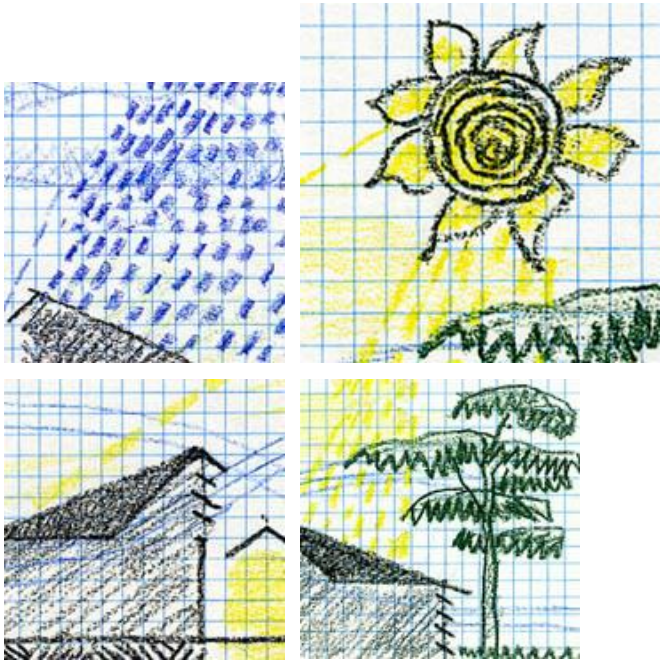
HARNESSING COMFORT THROUGH CLIMATE



BRUNO STAGNO
JIMENA UGARTE
a r ch i t e c t s
2004

HARNESSING COMFORT THROUGH CLIMATE

Bruno Stagno, Jimena Ugarte architects – Costa Rica

Lecture

USGBC (US Green Building Council) Miami, Florida Chapter and Miami Dade College, Wolfson Campus

November, 18 – 20, 2004

PRESENTATION

I was surprised by the fact that I was invited to lecture today since I am not a star, I do not follow architectural trends or fashions, my buildings are not big in size, they are not expensive, I have not been published in Architectural Record, I did not graduate from an ivy league university, and my English is mediocre.

In spite of this all, thank you very much for inviting me, it is of great honor and pleasure to be here. This lecture synthesizes my way of thinking in architecture. I began this journey 30 years ago when I moved from Chile to Costa Rica. That is, to a tropical latitude. I am going to illustrate this lecture with the buildings I have designed.

Recently, some of these buildings were exhibited at the Venice Biennale alongside the Museo de la Biodiversidad – Panamá, designed by Frank Gehry.

ISTITUO ITALO-LATINO AMERICANO

BRUNO STAGNO
COSTA RICA

IDENTITÀ TROPICALE

FRANK O' GEHRY
PANAMA

Metamorph 9ª Mostra Internazionale di Architettura Bienale di Venezia

METAMORPH

Biennale di Venezia 2004

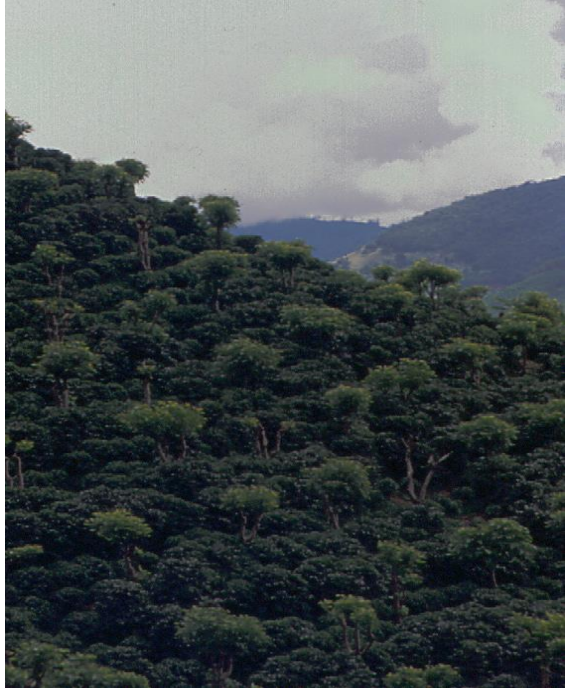
FRANK GEHRY
panamá, biodiversity museum

BRUNO STAGNO
costa rica, his work

INTRODUCTION

I come from a small country that has resolved not to give an opportunity to the oil industry and is currently wording an act in favor of environmental guarantees of constitutional rank in order to preserve the richness of its amazing natural biodiversity.

My work as an architect is significantly supported by the work we have been doing since 1994 at the Institute for Tropical Architecture, whose direction I share with the architect Jimena Ugarte, here present, and which aims to reveal the useful characteristics for architecture, urban planning and landscaping in this unique tropical latitude. In short, it is a constant reflection on tropicality, based on the observation of nature and people's experiences.



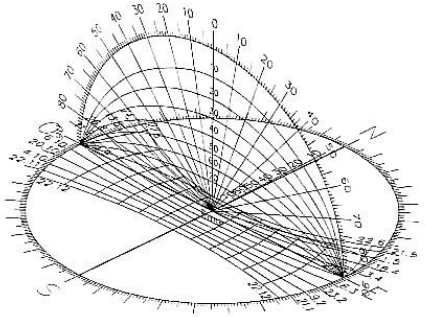
LANDSCAPES OF COSTA RICA

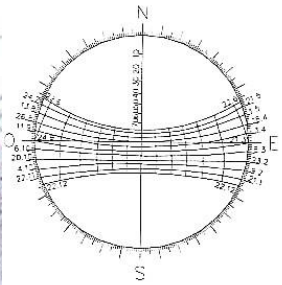
Along this same line of thinking, Costa Rica initiated more than 30 years ago (1974) a plan of protected areas that presently covers nearly 30% of its territory.

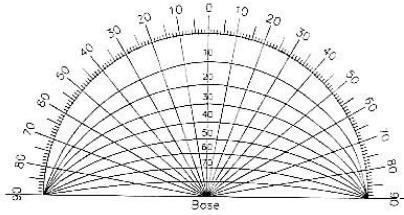
BIOLOGICAL CONSERVATION AREAS

- **Besides being a country without an army and being recognized as a zealous activist in human rights, Costa Rica has embraced in its territory immigrants from Central America, to whom it has granted the same rights as those of its nationals. To this day, they represent one fourth of the country's population.**

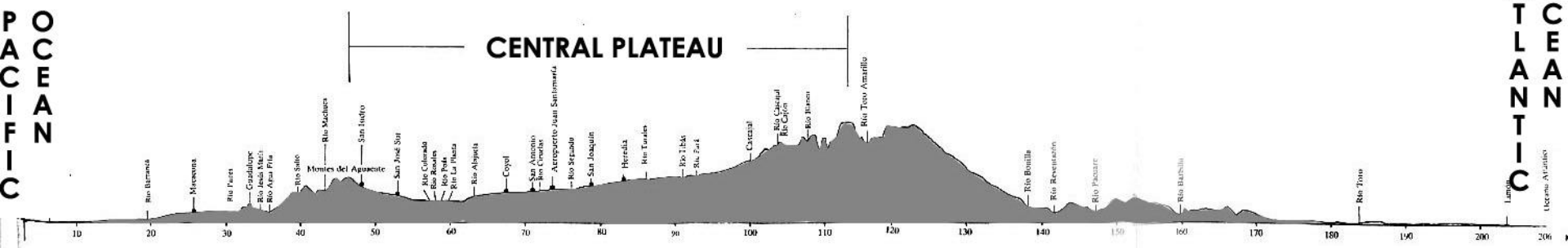
SOLAR PATH FOR LATITUDE 10°N, LONGITUDE 85°W







MAP OF COSTA RICA

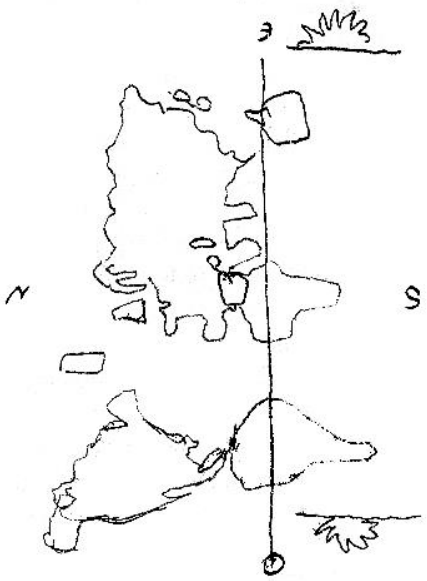


- Besides being a country without an army and being recognized as a zealous activist in human rights, Costa Rica has embraced in its territory immigrants from Central America, to whom it has granted the same rights as those of its nationals. To this day, they represent one fourth of the country's population.

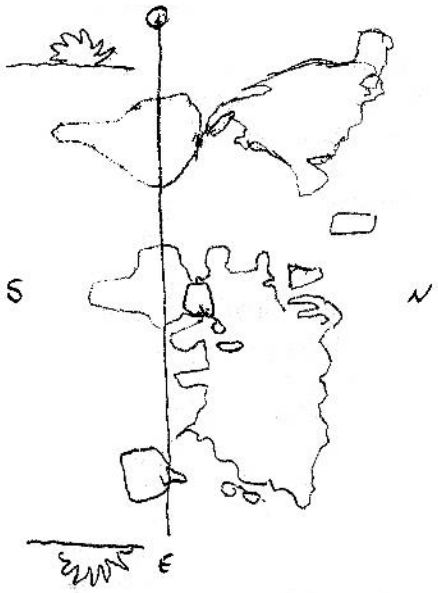
- Costa Rica is a country of contrasts in the generation of its wealth; along with being a tourist destination it produces coffee, bananas, pineapple and sugar (the desserts), and sophisticated chips for Intel, which end up inside many computers. Furthermore, with intellectual resources it creates innovative software that are exported as one of the great headings of foreign trade.

- As an extension I represent developing countries that attempt to focus towards bioclimatic architecture as a strategy to economize the presently limited natural resources, and very specially those countries in the tropical fringe.

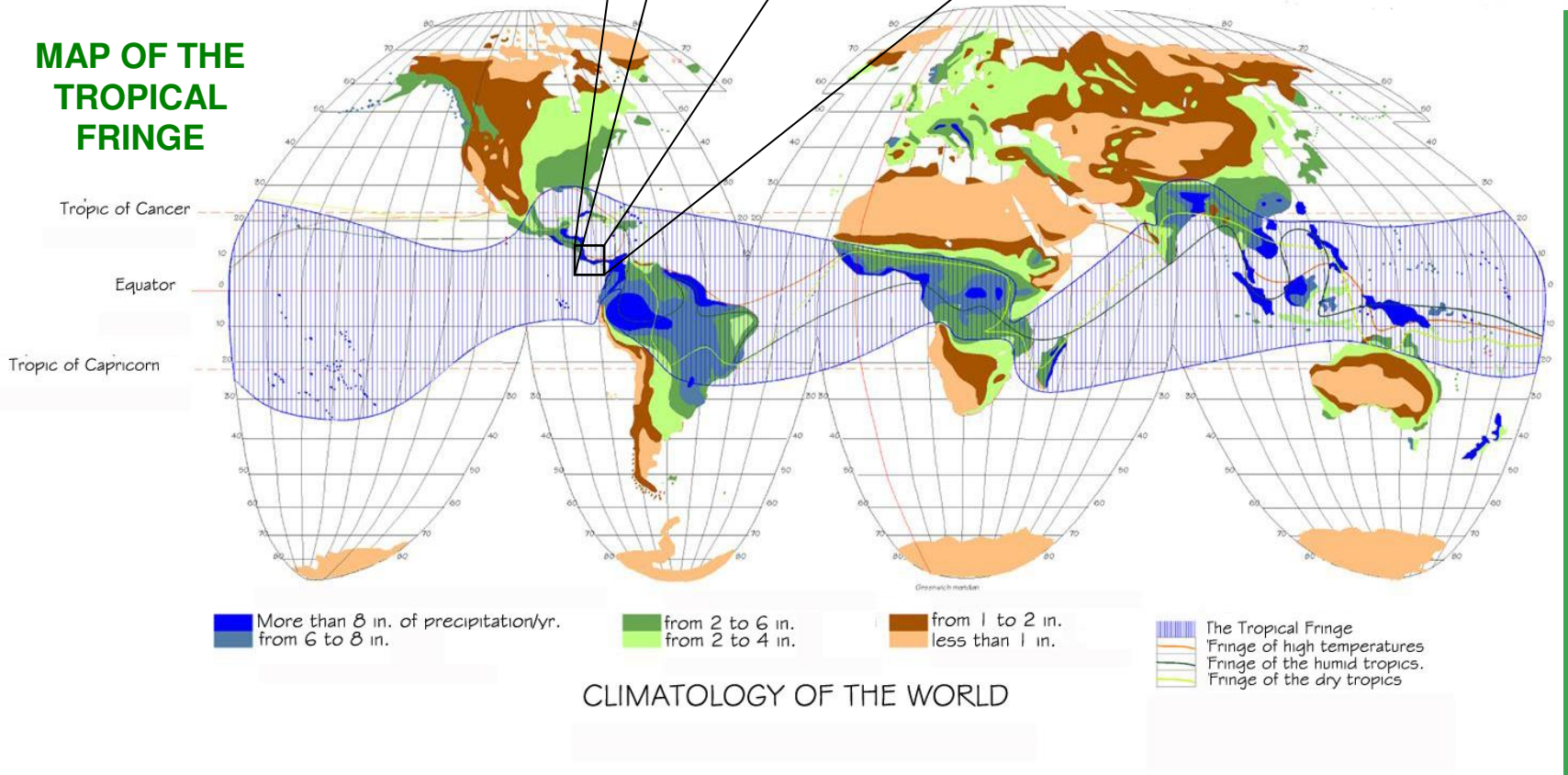
- The tropical fringe stands for the area with greatest biodiversity, and 39% (2004) of the world population lives in it. Its cities presently possess the highest rate of growth, as well as the most accelerated process of urbanization, which represents an enormous challenge for architecture and urban planning.



COSTA RICA



MAP OF THE TROPICAL FRINGE



INDICATORS OF THE PLANET'S CONDITION

Unequal consumption of energy.
Industrialized countries with 25% of the world's population, consume 75% of the energy, versus developing countries that with 75% of the population only consume 25% of the energy. Hence, we need to balance consumption.

UNEQUAL ENERGY CONSUMPTION

INDUSTRIAL COUNTRIES (EAST AND WEST)

75%

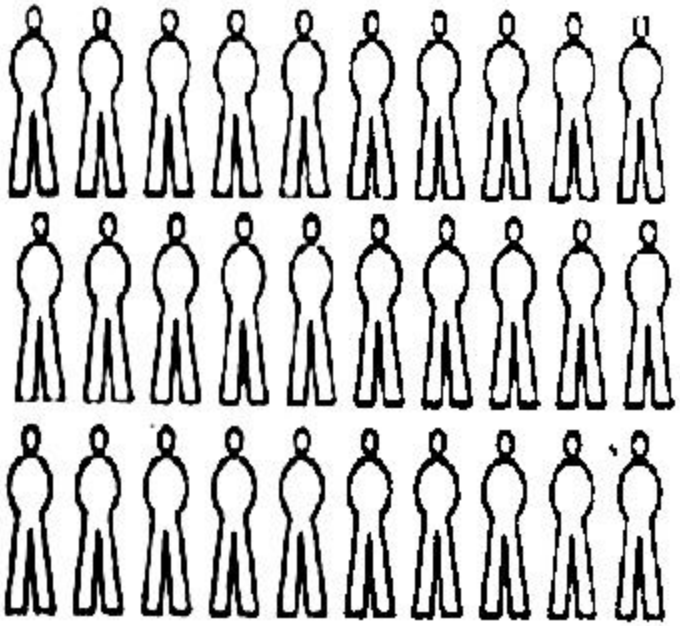
WORLD POPULATION PROPORTION

25 %

DEVELOPING COUNTRIES

25%

WORLD POPULATION PROPORTION



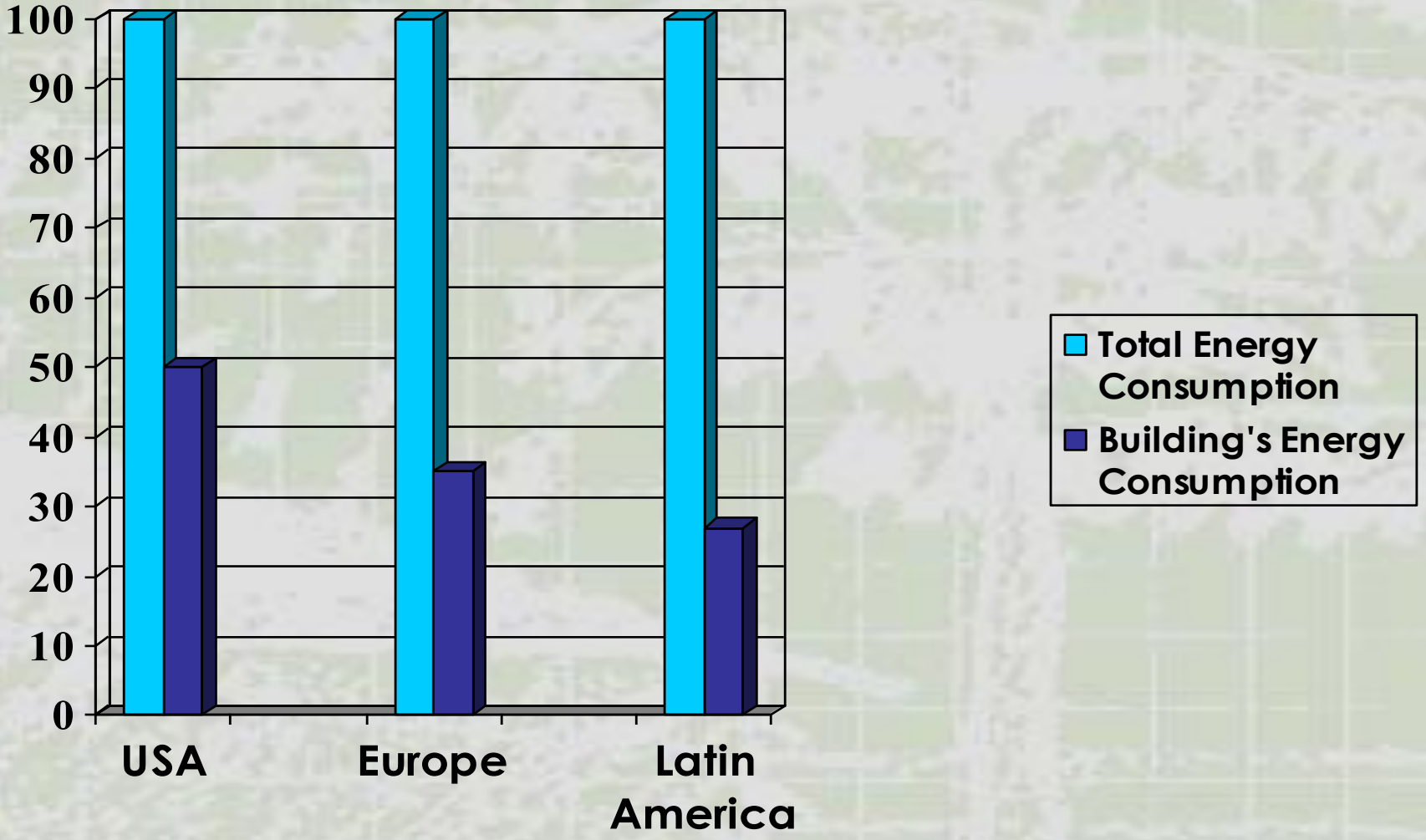
75 %

Hence, we need to balance consumption

Building's energy consumption

In the USA, buildings spend 50% of the whole country's energy bill. In the European Union they spend 35% and 27% in Latin American countries. Hence, we need to make changes to contemporary architectural design.

