Kneese de Mello, Eduardo Corona, Roti Nielba Turin and Maurício Nogueira Lima among others. He took part in various workshops and master classes with Kenzo Tange, Oscar Niemeyer, Yona Friedman, Peter Cook (Archigram) and Charles Moore among others.

He also studied with Hans Joachim Koellreutter – his main master on music and on aesthetics (Koellreutter was pupil of Paul Hindemith, Hermann Scherchen, Kurt Thomas and Marcel Moyse; flutist with Darius Milhaud; and teacher of Luigi Nono and Karlheinz Stockhausen), Demetrio Lima (flute), Decio Pignatari, Holger Czukai (Karlheinz Stockhausen) and Conrado Silva (Olivier Messiaen, Karlheinz Stockhausen) among others.

Mr. Pimenta has been frequently invited, as professor and lecturer, by several institutions, among then the universities of New York, Georgetown, Lisbon, Florence, Lausanne, Tsukuba, São Paulo, Palermo, the Calouste Gulbenkian Foundation in Lisbon, the Monte Verita Foundation in Switzerland and the Technion Institute of Technology in Haifa, Israel.

He his founder and director of the Holotopia Academy: an informal institution oriented to music, art, philosophy and science, in the Amalfi Coast, Italy. He is also founder and director of the Foundation for Arts, Sciences and Technology – Observatory, in Trancoso, Portugal.

He lives between Locarno, Switzerland, which is his main residence, New York and Lisbon. His website is www.emanuelpimenta.net. In his website one can find his architectural projects, music projects, books, ebooks, photographic projects and essays, articles, films and his radio.

BIBLIOGRAPHY

ABOUEL-FOTOUTH, A.M., A.I. Elsharkawy, I. Shabaka and A. Elfar - The Effect of Satellite Orientation on Satellite Surface Temperature Distributions, INSInet, 2006, Cairo University, Egypt

AKIN, Dave – Spacecraft Design Reference Library, University of Mariland, Space Systems Lab

ANNARELLA, Cyril (ed), FRASER, David; KLEESPIES, Hank; VASICEK, Cliff - Spacecraft Structures, 1991

APEL, Uwe – Human Factors and Health in Space Tourism, paper at ISST, Bremen, Germany, 1999.

BELK, C.A.; ROBINSON, J.H.; ALEXANDER, M.B.; COOKE, W.J.; and PAVELITZ, S.D. - Meteoroids and Orbital Debris: Effects on Spacecraft, NASA Reference Publication 1408, August 1997.

BENAROYA, Haym – Turning Dust to Gold, Praxis, Chichester, United Kingdom, 2010.

BERARDELLI, Phil – Lessons from Skypping Stones Could Improve Aircraft Safety, in Science, August 16, 2010.

BIZONY, Piers – How to Build Your Own Spaceship, Plume, Penguim, New York, 2009.

BRAEUNIG, Robert A. - Orbital Mechanics, in www.brauenig.us, 2008

COLLINS, Patrick – Space Hotels – Civil Engineering's New Frontier, paper at the Advances in Civil Engineering IV International Congress, North Cyprus, 2000.

DOWNES, Kieran - Actually, it *is* rocket science: The military, the media, and the Americanization of Wernher von Braun

DUDLEY-ROWLEY, Marilyn (ed alt) – Crew size, Composition, and Time: Implications for Habitat and Workplace Design in Extreme Environments, Society of Automotive Engineers, 2001.

DUPAS, Alain – Demain, nous vivrons tous dans l'espace, Robert Laffont, Paris, 2011

DUPAS, Alain – La Nouvelle Conquête Spatiale, Odile Jacob, Paris, 2010

DUPAS, Alain – Le Village Interplanétaire, Gallimard, Paris, 1999.

FULLER, Richard Buckminster – Cosmography, MacMillan, New York, 1992.

FULLER, Richard Buckminster – Spaceship Earth, MacMillan, New York, 1963.

FULLER, Richard Buckminster – Synergetics, MacMillan, New York, 1975.

FULLER, Richard Buckminster – Synergetics 2, MacMillan, New York, 1972.

