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A physical and human geographic approach to the environment and landscapes of the Argive sites, excavated by H. Schliemann

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Abstract

This paper aims to elucidate the interrelationships between humans, landscapes and environment in the setting of ancient Argolide. After reviewing possible causes of destabilisation of the Argive sites during the Mycenean antiquity, it is argued that Argive landscapes underwent alternating cycles of stabilisation and destabilisation caused by the interplay of both human and physical geographic factors (land use, climate change, earthquakes). Following this, any explanation of the discontinuity at the Late Helladic III should take into account all these factors and the interrelationships between them.

1. Introduction

Geomorphic conditions are often tightly connected to archaeological problems; particularly those concerning prehistoric man-environment interrelationships. One such characteristic example is the geomorphological interpretation of past shoreline shifts nearby the Bronze Age port of Tiryns. In this case, coastal geomorphology can be useful in the efforts to resolve the riddle of the exact location of the former shoreline, as the present seashore is remote enough from the fortification borders, to allow us to easily draw conclusions. But the implications of adopting a physical geographic approach are much broader than the case of the port of Tiryns suggests.

The causes of alternative periods of stability and instability of the landscape consist a problem of major importance, revealing several facets of man-environment interactions. We know that a discontinuous event (climatic, tectonic, hydrological etc.), which upsets the physical geographic conditions of a region can sometimes trigger off environmental equilibria to the extent that the entire regional landscape may become geomorphically or ecologically destabilised. Such destabilisations intensely interfere with the long-established humans-environment interrelationships by chain-transitions or even feed-back mechanisms (i.e. if the causes of the destabilisation are of human origin). In the examination that will follow, no political or socioeconomic perturbations will be considered volved in the geomorphological and/or palaeoenvironmental reconstructions.

2. The main physical geographic features of the Argive sites

The geological setting of the Argive sites excavated by Schliemann is diverse: mesozoic limestones, marbles, low-metamorphosed schists, as well as sandstones, flysch, ceratites and basaltic intrusions (diabase), outcropping in the surrounding mountainous masses. Pliocene fluvial and lacustrine marls occur to the north, whereas a major part of the plain's area is covered by quaternary deposits (pleistocene alluvial fans, red soils and holocene fans). Three streams cross the plain ejecting into the Argolic bay: Inachos, Erasinos and Megalo Rema. Inachos' flow direction coincides with the NW -SE direction of maximum tectonic depression.

Aside of the geological features, four main soil types appear in the area:

a) Red soils, rich in calcium, unsorted, unbedded soils, resulting from limestone erosion, widely known as "terra rossa".
b) Green and red soils, of fine to medium coarseness, produced from highly-weathered peridotites and serpentinites, which might be classified in the broad category of "Mediterranean dry brown forest soils".
c) Redzina soils, originating from sandy and silty tertiary marls and conglomerates.
d) Brown (most fertile) soil, roughly coinciding with the "younger fill" sedimentation period, in the terminology of Vita-Finzi (1969).

In our era, streams neither erode nor alluviate their beds; so an equilibrium regime is maintained even with heavy rainfalls, although strong evidence of intense grazing since the Palaeolithic has been documented by Jacobsen (1973) and it is suspected to have inflicted severe soil erosion at that time. The onset of the recent alluviation can either be related to human-caused deforestation, or to deforestation due to goats' grazing, or even to climatic fluctuations of the past. As for land use, olive trees, vines, cereal cultivations and tree crops have traditionally been cultivated in the Argive plain, but it can not be verified whether these constituted the main crops and plantations in the antiquity also.

3. Physical-Geographic explanations applied to archaeological problems

Geomorphological investigations have much to offer to archaeological research, as they can unveil the interactions between prehistoric humans and their environment. As stated earlier, the geomorphological examination of past shoreline shifts in relation with the possible existence of an ancient port close to Tiryns in the Bronze Age consists an archaeological problem, which can be studied by Physical Geography. The causes of alternate stability-instability cycles of the landscape of that region is a related (although different) problem, to which Geography can also contribute.

Beginning with the problem of the precise identification of past shorelines of the port of Tiryns, we have evidence from past surveys of the area by Schliemann (1885), that shoreline shifts had occurred in late Quaternary. In the modern era however, we can be aided by the discovery that large volumes of gypsum were transported by boat from Crete to Argolis for the various needs of the Argive cities (Mylonas 1957). Further, after a series of results from borings reported by Kraft (1977), from the Tiryns fortification up to the seashore, marine sediments were identified supporting the conjecture that Tiryns was indeed a port to the Argive bay during the Middle Helladic phase. Kilian (1978) had also suggested that ancient Tiryns had a port. After radio-dating of Mycenaean palaces' gypsum, Gale *et al*. (1988) pointed out that the Pleistocenic gypsum from Crete which had supplied Tiryns was in fact brought from either the Ionian Islands or Crete or from the mainland. The problem of gypsum supply of the ancient Argive cities is thus closely related to the marine transport of gypsum. Yet, gypsum was used as an interior building material in the Bronze Age palaces, so there should exist a port near the cities to facilitate the unloading of voluminous gypsum chunks needed for the construction.

Though a full-depth study of sea-level changes and related eustatic changes is beyond the scope of this paper, an outline of eustatic changes should nevertheless be taken into account in order to address the "Tiryns port" problem: As the post-glacial regression marked the onset of the Holocene, the 18.000 years B.P. shoreline should be expected to lie as far as 10 km seawards, due to the low sea-level of the Pleistocene glaciers. Yet, following Flemming (1968), Tiryns was unlikely to have a port, as he supposed a rate of elevation of sea-level equivalent to 0,5m/200 years.

