A HOUSING DEVELOPMENT FOR GREECE
DESIGN FOR A COMMUNITY ON MOUNT KOJAKAS

A report submitted as partial requirement for the
Degree of Master in Architecture from the Massachusetts
Institute of Technology within the School of Architecture
and Planning in the Department of Architecture.

August 11, 1958

Dean of the School of Architecture and Planning
Pietro Belluschi

Head of the Department of Architecture
Lawrence B. Anderson

Submitted by
Alexis Papageorgiou
820 Massachusetts Ave.,
Cambridge 39, Mass.,
August 11, 1958

Dean Pietro Belluschi
School of Architecture and Planning
Massachusetts Institute of Technology
Cambridge 39, Massachusetts

Dear Dean Belluschi,

In partial fulfillment of the requirements for the degree of Master in Architecture I submit the following thesis entitled, "A Housing Development for Greece."

Sincerely yours

Alexis Papageorgiou
ABSTRACT

A HOUSING DEVELOPMENT FOR GREECE

DESIGN FOR A COMMUNITY ON MOUNT KOJAKAS

SUBMITTED BY ALEXIS PAPAGEORGIOU FOR THE DEGREE OF MASTER IN ARCHITECTURE AUGUST 11, 1958

The proposed community is one of approximately seventy families whose breadwinners will be working in a mountainous and pine-forested region in Greece. The site is set on the steep south slope of Mount Kojakas in the Province of Trikala. The ground is rocky. The summer is long and yet occasional light snow is encountered in winter.

Economy and tradition have been major influences on the design proposals for both the community as a whole and for the houses. Economy dictates, among other things, the use of concrete. The planning is intended to re-create traditional concepts in contemporary spatial forms.

The core of the community runs along the contour through the center. A sunken "Gymnasium" is flanked by two Agoras; these latter symbolise the two centers of human exchange - the exchange of ideas, and the exchange of goods - a concept expressed in the writings of Aristotle, and in the city planning of ancient Greece. The church or "Temple" is set
on slightly higher ground, so that the symbol of the sublime visually dominates the community.

Houses are combined and related to each other in two forms. The more complex form, on the lower part of the slope, is explored in detail in this thesis. These houses are grouped into clusters accommodating six families. Each cluster has a central Atrium, and each house has a private, smaller Atrium. Orientation is to the desirable South-East while North and West walls are of unbroken character. Lightweight concrete shells are a feature in the simple and modular planning and structure, which is generally governed by the overall demand for economy.

The design provides for and symbolises that strong sense of local community that has traditionally inspired Greek city form.
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PART I
THE PROBLEM

A - Site and Environment

The University of Thessaloniki is exploiting the forests of Mount Kojakas in the province of Trikala. Kojakes lies to the northwest of the valley of Thesalia and when seen from below leads the eye to the perennially snow-capped summit of Mount Pindos.

Mount Kojakas frames on one side a pass through the foothills to the great range beyond. The local people call this pass "Pily", literally "pylon" a monumental entrance. This name expresses their feeling for its grandeur and majesty.

A road winds through the pass, over a delicate arched bridge spanning the watercourse. Near the bridge stands an eleventh century church, of the Virgin of the Pily, who guards the tiny villages clinging to the mountainside.

A few miles away from the Pily the University has built a factory for the milling and lamination of the pine timber that covers Kojakas. A secondary road runs from the pass to the factory and terminates two miles later in a village. This road naturally carries very light traffic-volumes.

Forty-five men, mostly local peasants, are now working in the factory. But the management wants to attract
younger families from other areas to Kojakas. The factory could employ seventy men.

Therefore the University authorities have decided to create an environment for a community of seventy houses near the factory. A site of 1,500 feet by 1,000 feet is available on the mountainside. The grade varies between 6 and 20 per cent for the most part, and in one or two places it is even greater. A stream runs by the southern side of the site.

The top-soil varies between 3 and 5 feet in depth, and the sub-soil is rocky; the design should therefore minimize excavation. There is a strip of land by the stream side, varying between 100 and 150 feet, which does not offer a firm foundation.

The climate is mild. Summer runs from April to September. There is little fluctuation of temperature from day to night. The atmosphere is dry, but during the winter there is some rain and snow.

