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The Dynamic Land

Introduction

Greece is a land of contrasts (Admiralty 1944, Bintliff 1977, Higgins and Higgins 1996: and see Color Plate 0.1). Although promoted to tourists for its sandy beaches, rocky headlands, and a sea with shades of green and blue, where Aleppo pine or imported Eucalyptus offer shade, in reality the Greek Mainland peninsula, together with the great island of Crete, are dominated by other more varied landscapes. Postcard Greece is certainly characteristic of the many small and a few larger islands in the Cycladic Archipelago at the center of the Aegean Sea, the Dodecanese islands in the Southeast Aegean, and the more sporadic islands of the North Aegean, but already the larger islands off the west coast of Greece such as Ithaka, Corfu, and Kephallenia, immediately surprise the non-Mediterranean visitor with their perennial rich vegetation, both cultivated trees and Mediterranean woodlands. The Southwest Mainland is also more verdant than the better known Southeast.

The largest land area of modern Greece is formed by the north–south Mainland peninsula. At the Isthmus of Corinth this is almost cut in two, forming virtually an island of its southern section (the Peloponnese). Although in the Southeast Mainland there are almost continuous coastal regions with the classic Greek or Mediterranean landscape, not far inland one soon encounters more varied landforms, plants, and climate, usually through ascending quickly to medium and even higher altitudes. There are coastal and inland plains in the Peloponnese and Central Greece, but their size pales before the giant alluvial and karst (rugged hard limestone) basins of the Northern Mainland, a major feature of the essentially inland region of Thessaly and the coastal hinterlands further northeast in Macedonia and Thrace. If these are on the east side of Northern Greece, the west side is dominated by great massifs of mountain and rugged hill land, even down to the sea, typical of the regions of Aetolia, Acarnania, and Epirus.

Significantly, the olive tree (Figure 1.1), flourishes on the Aegean islands, Crete, the coastal regions of the Peloponnese, the Central Greek eastern lowlands, and the Ionian Islands, but cannot prosper in the high interior Peloponnese, and in almost all the Northern Mainland. The reasons for the variety of Greek landscapes are largely summarized as *geology* and *climate*.

Geological and Geomorphological History

Although there are many areas with very old geological formations (Figure 1.2: Crystalline Rocks), the main lines of Greek topography were formed in recent geological time, resulting from that extraordinary deformation of the Earth's crust called the Alpine

The Complete Archaeology of Greece: From Hunter-Gatherers to the 20th Century AD, First Edition. John Bintliff.