In the United States buildings spend 50% of the energy consumption of the country, in Europe it is 35% and in Latin America it is 27%.

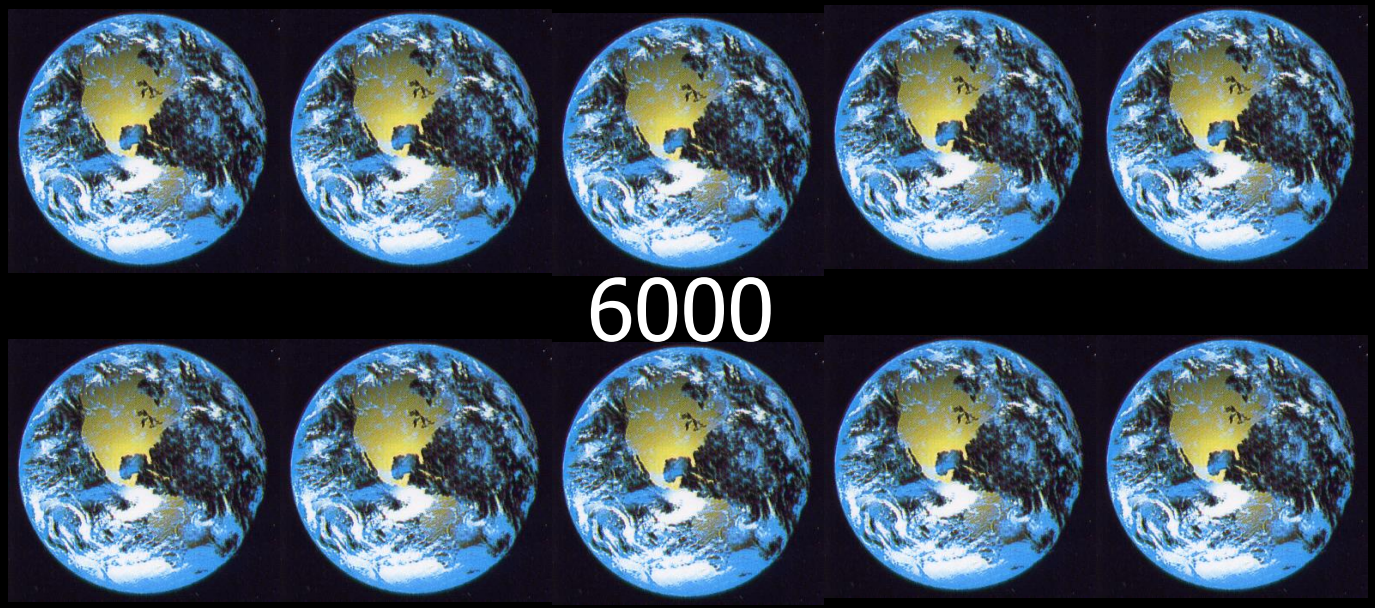


Hence, we need to make changes to contemporary architectural design.

brundtlan report UN 1987

If the 6,000 million inhabitants in our planet had the opportunity of consuming the way that the USA, Europe and Japan (1.000) do, we would need 10 planet earths to provide the resources.

1000

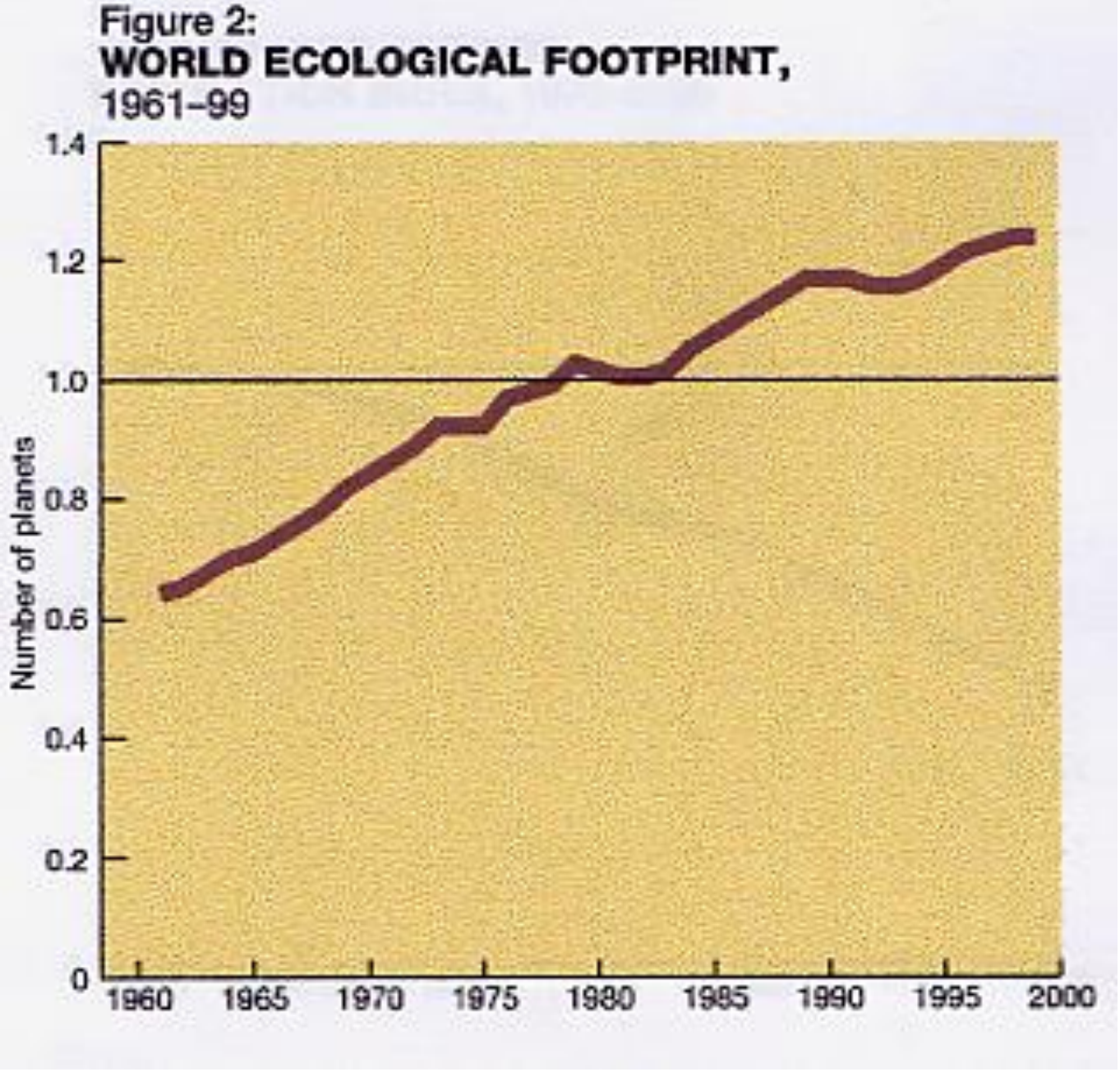


6000

Hence, countries with high consumption must reduce it.

Ecological Footprint

Humanity is consuming at such a rate that the biosphere does not have the capacity to replace what we consume. This deficit is today greater than 20%, with a tendency of growth. Hence, we need to modify our relationship with the planet



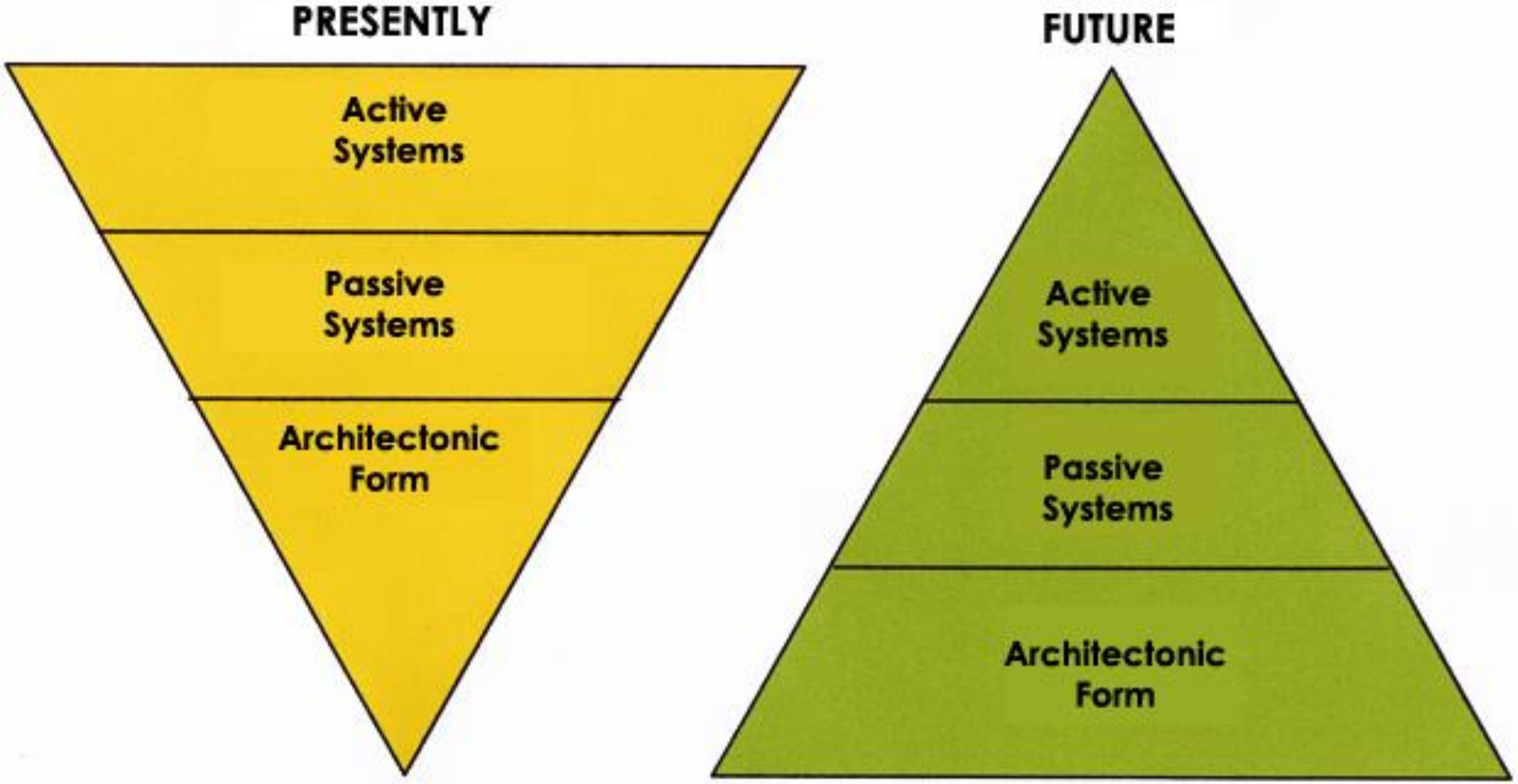
Humanity is consuming at such a rate that the biosphere does not have the capacity to replace what we consume. To this day the deficit is greater than 20%.

Hence, we need to modify our relationship with the planet.

Stefan Behling's Triangles

Inverting the priorities in the architectural design proves to be fundamental. The application of passive energies should be more widespread in architectural design. Hence, we need to focus design methods in the right direction

If we stop and think upon these few indicators, and with no intention of seeming apocalyptic and presenting future ¨Dantesque¨ scenarios, the least we can deduct is that we have to act urgently.



ENERGY HANDLING DIAGRAM ACCORDING TO STEPHAN BEHLING, GERMANY, UIA WORLD CONGRESS OF ARCHITECTURE, BERLIN, 2002

Hence, we need to focus design methods in the right direction.

In order to face the solution to the planet's deterioration, which constitutes a macro-problem totally unheard-of for humanity (2004), we consider that bioclimatic architecture and urban ecology are some of the adequate and available tools.

FORD AGENCY & BAC SAN JOSE BANK

The solution to these problems, which corresponds to architects, builders and developers, will demand important changes in architecture of resources along with an agreement between all the countries. The bioclimatic focus is a responsible approach that has the potential of reducing the consumption of energy resources and materials, which go to waste in these activities.

In the case of developing countries this focus is in the same line of the, not so distant solutions of traditional architecture. I think that they enclose enormous, profitable teachings in the present circumstances if we manage to make them evolve towards the actual standards.

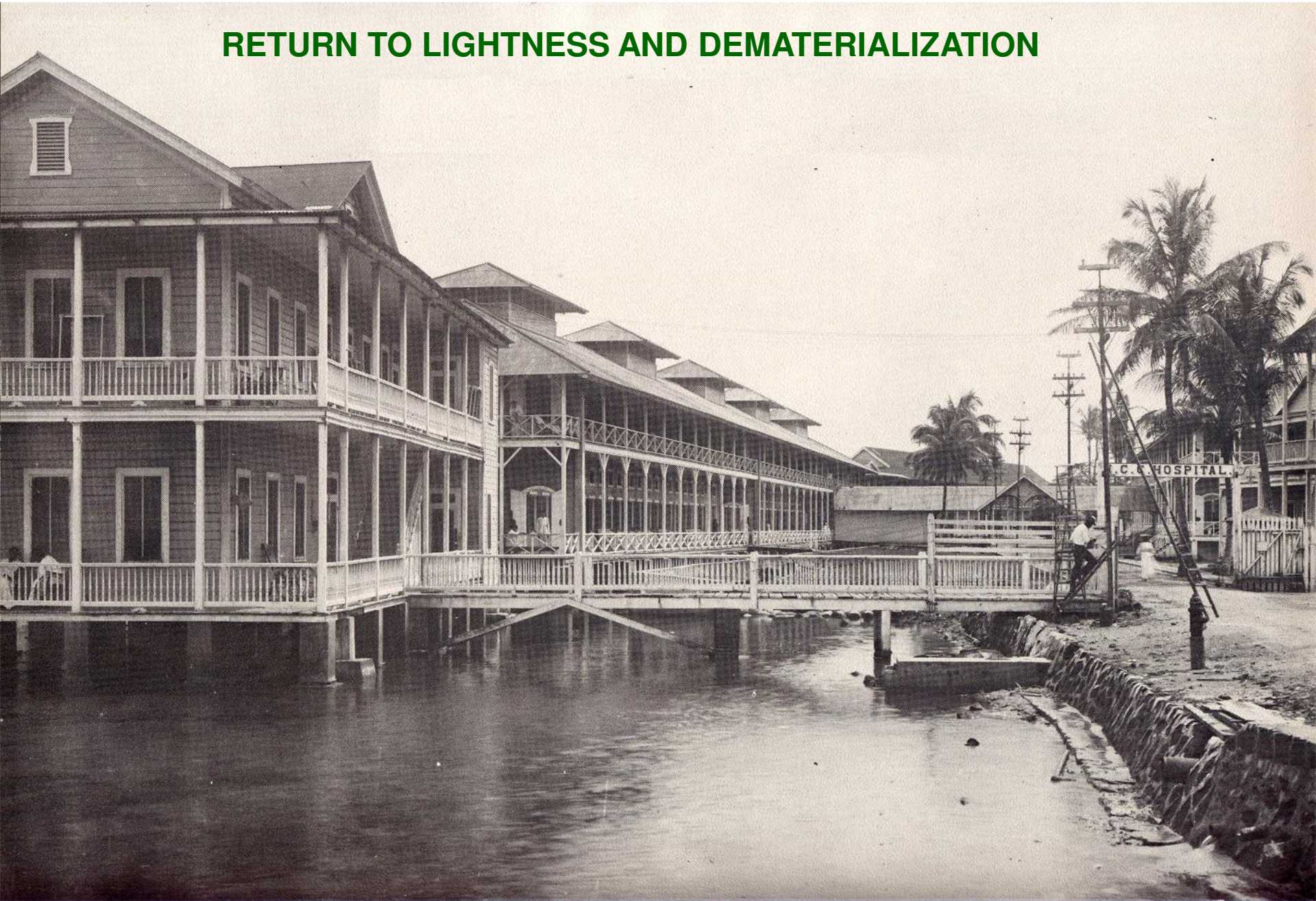
FORD AGENCY & BAC SAN JOSE BANK

BRUNO STAGNO ARCHITECT AND ASSOCIATES
design: 1994 construction: 1995
built area: 16,145.85 sq. ft.
property area:134,548.75 sq. ft.
Cost: US$ 1.125.000
location: Curridabat, San José, Costa Rica

BRUNO STAGNO, architect
CARLOS ARAYA, assistant
LUIS ZAMORA, structural engineer
CARLOS BRENES, electrical and mechanical engineer
VAN DER LAAT y JIMENEZ S.A., builder

What I propose is to concentrate in resolving with independence and coherence the challenge that represents the design of each building and each city in its specific region, in search of favoring the use of the local resources.

