

An aerial, black and white photograph of Santorini, Greece, showing the characteristic white-washed buildings with dark roofs and blue accents. The buildings are built on a steep, volcanic slope. The text is overlaid on the upper portion of the image.

SANTORINI

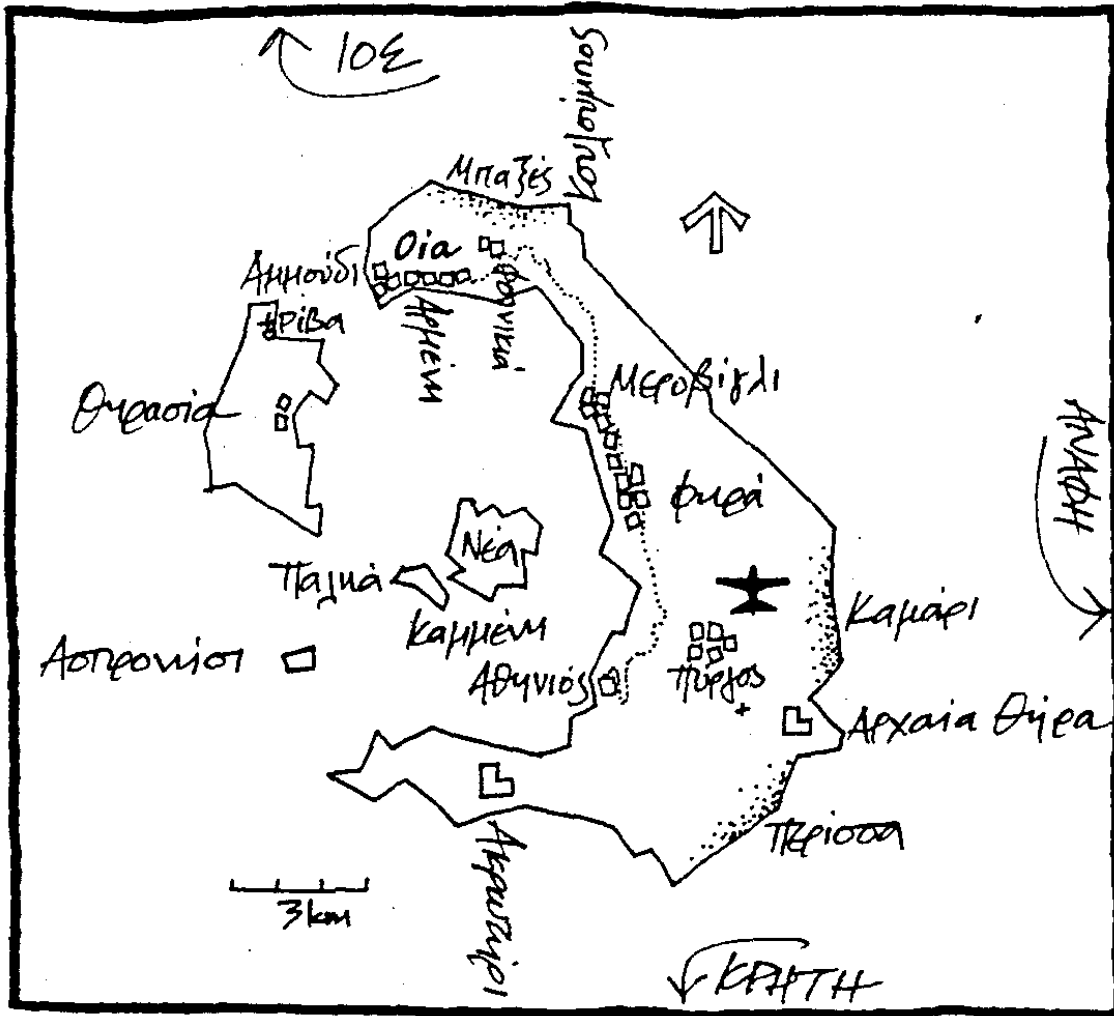
"the blue drinkable volcano"

A brief introduction
by Thanos N. Stasinopoulos

Athens 2002

*'The islands with all their minium and lampblack
 the islands with the vertebra of some Zeus
 the islands with their boat yards so deserted
 the islands with their drinkable blue volcanoes'*

(Odysseus Elytis 'The Axion Esti'; translated by E.Keeley & G.Savidis, Anvil Press Poetry 1980)



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This text was originally written in Greek for the 1st year students of National Technical University of Athens Department of Architecture, as an introduction to their annual study trip to Oia. An English version was prepared for the students of Architectural Association Environment & Energy Studies Programme in 1993 with later amendments.

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T h e i s l a n d

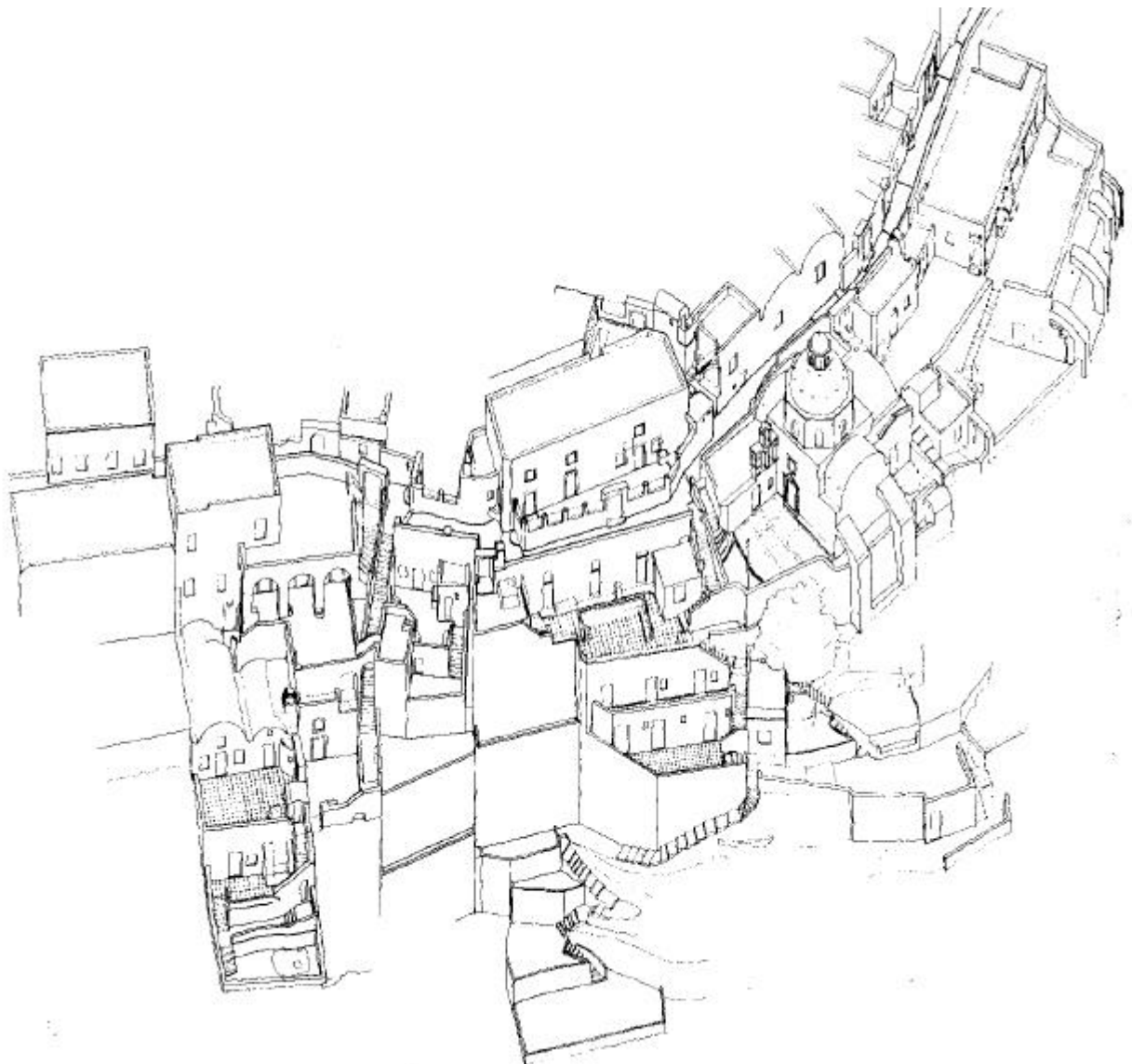
T h e g e o g r a p h y

Santorini (Stroggili, Kallisti or Thira during various periods) is the southernmost of the Cyclades group of islands in the centre of the Aegean Sea. It surrounds the bay of Caldera from the east, with the smaller island of Thirassia to the west and the rock of Aspronissi towards southwest.