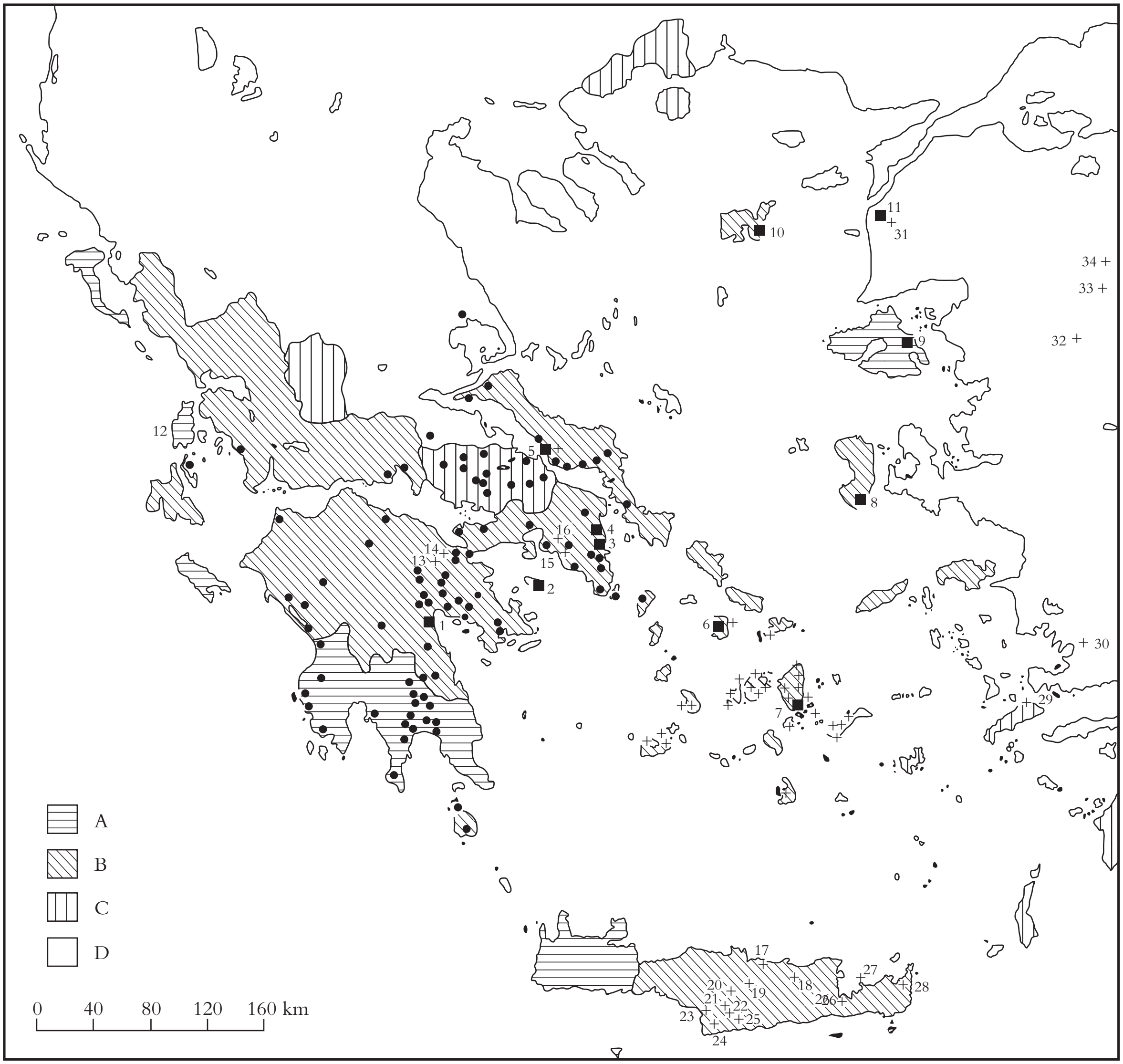

Figure 1.1 Distribution of the major modern olive-production zones with key Bronze Age sites indicated. The shading from A to C indicates decreasing olive yields, D denotes no or minimal production. Major Bronze Age sites are shown with crosses, circles, and squares.

C. Renfrew, *The Emergence of Civilization* (Study in Prehistory), London 1972, Figure 18.12. © 1972 Methuen & Co. Reproduced by permission of Taylor & Francis Books UK.

Orogeny, or mountain-building episode, which not only put in place the major Greek mountain ranges but the Alps and the Himalayas (Attenborough 1987, Higgins and Higgins 1996). In the first period of the Tertiary geological era (the Palaeogene), 40–20 million years ago, as the crustal plates which make up the basal rocks of Africa and Eurasia were crushed together, the bed of a large intervening ocean, Tethys, was compressed between their advancing masses and thrust upwards into high folds, like a carpet pushed from both ends. Those marine sediments became folded mountains of limestone (Figure 1.2: Limestone).

