Solar Building Practices and Urban Planning in the Work of Gaetano Vinaccia (1889 - 1971)

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INTRODUCTION

The purpose of this presentation is to recall the work of the Italian architect and engineer Gaetano Vinaccia, who authored more than 180 publications and dozens of projects and patents during the first half of the 1900s.

Research on Vinaccia is part of the ongoing work on Italian solar energy pioneers in the framework of "The Italian Solar Energy History Program" promoted by GSES and supported by the Italian Ministry for Cultural Heritage and Activities.

BIOGRAPHIC NOTES

Gaetano Vinaccia was born in Naples on May 18, 1889, to a family with a long tradition in the arts and professions. His formal education suffered from the family's travails.

Fig. 1 - Vinaccia in 1909, at the Brescia Technical Institute (standing second from the left).

In 1917 he was awarded a diploma as professor of architectural drawing. In 1926 he was in Freiburg, where he earned a diploma in civil engineering.

But Vinaccia probably acquired most of his knowledge through his own efforts and through experience in the field. In one of his writings, he remarks that "There were no schools, institutes, academies or universities during the luminous Italian Renaissance, and the teachers of that time handed out no certificates of the kind we now call diplomas."

Even before being admitted to the Rome Order of Engineers and Architects in 1928, he had already designed a number of works, including an apartment building on Via Monteverdi, in Rome (1921; one of the apartments was to be his own home). In 1927 he and other architects entered a competition for the construction of the League of Nations building in Vienna (they did not win).

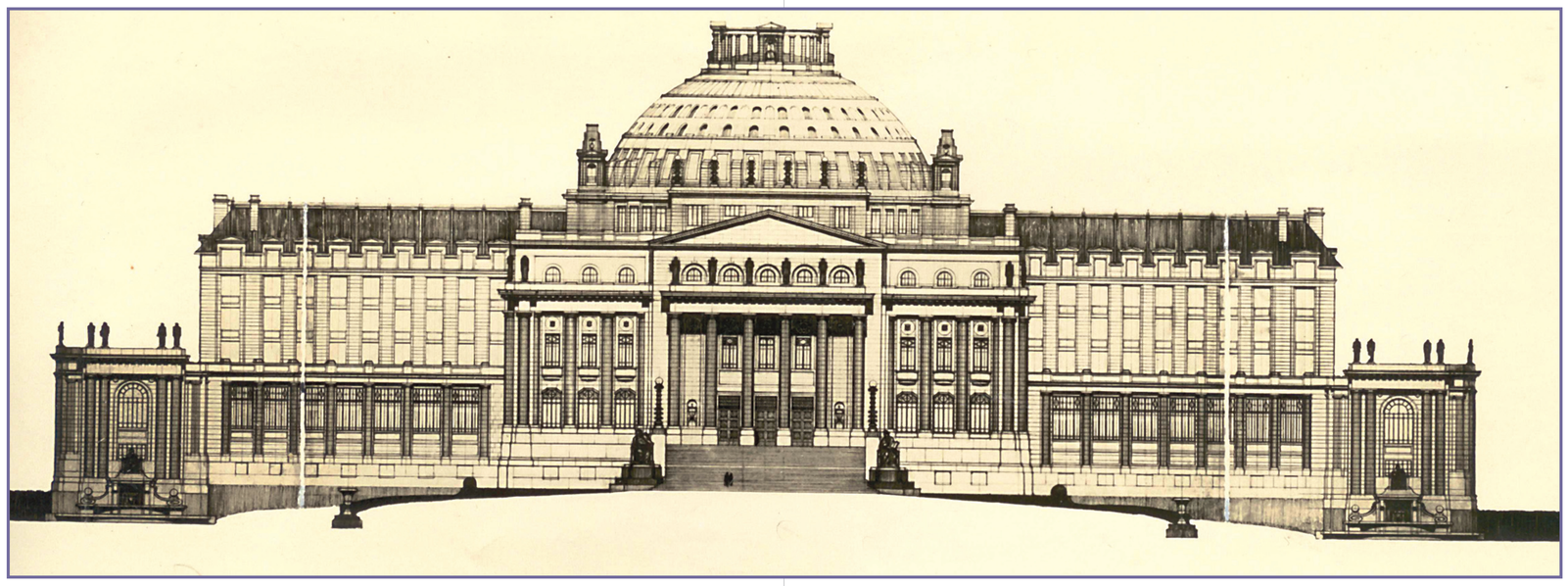


Fig. 2 - The Vinaccia team's design for the League of Nations building in Vienna.

Vinaccia's professional work was mainly on what he used to call "architettura minore" such as low income housing, small churches, small monuments, economic schools.