These islands are the remnants of the original conical island which existed before the great volcanic eruption (ca. 1500 BC). The islets of Old & New Kammeni, in the middle of Caldera, are products of later volcanic activity.

T h e g r o u n d

The topography and the nature of the ground bears the clear marks of the eruption: Towards the crater there are steep red & black rock cliffs up to 300m high, covered with light-coloured ash (aspa) and pumice. On the outer side there are low hills and long beaches with dark sand. Vegetation is scarce due to the scarcity of water, but still there are many small vineyards -and millions of white or yellow daisies in spring.



A view of Fira near St.Minas church

The settlements

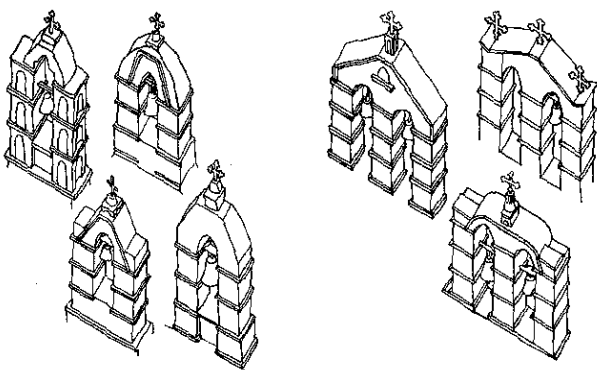
Compared to other Cyclades, Santorini is rather densely populated, even during winter. The volcanic soil is fertile, justifying the existence of many farming villages like Mesaria, Pyrgos, Mesa & Exo Gonia, Vothonas, Merovigli or Finikia. There are also settlements of maritime origin (Oia, Athinios) and others of mainly tourist character (Kamari, Perissa). Fira is the capital of the island, with most of the public services.

The past

Archaeological findings in Santorini cover all the Historic period. The island is considered by many to be the legendary Atlantis that suddenly vanished. Recent excavations started by Prof. Marinatos near the village of Akrotiri revealed a large settlement about 35 centuries old, well-preserved under thick volcanic ash layers. The sound & ash of the great eruption -which seems to have destroyed the Minoan civilisation of Crete- reached Egypt and even further.

Traces of the Classic era exist in Ancient Thira. Several invaders, from Doric tribes to the Saracens left their marks on the local population, which has known many fluctuations in size. The Venetians gave the island its present name when they first anchored at the Riva beach in Thirassia, next to the Santa Irini chapel.

The volcano never ceased to remind its presence: its underwater branch in Koloumbos, NE of Oia, caused death to thousands of people and animals with its poisonous gases around 1700 AD. The last eruption occurred without any victims in the 1920s, when New Kammeni was formed. However the earthquake of 1956 caused many casualties and extensive damages, which forced the Greek State to implement a rare example of new group housing blending vernacular and Modern features.



Bell towers

The legend of Atlantis

Plato refers to an ancient civilisation that vanished due to a sudden natural disaster. The legend has puzzled many generations of historians who variously locate Atlantis in the Antilles, America, some island west of Gibraltar, Malta, or just in Plato's imagination. During recent years Greece has been considered as the most likely location of Atlantis and according to several experts Santorini is the mythical island.

We know that Thira had been inhabited before 2000 BC and that the advanced Minoan civilisation existed in Crete & Thira before the disastrous eruption. That civilisation suddenly disappeared about 1400 BC, a fact that was interpreted as the result of an invasion by tribes from the Greek mainland. But the Thira eruption -that took place during the same era- led Marinatos among others to believe that the great explosion not only destroyed Thira but also created a huge tsunami, which vanished the Minoan society of Crete.

Santorini is the largest active caldera (sea crater) in the world, 5 times larger than Krakatoa between Sumatra & Java in Indonesia. The Thira eruption is estimated to have been 5 times more powerful than the one of Krakatoa that is described by J.V.Luce in "The End of Atlantis":

"Between just two days, 26-27 of August 1883, 23 square kilometres of Krakatoa disappeared after a series of explosions. The largest of all, at 10 am of the second day, was heard from Alice Springs in central Australia to Martinique in the Caribbean and from Ceylon to north Malaysia. The pressure waves created in the atmosphere travelled 3.5 times around the Earth, and heavy damages were caused to buildings up to 160 km away. The explosions created tsunamis, the biggest being 17 m high at a distance of 88 km from Krakatoa. The waves destroyed about 300 towns and villages on the neighbouring coasts of Java & Sumatra, causing the death by drowning of a large part of the coastal population, around 36,000 souls in all."

Based on the Krakatoa disaster, it is quite reasonable to believe that the Thira eruption devastated the north coast of Crete -located just 90 km away- through waves perhaps 60-100 m high travelling with a speed of 160 km/h. The volcanic ash might had covered the entire island in layers 10-75 cm thick, enough to minimise the fertility of the soil for 2-15 years.

The volcano has been active on several occasions since the great disaster. The eruption of 236 BC separated Thirassia from the NW edge of Thira, whilst Old Kammeni

(Old Burned) appeared in 196 BC. The southern coast of Santorini was submerged in 1570 AD; three years later Small Kammeni was created and between 1711-12 New Kammeni emerged from the sea. In 1866 a series of eruptions lasting two years caused the islet of Aphotessa to appear and then disappear. The eruption of 1925-26 that connected Small & New Kammeni caused little damage, but the powerful earthquake of 1956 destroyed many buildings and created tidal waves up to 17 meters high.

T h e c l i m a t e

Climatic conditions are typical for the Cyclades region, with long sunshine duration and little rainfall. Humidity is relatively high (in fact, it is the main water source for vegetation). Temperature fluctuations are rather limited throughout the year and snow is a rare event. Winds usually come from the North quite strongly (especially the meltemi in August), but sometimes the south ones are nasty too.

T r a n s p o r t

Santorini has 3 ports (Athinios, Fira, Oia) with sea connections to Piraeus, other Cyclades islands and Crete. There are direct flights to Athens, Rhodes, Mykonos & abroad (chartered) from the long runway of Monolithos. Buses & taxis on the extensive asphalt road network serve local transport, while large & small boats connect several points within Caldera. Additional transport means include animals (donkeys & mules), a cable car (in Fira), and of course a growing number of cars & motorcycles.

T h e e c o n o m y

Santorini is well known for its strong and tasty wines which are the major local products, the most interesting being the white nikteri (from grapes picked before dawn), the sweet red vissanto ('vino santo') and the powerful tsikoudia (grape schnapps, identical to grappa). The local agriculture yields a limited amount of vegetables, small and tasty. A few old tomato processing factories still exist, charming examples of past industrial architecture.