These conditions, particularly the lack of humidity, permit a simple type of construction, and this simplicity in turn influences the architectural forms that are created. For example, a structurally discontinuous wall, made up of a concrete skeleton and brick or stone panels, can be faced with cement rendering three-quarters of an inch thick, and yet there will be no danger of cracks appearing at the joint
of concrete and brick and stone. Again, no roof projection is necessary to protect the walls from wind-driven rain. The people whitewash the outside of their houses at least twice a year.

Climate, however, varies between the regions of Greece, and traditional types of domestic architecture are employed to satisfy differing environmental conditions. The Kojakas site lies somewhere between the valley and the mountain; and this influences the character of design in the manner described in Part II.

**B - PROGRAM**

The university authorities have made certain decisions concerning the organisation of the community that influence the architectural composition and the cost level of the structures.

They have determined to improve living conditions in this area and have therefore adopted a generous view of the first-cost investment necessary to create a satisfying environment. This is reasonable, for the factory's income is relatively high. The university itself is a non-profit institution ultimately dependent upon the Government; and it is now Government policy to provide good living conditions in the rural areas in order to reduce the rate of growth of the big cities.
The authorities have decided to encourage the seventy families in the community to earn the additional income by setting aside one or two rooms in each of their houses during the summer for vacationers and tourists.

This arrangement will not be inconvenient for the local families if they are provided with verandahs suitable for outdoor sleeping during the summer season. The wives will be able to handle the negotiations and housekeeping created by this subsidiary industry.

A small church, a shopping center and market place, a club and elementary school will be needed by the community and their visitors.
PART II

INFLUENCES ON DESIGN AND CONSTRUCTION

A - Economy

In Greece, there is a low ratio of labor cost to the cost of building materials. According to a bulletin setting out standard wages during the period April-June, 1958, labor cost remains stable at the following levels:

- A skilled worker earns 50 cents (U.S.) per hour
- A semi-skilled assistant earns 37 " " " "
- An unskilled assistant earns 30 " " " "

Materials available on the Greek market are mostly raw and unprocessed; the building materials industry is still under-developed. The following list gives some idea of the easily available materials and their prices:

- stone $1.15 per cubic meter;
- gravel $1.75 " " " ;
- cement .05 " kilogram;
- timber, imported $150 " cubic meter;
- timber, second quality $61 " " " ;
- marble $80 " " " ;

It is important to note the high cost of timber; even second quality lumber, suitable for rough scantlings,
costs almost as much as marble. Greece has never enjoyed large forests, and yet much standing timber was destroyed during the Second World War.

Therefore, the most preferred structure in Greece is that of concrete for the skeleton and stone or brick for the skin. Metals, of course, are both expensive and rare in Greek construction, and out of the question in rural areas.

Even though there is a lack of fabricated structural materials, architecture nevertheless follows standardized methods and modules in Greece. This is an economizing procedure.

Immediately after the 1939-1945 War, the Ministry of Reconstruction began rebuilding destroyed villages, using standard housing units. The economic conditions of that period were so bad and the housing need so great that the sizes of dwelling units were restricted. The architectural work of the Ministry was done hurriedly and a problem has now been caused by the multiplication of the same unit all over the countryside. Diversity of character in the environment was in many places destroyed. Therefore, today a more careful treatment of similarity and variety in housing is needed.

B - Tradition - A comprehensive economy of means.

Economy influences the arrangement of the material
in a certain order, allowing more profit and less effort.

From a legislation of particular laws, which established through experience produces the most economical treatment of the matter.

When we speak about tradition our thinking goes to the tradition of ethics. And we take its principles merely as a faint voice of the past.

The careful examination of the item, though, proves that tradition is something more than that. What is retained from tradition, I should say, is also a legislation of economy, in the broader meaning of this word. It is a treatment of the environmental conditions that benefit man's life.

This benefit, though, concerns not only the matter, but the spirit too.

 Tradition refers to a condensed legislation of experiences, cultivated by time and many efforts of generations. Although tradition has a wisdom because of its origin, it also retains an inflexibility to the ever new conditions.

But here I will reduce the theme into the limits of the traditional architecture, referring to the form and its reason.

A careful examination of the traditional architecture can lead toward its general laws - the laws of thinking behind the form. From these laws the form had been produced
in the past, as a proper solution of certain problems, or else we could say, the form was the most economic answer to the material and spiritual problems of the past.