THE ARCHITECTURE IN THE TROPICS SHOULD RETURN TO LIGHTNESS AND DEMATERIALIZATION



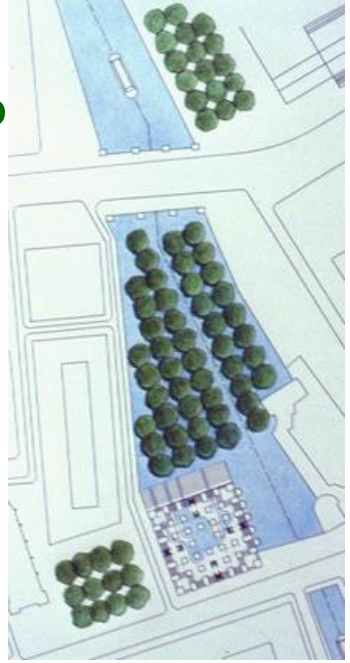
Besides the economic advantages that this represents, the cultural tradition is reinforced through architectural and urban solutions adapted to the specific and environmental experiences of each region.

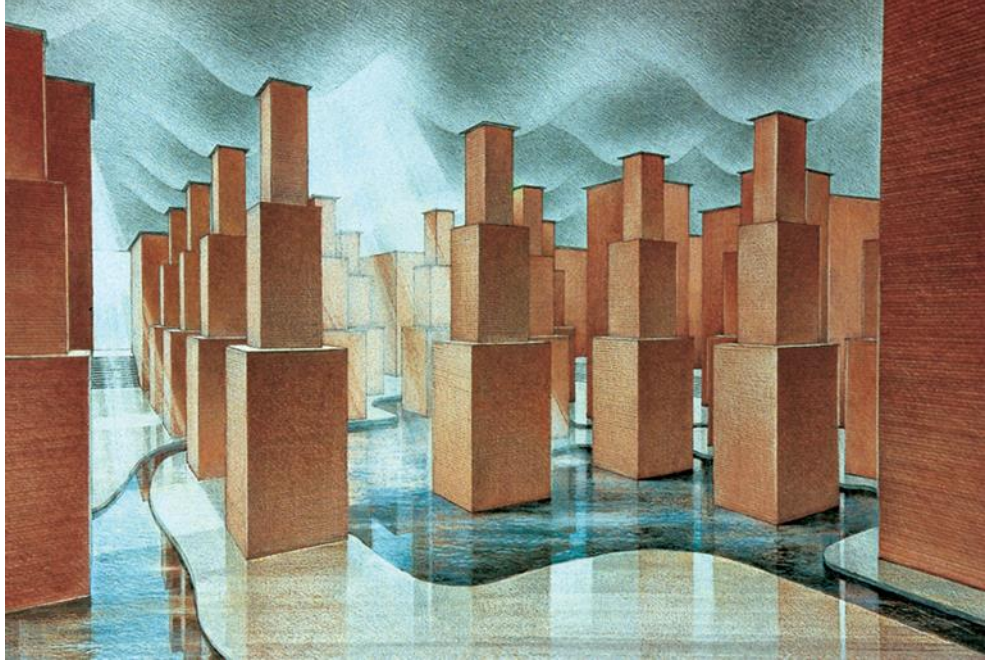
A MANGROVE-SWAMP FOR BERLIN

(from the tropics to Germany)

BRUNO STAGNO ARCHITECT AND ASSOCIATES
design: 1995
built area: 35,520.87 sq. ft.
location: Berlin, Germany

BRUNO STAGNO, architect
CARLOS ARAYA, assistant
Exhibited at Altes Museum “The hands of the architect”, 2002, Berlin
Exhibited at the Rathaus, 2000, Berlin





We conclude that we must look towards our own immediate setting in search for the renewable resources that reduce the energy demand, and then design an adapted architecture. It is convenient to capitalize the potentiality of these resources in order to approach a sustainability, based on our possibilities more than turning to copying foreign, expensive solutions, therefore, unreachable and not replicable on a large scale.

DOLE FRESH FRUIT CO

BRUNO STAGNO ARCHITECT AND ASSOCIATES
design: 1987 construction: 1988-1990
built area: 21,527.8 sq. ft.
property area: 123,192.83 sq . ft.
Cost: US$ 900.000
location: Rohrmoser, San José, Costa Rica

BRUNO STAGNO, architect
CARLOS ARAYA, assistant
JUAN CARLOS SOTELA, structural eng.
FRANCISCO QUESADA, electrical eng.
ESTRUCTURAS S.A., builder

OUR RESOURCES

Before passing on to the resources, I will mention some general facts that guided the architecture I have done.

The ideal is to design buildings that due to their technological characteristics and costs can be replicated making them available to a wider majority.

I believe in bioclimatic architecture as a planetary response and not as a dilettantism and fashion of elites.

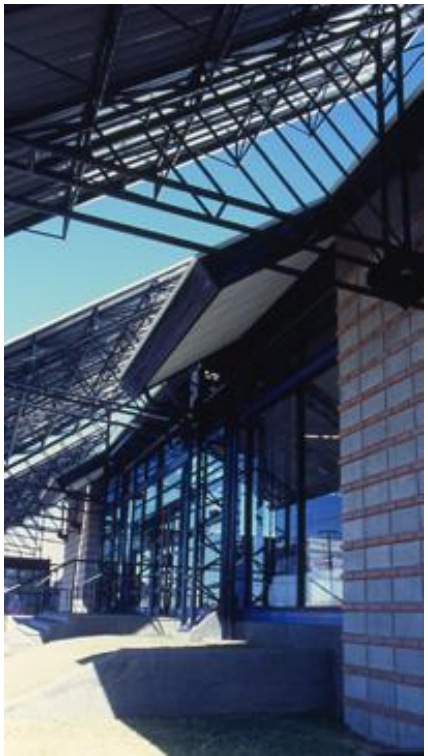
LANDSCAPES OF COSTA RICA

For bioclimatic architecture I use, as a primary resource of design, the climatic conditions of the Costa Rican territory, knowledge of the materials and the cheapest technologies available. In other words, instead of undertaking the solutions through imported concepts, we transform the local environmental resources and materials into challenges for designing.

BAC SAN JOSE-MORAVIA BANK AGENCY

BRUNO STAGNO ARCHITECT AND ASSOCIATES
design: 1996 construction: 1997
built area: 7,534.73 sq. ft.
property area: 20,720.51 sq. ft.
Cost: US$ 525.500
location: Moravia, San José, Costa Rica

BRUNO STAGNO,architect
CARLOS ARAYA, assistant
JUAN CARLOS SOTELA, structural engineer
CARLOS BRENES, electrical engineer
VAN DER LAAT y JIMENEZ, builder

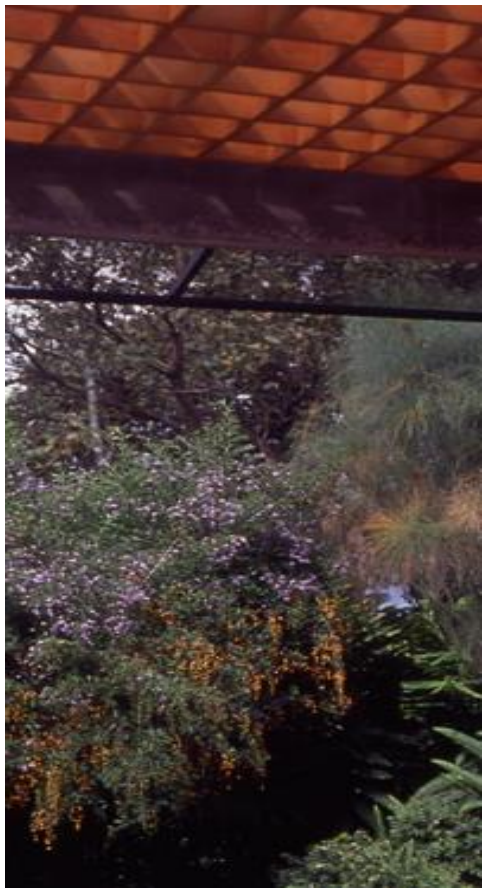


The gestating concept for bioclimatic architecture in tropical latitudes is what I like to call resource and response; in other words, search for what is abundant, be it natural or manufactured, and with this give an architectural response. For instance, I make the roof a response to the abundant rainfall, or that the exuberant vegetation has a favorable presence in the buildings.

HOUSE IN ESCAZU

BRUNO STAGNO ARCHITECT AND ASSOCIATES
design: 1976 construction: 1976 - 1992
built area: 6,070.84 sq. ft.
property area: 72,656.33 sq. ft.
cost: US$ 41,480.00
location: Pavas, San José, Costa Rica

BRUNO STAGNO, architect
RODOLFO HERRERA, structural engineer
RAFAEL SEQUEIRA, electrical and mechanical eng.
GERMAN HAERNACKER, builder



Or favoring the use of the corrugated iron sheets, a popular, light, cheap, and accessible material, therefore, set aside by, let's say, jet-set architects.

The solutions in the process of designing come through the application of principles of physics or with wit, and only when I do not achieve the appropriate response through these means, I appeal to technology. This is why my buildings are naively intelligent and not acclimatized capsules by means of mechanisms and sophisticated devices that may be valid in other circumstances.

ART-CENTER
HUMBOLDT SCHOOL

BRUNO STAGNO ARCHITECT AND ASSOCIATES
design: 1999 construction: 1999
built area: 12,916.68 sq. ft.
property area: 21,527.8 sq. ft.
cost: US$ 405.000
location: San José, Costa Rica

BRUNO STAGNO, architect
CARLOS ARAYA, assistant
WILLIAM BOLAÑOS, mechanical engineer
JUAN CARLOS SOTELA, structural engineer
CLAUDIO SOTO, electrical engineer
RAE INGENIEROS, builder

A design process as such, is unquestionably cheaper with adapted solutions to the context, which do not require a technical maintenance, many a time unreachable due to its high cost or to the lack of local technicians, and at the same time it reduces the technological dependency.

INSTITUTO PEDAGOGICO DE LOS COLEGIOS ALEMANES

BRUNO STAGNO ARCHITECT AND ASSOCIATES
design: 1989 construction: 1992-1993
built area : 10,763.9 sq. ft.
property area : 36,597.27 sq.ft.
cost: US$ 470.000
location: Rohrmoser, San José, Costa Rica

BRUNO STAGNO, architect
CARLOS ARAYA, assistant
LUIS ZAMORA, structural engineer
RAFAEL ARAYA, electrical engineer
FRANCISCO QUESADA, mechanical engineer
EDIFICAR S.A., builder

Another characteristic is the relativity of what comfort and well-being are. This has an effect regarding the tolerance in the face of the oscillating variables of the homoclimate. Something that disturbs me is the idea of restricting comfort in life to some invariable constants. This makes me uneasy and even rebellious because obtaining constant relative humidities and temperatures implies a high cost, in addition to the excessive energy consumption.

NOHE SUPERMARKET

BRUNO STAGNO ARCHITECT AND ASSOCIATES
design: 2000 construction: 2001
built area: 66,585.46 sq. ft.
property area: 82,462.28 sq.ft.
cost: US$ 2.858.000
location: Heredia, Costa Rica

BRUNO STAGNO, PIETRO STAGNO, architects
CARLOS ARAYA, assistant
JUAN CARLOS SOTELA, structural engineer
CLAUDIO SOTO, electrical engineer
EDIFICAR S.A., builder

On the contrary, a body accustomed to perceiving the differences in temperature and humidity is a healthy organism, alert to sensorial stimulus and with all of its body capacities functioning well.

People who have lived for years in hermetic, in conditioned air environments and then transfer to a building in which the climate is controlled naturally, experience a rejection at first, but after a few weeks, when they learn to open windows, they get accustomed to it.

NOHE SUPERMARKET

Their organism regains the capacity of adaptation and begins to feel affable with the new environment.

To conclude, it is necessary to look for a balance between architecture and nature by means of a synthesis between technology and the resources of climate, with the architect as a protagonist in this agreement.

BAC SAN JOSE– ESCAZU BANK AGENCY

BRUNO STAGNO ARCHITECT AND ASSOCIATES
design: 1996 construction: 1997
built area: 9,149.32 sq. ft.
property area: 29,062.53 sq. ft.
cost: US$ 586.500
location: Escazú, Costa Rica

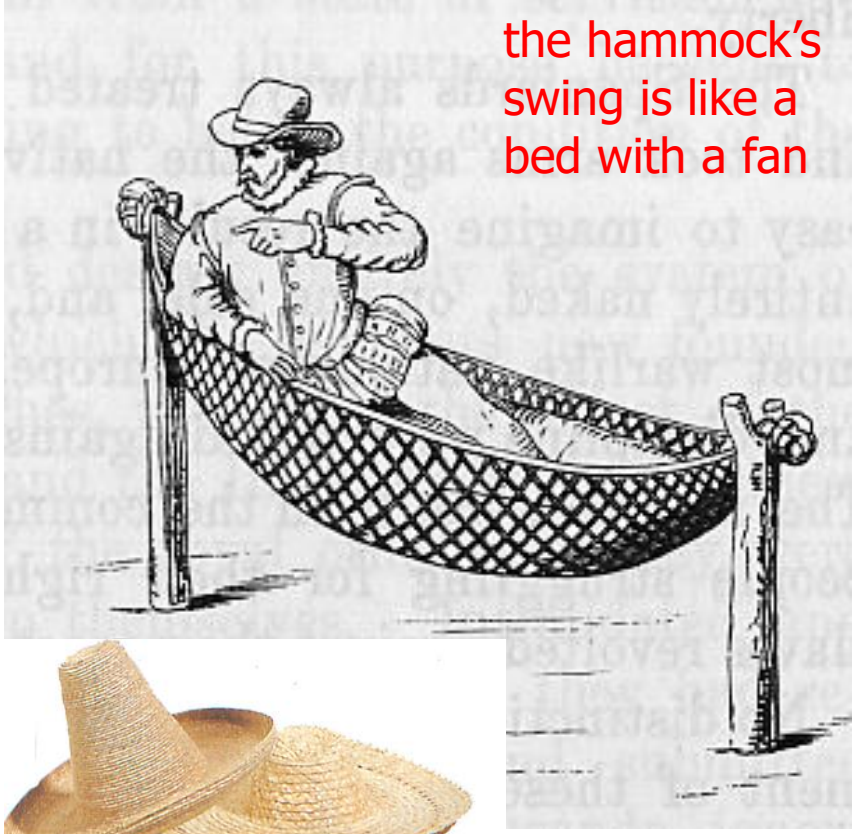
BRUNO STAGNO, architect
CARLOS ARAYA, assistant
JUAN CARLOS SOTELA, structural engineer
CARLOS BRENES, electrical engineer
COCOSA S.A., builder

1- TROPICALITY AND ADAPTATION

I would like to begin with a resource very particular of tropicality. I am referring to the tropical thinking and to its particular ways of reflection because they are set apart from the Cartesian method that characterizes Western thinking.

nature loves equally

the hammock's swing is like a bed with a fan



The Cartesian way of thinking, as we might know, is oriented by a rationality that discards variables and options with the object of obtaining a concrete conclusion upon which it can keep on building the ideas. The Cartesian thought is lineally methodical and focuses and aims towards resolving with efficiency.

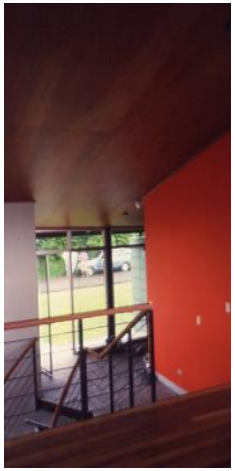
PETIT BLANC QUE J´AIME

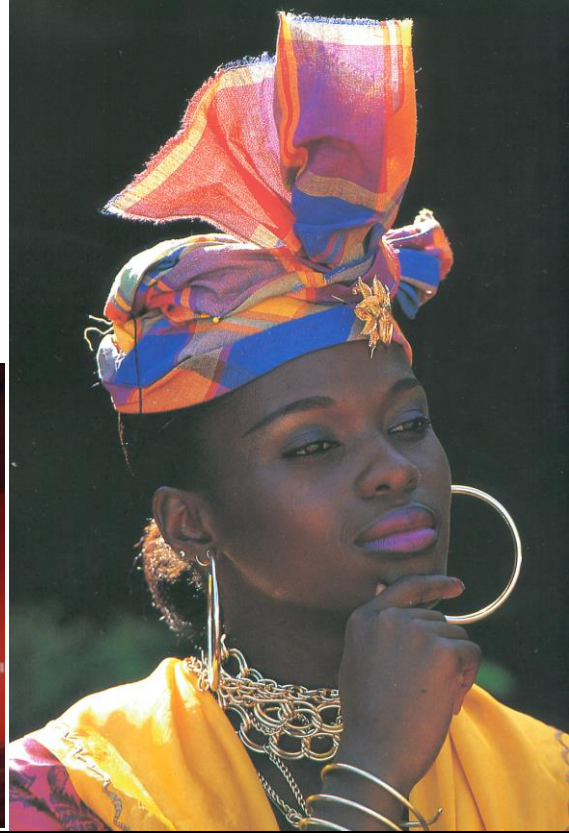
In the West, thinking is guided by Cartesian rationality of "I think therefore I am"; nevertheless, in the tropics, thinking is guided by another kind of rationality. A rational one, conditioned by life and its strong relationship with nature. It is my conviction that "I am here, therefore I am" is more appropriate. In other words, when a being from a tropical latitude has to choose between life and system, life primes.

TROPICAL AMERICAN VERNACULAR HOUSE

EUROPEAN HOUSING

As always, our tropical being has developed special resources in order to make good use of the sudden attacks from the exterior, for instance, its ability to coexist with uncertainty and of course ambiguity. Certainties do not matter, because they exclude options and arrive at definitive conclusions for these intellectually free spirits, whom are in search of some immediate benefit in relation to their similar.






EDITIONS
ATLAS

In the poor tropics, as is the majority of the population that inhabits in this latitude, discarding implies limiting the opportunities, and as it can be understood this is not desirable in a world of lacking. Thus, in the tropics, all possible variables coexist. This produces versatile, non-compromised situations as a life strategy that is applied before a speaker while attempting to grasp his intentions before responding with the purpose of obtaining some profit.

TROPICAL NATURE IS COLORFUL AND LAVISH

To illustrate this and not extend myself more in this resource, I would like to show you some popular replies and of common use in the Latin American Tropic that also have their similar in other places of the same latitude. These expressions are of common use and reflect that ambiguity, "I am not against nor in favor, but all of the contrary", or "We are all doing bad, except for me too". Or the reply of a minister to a specific question of King Juan Carlos of Spain that demanded a precise and exact answer "the most sure, Your Majesty, is that who knows".