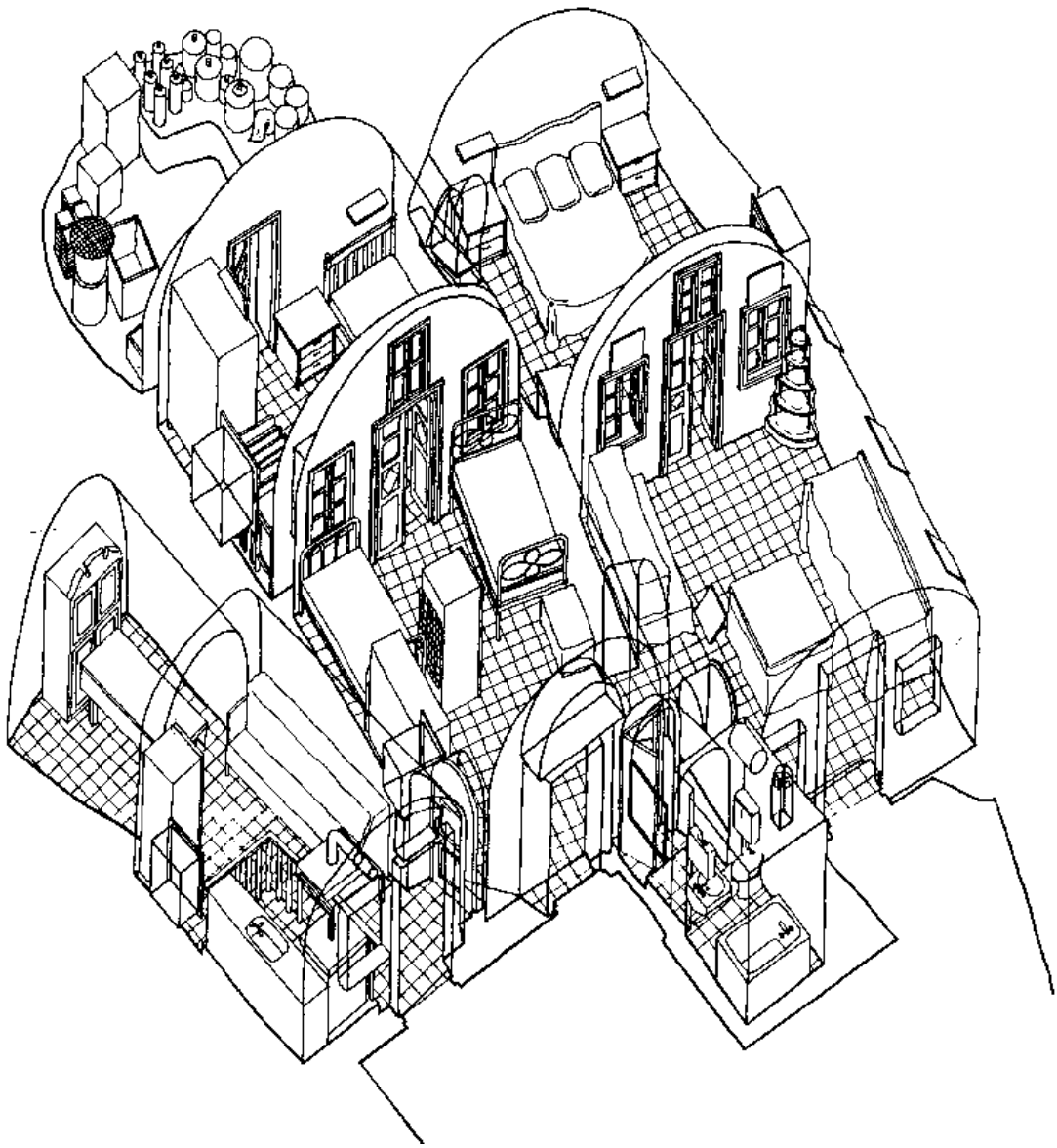
An important sector is the mining of Thera soil (pumice), used by building industries in Greece and abroad. Shipping has always had a great historical, financial and political importance, with many local seamen and shipping tycoons. The surrounding waters are very good for fishing, but usually the demand for fish exceeds the supply. The newest sector with vast & fast growth is tourism, involving a large part of the permanent and seasonal population.

T o u r i s m

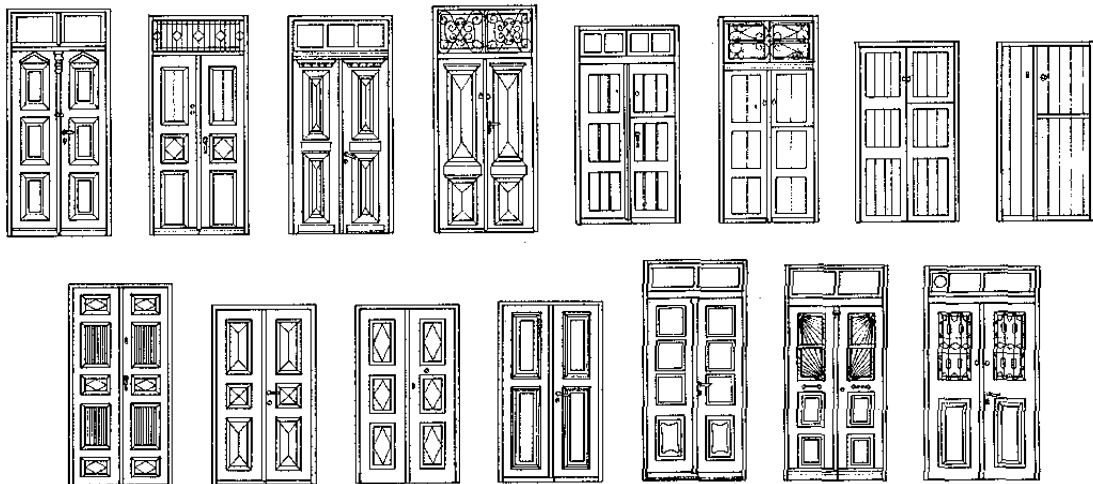
The spectacular and unique landscape, the distinctive vernacular architecture and the long runaway have caused a rapid increase of mass tourism during the recent years, with all the related side effects ("collateral damage"?) on the environment and the mentality of local people. Settlements like Kamari & Perissa are quite busy in summer, continuously growing thanks to the hordes of visitors. The port of Fira is a routine stop for every East Mediterranean cruise. There are quite a few sandy sea-sides easily accessible by car; Kamari & Perissa beaches are crowded in summer, though there are better sands with few people at short distance. The sea in Caldera is deep (down to 400 meters) and clean, but accessible only at a few points -and by few people. Nudism is tolerated, especially in some less crowded spots like Koloumbos. Special attractions are the excavation site in Akrotiri, the islets of New & Old Kammeni (with black lava rocks and warm sulphur water), and local religious events (like in Riva on the 5th of May).



Lonely chapel over Ammoudi (1983)



Typical interior of excavated houses



Door types

T h e a r c h i t e c t u r e

The urban fabric

The villages of Santorini still retain much of their old visual character today, in spite of greedy 'development'.

The fear of pirates was a compelling motive to select sites far from the shore, on steep cliffs or hidden valleys. Several factors have led to high density with narrow streets & small buildings: shortage of available safe space, mutual protection from the wind & the solar heat, defence, family growth, construction materials saving, as well as the highly communal spirit of the old societies.

In other Aegean settlements, like Mykonos & Astypalea, densities of up to one person per square meter have been reported, so one can imagine similar conditions in Santorini villages -without counting the numerous animals.

in our era, when the sea is the main attraction and sunburns are more frequent than pirate assaults, more and more settlements appear near the shore, where few buildings existed even 30-40 years ago.



Free forms in Oia (1979)

Major features

Le Corbusier was greatly impressed by the visual virtues of Santorini vernacular buildings when he visited the island during the CIAM conference in the 1920's. The basic building features, like in the rest of Cyclades, are solid volumes, thick masonry walls with small openings, the whitewashed plaster skin covering almost everything with an integrative power, the creation of composition through continuous repetition. All these elements have produced organic urban & building forms, evolving through a long response to the climatic conditions using the locally available resources, and at the same time imprinting the social evolution through time.

One can say that Nature is the chief designer of that architectural style, dictating its whims on the local builders, i.e. the dwellers themselves in most cases. Climate, earthquakes, materials, and topography had been the primary design parameters, and were respected with admirable honesty & ingenuity. Tradition, resulting from long experience, was regulating the building specifications from layout to decoration, leaving little ground for experiments or deviations from the established norms. The introduction of Neo-classical elements at the end of the 19th century must have been a radical act, adopted by rich captains who could afford showing off that they can follow the new architectural trend which was then flourishing in Europe.