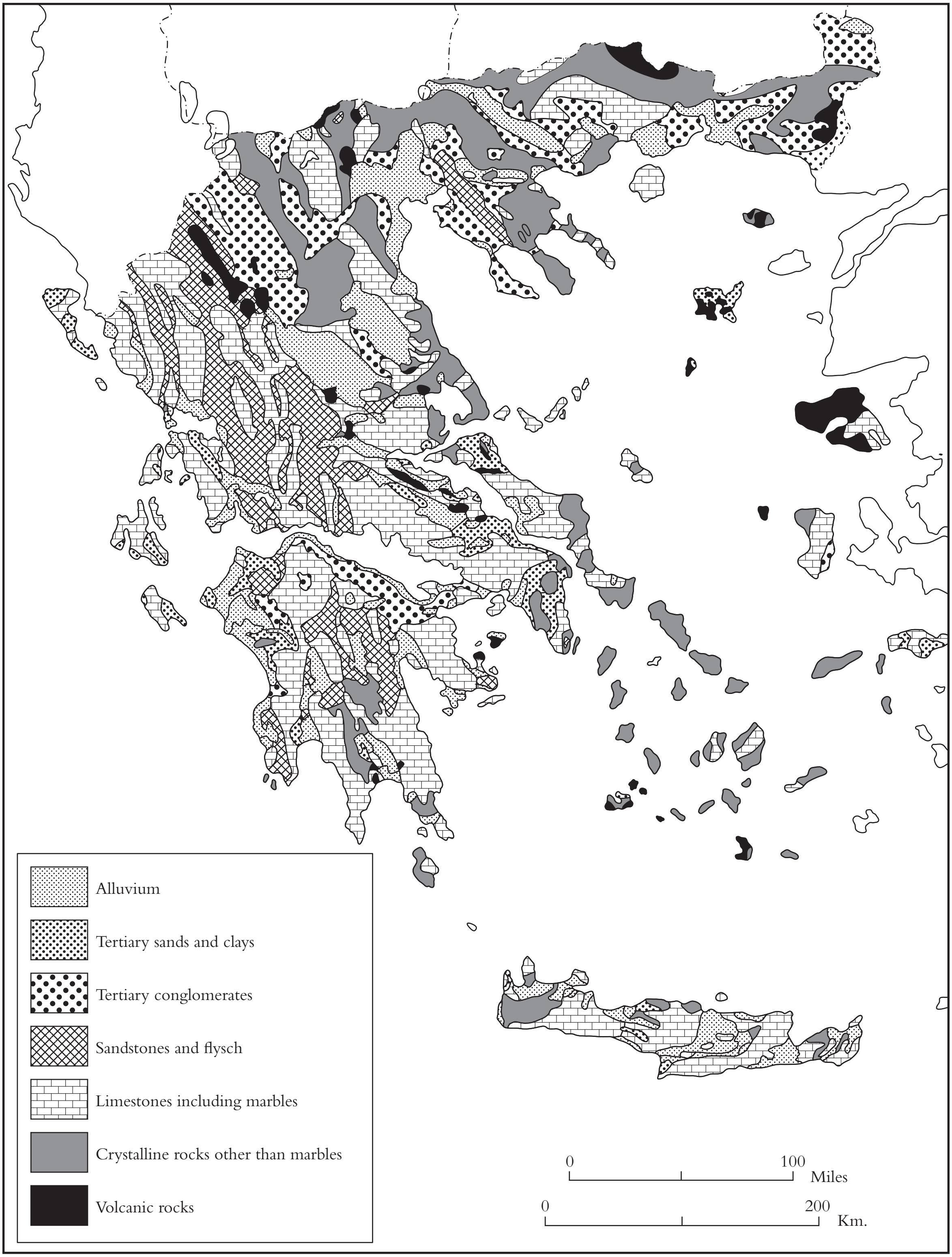

Figure 1.2 Major geological zones of Greece.
H. C. Darby *et al.*, *Naval Geographical Intelligence Handbook, Greece*, vol. 1. London: Naval Intelligence Division 1944, Figure 4.

This plate-tectonic compression created an arc-formed alignment of Alpine mountains and associated earthquake and volcanic belts (Figure 1.2: Volcanic Rocks), which begins as a NW-SE line for the Mainland mountain folds, then curves eastwards across the center of the Aegean Sea, as the E-W orientation of Crete illustrates, and also the associated island arc of volcanoes from Methana to Santorini, to be continued in the E-W ridges of the Western Mainland of Anatolia-Turkey (Friedrich 2000). The Ionian and Aegean seas have been formed by differential sinking of those lateral parts of the Alpine arc, creating the Aegean and Ionian Islands out of former mountain ridges, hence their often rocky appearance. But also there have been tectonic ruptures in different alignments, the most notable being that E-W downward fault which forms the Gulf of Corinth. The artificial cutting of the Corinth Canal in 1893 accomplished the removal of the remaining 8 km stretch left by Nature.

These plate-tectonic forces still operate today, since the Aegean region forms an active interface between the southerly African and northerly Eurasian blocks, and is itself an unstable agglomerate of platelets. Where zones of the Earth's crust are clashing, and ride against, or force themselves under or over each other, there are notorious secondary effects: frequent earthquakes and arcs of volcanoes set behind the active plate boundaries (Color Plate 1.1). Recurrent Greek earthquakes are a tragic reality, notably along the Gulf of Corinth, and the same zone curves into Turkey with equally dire consequences. The volcanic arc runs from the peninsula of Methana in the Eastern Peloponnese through the Cycladic islands of Melos and Santorini-Thera. A secondary arc of earthquake sensitivity runs closer to Crete and its mark punctuates that island's history and prehistory. Around 1550 years ago, a violent earthquake through the Eastern Mediterranean elevated Western Crete by up to 9 meters (Kelletat 1991), lifting Phalasarna harbor out of the ocean (Frost and Hadjidaki 1990).