"I am not against or in favor, but all of the contrary".

"No estoy en contra ni a favor, sino todo lo contrario"

"The most sure, your Majesty, is that who knows".

"Lo más seguro, su Majestad, es que quién sabe".

"I do not know if it is true but they believe it and so do I".

"yo no sé si es cierto pero ellos lo creen y yo también lo creo".

"We are all doing bad, except for me too".

"Todos estamos mal, menos yo también"

2. MATERIALS AND TECHNOLOGY

As far as possible I choose the cheapest and most abundant and I lean on the skills of relatively cheaper hand labor. I pick metal tubes for the structure, cement blocks, corrugated metal sheets for roofing, plants and trees as climatic conditioning, and even though glass is more expensive, I compensate it with a low-cost design of window frames.

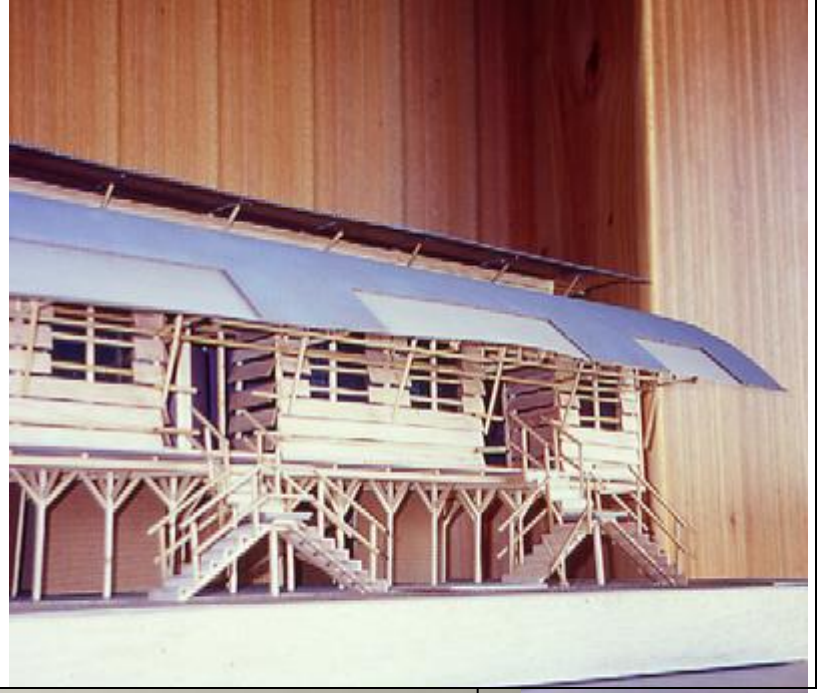
COUNTRY DAY SCHOOL

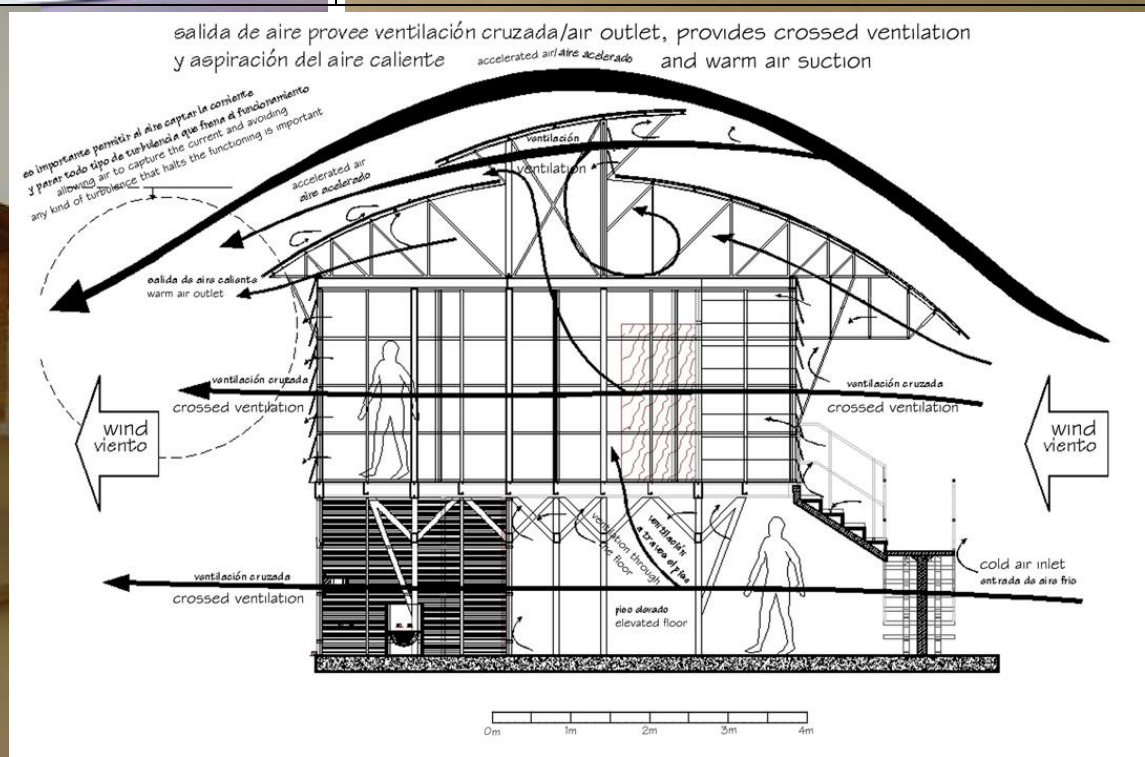
BRUNO STAGNO ARCHITECT AND ASSOCIATES
design: 1982 construction: 1983-1984
built area: 16,576.41 sq. ft.
property area: 43,055.6 sq. ft.
cost: US$ 630.000
location: Escazú, Costa Rica

BRUNO STAGNO, architect
CARLOS ARAYA, assistant
HUMBERTO CHACON, structural engineer
RAFAEL SEQUEIRA, electrical and mechanical eng.
ESCOSA, builder

Preferring the available natural resources and the simple materials to obtain an adapted architecture is a challenge that puts us face to face with the crude reality of costs. If this attitude is conjugated with the adaptation of buildings to thinking of vanguard the results will be of vanguard without depending on the novelties that the technological market of materials has to offer. It is my conviction that vanguard is a mental attitude, a compromise, and in no way a reduction to the use of materials with sex appeal or trendy, fashionable mechanisms, for the simple reason that they cease to be of vanguard as soon as they are surpassed by their latest generation.

BACHES



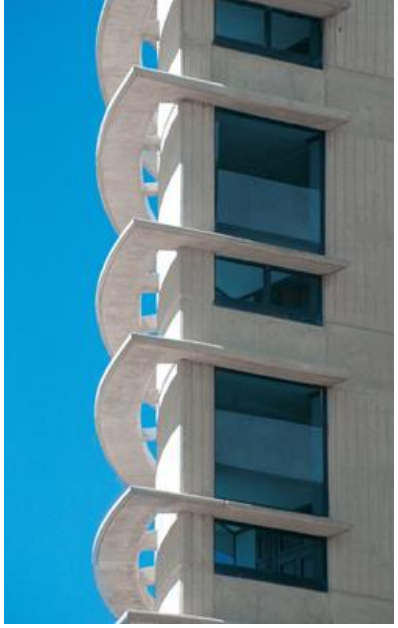

salida de aire provee ventilación cruzada/air outlet, provides crossed ventilation
y aspiración del aire caliente
accelerated air/aire acelerado
and warm air suction
es importante permitir al aire captar la corriente
y poner todo tipo de turbulencia que frena el funcionamiento
allowing air to capture the current and avoiding
any kind of turbulence that halts the functioning is important
accelerated air
aire acelerado
ventilación
ventilation
salida de aire caliente
warm air outlet
ventilación cruzada
crossed ventilation
wind
viento
ventilación cruzada
crossed ventilation
wind
viento
ventilación cruzada
crossed ventilation
ventilación a través del piso
ventilation through the floor
cold air inlet
entrada de aire frio
piso elevado
elevated floor
0m
1m
2m
3m
4m

When architecture is considered of vanguard because it uses sophisticated materials, mechanisms and devices, and not due to the suitability of the contemporaneous spaces of life, or to the quality of their spaces and the stimulus that they produce, we stand before confusion. This confusion can be called consumerism. Buildings considered this way have a very short-lived life span, and stop producing teachings and contributions very soon. They become rapidly forgotten when not discarded. This means that there is bad handling of the resources and a failed occasion for architecture that should keep its works valid.

TRIGAL APARTMENTS

BRUNO STAGNO ARCHITECT AND ASSOCIATES
design: 1996 construction: 1998
built area: 37,135.46 sq. ft.
property area: 20,279.19 sq. ft.
cost: US$ 2.448.000
location: Rohrmoser, San José, Costa Rica

BRUNO STAGNO, architect
CARLOS ARAYA, assistant
FRANZ SAUTER y ASOC. S.A., structural engineer
FRANCISCO QUESADA, mechanical & electrical eng.
EDICA LTDA, builder



Confusing vanguard with high technology seems to be a mistake since vanguard, to me, is proposing the opportune and adequate answer to a historical instant that is approaching. Presently, I am more sensitive to the need of reducing consumption, therefore, there is not just one architecture of vanguard, but all that are oriented in that direction which adapt to its circumstances and because they exalt the differences.

DINCA WAREHOUSE

BRUNO STAGNO ARCHITECT AND ASSOCIATES
design: 1991 construction: 1993
built area: 26,909.75 sq. ft.
property area: 177,927.26 sq. ft.
cost: US$ 950.000
location: Heredia, Costa Rica

BRUNO STAGNO, architect
CARLOS ARAYA, assistant
LUIS ZAMORA, structural engineer
CARLOS MENESES, electrical engineer
CONSTRUCTIVA S.A., builder

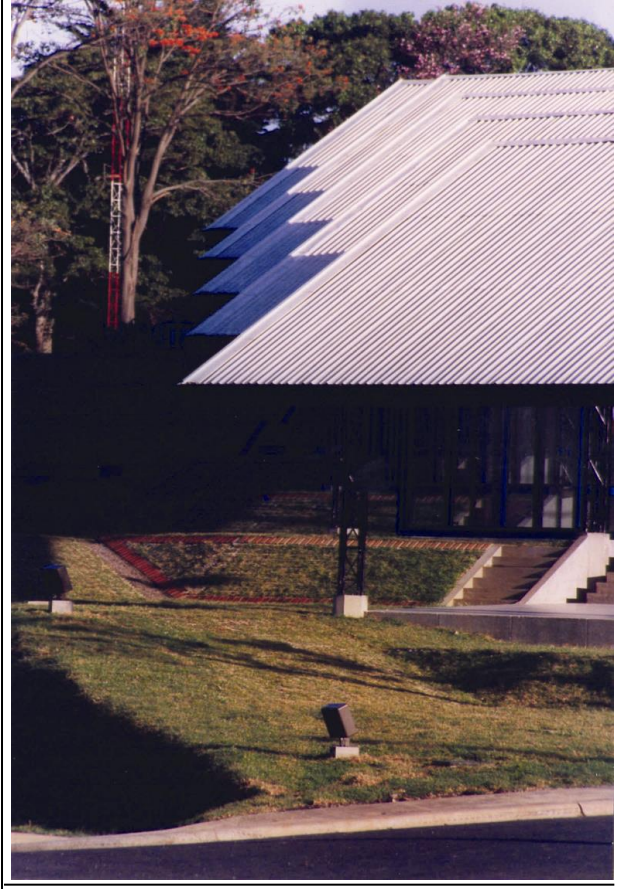
Yet another aspect that is of interest to the USA is the great disparity in the access to modern construction technologies. In the USA, multidisciplinary teams that gather many professionals and technicians, direct construction, but in our case (2004), we only have access to ingenious workers, self-taught people and a few process engineers.

RODRIGUEZ HOUSE

BRUNO STAGNO ARCHITECT AND ASSOCIATES
design: 2002 construction: 2003
built area: 3,584.38 sq. ft.
property area: 6,716.67 sq. ft.
cost: US$ 210.000
location: Valle del Sol, San José, Costa Rica

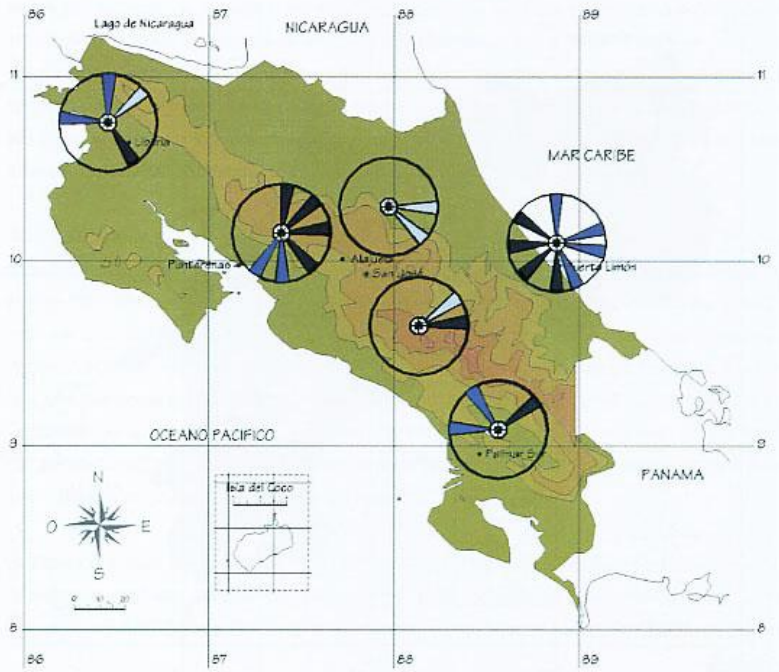
BRUNO STAGNO, PIETRO STAGNO, architects
CARLOS ARAYA, assistant
MIGUEL CRUZ, structural engineer
CLAUDIO SOTO, electrical engineer
ROLANDO RIVERA., builder

As it may be easily deduced, the cost of construction in these circumstances is very much below that of those seducing buildings presented to us by current magazines, but equivalent in well-being and directly proportional to our possibilities and the country's economy.

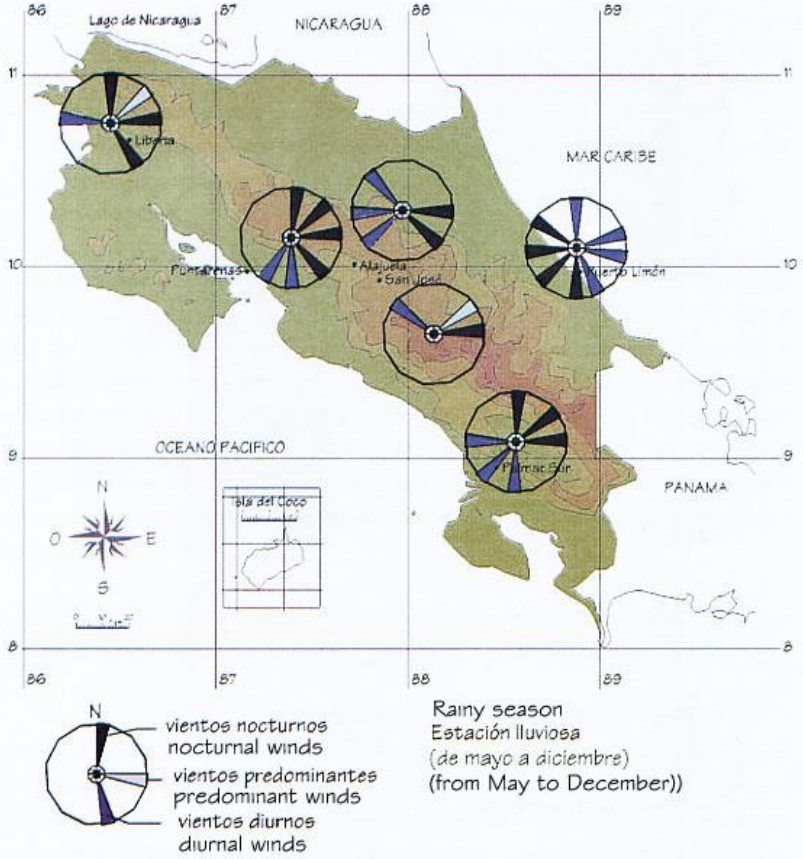


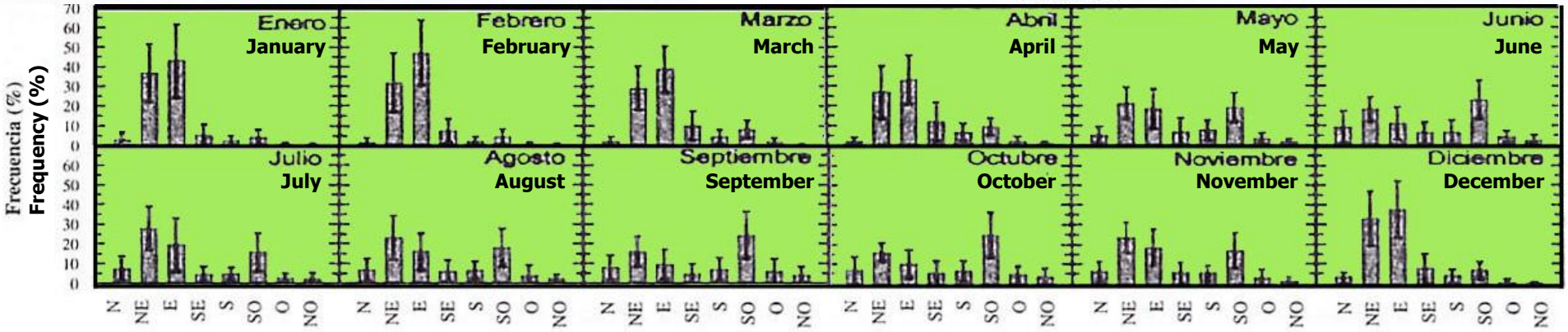
3- AIR AND VENTILATION

Christopher Columbus was not mistaken when he described the new sensation he experienced at his arrival at the Caribbean: "the sensuality comes with the air. Sweet and warm, hot and humid air". Tropical air delivered messages from nature, and we can now amplify this observation by adding that tropical air brings the information about temperature, perfumes, sounds and clouds that announce the weather conditions and the sudden changes in the atmosphere: rain is heard and is seen approaching.