A special ergonomic scale is all too obvious, very similar to the one found in ships: low doors, narrow and steep stairs, tiny inner/outer spaces. These are products of necessity rather than choice, since the dominant design rule is economy in every respect.

The buildings of Santorini feature a couple of additional characteristics that give a unique flavour to the local architecture, quite distinct from the surrounding islands: excavated buildings in a stepped-back layout and cylindrical vaults.

Excavated buildings

The slope and hardness of the ground, coupled with the need for material saving, led to the creation of vaulted caves dug into the top layer of the volcanic ash for use as dwellings, stables, wineries, etc. Their front was closed by masonry walls, frequently supporting the veranda of the next house up. The deep caves are typically divided in 2-3 rooms by partitions similar to the front elevations.

The challenge of ventilating and lighting such deep spaces is sometimes solved with vertical ducts through the ground that enhance air & light admitted by the front openings.

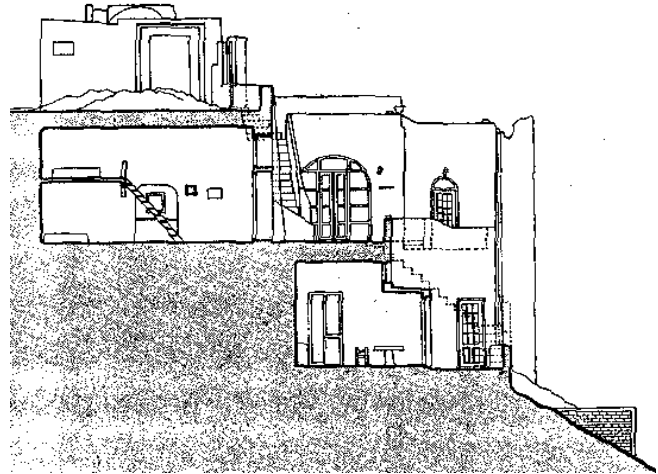
Besides the ease of construction, a major advantage of the excavated dwellings is their thermal performance. The large heat capacity of the soil dampens down the diurnal & annual fluctuations of indoor temperature, even more than thick masonry walls. Thus a satisfactory level of thermal comfort is achieved in summer & winter, with a reduced need for auxiliary heating which is required mainly to reduce discomfort caused by humidity.

These cave-like structures are particularly earthquake-proof: during recent restoration works, several excavated rooms were found intact, buried behind ruined facades.

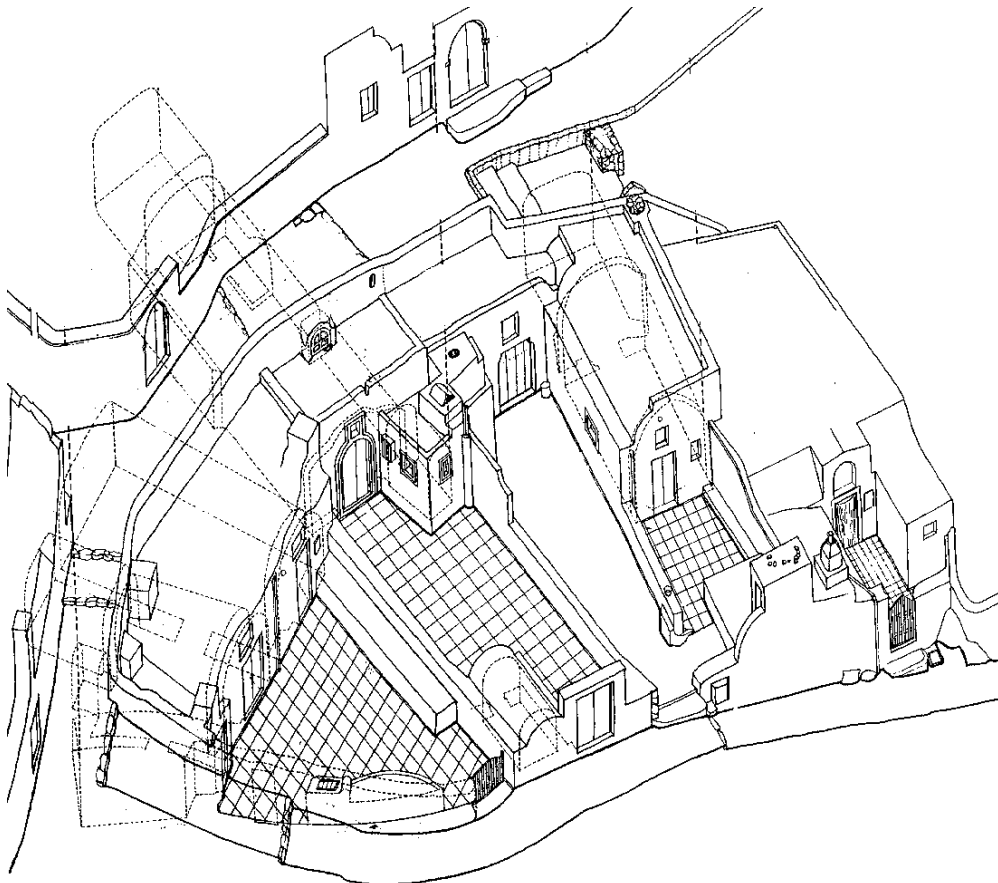
The stepped layout

Due to the sloping topography, a stair-like urban structure has been developed: The roof of a house is frequently the veranda of the next one above -or perhaps a public street. Thus, an unusual status of 3-dimensional property has been adopted, requiring close co-operation between neighbours in issues like construction, access, sewage, etc.

Such a layout obviously requires numerous stairs of many forms & sizes, and of course brave legs & hearts.



Cross section of excavated dwellings

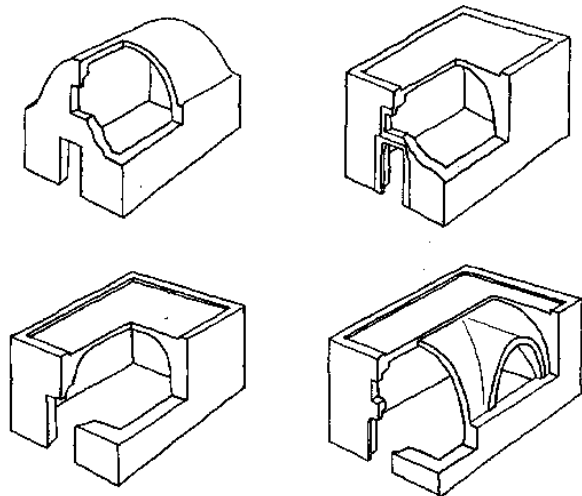


Caves & courtyards

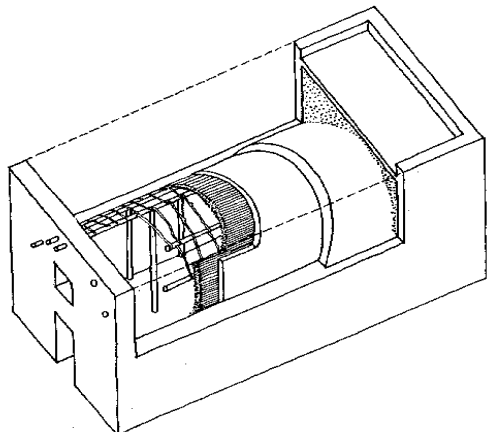
The vaults

The main building material is the abundant red or black lava stone, used with or without mortar and covered with plaster. Theran Soil, with properties very similar to cement, had been widely used from ancient times. Mortar made with Theran Soil powder is cheap, locally available and very strong. Structural timber has been a rare & expensive luxury, thus the most common way to cover large or small spaces was through remarkably thin vaulted roofs, bridging the gap between the thick sidewalls.