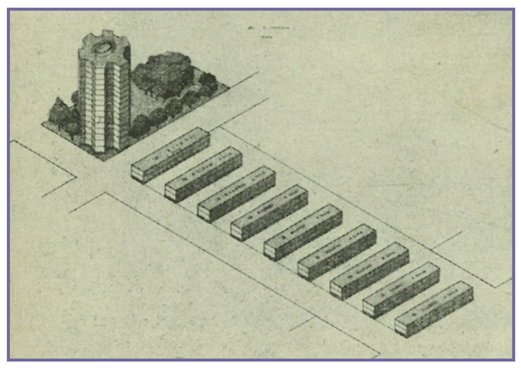


Fig. 3 - Low income housing project by Vinaccia (1935).

In this drawing he compares soil occupation by his proposed "casa a stella" and "town houses."

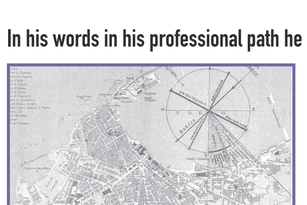
A turning point in Vinaccia's career came in 1930, when he was 41: he was appointed professor of geometry at the arts high school in Rome.

In his "Memoirs" – two notebooks in which he recounted his personal life and his work, from 1923 to 1952 (Vinaccia, 1952), he recalls that from this time on, solar energy became one of the central themes in his work. His interest in the subject was aroused by his teaching of geometry and shadows, which led him to investigate the many aspects of "Solar exposure."

From the early 1930s on, Vinaccia published more than 100 essays and articles dedicated specifically to the course of the sun in city planning and construction. Vinaccia also investigated the history of art and architecture in different civilizations, in the conviction that one cannot understand art without a knowledge of at least the principal geographic, historical, religious and social factors that determined it.

His multifaceted studies seem to have persuaded him to study the "scientization of architecture and city planning," where the climate and the sun are at the centre of all his analyses and practical conclusions.

In his words in his professional path he had the "idée fixe of the aesthetics of things," well underlined in relation to sun's light in his essay of 1952 "L'ensoleillement dans l'estétique architectonique.".



He patented and built dozens of solar devices, including an aircraft navigator that was used for the first time on the Rome–Tokyo and Rome–Tripoli flights.

Fig. 4 - Vinaccia's study on solar orientation and wind directions for the urban plan of the city of Tripoli.

DISCOVERY OF AND INTEREST IN INSOLATION

Teaching geometry and shadows at the Rome arts high school, led Vinaccia to investigate the many aspects of "Solar exposure."

Along with a few other solitary scholars, he sought to promote knowledge of the subject through numerous publications. For Vinaccia, the study of this subject should start from the consideration that the phenomenon is characterized by four fundamental aspects:

- psychological (quantified by the amount of time that the sun at least touches our windowsills),
- hygienic (meaning the germ-killing properties of the high sun's rays as they penetrate deeply into rooms, and their triggering of biological processes in higher organisms),
- thermal (quantifiable in terms of the calories received by a facade surface unit during the observation day)
- luminous (expressed as the quantity of light received by the sunny parts of a room: windows, walls and floors).

Each of these aspects has characteristics of its own that must be measured in different ways, then evaluated as a whole so as to draw practical conclusions for the purposes of designing the solar exposure of buildings and in city planning.

Fig. 5 - To orient buildings and streets he patented various devices as the poliesometro shown in this picture (1946).

SOLAR URBAN PLANNING

For Vinaccia, the fundamental rules followed by the city-planners of thirty-five hundred years ago – good insolation, protection from the wind – should be given adequate consideration in the zoning plans of all the cities in the world.

Vinaccia's principles and studies regarding solar urban planning are well summarized in one of his best-known books, Per la città di domani (For the City of Tomorrow), which he wrote in the 1930s and during WWII. His purpose, as he modestly specified, was simply to describe city planning for the general public.

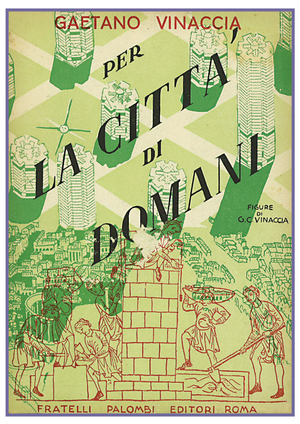


Fig. 6 - Cover's of Vinaccia "For the city of tomorrow" Vol I (1939).

In the preface to Vol. II "For the city of tomorrow" (1952), Vinaccia poses this question: "Will the cities that spring up after this huge, devastating fire be on the same pattern as today's?" The questions he raised above seem be even more difficult to be answered today.

Some of his reflections at that time:

"To reach the city of tomorrow, we need first of all – to save time and effort – to re travel old paths considered useless by people who think the past is a lead ball bound to humanity's feet so as to prevent our triumphant march toward progress."