GAMBLIN, Charles R. - SPACECRAFT STRUCTURAL ANALYSIS TODAY AND YESTERDAY, Teledyne Brown Engineering. Huntsville, Alabama

GARINO, *Maj Brian (USAF); LANPHEAR, Maj Jeffrey (USAF)* - Spacecraft Design, Structure, and Operations

GRAY, Jim; LIU David T.; NIETO-SANTISTEBAN, Maria; SZALAY, Alexander S.; DeWITT, David; HEBER, Gerd - Scientific Data Management in the Coming Decade, Microsoft, 2005

HALE, Edward Everett – Brick Moon, 1869, Gutenberg Project.

HALL, Christopher D.; and KLUEVER, Craig - Spacecraft Dynamics and Control, 2002

HALL, Theodore W. - Artificial Gravity and the Architecture of Orbital Habitats, paper at ISST, Bremen, Germany, 1997.

HALL, Theodore W. - The Architecture of Artificial Gravity; Theory, Form, and Function in the High Frontier, postdoctoral research fellow at the Department of Architecture of the Chinese University of Hong Kong, 1995.

HALL, Theodore W. - Inhabiting Artificial Gravity, paper at AIAA 99-4524, Albuquerque, New Mexico, United States, 1999.

HARRIS, Philip Robert – Space Enterprise: Living and Working Offworld in the 21st Century, Praxis, Chichester, UK, 2009.

HICKS, Michael Thomas - Design of a Carbon Fiber Composite Grid Structure for the GLAST Spacecraft Using a Novel Manufacturing Technique, Stanford Linear Accelerator, Center Stanford University, June 2001.

HUNTINGTON, Samuel Phillips – Clash of Civilizations, 1993

JONES, Harry W. - The Cost and Equivalent System Mass of Space Crew Time, NASA, 2001.

KATTI, V. R.; THYAGARAJAN, K.; SHANKARA, K. N.; and KUMAR, A. S. Kiran Kumar - Spacecraft technology**,** ISRO Satellite Center, India, CURRENT SCIENCE, VOL. 93, NO. 12, 25 DECEMBER 2007.

LANDIS, Geoffrey A. - Magnetic Radiation Shielding: An Idea Whose Time Has Returned?, Space Manufacturing 8: Energy and Materials from Space, 383-386 (AIAA, 1991).

LYNCH, Kevin A. - Image of the City, MIT, 1960.

NAISBITT, John – Global Paradox, Avon, New York, 1995.

NARAYAN, S. Shankar; NAIR, P. S., and GHOSAL, Ashitava – Dynamic Interaction of Rotating Momentum Wheels with Spacecraft Elements, ISRO, India.

NOORDUNG, Herman Potočnik - The Problem of Space Travel: The Rocket Motor, Original: Hermann Noordung, Das Problem der Befahrung des Weltraums - der Raketen-Motor, Richard Carl Schmidt & Co., Berlin W62, 1929.

PALUSZEK, Michael; BHATTA, Pradeep; GRIESEMER, Paul - Spacecraft Attitude and Orbit Control, 1996-2009, Princeton Satellite Systems, Inc.

MUELLER, Joseph; THOMAS, Stephanie - Decentralized Formation Flying Control in a Multiple-Team Hierarchy, Princeton Satellite Systems, Princeton, NJ 08542.

PASSINI, Romedi – Wayfiding in Architecture, University of Montreal, 1984.

PERRY, Jay L.; LeVAN, M. Douglas - AIR PURIFICATION IN CLOSED ENVIRONMENTS: OVERVIEW OF SPACECRAFT SYSTEMS**,** Marshall Space Flight Center; Department of Chemical Engineering at Vanderbilt University.

PILAND, W. (editor) - General Public Space Travel and Tourism Volume 2 – Workshop Proceedings, NASA, 1997.

O'NEIL, D. (Compiler), MANKINS, J. and BEKEY, I. (Editors) – General Public Space Travel and Tourism Vol 2 – Workshop Preceedings, NASA, CP-1999-209146, 1999.

REDLIN, DeAnn – LEO Communications Satellites: the IRIDIUM Constellation, ASEN5050, 2000.

REED, Kevin – Early Commercial Demonstration of Space Solar Power Using Ultra-Lightweight Arrays, SESCRC, Germany, American Aerospace Advisors Inc, United States, IAC-07-C3.2.04, 2004.

ROACH, Mary – Packing for Mars, W. W. Norton, New York, 2010.

SCHAUB, Hanspeter - SPACECRAFT RELATIVE ORBIT GEOMETRY DESCRIPTION THROUGH ORBIT ELEMENT DIFFERENCES, 14th U.S. National Congress of Theoretical and Applied Mechanics, Blacksburg, VA, June 23–28, 2002.