In sharp contrast to their decorative function and high cost today, vaults were regarded as an inferior building method in the past. A way to show off wealth was by the transformation of the vaulted roofs into rectangular volumes through parapets built over the perimeter walls, thus giving the impression of timber flat roofs. An all-too-obvious example of such fake semiotics can still be seen in Finikia: A thin rectangular wall facing the main street hides two lower vaults behind it. The elaborate vaulted ceilings of Oia's captain mansions are visible only from inside, as they have been hidden by 'flat' roofs. Part of the facades of those buildings is ornamented with carefully built red stones ('pori'), which in less luxurious houses are used only to outline openings.



Vault typology

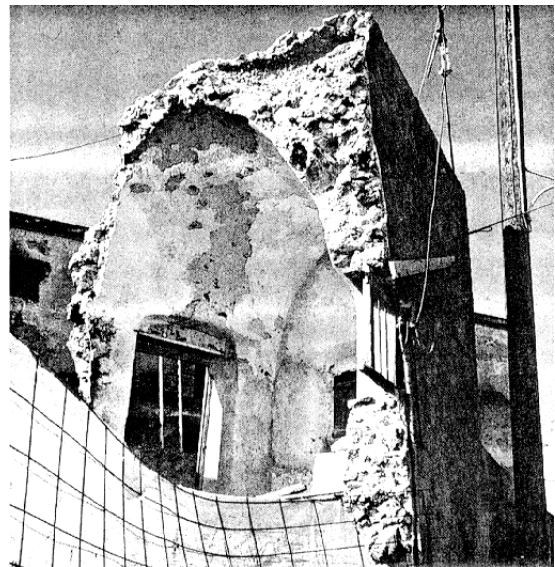


Vault construction method

The construction

The major construction difficulty, even today, has been the transport of materials over cliffs & steps with the only available -and best suited- means: donkeys & mules. That explains odd features such as massive rock chunks left on verandas, or half-ruined walls merged into later structures. The excavated walls of caves are sometimes 'adorned' by protruding rocks, left as they were found during construction in order not to alter the stability of the ground or to increase the transportation burden.

Contemporary refurbishing methods include the inner reinforcement of vaults with steel mesh & sprayed concrete. Hollow cement blocks have replaced local stone in external & partition walls, with negative effects on the strength of the structure and the thermal performance of the buildings. The housing units built by the state on several locations across the island after the 1956 earthquake is an interesting example of old forms implemented in contemporary mass production. But they do not offer satisfactory living conditions, as the thin concrete slabs and cement walls offer a much inferior thermal behaviour than the traditional stone & soil. A global comparison between the old & new building practices can lead to scepticism on which era is truly rational.



Natural section of a vault disguised as rectangular block

The services

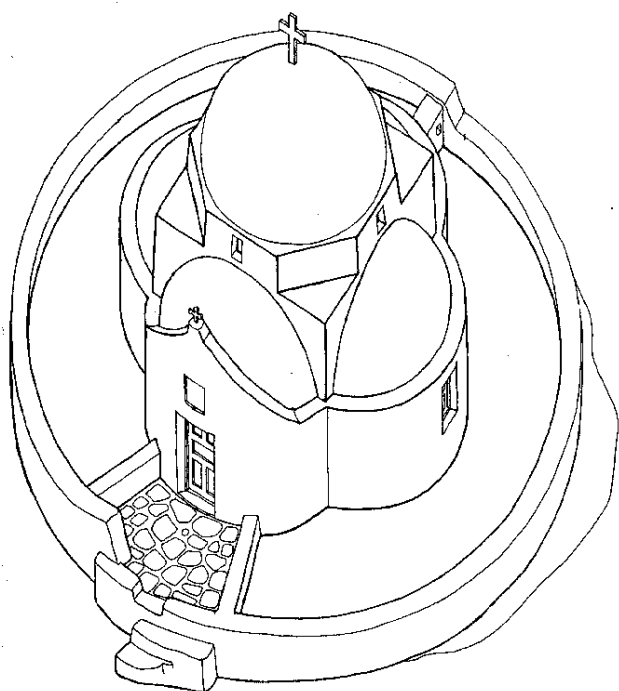
The typical dwelling includes at least one cistern where the precious rainwater is collected via elaborate drainage systems. Consideration for water collection has regularly been a decisive factor in the layout and form of buildings.

The washrooms were built away from the main quarters, usually above a small closet with a collection tank; its contents were periodically transported outside the village on donkeys, or just fed to the pigs of the household, thus achieving complete recycling.

The single fuel available for space heating & cooking was bush branches, carefully collected from the countryside. Heating is often needed in the winter, especially given the high humidity at times. Portable stoves (mangali) were the only alternative to heavy clothes, body heat, or patience, as there are no fireplaces other than the ones in the kitchen.

The small openings minimise heat losses, a vital fact in the not so distant era when glass was a tremendous luxury for the few -if available at all; but at the same time they decrease natural light in the interior, where the only lighting alternative was oil lamps.

Lack of heating and limited ventilation inevitably lead to condensation, especially in the excavated vaults which are surrounded by the moisture of the soil. It is easy to imagine the unhealthy living conditions under such circumstances; considering also the chronic water shortages and the co-existence with numerous animals, one should have a smelly rather than idyllic picture of everyday life in the past.

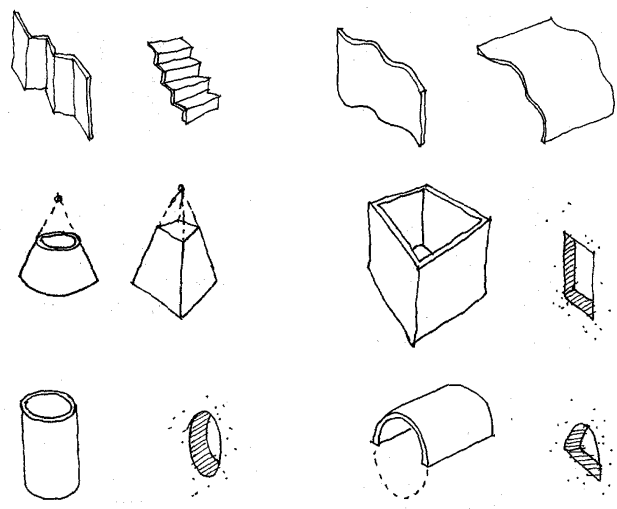


Strict geometry -but notice the front steps!

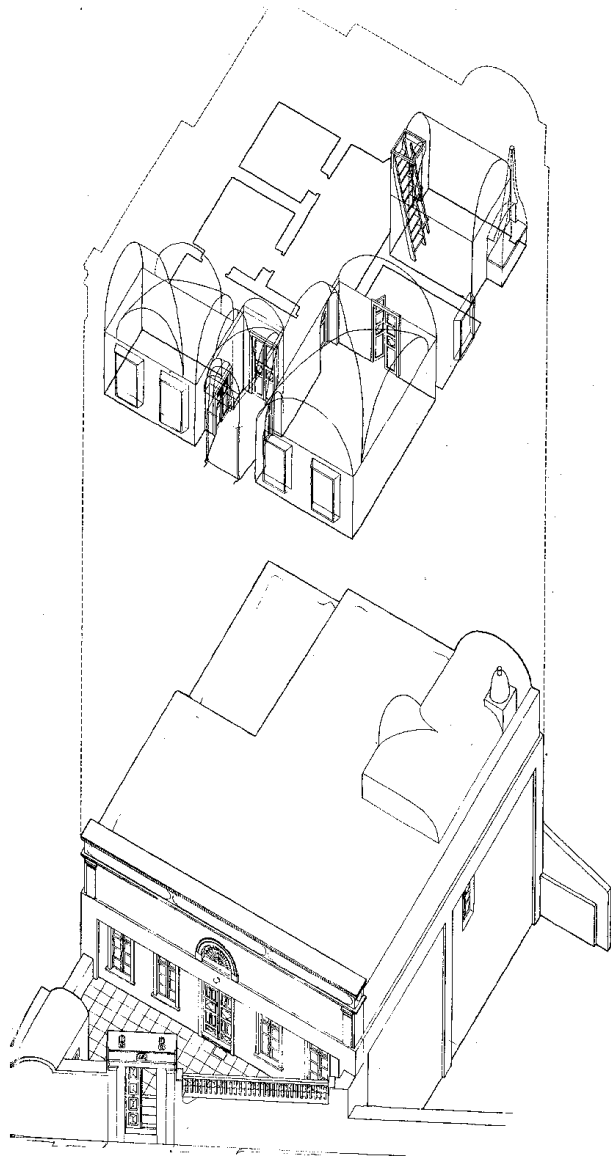
The forms

Topography, materials, building methods, and -above all-time have contributed to a complex uniformity in the built space. The geometric typology of the structural solids is quite simple, consisting of prisms, cylinders, and domes, all being covered by a continuous plaster membrane. However, it is the combination & transformation of these few primitives in many and random fashions that generate a unified totality with a strong sculptural atmosphere, amplified by light & shadow contrasts -strong or soft-according to the hour and season. Thus, the forms acquire a varying personality, enriching a walk through them with a series of visual surprises. The plasticity of the solid surfaces is enhanced by the rectangular or semi-circular openings, as by the numerous bell-towers & chimneys.