PREDOMINANT WINDS

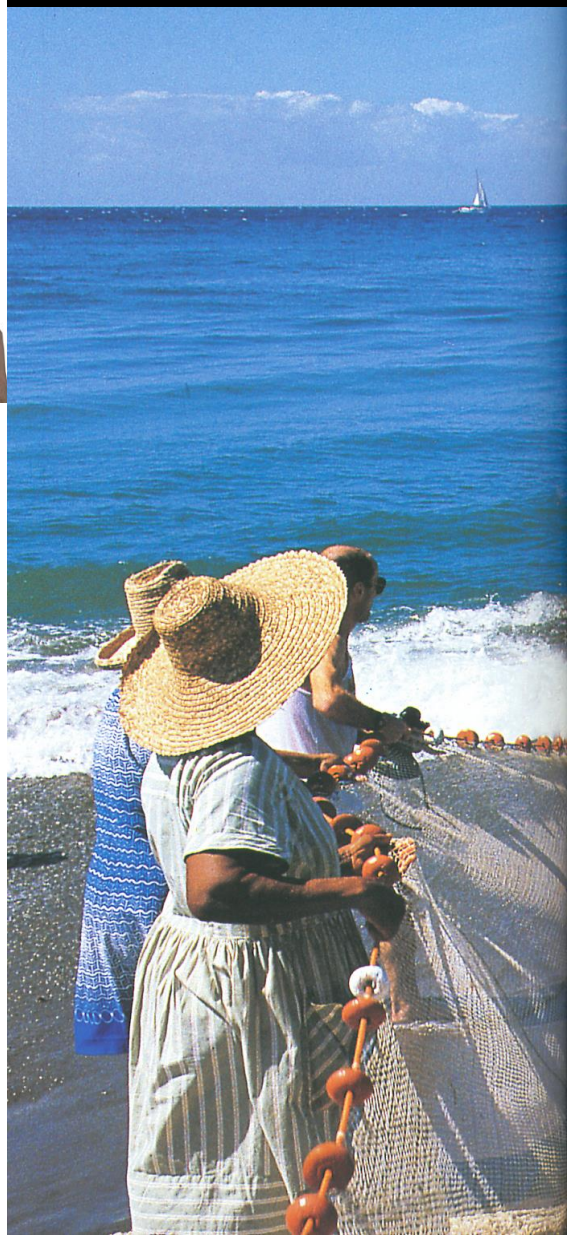




In general, in Costa Rica, the wind blows constantly from the northeast and crosses through its territory from the Caribbean to the Pacific Ocean, sweeping the hot lowlands as well as the fresher mountains. This condition, that lasts all year, represents a resource full of possibilities to obtain the comfort when attempting to harness it through the climate.

CLOTHES :

LOOSE & LIGHT



In Costa Rica (latitude 11 - 9.5 North, longitude 88 - 83 West) and as in many countries located in the tropics, the relative humidity of the air is more than 85% as a monthly average during the rainy season, and with registries of up to 100% at daybreak. In the dry season the relative humidity drops to 78% average.

BRUNO STAGNO
ARCHITECT AND
ASSOCIATES
design: 1986
construction: 1987
built area: 2,927.8 sq.ft.
property area: 1,560.8
sq.ft.
cost: US$ 56.370
location: Paseo Colon,
San José, Costa Rica

BRUNO STAGNO,
architect
CARLOS ARAYA,
assistant
LUIS ROJAS,
structural engineer
FRANCISCO
QUESADA, electrical
and mechanical eng.
ELPIDIO SOTO,
builder

STAGNO

ARCHITECT'S STUDIO

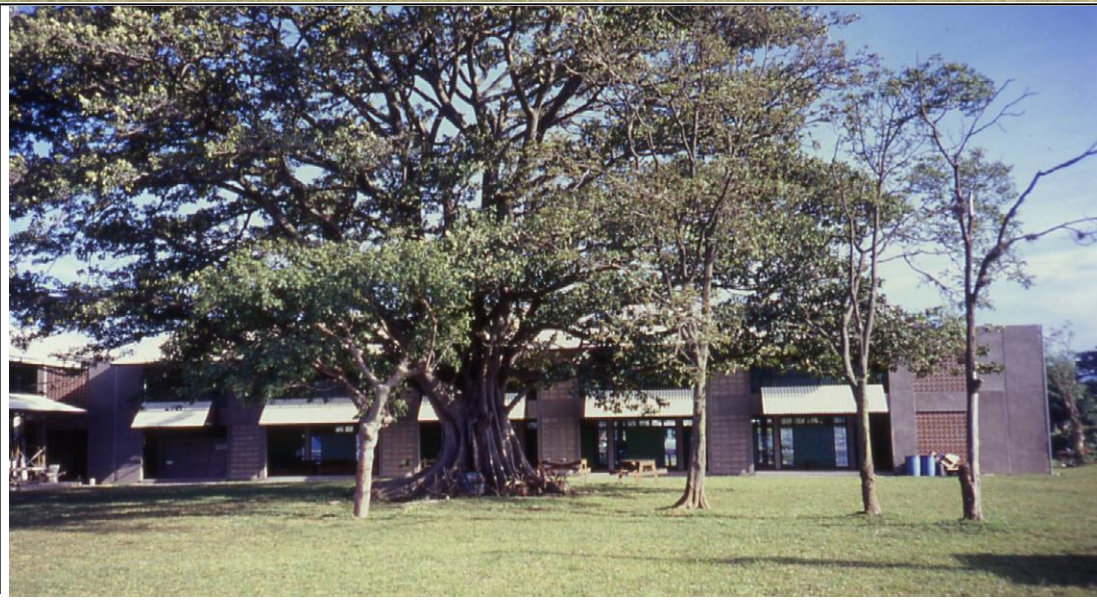
In developing countries, the instrument for measuring comfort is the body, and the exactness is as relative as the feeling, but it matches with the flexibility and tolerance of tropical rationality. Office buildings are said to be pleasant when there is enough breeze not to blow papers off the desks and enough heat not to make sweat drops fall on top of them.

PANAMERICAN SCHOOL

BRUNO STAGNO ARCHITECT AND ASSOCIATES
design: 1996 construction: 1997
built area: 28,524.34 sq.ft.
property area: 312,153 sq.ft.
cost: US$ 1.183.000
location: Belén, Heredia, Costa Rica

BRUNO STAGNO, architect
CARLOS ARAYA, assistant
LUIS ZAMORA, structural engineer
CLAUDIO SOTO, electrical engineer
EMSA, EDIFICADORA S.A., builder

The solution to this condition is natural ventilation that aids in conditioning buildings by means of an appropriate wind circulation for which a porous architecture with de-materialized and of course non-hermetic facades is required. Air movement control inside and outside the building.



PANAMERICAN SCHOOL

This access control results of importance especially when temperatures drop exceptionally to +63.6 °F (17°C) in the mountainous zone of the Central Plateau which is where the metropolitan area and greatest population is concentrated


AMBOS
MARES
NISSAN
SENTRA
306947

AMBOS MARES

BRUNO STAGNO ARCHITECT AND ASSOCIATES
design: 1988 construction: 1991
built area: 8,072.93 sq.ft.
property area : 3,175.35 sq.ft.
cost: US$ 350.000
location: Barrio Amón, San José, Costa Rica

BRUNO STAGNO, architect
CARLOS ARAYA, assistant
RODRIGO ALTMANN, structural engineer
FRANCISCO QUESADA, mechanical and electrical eng.
CIA MONTEALEGRE OF ENGINEERING, builder

The combined effect of wind gusts with rain can be annoying since water whips the buildings horizontally and forces to shut the ventilation openings causing a rise in the interior relative humidity. Even though these are isolated cases that may only last instants, they must be foreseen, considering that they might cause damage due to flooding.

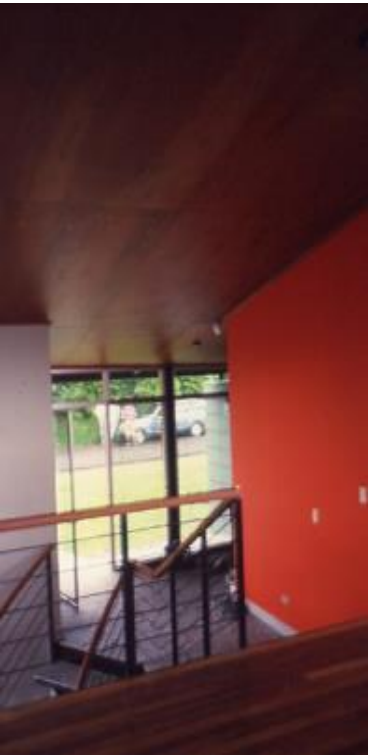
MALINCHE OFFICES

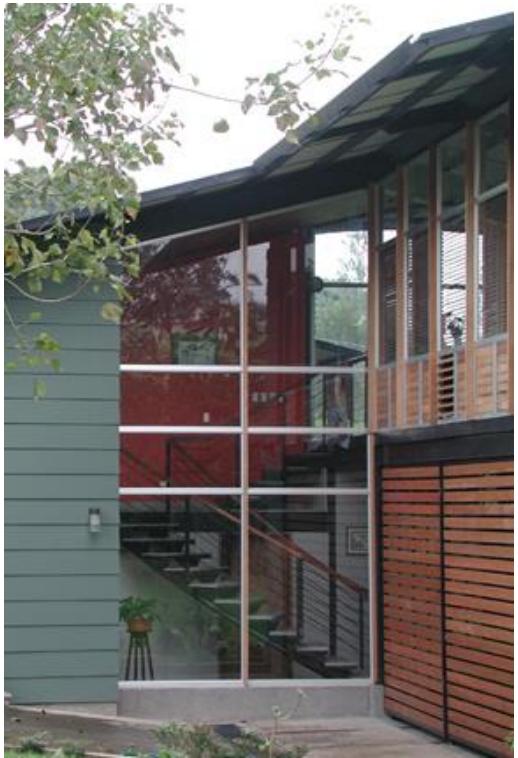
BRUNO STAGNO ARCHITECT AND ASSOCIATES
design: 1995 construction: 1997
built area: 7,750 sq.ft.
property area: 3,121.5 sq.ft.
cost: US$ 325.000
location: Pitahaya, San José, Costa Rica

BRUNO STAGNO,architect
CARLOS ARAYA, assistant
JUAN CARLOS SOTELA., structural engineer
FRANCISCO QUESADA, mechanical and electrical eng.
KONSTRUCTIVA S.A., builder

The absence of breeze is also occasional and as may be inferred, it eliminates freshness. When this happens, the surfaces exposed to direct sunlight heat up and radiate their heat to the ambient producing an unexpected heating inside and out. It is possible to provoke air movement in the interior spaces with passive or active resourcefulness that moves air by means of convection. This movement that accelerates the passage of wind, lowers the temperature and is a relief. Reaching comfort by thermodynamic principles.

BRUNO STAGNO ARCHITECT AND ASSOCIATES
design: 2000 construction: 2001
built area: 3,013.9 sq.ft.
property area: 20,451.4 sq.ft.
cost: US$ 145.000
location: Rancho Redondo, Costa Rica





BRUNO STAGNO, PIETRO STAGNO, architects
CARLOS ARAYA, assistant
MIGUEL CRUZ, structural engineer
CLAUDIO SOTO, electrical engineer
ARCHITECTURE AND ENGINEERING S.A. (AISA), builder

ROSERO HOUSE

4- TEMPERATURE AND SPACE

The average maximum temperature during the 12 months is of 77 °F (24.9° C) and the average minimum is of 63.6 °F (17°C). These measurements correspond to the Central Plateau. It is a tempered climate with no extremes and characterized by its instability between maximums and minimums.

Due to Costa Rican mountainous topography and to the Caribbean wind influence, there exist multiple microclimates that oscillate between these maximum and minimum conditions in Costa Rica.

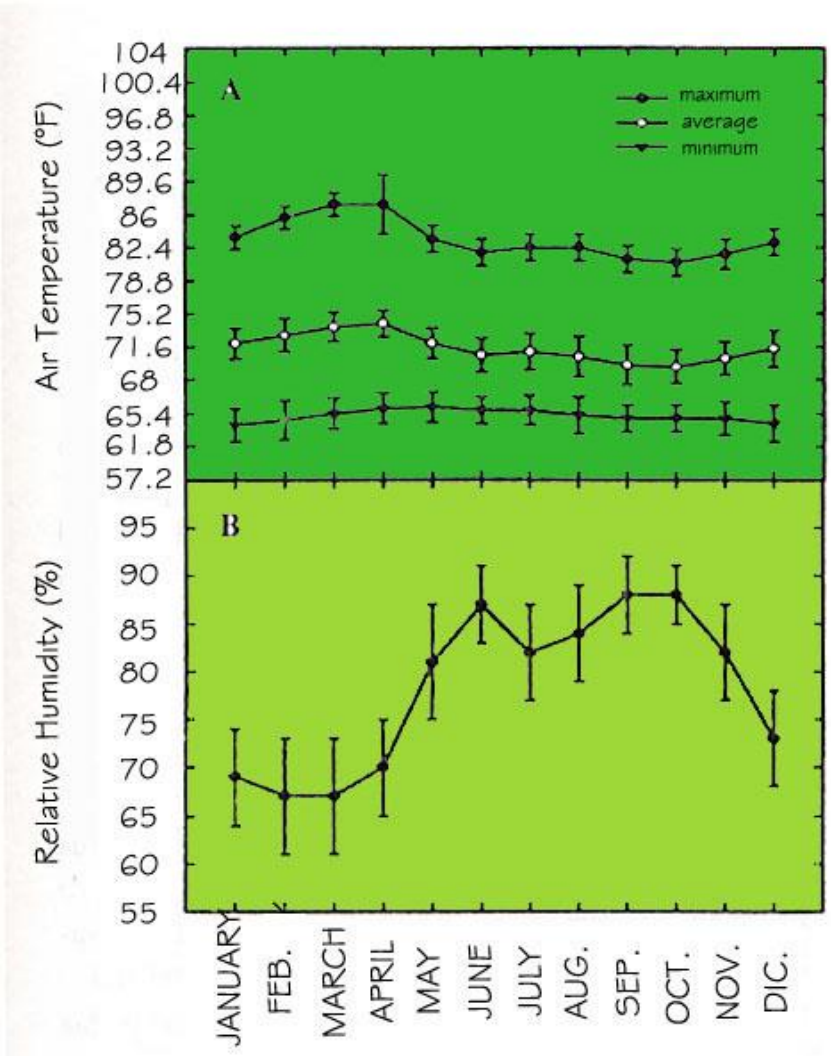


Figure 8: Average monthly régime for air temperature (°F) (A) and relative humidity (%) (B) experienced throughout a year at the Fabio Baudrit Experimental Station (1961-1997).

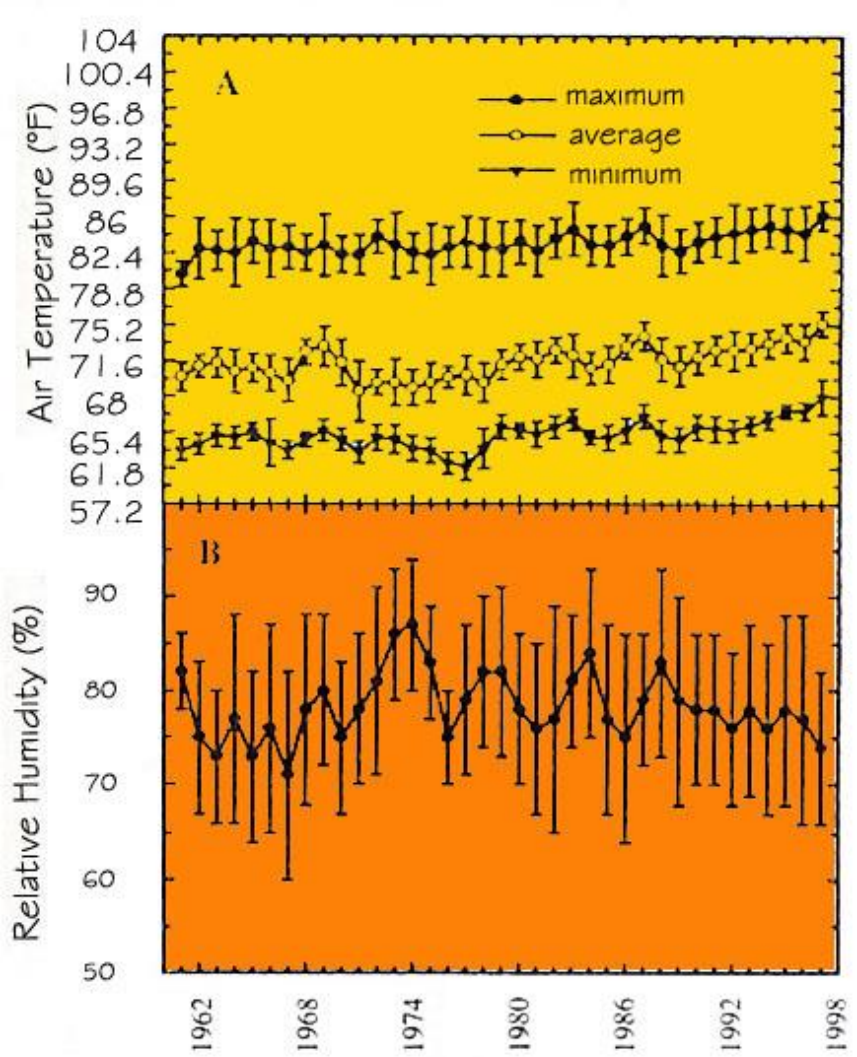


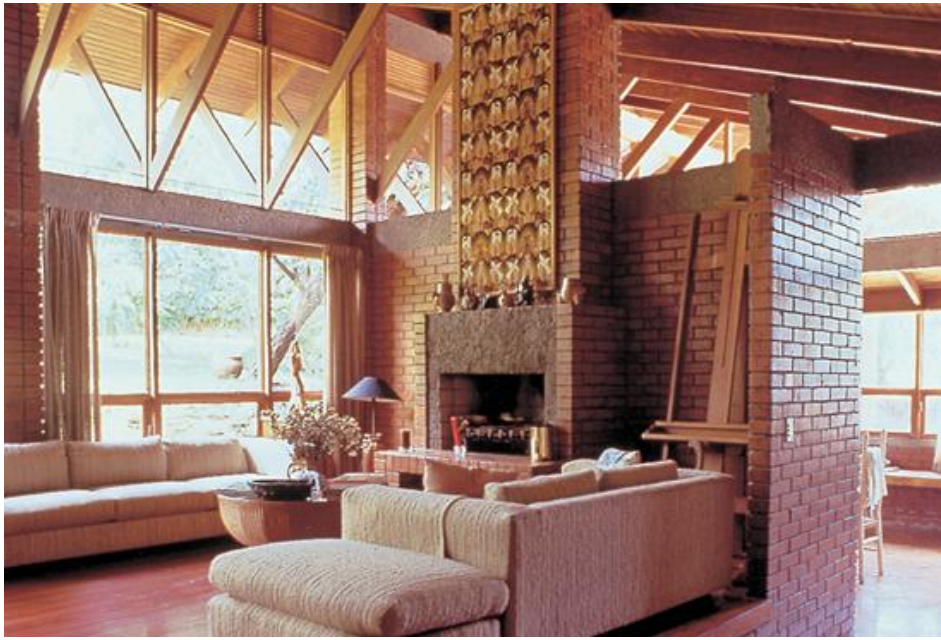
Figure 9: Average values, annual maximums and minimums for air temperature (A), and relative humidity annual average (B) registered at the Fabio Baudrit M Experimental Station (1961-1997).