SCHWARTZ, Jana L.; HALL, Christopher - SYSTEM IDENTIFICATION OF A SPHERICAL AIR-BEARING SPACECRAFT SIMULATOR, AAS 04-122

SIMBERG, Rand – Near-Term Prospects for Space Tourism – paper at The Sophron Foundation, 2000.

SIRMUDA, Laura Jeanette - SPACE TOURISM: COMMERCIALIZING THE FINAL FRONTIER, Faculty of the Graduate School at the University of Southern California, MA thesis, 2009.

SOLERI, Paolo – Arcologie – La Ville à l'Image de l'Homme, Parenthèses, Paris, 1980.

STREETMAN, Brett Streetman; PECK Mason A. - New Synchronous Orbits Using the Geomagnetic Lorentz Force, AIAA Guidance, Navigation, and Control Conference and Exhibit, 21 - 24 August 2006, Keystone, Colorado.

SWINERD, Graham – How Spacecraft Fly, Praxis, Chichester, United Kingdom, 2008.

WICHMAN, Harvey A. - Designing User-Friendly Civilian Spacecraft, Proceedings of the 6th ISCOPS, December 1995, AAS Vol 91 Paper nº AAS 95-604.

WHITE, Wayne – The Legal Regime for Private Activities in Outer Space – paper at Cato Institute, 2001.

ZHANG, Lihua; CHEN, Yuegen - The On-Orbit Thermal-Structural Analysis of the Spacecraft Component Using MSC/NASTRAN, Beijing Institute of Spacecraft System Engineering, CAST, China.

University of Leicester CubeSat Project – Radiation Environment for a Sun Synchronous Orbit, 2008

The University of Texas at Austin, Department of Aerospace Engineering and Engineering Mechanics, John Opiela, 1994.

AU Space Primer - Space Reference Guide, 7/23/2003, SPACECRAFT DESIGN, STRUCTURE AND OPERATIONS.

NASA – Goddard Procedures and Guidelines, Directive GPG 7120.5, from 2002 to 2007, Systems Engineering.

NASA – Greenbook 1992, MISSION DESIGN PROCESS: AN ENGINEERING GUIDE TO THE CONCEPTUAL DESIGN, MISSION ANALYSIS, AND DEFINITION PHASES.

NASA Procedures and Guidelines, NPG: 7120.5B, 2002 to 2007.

NASA / ESA – International Space Station, International Space Station Flight Crew Integration Standard – NASA-STD-3000/T, 1999.

NASA – Systems Engineering Handbook, SP-610S, June 1995.

NASA – The Nimbus 7 Spacecraft System, 2009.

NASA Technical Handbook - AVOIDING PROBLEMS CAUSED BY SPACECRAFT ON-ORBIT INTERNAL CHARGING EFFECTS, NASA-HDBK-4002 FEBRUARY 17, 1999

NASA TECHNICAL STANDARD - STANDARD MATERIALS AND PROCESSES REQUIREMENTS FOR SPACECRAFT, NASA-STD-6016, 07-11-2008 Washington, DC 20546-0001 Expiration Date: 07-10-2013

SPACE FUTURE – www.spacefuture.com – Space Vehicles

MIT – Space Systems Lab – ssl.mit.edu

David L. Akin - Akin's Laws of Spacecraft Design

US Patent Publication (Source: USPTO)
Publication No. US 7041372 B2 published on 09-May-2006
Application No. US 09/956304 filed on 19-Sep-2001
James Rhoads

orbitaldebris.jsc.nasa.gov
www.spacechronology.com/
www.o3bnetworks.com
www..buzzaldrin.com
www.nasa.gov
www.spacetourism.org
www.freemars.org
www.dyarstraights.com/resumes/cv-dnd.html

Some newspapers and magazines:

the New York Academy of Sciences' Annals
The New York Times
Washington Post
Science
New Scientist
O Estado de São Paulo
Le Monde
Nature
Público
La Republica
Il Sole 24 Ore
Giornale del Popolo
Science et Vie

images - thanks, description and credits

Page 7 - Nicolas Aubin, 1702. Private collection.

Page 27 – logo of the 1968 Olympic Games in Mexico, public domain.

Page 28 - Monteiro Lobato, circa 1920, unkown photographer. Public domain.