"The fruit of thousands of years of intelligent work, the selection that centuries of experience has contributed to it, cannot be bypassed, cannot be modified, cannot be refuted except through centuries of very hard and serious work. And there are absolute truths that no one can modify, much less destroy."

"We should always draw on the wisdom of a very ancient urban planning practice, at once an art and a science, in which Latin civilization was a master, as codified by Vitruvius.

"No universal building forms, the same for everywhere; no identical orientation for all. Place by place, the shape of cities and buildings, each with its own orientation, is the outcome not of whim but of climate, solar and wind factors."

Fig. 7 - Cortina d'Ampezzo in the early 1940's. Vinaccia proposed a new urban plan based on his solar and wind directives.

POLISCLIMATOLOGY

To treat city plans in a systematic way, Vinaccia recommended developing scientific urban planning or scientized architecture, at the centre of which he placed what he called "polis-climatology," or urban climatology, the study of the microclimate of cities.

For Vinaccia, this was an ancient science to which he merely gave a new name. Using simple methods, polis-climatology would turn vague principles of hygienic city planning – such as providing sun, air and light to cities and buildings, and defending them from the inclemency of the weather – into concrete scientific reality. In 1948, at a Conference in Zurich, he urged the creation of an international research centre on polis-climatology, where geophysicists, public-health experts, engineers and architects could make valuable and dispassionate contributions to progress in building construction and urban planning.

HOW TO ORIENT BUILDINGS AND STREETS

Vinaccia wrote a number of essays on "solar and wind directives" for the zoning plans of Italian cities on flatlands and in the mountains, and for cities in North Africa and the tropics.

He also made critical analyses of specific cities and towns, for instance Cortina d'Ampezzo, Rome, Tripoli, Sora and Caracas, offering suggestions and recommendations on how to orient houses, streets, loggias and colonnades.

In this analyses, he reached the conclusion that the best orientation for buildings was not along the heliothermal axis suggested by Augustin Rey, Pidoux and Barde in 1920, in La Science des Plans de Ville (The Science of Urban Planning).

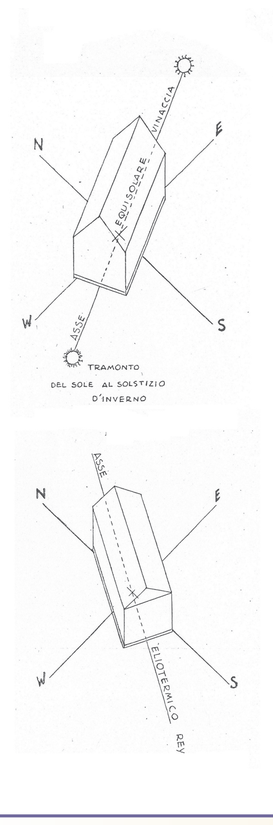


Fig. 8 - Equisolar and heliothermal orientation.

Instead, for temperate regions he proposed the "Vinaccia equisolar or solstitial" axis, which he devised to "equate" solar exposure on all four sides of a cubic block. A limited amount of sun hits all the sides, to the extent possible, thereby providing winter insolation on the northern sides too, and increasing building intensity.

According to Vinaccia, the orientation recommended by Rey, unthinkingly accepted by most architects, ruined many towns, producing buildings that are colder in winter and hotter in summer than need be.

SOLSTICE				
	WINTER		SUMMER	
	Facade facing		Facade facing	
	East	West	East	West
Ray Orientation	5h 26'	10h 34'	17h 55'	17h 5'
Equisolario Orientation	9h 25'	6h 35'	17h 15'	14h 25'

Table - Examples of the duration of insolation on four-sided buildings, according to Rey and Vinaccia.

He says that even Le Corbusier "believes in the heliothermal axis, calling it the 'armature of the urban map.'"

CONCLUSION

Vinaccia died in 1971, after a long illness. This was two years before the first great oil crisis, which was to call the whole world's attention to solar energy. Though the work done by other solar-energy pioneers in the first half of the 20th century and into the 1950s was reviewed with attention, Vinaccia's remained almost entirely unnoticed. Perhaps, in a world that was quickly industrializing under the impetus of technological development, people were more interested in technology than in the systemic architectural and city-planning aspects of the use of solar energy over the ages, and saw them as something belonging to the past: the past that Vinaccia placed at the centre of any enterprise headed for the future.

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Vinaccia, G., Il corso del sole in urbanistica e in edilizia (The Course of the Sun in Urban Planning and Construction), Milan: Hoepli, 1939. Contains 337 pages, 235 illustrations, 2 plates, 24 tables and an appendix with tables for calculating the position of the sun at all latitudes from 0° to 60° north and south, and for all declinations from degree to degree and hour to hour.

Photos and documents courtesy of Vinaccia's heirs.