In a climate with these characteristics, buildings do not need thermal insulation, either in the walls, or floors; however, in the roof it is necessary in order to avoid morning radiation and condensation. An aluminum sheet of 12 microns placed directly under the roof reflects 93% of the heat and then a 3" cushion of fiberglass resolves the problem of radiation.

FRIEDLANDER HOUSE (GILMORE HOUSE)

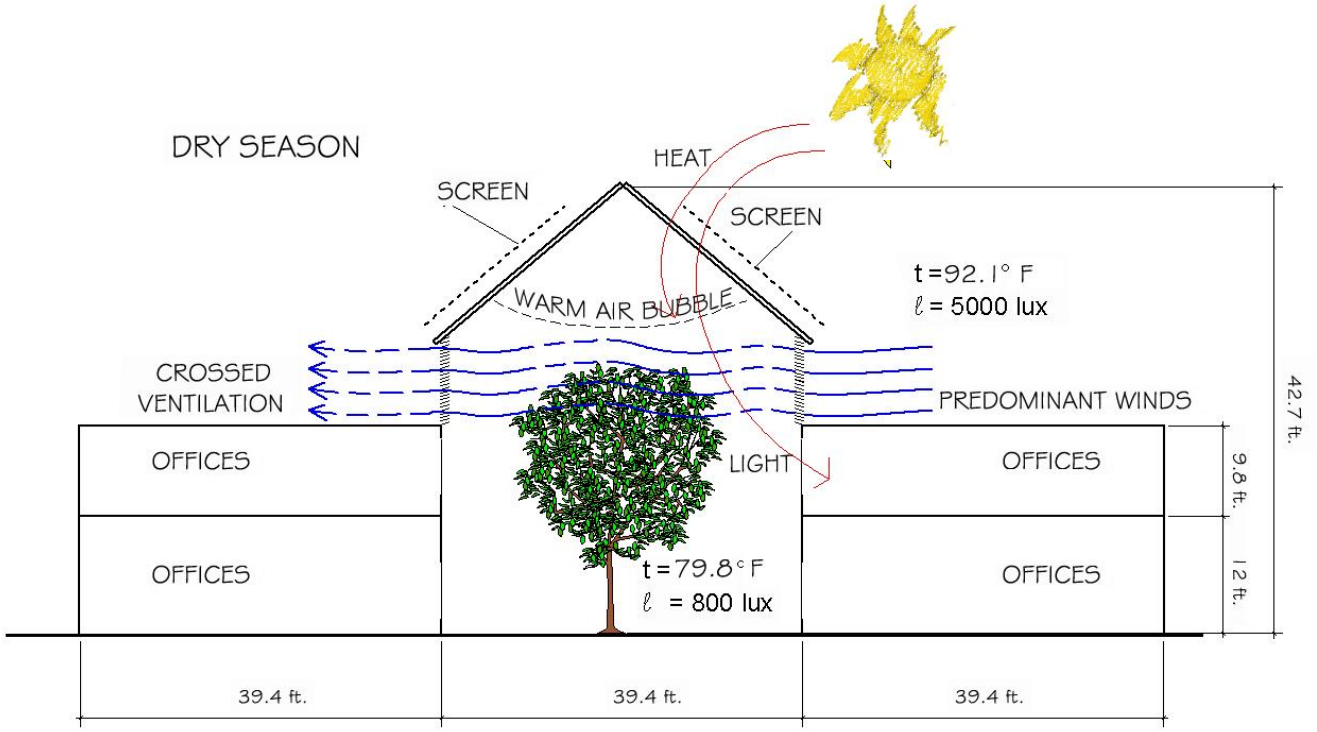
BRUNO STAGNO ARCHITECT AND ASSOCIATES
design: 1979-1997 construction: 1979-1997
built area: 8,126.7 sq.ft.
property area: 29,062.5 sq.ft.
location: Escazú, Costa Rica

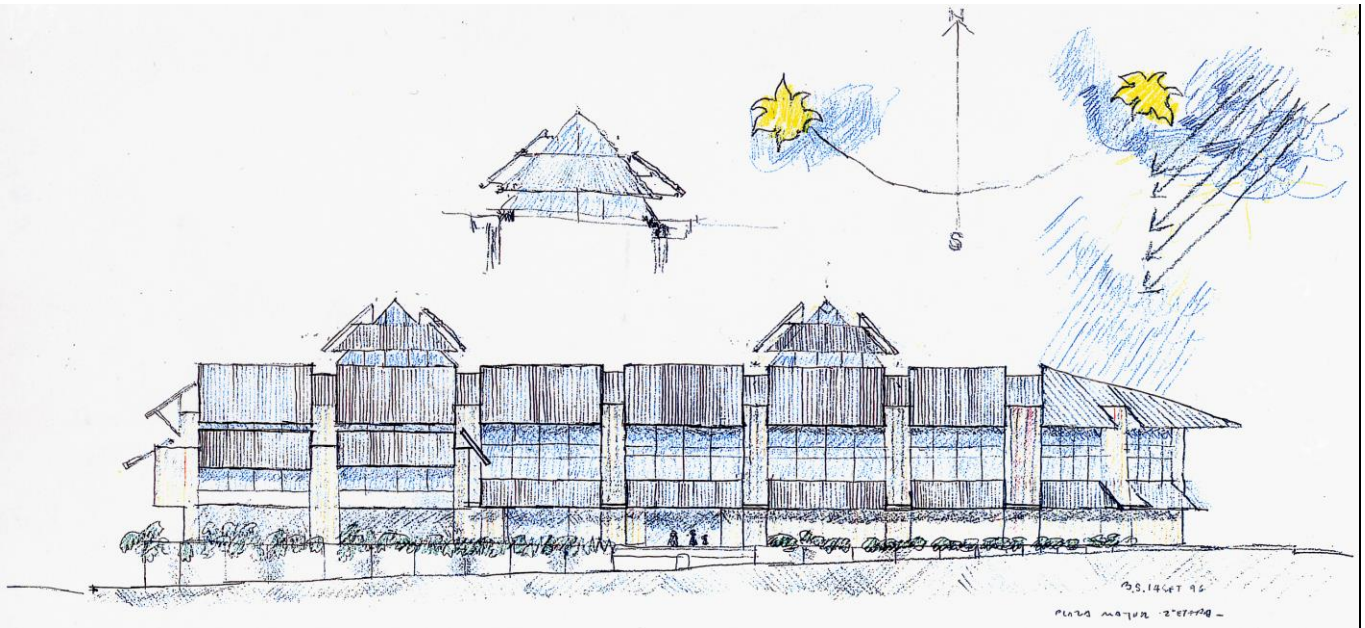
BRUNO STAGNO, architect
CARLOS ARAYA, assistant
JUAN CARLOS SOTELA, structural engineer
CLAUDIO SOTO, electrical engineer
EMSA, EDIFICADORA S.A., builder

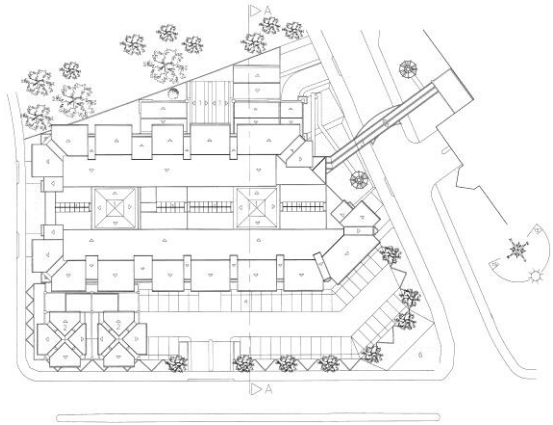


Combining freshness and illumination is a contradiction for bioclimatic, tropical architecture because we know that light is accompanied by heat; nevertheless, we have built some projects that called for illumination from the zenith, as the one I am now presenting to you. Here I am introducing light into the heart of the building to achieve a double oriented illumination for the offices, but by doing so I am also introducing heat. I resolve the excess heat by introducing an important horizontal air-stream that isolates this heat in a bubble that remains at the top of the pyramid. The values of temperature and luminosity can be appreciated in the sketch.

PLAZA MAYOR OFFICE CENTRE PHASE 2







Due to their sizes, the roofs are the main heat sources, but if the spaces are high, the effect on people is reduced. And if on top of that, crossed-ventilation is introduced, the conditions improve considerably. This spatial determinant offers the possibility of working with generous, open and transparent spaces.

BRUNO STAGNO ARCHITECT AND ASSOCIATES
design: 1996 construction: 1998
built area: 204,514 sq.ft.
property area: 74,809 sq.ft.
cost: US$ 7.125.000
location: Rohrmoser, San José, Costa Rica

BRUNO STAGNO, architect
CARLOS ARAYA, assistant
JUAN CARLOS SOTELA, structural engineer
FRANCISCO QUESADA, electrical and mechanical eng.
EDIFICAR S.A., builder

PLAZA MAYOR OFFICE CENTRE PHASE 2

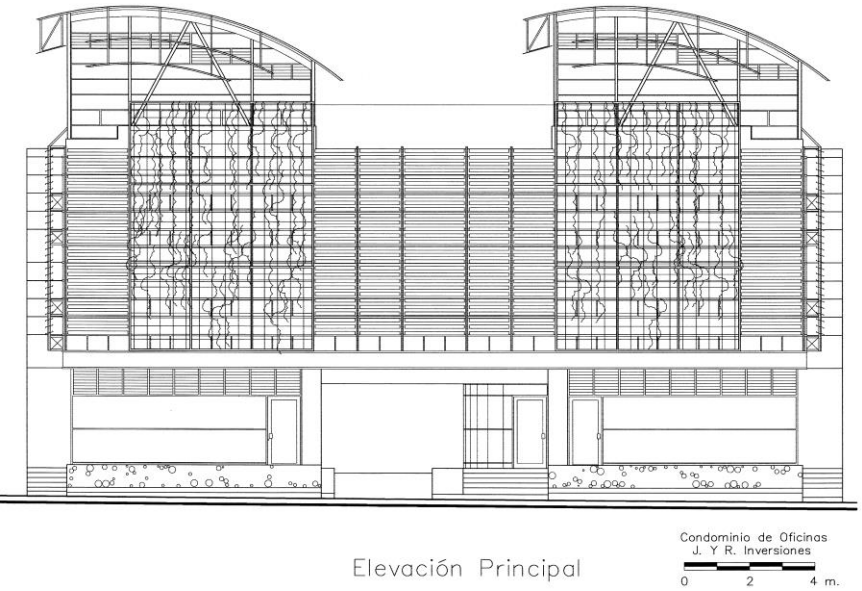
These spaces have the particularity of being under roofs with strong slopes which establish a high zone close to the roof and another horizontal zone related to the exterior, and this generates a spatial situation related to the exterior but sheltered by the roof. It is a very different spatial situation compared to that of Mies van der Rohe in which space slides towards the exterior without obstacles between the horizontal planes of the floor and roof.

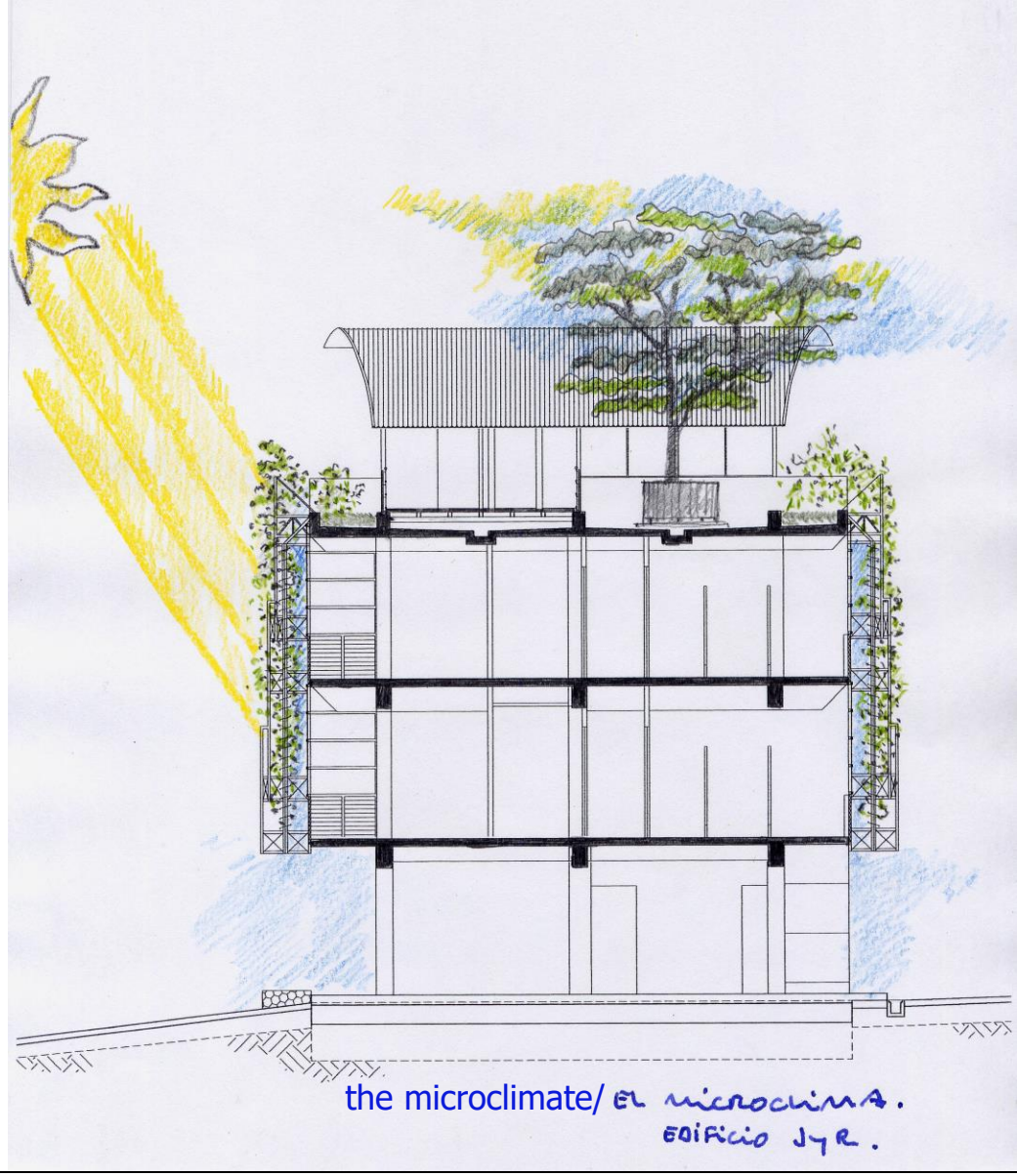
J&R
OFFICES

BRUNO STAGNO ARCHITECT AND ASSOCIATES
design: 2000 construction: 2002
built area: 8,363.6 sq.ft.
property area: 8,062.2 sq.ft.
location: Uruca, San José, Costa Rica

BRUNO STAGNO, architect
CARLOS ARAYA, assistant
JUAN CARLOS SOTELA, structural engineer
CLAUDIO SOTO, electrical engineer
EDIFICAR S.A., builder

Just as there is certainty in the horizontal sense of space in Mies van der Rohe's buildings, in the tropical space there is ambiguity. On the one hand, space has a clear relationship with the exterior, and simultaneously there is a clear intention of containing it under a high roof. Shade plays a very important role because it establishes a counterpoint that reinforces this situation.


Elevación Principal
Condominio de Oficinas
J. Y R. Inversiones
0 2 4 m.


the microclimate/ El microclima.
Edificio J y R.

J&R OFFICES

5- SUN AND SHADE

Sunlight is abundant, averaging 8 hours of sun per day during 12 months. Sun and clarity are two other factors that determine my architecture. Just as in cold latitudes where heat is a source of life, in the tropics, shade is the one who summons and gathers. It is "under the shade of a tree is where the guru finds enlightenment", states the Indian architect, Charles Correa.