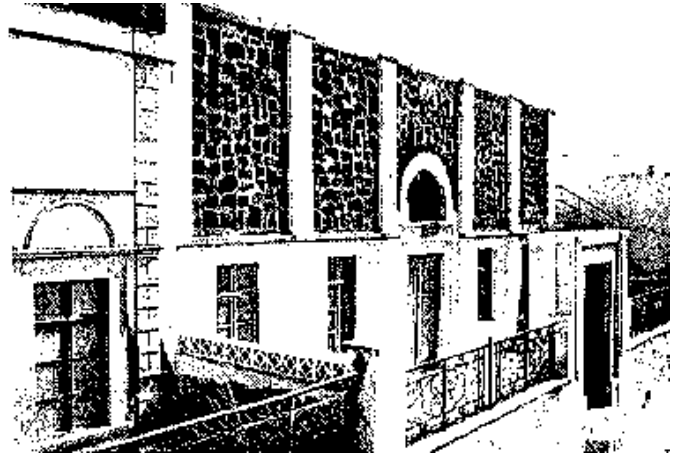
The colours still embedded in the plaster of old ruins remind us of the era before the too-common whitewashed surfaces of today, an attribute that originated as a cheap method for disinfecting & sun protection, imposed later as a common Greek vernacular trademark. The villages in Thirassia still remain far from the contemporary artificial concept of Cycladic architecture (electricity was brought there in the early '80s), thus giving many original examples of the vernacular use of colour.



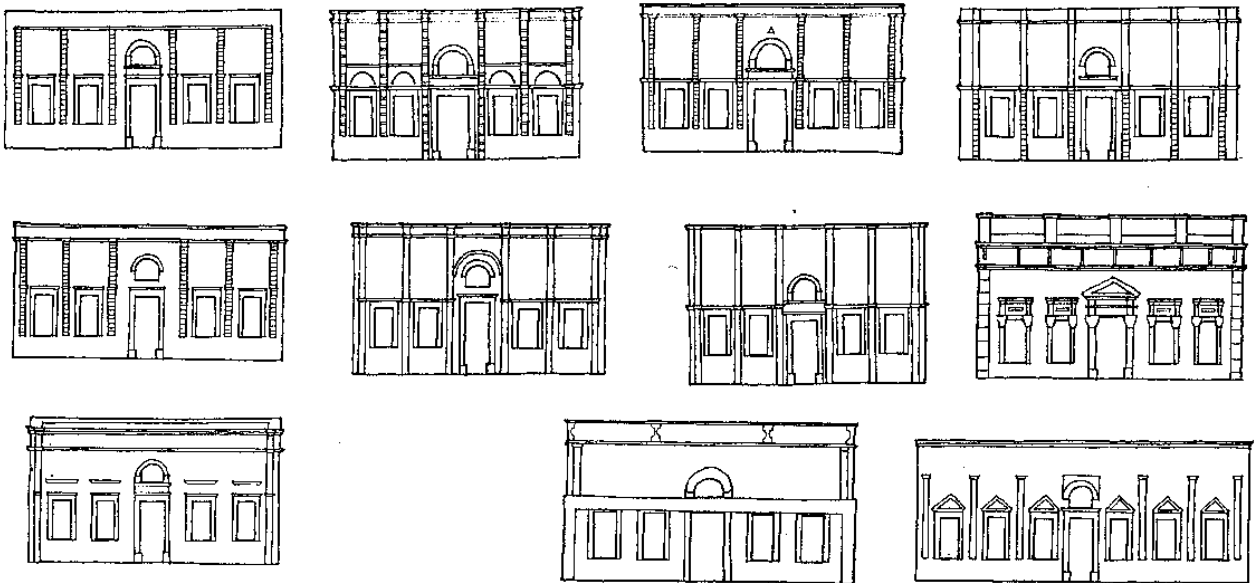
Geometric typology of building forms



A typical captain's mansion (near Oia's bus terminal)



Elevation & interior of a splendid captain's mansion in Oia (now restaurant '1800')



Elevation typology of captain's mansions

O i a



Oia (1983)

Y e s t e r d a y

Oia (or Pano Meria, Upper Side) had been one of the major towns of the Cyclades. It had reached 10,000 inhabitants about 100 years ago, with shipping as its main force. The beginning of its decline coincides with the decay of commercial sailing ships. Most of its inhabitants emigrated to Piraeus and abroad, and the earthquake of '56 delivered the final blow. During the '60s, its houses - ruined or not- were on sale 'for peanuts' to those who could appreciate their value, Greeks or foreigners, while the permanent residents had been reduced to about 400.

T o d a y

A remarkable change takes place during the last 15 years: Visitor numbers increase sharply, bars compete with taverns, and numerous tourist boutiques follow the first one opened in 1983. Prices for ruined houses go sky-high and so does the repair cost; the official property value in Oia is among the highest in Greece (more than 3,500 per square meter), but still more and more restored buildings continue to spring amongst the debris of earthquake and time.

Emigration is reversed in summer: Its ex-inhabitants or their children return to rent rooms to visitors and the local tourism professionals are competing with others from Athens & Piraeus. The demand for accommodation still exceeds the supply, so there are many daily visitors who have to leave Oia for other locations in the evening, after they have taken some snaps of the sunset from the ruins of the old watchtower (Kastro) at the westernmost edge of the village. Thus the lucky ones who enjoy the full moon over the mercury waters of Caldera are relatively few.

T h e v i l l a g e

Oia is built on the NW end of Santorini, facing south in a fishbone-like layout: the main pedestrian street connects its ends across the top of the cliff, with many local branches. The length from the east end (Perivolos) to the west (Goulas) is about 3 km, but the horizontal width of the village is no more than 300m.

A sort of 'class planning' can be observed: The large captain mansions with the elaborate Neo-classical ornaments are located mostly on the upper part, whilst the excavated houses of the crews are spread below, along the cliff, both being at a distance from the farmers of Finikia.

At the foot of the cliff, and about 250 steps below the main street, are the fishing hamlets of Armeni on the south coast and Ammoudi on the west; between them there is the tiny islet of St.Nicolas with a small chapel dug in the solid rock and a concrete platform.

The asphalt road from Fira marks the northern edge of the village, with a branch towards the sandy beaches of Baxes and Kolombos, and recently all the way down to Ammoudi.

Oia has officially been declared as a "Traditional Settlement under Preservation Order", which means that every building project must have been approved by the planning authority in order not to alter the old style of the visual environment.