New architecture should not imitate the form but can retain its general laws and use them according to the new conditions. In that way the new is not unconnected from the old at the same time is not its shadow.

From the variety of the traditional architecture in Greece I will mention here the two most representative and opposite in character types. The huge mushroom-like tower of the north, with its extended roof, its perforated elevation of the upper floor, and its panel like structure and the low white solid houses of the islands. The vault characterizes the structure in some islands, as in Santoriny, but in others a sequence of terraced roofs gives the impression of a white sculpture following harmoniously the slopes of the irregular terrain.

A new architectural form could be treated conveniently according to the laws of the tradition as to conserve the original character of the province of Greece.
A - General Community Plan - The oval shaped community has its major axes parallel to the contours, keeping the differences at the level of the roads to a minimum.

The main road crosses the community dividing its length in two unequal parts. The upper part, having half the width of the lower is the steeper part of the community. For that reason, two types of housing units have been used for this problem. A unit for the steep slope and another one for the more regular land. The crossing road is not straight or equal in width within all its length. It follows the natural curvature of the contour lines and is created mainly by them. It broadens in its width at the omnibus station next to the shopping center.

In the distribution of the main and the secondary roads, of piazzas and private courtyards, care has been given to keep the variety of spaces within the sequence of their importance. The vista from the entrance does not cross the town toward a vanishing point, because of the curvature of the road. If we had a straight line, the immediate perception of the limits of the community right from the entrance should minimize the importance of its inner space. For the same reason care has been given to avoid the continuation of the crossing roads. On the other hand,
the retaining walls unify the groups of houses into large interdependent units.

The center of the oval is occupied by the nucleus of the small community, a sunken Stadium-like Piazza which is a playground for young people, and useful for many other occasional community purposes.

On the west part of this stadium and under the level of the small west piazza are the necessary closets and showers of the stadium. The adults can enjoy the play of the young people, chatting in the shadowed west piazza, either walking up and down the south road, as they love to do in those communities.

On the east end of this pedestrian path is the shopping center in a lower level from the road, covered with a concrete membrane. The shopping center and the church on the other side of the road emphasize with cross axes the importance of this area.

The church is on the top of the town because the contours make a projection toward the road at this point. The roof of the church is kept low from the north and a natural rocky near vertical surface encloses its atrium, relating the composition to the earth.

The zig-zag roads of the upper part make the walk to the houses more easy for the pedestrians. With this arrangement, the axes of the road become slightly oblique
to the grade, and a more advantageous slope is obtained. Attempts have been made to synthesize the roads and the private yards of the houses into a complementary arrangement. The houses here are not parallel but follow the slight curvature of the ground. On the lower territory the houses are clustered into large organic units with a big atrium in the middle.

A private road connects the six houses of each cluster with the center of the community. Three of them have their main entrance through the atrium and the rest through the side street. Therefore circulation and access to the houses is evenly distributed through the adjacent spaces.

The positive masses of the houses are related to the negative spaces of court-yards, keeping the necessary variety within the limits of the unity of the whole composition. The peripheral private yards of the houses unify their space with the space of yards of the nearby units. The wings of the houses are contributing to that arrangement of the outer space. The composition relates lightly the upper and the lower part of the community, in the entrance and the exit.

At each end of the mainroad, through the community, a house on each side of the road projects to form a perceptual "gateway".
B - House Clusters

The problem is divided into two stages. The first stage relates to the general composition based on a diagrammatic proposal of the houses; the second, to the evolution of the units, architecturally and structurally. An idea of chain-like flexible units following the natural variety of the ground prevails in the composition.

Each house has a staircase (between its two basic functions, the living room and the bedrooms) which is the flexible junction of the elements of the chain. The living rooms are in the mezzanine of the two-storey bed-room wing. Within this unity the houses keep their privacy and develop their functions around a private court-yard.

A care for the proper distribution of the openings is done to avoid annoying interferences of the privacy of each house. On the other hand, the north and west orientation was avoided. The hot west sun is undesirable in this area. All houses and private yards have a south-east orientation.

Each house is also related to the growth of the family. For a single person, a unit consisting of a living-room, a bathroom and a kitchen is sufficient. The construction of the bed-room wing is necessary when the person gets married, and a second addition of the upper floor makes the unit proper for a family of four or five persons.