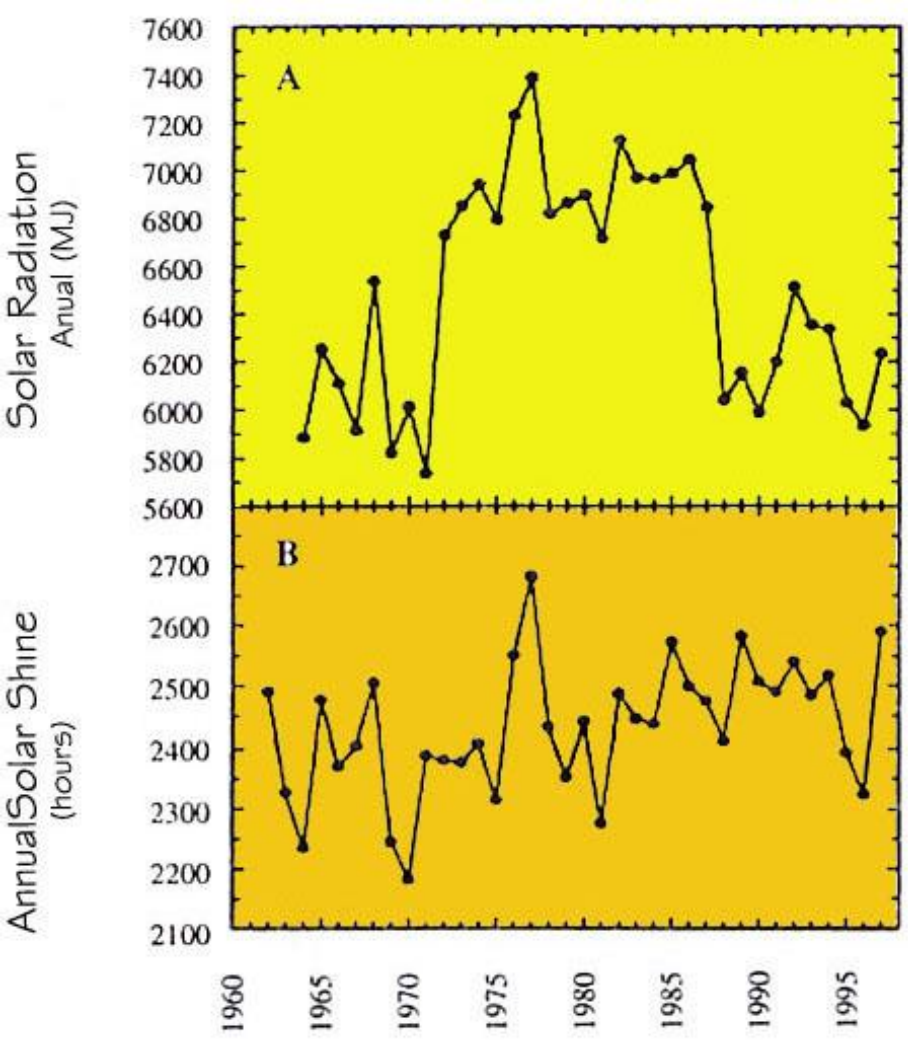


Figure 7: Total annual solar radiation (MJ) (1963-1997) (A) and of solar shine (H) (1961-1997) (B) observed along the historical record of measurements attained at the Fabio Baudrit M. Experimental Station.

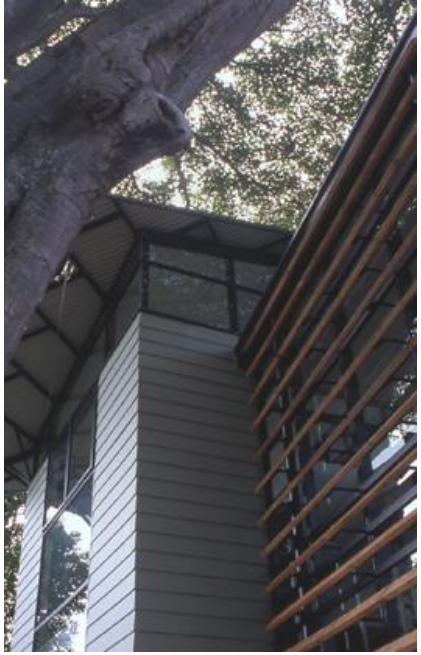
making use of the only shade available

In the tropical climate, shade is a necessity for well-being, furthermore, the skills in the handling of shade must become a crucial element in the design of buildings. The black shade and the dazzling exterior light are two counterpoints of the light spectrum that live in between a wide band of semi-shades with the potential of becoming an innovative and interesting architectural design resource.

LIBRO LIBRE

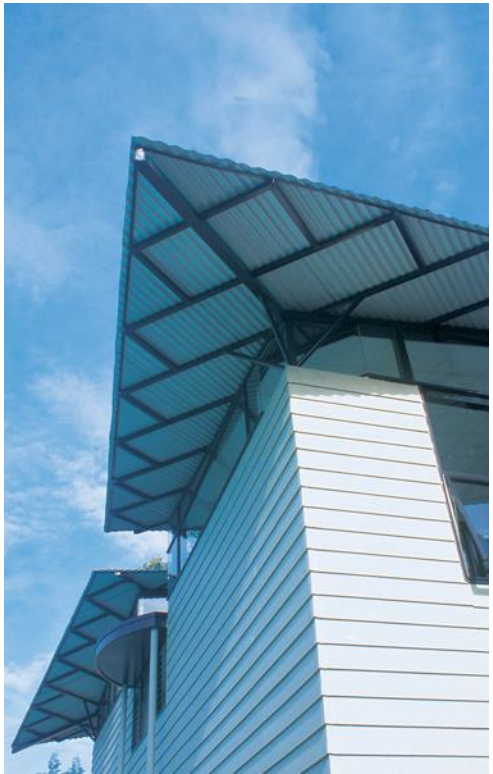
BRUNO STAGNO ARCHITECT AND ASSOCIATES
design: 2000 construction : 2001
built area: 1991.3 sq.ft.
property area: 30,677 sq.ft.
cost: US$ 96.000
location: Escazú, Costa Rica

BRUNO STAGNO, architect
CARLOS ARAYA, assistant
CLAUDIO SOTO, electrical engineer
CHANG DIAZ y ASOCIADOS S.A. , builder



It is due to this that space in tropical architecture has been traditionally modeled by shade and all of its variants of penumbra, semi-shade and *chiaroscuros*, which are achieved by diminishing the luminosity of the environment. Tropical space is characterized by being protected and shaded, and at the same time open, in order to offer crossed-ventilation with less possible obstacles.

LIBRO LIBRE



The penumbra is a veiled atmosphere that surrounds us, in which the eye rests, skin refreshes itself, and we find solace. The penumbra acquires value in contrast with the exterior luminosity; shades value space going from attenuated light to the total absence of it in a game of *chiaroscuros* that the architect should handle.

BRENES HOUSE

BRUNO STAGNO ARCHITECT AND ASSOCIATES
design: 2000
built area: 1,991.3 sq. ft.
property area: 158,498.4 sq.ft.
location: Tárcoles, Costa Rica

BRUNO STAGNO, architect
PIETRO STAGNO, architect
CARLOS ARAYA, assistant
EDUARDO CARVAJAL, structural engineer
CLAUDIO SOTO, electrical engineer

It is the roof, with its eaves, that produces shade and creates a microclimate for the building. Shade and not light becomes the sculptor of space. Shade is also semi-shade, *chiaroscuros*, veils in depths and reflections in shining surfaces.

JORGE MANUEL DENGO MEMORIAL

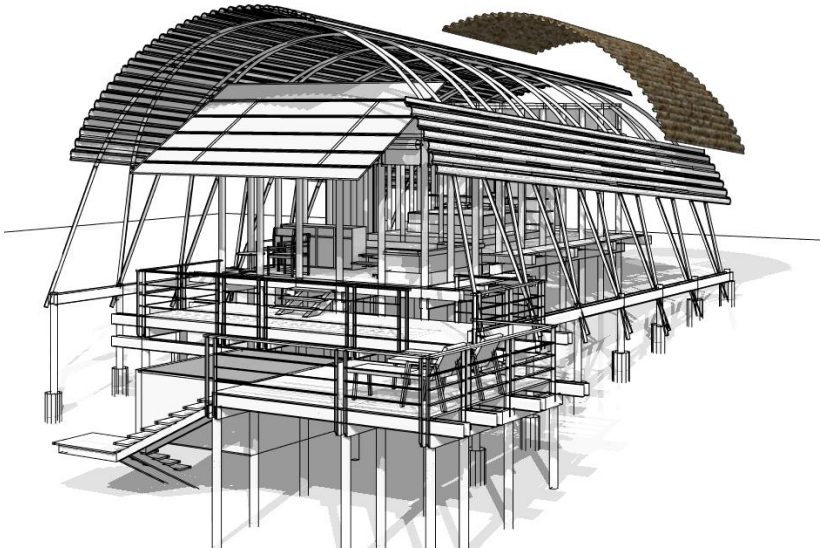
BRUNO STAGNO ARCHITECT AND ASSOCIATES
design: 2002 construction: 2003
built area: 2,691 sq.ft.
cost: US$ 38.750
location: Escuela Guácimo, Costa Rica

BRUNO STAGNO, architect
CARLOS ARAYA, assistant
JUAN CARLOS SOTELA, structural engineer
CARLOS HERNANDEZ., builder

It has many resources to model space and grant it a meaning.

This search for shade is a very important attitude and extendible to all tropical latitude, and that is why I say that “my architecture is in light of shades”.

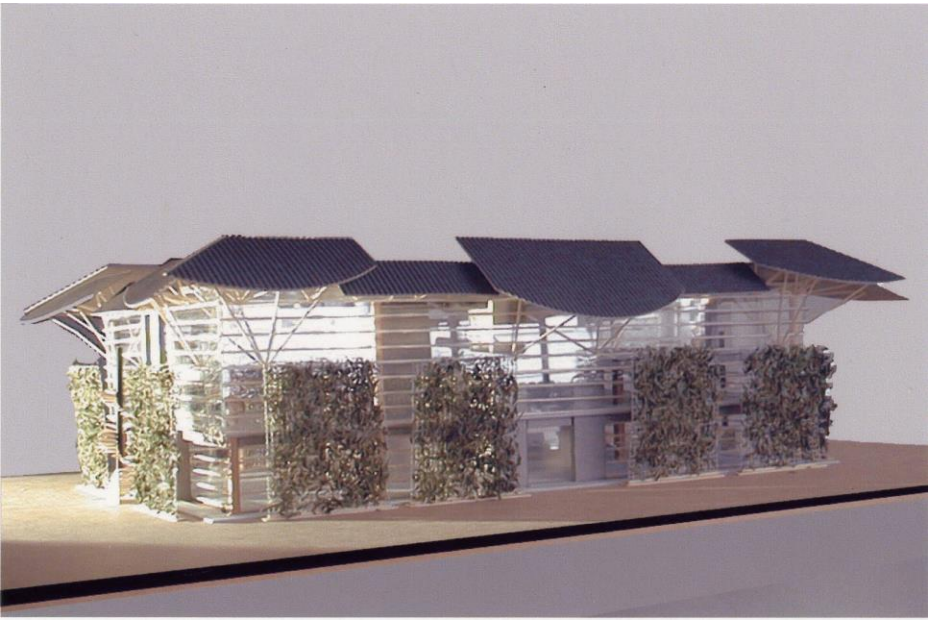
ECO-HOTEL PACUARE



6- GREENERY AND LEAVES

Vegetation grows rapidly and I use it as an architectonic element, vertically as much as horizontally, in the shape of pergolas, screens, vegetated atriums, patios, flowerpots, and others, in order to create microclimates and to favor architectural design. The vegetation in the tropics generally grows at such a rate that by the end of the construction it can be seen and the goodness of the climatic conditioning can begin to be enjoyed.

CREDOMATIC OFFICES



Besides being an important resource that is cheap and accessible to everyone, interior and exterior vegetation could be considered as a potential design element. The deal is to use it not as a complement but as an essential characteristic or statement of tropical architecture, and very specially to produce the benefit of a microclimate that adapts buildings to their immediate environment.

CENTRAL AMERICAN BANK FOR ECONOMIC INTEGRATION

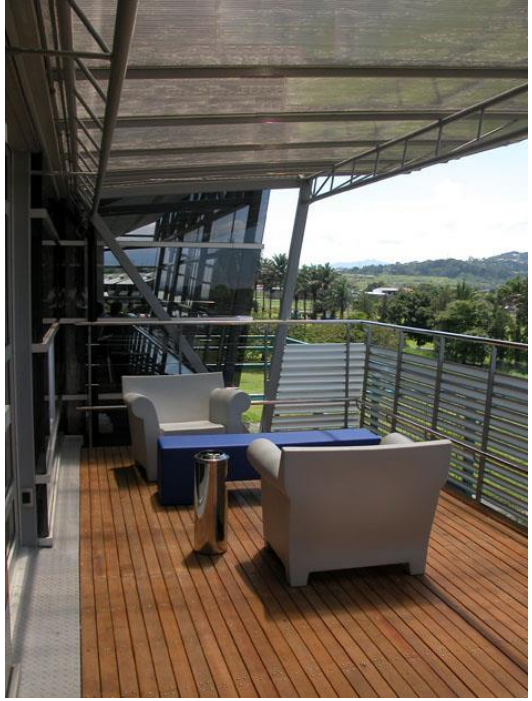
In this case shade and freshness are welcome during the whole year, and to create this effect I use perennial varieties that are typical of the tropics. Wrapping the buildings with vegetated screens achieves a natural freshness that isolates the building from the direct sunrays. A difference of up to 37.4 °F (3° C) can be attained behind a pergola or a green screen.

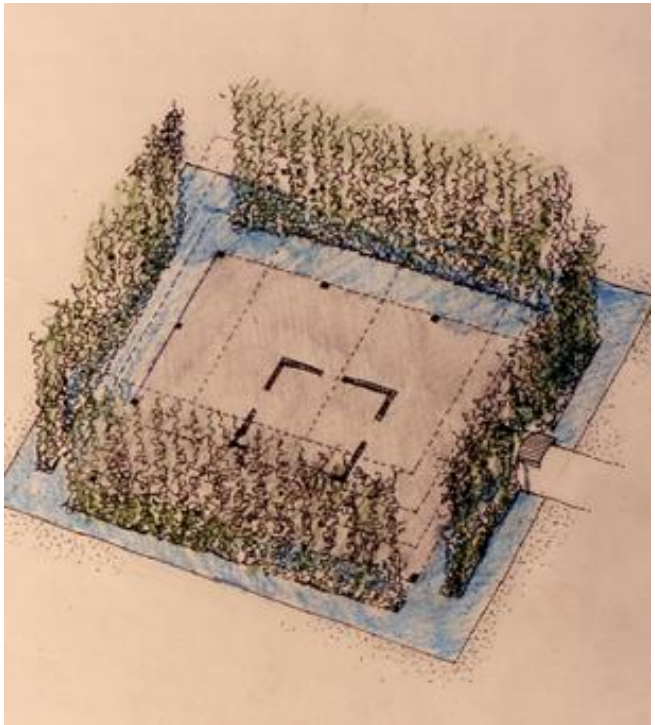
In the vertical screens we use *thumbergias grandifloras* that reach effortlessly the third floor (29.9 ft high/ 7 mts) in 8 weeks. The care and maintenance is minimal, concentrating in a daily watering during the dry season, avoiding the ant attacks, and keeping rabbits away.

PERGOLA BUILDING
(TRIBU ADVERTISING AGENCY)

BRUNO STAGNO ARCHITECT AND ASSOCIATES
design: 2003 construction: 2003-2004
built area: 30,386.5 sq.ft.
property area: 215,278 sq.ft.
cost: US$ 1.128.500
location: San Antonio, Heredia, Costa Rica

BRUNO STAGNO, architect
CARLOS ARAYA, assistant
LUIS ZAMORA, structural engineer
JUAN LUIS FLORES, mechanical engineer
CLAUDIO SOTO, electrical engineer
EDIFICAR S.A., builder



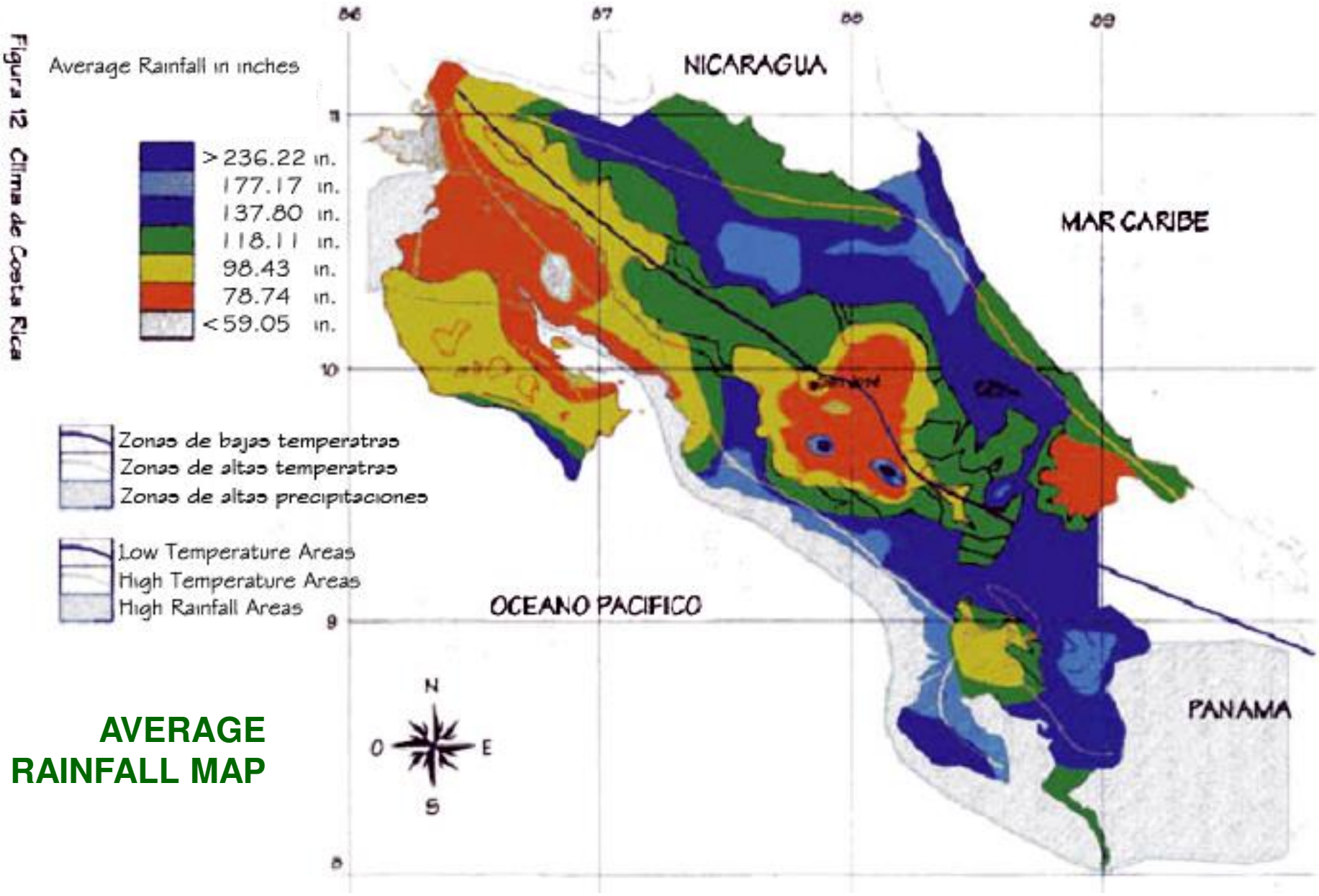


This vegetated architecture that is expressed in walls and roofs is a new built expression that is halfway between the spatial sensations of the forest and the traditional architecture. Its application in the urban context offers the possibility of incorporating, in a massive manner; the greenery adhered to buildings contributing a natural, aesthetic dimension and a climatic conditioning of important performance.