T h e p u b l i c s e r v i c e s

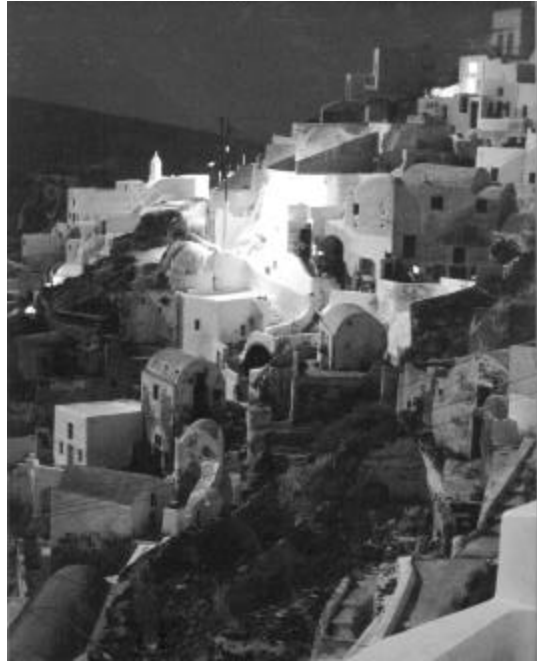
Public services in Oia are very few: Post office, a pharmacy, a bank, and a doctor. In Fira there are several banks, the Greek Telephone Organisation main office, petrol stations, Police, the Olympic Airways agency, and more. Buses cover the distance of 13km to Fira every 30 to 60 minutes until the evening when taxis become the only public transport. In summer there is limited bus service to the beach of Baxes, and also boat-taxis to Thirassia. Several tourist agencies issue boat tickets and organise local excursions.

S i g h t s e e i n g

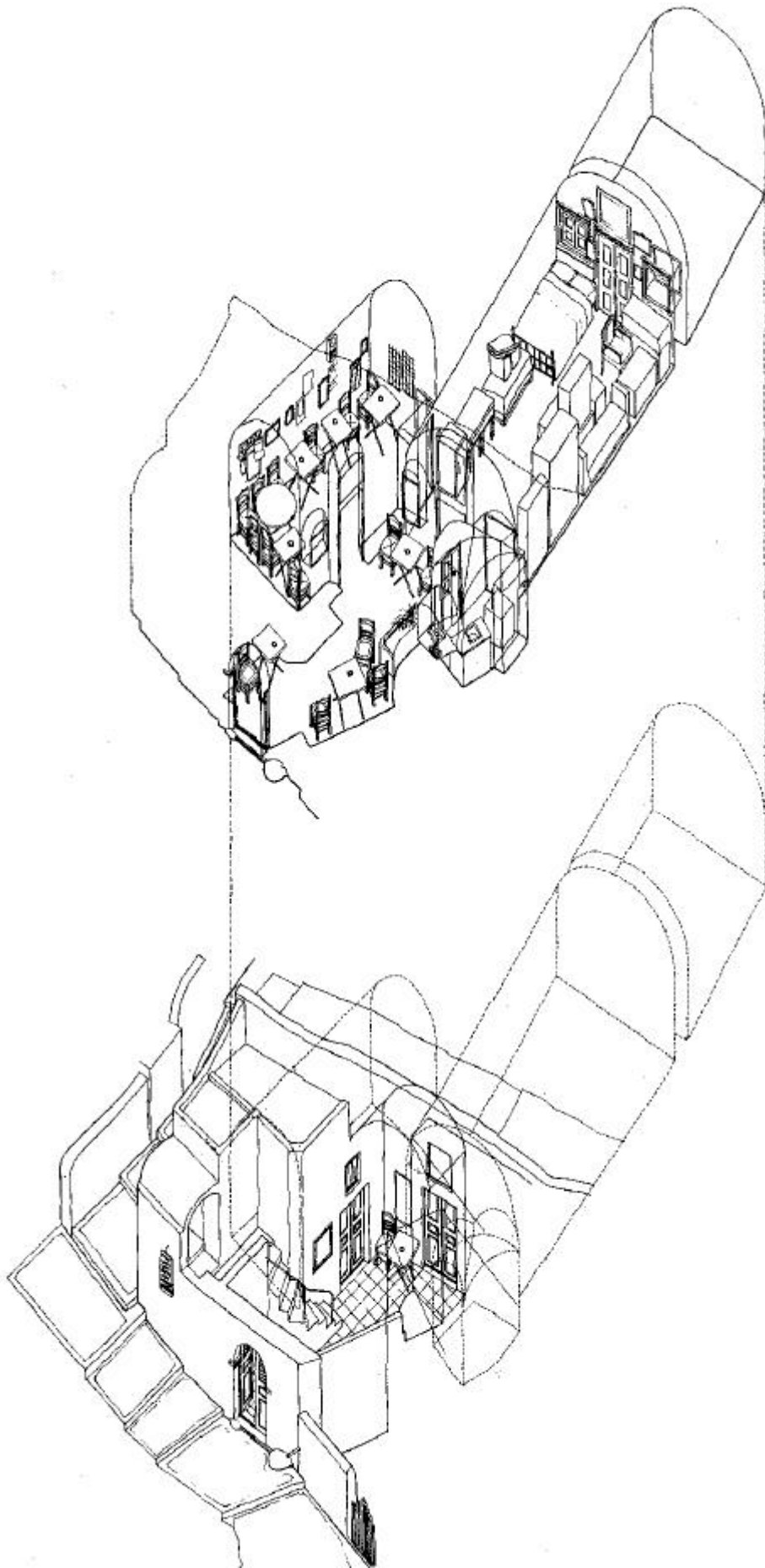
The houses of Oia, with the alleys & terraces over "the blue drinkable volcano" of Odysseus Elytis in "Axion Esti", is the main attraction. Some additional interesting spots to explore are:

- Kyr-Manolis old cafe,
- the Marine Museum, with remnants of the sailing past,
- the Goulas ruins with the "sunset pilgrims" overlooking Ammoudi,
- the splendid view from verandas like those of Lauda and Lotza,
- the big church of St. George with its arched feast hall,
- the local specialities like fried tomato balls, fava (mashed local beans) and tsikoudia, wherever can be found.

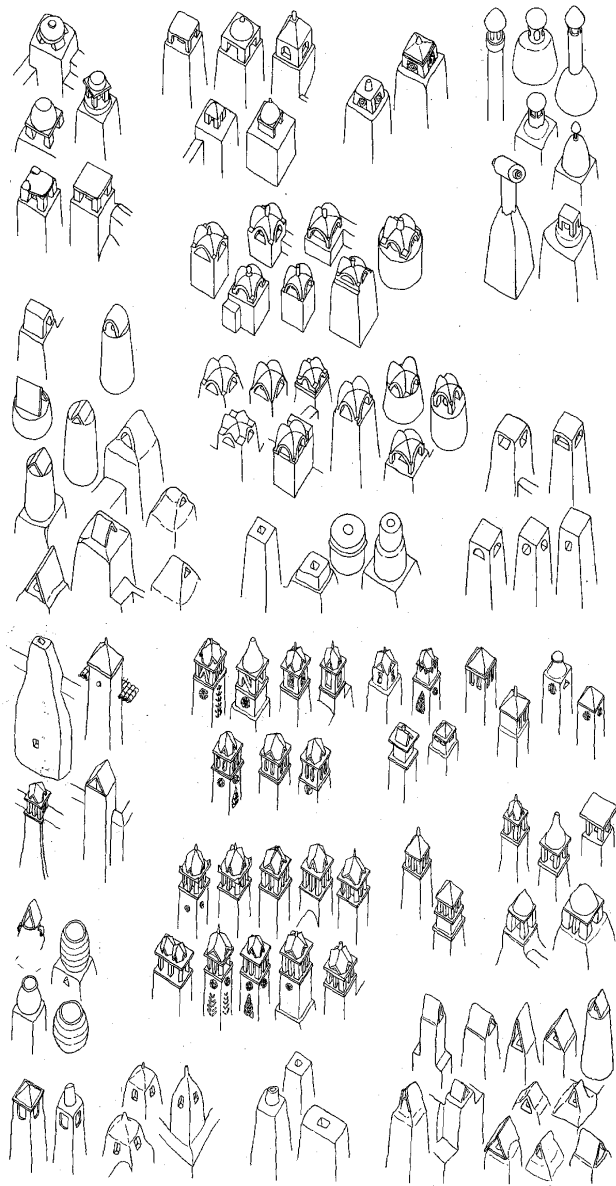
And above all, as a way to ecstasy, one should not miss the full moon over Caldera, accompanied by Bach or Pink Floyd music -or just with the sound of the night breeze over the silver waves far below...