This flexibility of the house-cluster retains for the
town the potentiality of growing-up within its limits as a sea-shell grows relatively to its contained living organism.

This community is very small and gains only a small economic advantage from this idea, but the same principles could be useful for an extended housing development program, with stages related to the growth of the family. A work shop could be continuously employed in a preorganized way and economic advantages would be gained by that organic relation of structure and growth.

Two types of thin shells, poured in situ on re-usable forms, are the features of the roof construction of the house clusters. Walls are brick, except that the external walls of those bedrooms that are on the first floor and their extensions, the side walls of the courtyards, are of stone. This is to provide insulation and stability, for some of these walls will be partially retaining walls.

The shells are governed by a simple surface of translation. Two circular arcs form the generatrices, and another, equal to the first pair, form the directrice. The principle is the same as was used for the Dishinger shells in Germany. On each side of each shell there are four stiffeners that make the structure adequately rigid and prevent distortion. If a crane were available for use on the site, the whole roof structure could be precast on the ground; but this is not absolutely necessary, and only detailed
consultation with the building contractor would reveal whether in-situ or ground pouring would be cheaper. In view of the recommendation that some of the units be constructed in stages over a period of family formation and growth, it is probably unreasonable to maintain a crane for this special purpose. Otherwise a wooden form should be used for the construction. The dimensions chosen for the two shell units now create a structural module which prevails throughout the composition. Instead of having a big roofing unit for the whole house, the idea was, to subdivide the roof into small elements, which could follow the movement of the underneath, relatively to the grade and to the function of the house. This principle was difficult for the design and many attempts were made for the definition of the proper dimensions of the shell unit. The secondary spaces of the houses, the kitchen, the bathroom, and the corridors are covered with flat roof and the bedroom, living room and, or staircases and verandahs with the shell construction.

The distribution of the furniture helps the differentiation of the inner space into a sequence of unequal rectangles related to their function, and this contrasts with the equality of the roof construction.

A space for the bed in each of the square main bedrooms is shaped between a step. The closets are built in
under the flat portion of the roof between shells. The third and smallest bedroom in each house has no door; it is spatially integrated with the short corridor leading to the largest bedroom. In this room again, a step is built to produce a corner for the bed, and closets are again provided. This room is roofed by one of the small shells, while the adjoining corridor has a flat roof, thus clearly marking the line between one function and another and providing an opportunity for the drawing of a curtain if any individual family should find this necessary.

The living room and kitchen spaces are divided by a double facing fireplace and chimney piece, providing both cooking and winter heating facilities. Coal and wood will be used here, for electricity is still excessively expensive in such rural areas. However, at a later time, it would be possible to instal electrical appliances. A step in the floor at the line of the fireplace further differentiates the living room and kitchen spaces.

Each shell spans over a ventilated roof space; during the summer, this roof space can be ventilated on four sides through a pattern of grillwork. During the winter, the grillwork can be covered with insulating panels.

A small yard by the kitchen is provided for secondary purposes, such as the drying of clothes and for the housing of domestic animals.
In the first floor of the bedroom wing is a workshop and a third room, which could be one of those rented during the summer months.

The outdoor spaces, beyond the house-clusters, are to be cultivated with vegetables and fruit trees, and maintained by the families for their own consumption needs.

In conclusion, one must emphasize that each house faces inwards towards its own private courtyard or Atrium a traditional characteristic of Greek houses for thousands of years.

Each cluster of houses, at the next level of organisation, is focused inwardly upon the common Atrium shared by six families.

Finally, the entire community clusters around the spaces that symbolize the cooperative, functional and spiritual parts of life .... the twin Agoras, the Temple, the Stadium, and the *Stoa*, or club, as it is called today.

The roads subserve these life-giving elements; they do not dominate, but remain simply paths for communication.

This thesis had an educational purpose for the author ..... research into the architectural needs of a small community. The chosen problem was a real one. The
needs of the family, orientation, structure, tradition etc. were the various restrictions of the problem. But within the limits of these restrictions the prevailed idea was to examine the general and the particular problems of the composition independently and utilise their answers simultaneously into interdependent components. Their resultant is intended to be the form.
TRADITION
A HOUSING DEVELOPMENT FOR GREECE
ALEXIS PAPAGEORGIOU 1945