PERGOLA BUILDING

7- RAIN AND ROOF

In Costa Rica it rains an average of 236.22 in. (6,000 mm) per year in the Caribbean coast and 110.24 in. (2,800 mm) in the Central Plateau whose altitude is of 3,609 fasl (1100 msnm). When analyzing these statistics, we encounter more than one surprise, for example, in the case of the Central Plateau the 110.24 in. (2,800 mm) fall during 8 months, concentrated in the afternoons in a span of 4 hours.



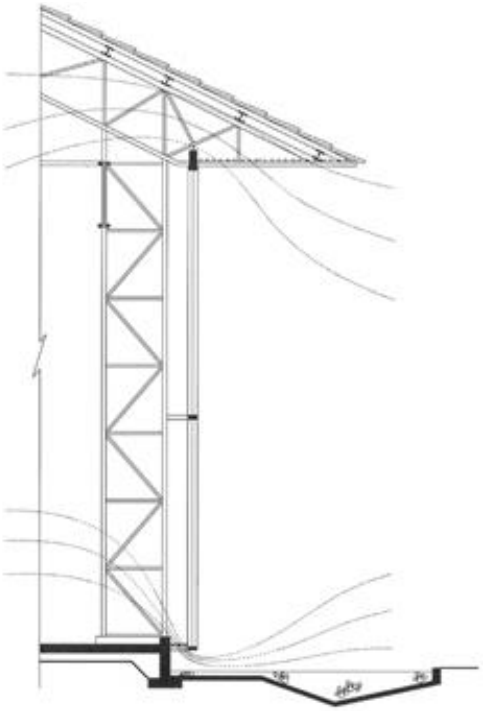
AVERAGE RAINFALL MAP

It is easily understood that tropical rainfall, due to the quantity of water concentrated in a short span, is an important determinant for the design of roofs that in case of being defective in design or construction, bring serious problems. For instance, there is statistic data that registered 1.97 in (50 mm) of water fallen in 30 minutes and 3.15 in. (80 mm) fallen in an hour for the area of the Central Plateau. For the Caribbean zone there are registries that indicate that 13.7 in. (348 mm) (December 1998) of the whole months' rainfall fell in just 6 days when the monthly average is of 17 in. (435 mm).

BOLCAFE BUILDING

BRUNO STAGNO ARCHITECT AND ASSOCIATES
design: 1986 construction: 1986-1987
built area: 16,145.85 sq.ft.
property area: 43,055.6 sq.ft.
cost: US$ 785.000
location: San José, Costa Rica

BRUNO STAGNO, architect
CARLOS ARAYA, assistant
JUAN CARLOS SOTELA, structural engineer
RAFAEL SEQUEIRA, mechanical and electrical engineer
C.M. CONSTRUCTORA DEL OESTE S.A., builder



The day begins with an intense morning sunshine that dazzles and heats up the air, followed by a strong and desired rainfall during the first hours of the afternoon that refreshes at first but later brings humidity and a persistent drowsiness. This daily cycle repeats itself with regularity during the rainy season and conditions life making the wide roofs necessary and generous.

PLAZA MAYOR SHOPPING CENTRE PHASE 1

BRUNO STAGNO ARCHITECT AND ASSOCIATES
design: 1988 constructionn: 1990
built area: 139,930.7 sq.ft.
property area: 141,383.8 sq.ft.
cost: US$ 5.400.000
location: Pavas, San José, Costa Rica

BRUNO STAGNO, architect
CARLOS ARAYA, assistant
FRANCISCO MAS, structural engineer
LUIS SEQUEIRA, electrical engineer
FERNANDO ZAMORA, mechanical engineer
VAN DER LAAT y JIMENEZ, builder

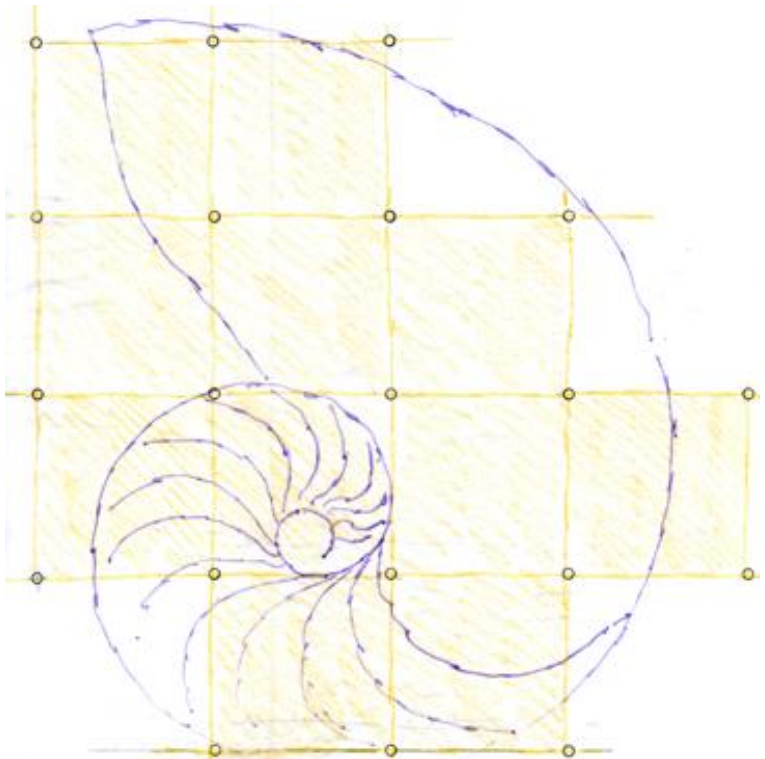
In the dry, hot months (March-April) the atmosphere becomes torrid.

Its great roof identifies tropical architecture, and this is easily understood. The roofs have an important presence in tropical architectures and it is around them that the solution to various aspects that have to be solved is centered.

BELLAVISTA COUNTRY CLUB APARTMENTS

BRUNO STAGNO ARCHITECT AND ASSOCIATES
design: 1988 construction: 1989-1990
built area: 69,427.2 sq.ft.
property area: 57,048.7 sq.ft.
cost: US$ 4.850.000
location: Escazú, Costa Rica

BRUNO STAGNO, architect
CARLOS ARAYA, assistant
FRANZ SAUTER, structural engineer
FRANCISCO QUESADA, electrical and mechanical eng.
VAN DER LAAT y JIMENEZ, builder



The roof is in charge of evacuating rainfall quickly, of producing shade, and also of participating in the ventilation by means of the circulation of air through strategically located openings.
After a cone-shaped roof made up of leaves, followed a roof with two slopes, then a pyramidal roof and ventilation was incorporated into the so-called Dutch roof. My architecture has evolved in the design of the roof granting it with a new leading role.

BAC SAN JOSE ROHRMOSER BANK AGENCY

BRUNO STAGNO ARCHITECT AND ASSOCIATES
design: 1998 construction: 1999-2000
built area: 11,043.8 sq.ft.
property area: 51,128.5 sq.ft.
cost: US$ 770.000
location: Rohrmoser, San José, Costa Rica

BRUNO STAGNO, architect
CARLOS ARAYA, assistant
JUAN CARLOS SOTELA, structural engineer
CLAUDIO SOTO, electrical engineer
EMSA. EDIFICADORA MODERNA S.A., builder

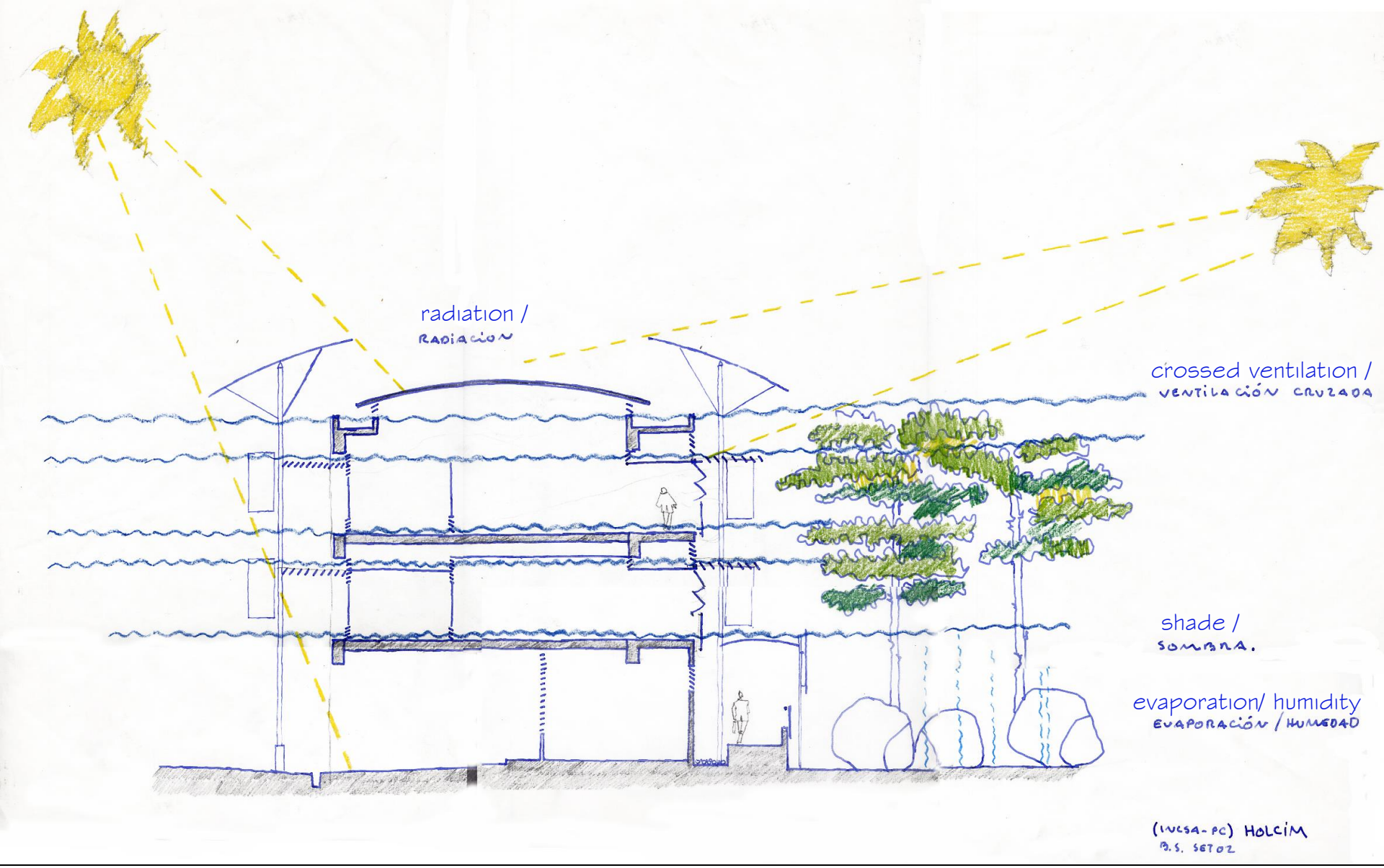
Of great size, with strong slopes, long and deep eaves, the roof has been broken into various planes making it more complex since each of these planes responds to a specific situation. This gathers the liberty of the popular buildings in which the necessity for protection against climate is what ends up shaping those architectures.

In my projects I use light metal sheets, beneath or on top of metallic structures to decompose the roofs and achieve the performance and expression we are looking for.

BAC SAN JOSE - ROHRMOSER BANK AGENCY

CONCLUSION

In poor countries, climate is our main resource to achieve a bioclimatic architecture that is coherent with the environment and that can be replicated by the people. That is why harnessing comfort through climate by design and by thermodynamic principles, seems to be an adequate and valid practice to us. This practice must be recovered and confronted with modern artificial methods.

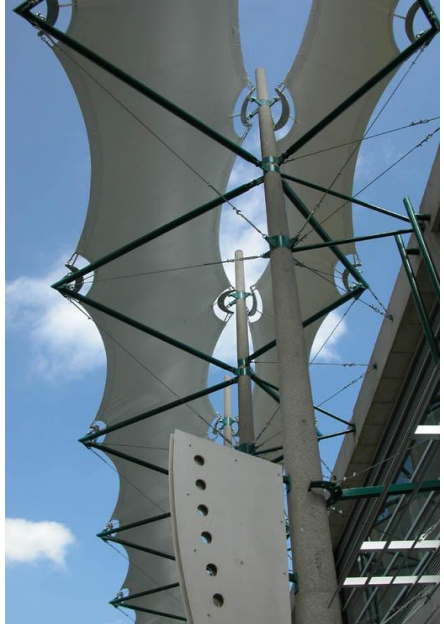


HOLCIM OFFICES

In Costa Rica there are no extreme winds because it is not in the normal route of hurricanes, but these do affect it with abundant rainfall that can be very harmful. What does characterize its climate is that there are numerous variations of wind and temperature, small but sensitive, several times a day making the climate unstable in between its maximums and minimums.

BRUNO STAGNO ARCHITECT AND ASSOCIATES
design: 2003 construction: 2004
built area: 41,936.2 sq.ft.
property area: 14 ha.
cost: US$ 2.850.000
location: San Rafael, Alajuela, Costa Rica

BRUNO STAGNO, architect
CARLOS ARAYA, assistant
JUAN CARLOS SOTELA, structural engineer
FTL Design Engineering Studio, structural eng.
JUAN LUIS FLORES, mechanical engineer
RAE INGENIEROS S.A., builder

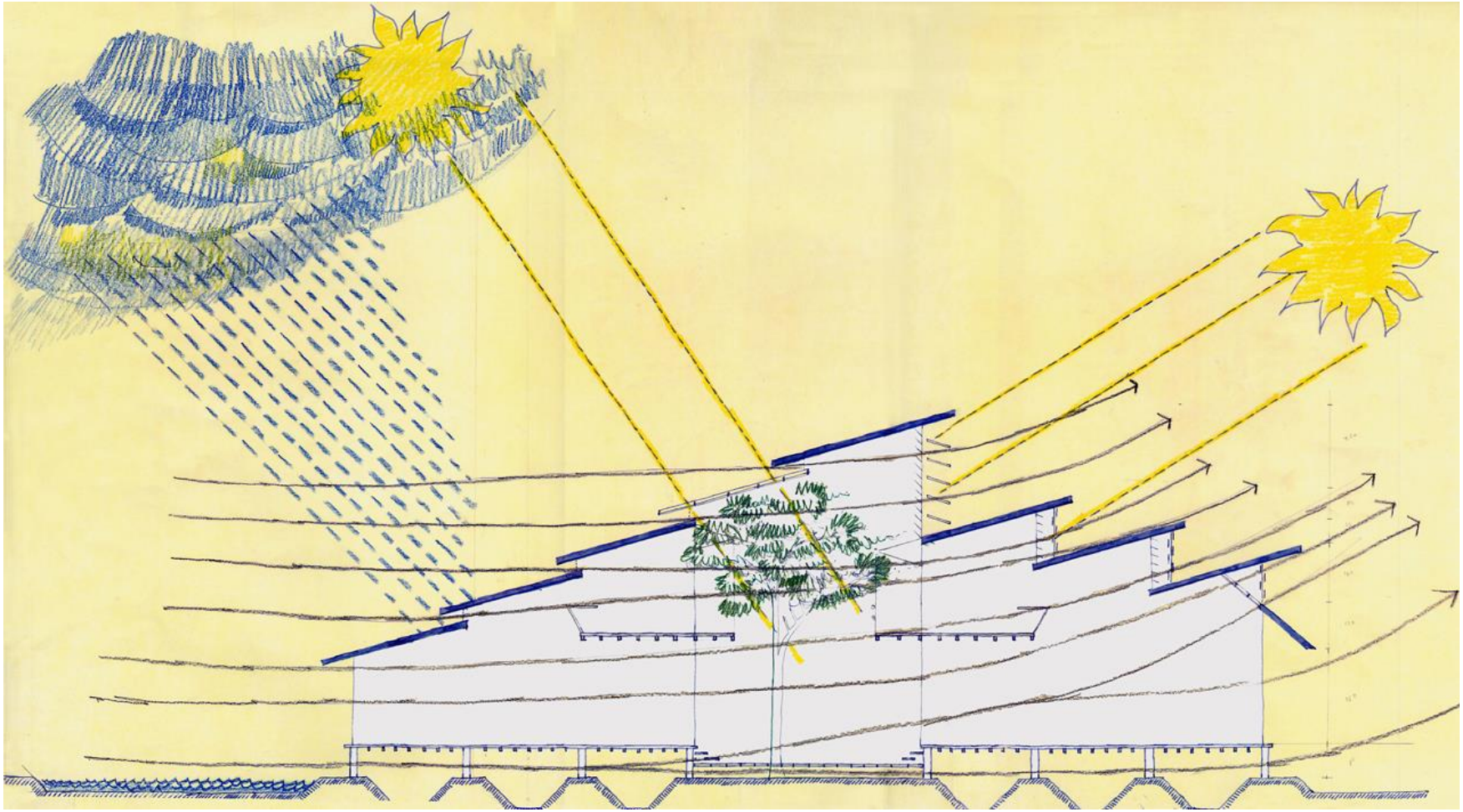


HOLCIM OFFICES

For bioclimatic architecture this characteristic calls upon an intervention from its users, several times a day to regulate the internal microclimate. Just how in the automatically conditioned buildings sensors and electronic devices are the ones that activate the machinery that intervene in the controlling of the interior climate, in bioclimatic, tropical buildings it is the people who are in charge of this control by manipulating the air openings. This deals with architectures that demand participation from its users. "Passive buildings for active people".

HOLCIM OFFICES

I hope I was able to transmit to you that being a contemporary architect in the Latin-American Tropics, who has a vision of vanguard, means working with basic concepts without design gadgets, without constructive acrobatics, but with a strong conviction of looking for frugality without being poor, austerity without being miserable, richness in the elementary, and always trying to avoid voracious and gluttonous architecture



an architecture in light of shade