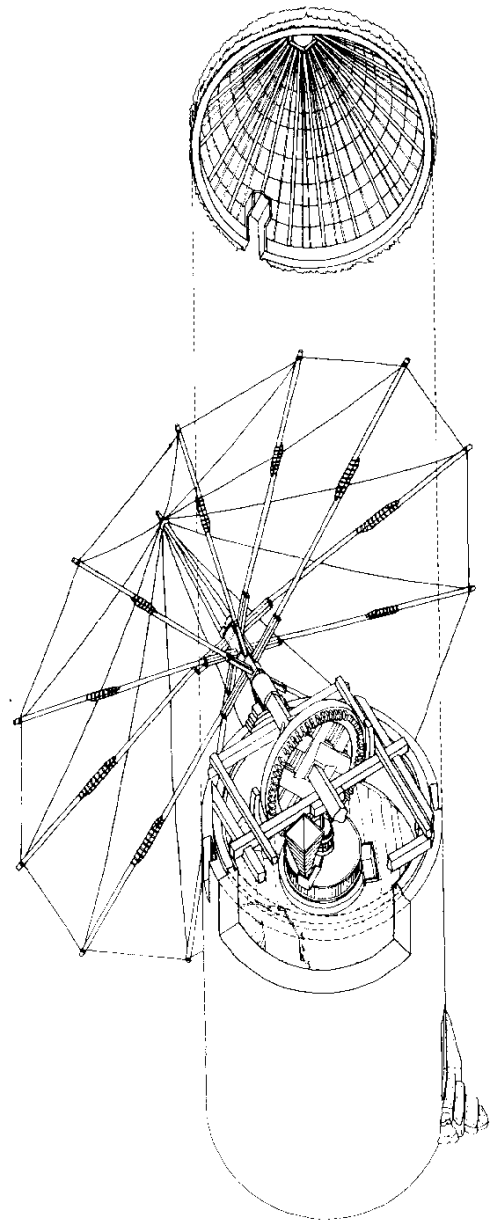
Full moon in Oia (1983)



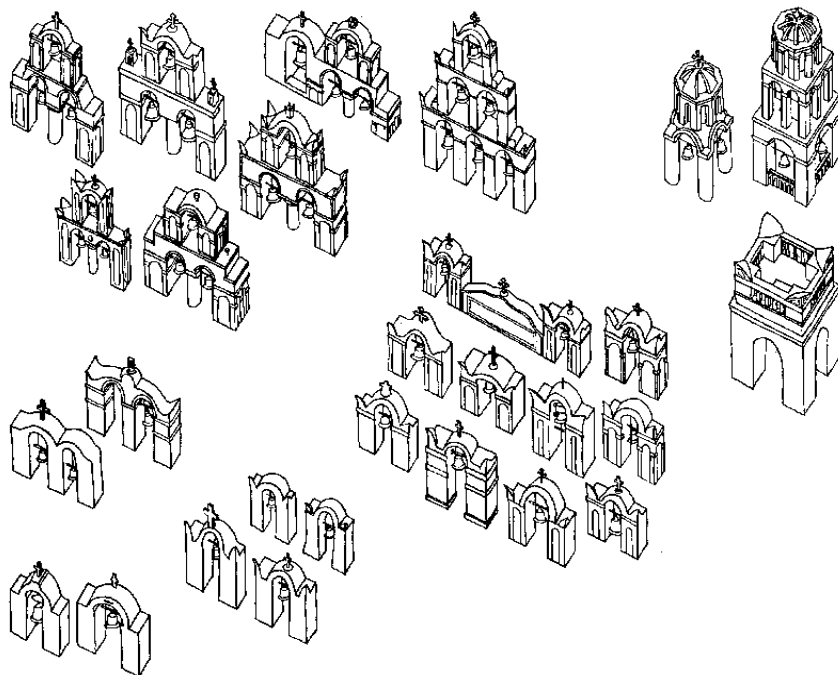
KyrManolis old café in/out



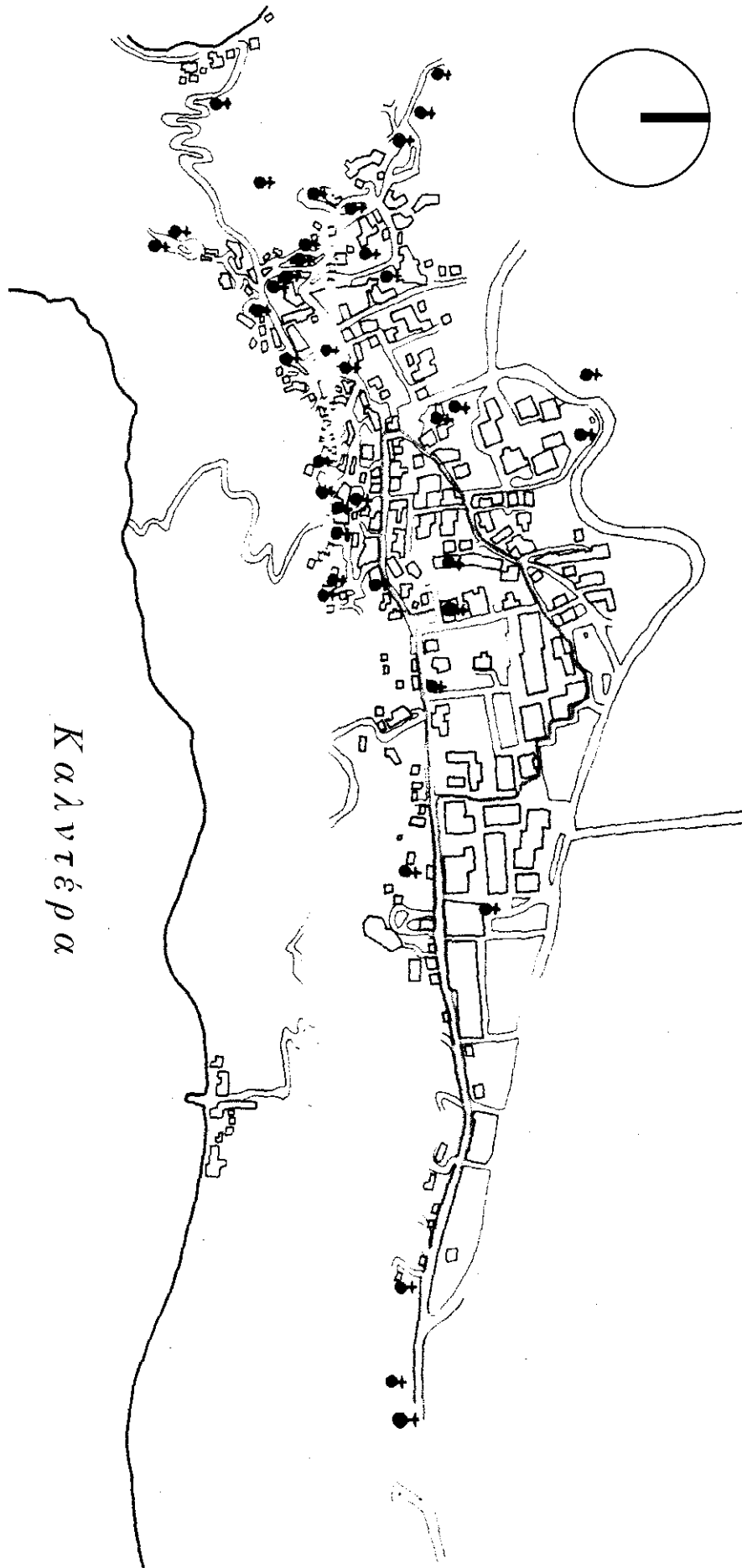
Chimney variations



Wind mill machinery



Bell towers collection



Oia map