Page 29 - Baron Pierre de Coubertin, em 1915. Photograph from the George Grantham Bain collection, which was purchased by the Library of Congress in 1948. According to the library, there are no known restrictions on the use of these photos. This work is in the public domain in the United States because it was published (or registered with the U.S. Copyright Office) before January 1, 1923.

Page 30 - Discobolus Lancelotti Massimo. Copy after Myron (Greek, 5th century BC). Public domain.

Page 31 - Kairos, aerial view of one module, 2011, copyright Emanuel Dimas de Melo Pimenta.

Page 32 - Kairos, lateral view of one module, 2011, copyright Emanuel Dimas de Melo Pimenta.

Page 33 - Kairos, lateral view of one module, 2011, copyright Emanuel Dimas de Melo Pimenta.

Page 34 – Stamp of the 1896 Olympic Games. Public domain.

Page 35 – Illustration in Jules Verne's book De la Terre à la Lune, published in 1865. Public domain.

Page 36 - Eduardo Kneese de Mello, in 1930 (in Aline Regino)

Page 37 - Maurício Nogueira Lima, in 1977. (in Ruptura)

Page 38 - Roti Nielba Turin, photo by Emanuel Dimas de Melo Pimenta, São Paulo, 1982, copyright Emanuel Dimas de Melo Pimenta.

Page 39 – Olympic Village in Baldwin Hills, Los Angeles 1932, first Olympic village of the modern times. Public domain.

Page 40 – Poster of the 1896 Olympic Games. Public domain.

Page 41 - Olímpia, antiga Grécia, gravura de 1891. Pierers Universal-Lexikon, 1891. Public domain.

Page 43 - UIRA, lateral view, copyright Emanuel Dimas de Melo Pimenta.

Page 44 - SSO Sun Synchronous Orbit. Ground track of Sun-synchronous Orbit. In LEO Communications Satellites: The IRIDIUM Constellation, by DeAnn Redlin, 2000.

Page 45 - Boundaries defining a typical spacecraft re-entry corridor. In http://www.aerospaceweb.org/question/spacecraft/q0218.shtml

Page 46 – Earth rotation.

Page 47 - UIRA, lateral view with emergency spheres, copyright Emanuel Dimas de Melo Pimenta.

Page 49 – Uira, perspective, copyright Emanuel Dimas de Melo Pimenta.

Page 50 - O vectran tem sido um dos tecidos balísticos utilizados em viagens espaciais.

Page 51 - A computer-generated image of objects in Earth orbit that are currently being tracked. Approximately 95% of the objects in this illustration are orbital debris, i.e., not functional satellites. The dots represent the current location of each item. The orbital debris dots are scaled according to the image size of the graphic to optimize their visibility and are not scaled to Earth. These images provide a good visualization of where the greatest orbital debris populations exist. Below are the graphics generated from different observation points. The GEO images are images generated from a distant oblique vantage point to provide a good view of the object population in the geosynchronous region (around 35,785 km altitude). Note the larger population of objects over the northern hemisphere is due mostly to Russian objects in high-inclination, high-eccentricity orbits. NASA. Public domain.

Page 52 - Georges Méliès, Voyage dans la Lune, 1902. Public domain.

Page 53 – Kairos, detalhe, 2011, copyright Emanuel Dimas de Melo Pimenta.

Page 54 – Uira, 2012, copyright Emanuel Dimas de Melo Pimenta.

Page 55 – “The Blue Marble” is a famous photograph of the Earth taken on December 7, 1972 by the crew of the Apollo 17 spacecraft en route to the Moon at a distance of about 29,000 kilometers (18,000 statute miles). It shows Africa, Antarctica, and the Arabian Peninsula. NASA. Public domain.

From Page 58 to 118 – Uira, 2012, copyright Emanuel Dimas de Melo Pimenta.

Page 125 - WOIKSED, first virtual plante of the world, design by Emanuel Pimenta, after 1981. Image of 1989, copyright Emanuel Dimas de Melo Pimenta.

índex of names

Some other books by Emanuel Pimenta

KAIROS - A Bird Orbitting Planet Earth
30 Years of Architecture
Logical Traps
John Cage - The Silence of the Music
Koellreutter - The Musical Revolutions of a Zen Master
Virtual Notations
Art and Zen
Hidden Beings
Low Power Society
Mondo: Literature and Democracy
Walden Zero Project
Kirkos: A Dialogue Between Marcel Duchamp and Josqin Des Près
Neapolis
Firenze: Mind Battle Fields of a Magical City
Ascona