Besides climatic eustatic changes, it is reasonable to assume that tectonic activity has also played an important role in the evolution of the region's landscape. Western Argolid is vertically tectonized, while Tiryns seems to be a non-tectonized area. Consequently, a synergetic approach should most likely be adopted, incorporating both structural geological factors and eustatic changes (e.g. as advocated by Kraft, 1977).

4. Stability-Instability cycles of the Argive landscape

Whether due to geodynamics or eustatic movements, it is true that the Argive landscape has experienced several "cycles" of environmental stability and instability, which have seriously affected its inhabitants through the ages. Even though it is most likely that these instabilities have been due to the interplay between various interdependent factors, the prevailing causes of these instabilities are not precisely known yet.

The decline of the Mycenaean civilization at the End of the Bronze Age (13th-12th century b.C.) has traditionally been attributed to invaders, but with archaeological research being still unclear as to the exact origin and characteristics of the alleged "newcomers"-invaders, our attention may also be drawn to other possible causes of landscape instability, such as earthquakes, abrupt climatic change and change in the use of land.

I. Earthquake

Kilian (1978) suggested that the strong impact of an earthquake at the end of Late Helladic IIIB, might have destructed Tiryns. The entire Peloponnese is a known seismically very active region (Papadimitriou, 1987; 1989).

II. Abrupt climatic change

The variations of climatic parameters (temperature, precipitation, insolation, relative humidity) can seriously affect agricultural production. The conjecture that persistent droughts had occurred in 1200 b.C. has been expressed by Bryson *et al.* (1974), who suggested that a sudden climatic change should have taken place from LH IIIB (ca. 13th century b.C.) to LH IIIC (ca. 12th century b.C.) was accompanied by a remarkable reduction in precipitation. Later, Kutzbach (1981) suggested that summertime monsoon intrusions affected the Aegean (10.000-5.000 B.P), with extraordinary quantities of soils eroded due to violent storms that ensued.

Yet, aside of the "climate" of an area (which is the phase space where the values of meteorological parameters converge in a given time interval), there also exist "discontinuous", "abnormal" events, which may create a disproportions between "cause" and "effect" within short periods of time. It is reputedly difficult to "prove" (even a posteriori) that such severe climatic disturbances have happened, despite the strong archaeological or historical evidence that may be available. A severe drought event is one such climatic peculiarity, which is difficult to detect after thousands of years after it has occurred.

Further, as Greece lies on the boundary between regions of excess and deficit moisture, it is likely to exhibit higher sensitivity than other regions of the world, even to the slightest changes in climatic parameters. The climate-human population connection can be seed from the fact that significant population movements had also taken place and several lakes dried out circa 1200 b.C. (evidences of this may be found from as different places as Syria, Libya, Kenya, Egypt, Alps, California, Caspian Sea, Norway and Hungary).

III. Land use and human impact on the environment of Argolid

The meso-scale impact of the Mycenaean humans on their environment was twofold: impact on the vegetation (through e.g. plants cultivation, ploughing, deforestation, grazing, burning etc.) and river modification (i.e. irrigation, drainage, dam building).

We now know (Hansen, 1980) that extended cultivations (wheat, barley, oats, lentils) and grazing had taken place during the Neolithic. These activities were associated with prolonged impacts on soil quantity/distribution and quality/ constituents. The chemical constitution and the erosivity of soils have changed after cultivation and agriculture. In this respect, the abundance of grinding stones in Argolid during the Bronze Age (Runnels, 1981) brings evidence of extended cereal cultivations at that time.

As concerns irrigation, ancient Tiryns was constructed with provisions for flooding. The researches carried out by Balcer (1974) lead us to believe that the Myceneans possessed a good knowledge of river modification and hydraulics. It seems that they have deemed it necessary to dam up certain river flows and divert them to other streams. The artificial structure was thus more likely to prevent the drainage system from floods than to provide a constant water supply to the city. Irrigation in the inner Argive plain would have required a technology far beyond prehistoric and ancient skills, to the extent that it might make sense to speculate whether the legend of the "Monster of Lerna" signified an artificial pumping system for drainage and irrigation.

Besides drainage and irrigation, it is very likely that the main patterns of land management had changed during the Early Bronze Age in the Argolid also. As soil erosion accelerated, the total surface of arable lands reduced significantly. In geomorphology, the terms "stability" and "instability" for the geomorphic systems of a landscape are usually taken to mean weathering of bedrock (and related pedogenesis or alluviation) or deposition of sediment loads accompanied by riverbed down cutting. Following Vita-Finzi (1969), the soils in the Argive plain were cut off because of climatic impact, while following Demitrack (1986), soil instability in the region should be attributed to human activity. It is noticeable, that this phase of changing land management was concurrent with the phase of decline of the Aegean world (Rutter, 1983). We can thus assume that a phase of landscape instability occurred in Argolid also (later than 1000 B.C.), which continued during the classic era, perhaps due to the use of artificial terraces.

5. Concluding Remarks

In the early 1990s, Greece experienced a severe drought, which could be interpreted within the broader ongoing desertification process in the country's semi-arid regions. It is probable that a similar, certainly stronger, climatic disturbance had occurred c. 1200 B.C. Whether changes in population patterns in the antiquity might have been an after-effect of a prolonged drought is not sure yet. Both eustatic changes and changes in land use management point to the importance of geomorphological research in archaeological studies (i.e. through climatological and pedological–palaeo-environmental reconstructions). Land use changes might explain the infilling-incision of Vita-Finzi's theory of "Younger Fill" sedimentation phase even, although climatic fluctuations might be considered in parallel with the human impact on the environment to explain overall landscape stability-instability cycles. In any case, there seem to be very complex interrelationships between alluviation, weathering, climate and land management in the Argive sites excavated by H. Schliemann, which need further investigation from within integrated physical-human geographic and archaeological studies.

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