The mostly limestone mountains of Mainland Greece and Crete, as young ranges, are high and vertiginous, even close to the sea. Subsequently these characteristics encouraged massive erosion, especially as sea levels rose and sank but ultimately settled at a relatively low level to these young uplands. As a result, between the limestone ridges there accumulated masses of eroded debris in shallow water, later compressed into rock itself, flysch, whose bright shades of red, purple or green enliven the lower slopes of the rather monotonously greyscale, limestone high relief of Greece (Figure 1.2: Sandstones and Flysch). For a long period in the next subphase of the Tertiary era, the Neogene, alongside these flysch accumulations, episodes of intermediate sea level highs deposited marine and freshwater sediments in the same areas of low to medium attitude terrain over large areas of Greece. These produced rocks varying with depositional context from coarse cobbly conglomerates of former torrents or beaches, through sandstones of slower river and marine currents, to fine marly clays created in still water (Figure 1.2: Tertiary Sands and Clays, Tertiary Conglomerates).

During the current geological era, the Quaternary, from two million years ago, the Earth has been largely enveloped in Ice Ages, with regular shorter punctuations of global warming called Interglacials, each sequence lasting some 100,000 years. Only in the highest Greek mountains are there signs of associated glacial activity, the Eastern Mediterranean being distant from the coldest zones further north in Eurasia. More typical for Ice Age Greece were alternate phases of cooler and wetter climate and dry to hyperarid cold climate. Especially in those Ice Age phases of minimal vegetation, arid surfaces and concentrated rainfall released immense bodies of eroded upland sediments, which emptied into the internal and coastal plains of Greece, as well as forming giant alluvial (riverborne) and colluvial (slopewash) fans radiating out from mountain and hill perimeters. We are fortunate to live in a warm Interglacial episode called the Holocene, which began at the end of the last Ice Age some 12,000 years ago. Alongside persistent plate-tectonic effects – earthquakes around Corinth, one burying the Classical city of Helike (Soter *et al.* 2001), earthquakes on Crete, and the Bronze Age volcanic eruption of Thera (Bruins *et al.* 2008) – the Greek landscape has witnessed the dense infilling of human communities to levels far beyond the low density hunter-gatherer bands which occupied it in the pre-Holocene stages of the Quaternary era or "Pleistocene" period.

The results of human impact – deforestation, erosion, mining, and the replacement of the natural plant and animal ecology with the managed crops and domestic animals of mixed-farming life – are visible everywhere, yet certainly exaggerated. Holocene erosion-deposits in valleys and plains are actually of smaller scale and extent than Ice Age predecessors. Coastal change in historic times may seem dramatic but is as much the consequence of global sea level fluctuations (a natural result of the glacial-interglacial cycle), as of human deforestation and associated soil loss in the hinterland (Bintliff 2000, 2002). (In Figure 1.2, the largest exposures of the combined Pleistocene and Holocene river and slope deposits are grouped as Alluvium.)

Globally, at the end of the last Ice Age, sea level rose rapidly from 130 meters below present, reflecting swift melting (eustatic effects) of the major ice-sheets (Roberts 1998). By mid-Holocene times, ca. 4000 BC, when the Earth's warming reached its natural Interglacial peak, sea levels were above present. Subsequently they lowered, but by some meters only. However, due to a massive and slower response of landmass readjustments to the weight of former ice-sheets, large parts of the globe saw vertical land and continental-shelf movements (isostatic effects), which have created a relative and continuing sea level rise, though again just a few meters. The Aegean is an area where such landmass sinking has occurred in recent millennia (Lambeck 1996). The Aegean scenario is: large areas of former dry land were lost to rising seas in Early to Mid-Holocene, 10,000–4000 BC, depriving human populations of major areas of hunting and gathering (Sampson 2006). Subsequently Aegean sea levels have risen slightly (around a meter per millennium), but remained within a few meters of the 4000 BC height, allowing river deposits to infill coastal bays and landlock prehistoric and historic maritime sites.

Let me try to give you the "feel" of the three-dimensional Greek landscape. From a sea dotted with islands, the rocky peaks of submerged mountains (Color Plate 1.2a), and occasional volcanoes, the Greek coastlands alternate between gently sloping plains of Holocene and Pleistocene sediments, and cliffs of soft-sediment Tertiary hill land or hard rock limestone ridges. The coastal plains and those further inland are a combination of younger, often marshy alluvial and lagoonal sediments (usually brown hues) (Color Plate 1.2b), and drier older Pleistocene alluvial and colluvial sediments (often red hues) (Color Plate 1.3a). The coastal and hinterland plains and coastal cliff-ridges rise into intermediate terrain, hill country. In the South and East of Greece this is mainly Tertiary yellowy-white marine and freshwater sediments, forming rolling, fertile agricultural land (Color Plate 1.3b), but in the Northwest Mainland hard limestones dominate the plain and valley edges, a harsh landscape suiting extensive grazing. A compensation in hard limestone zones within this hill land, including the Northwest, is exposures of flysch, which vary from fertile arable to a coarse facies prone to unstable "bad-land" topography. As we move upwards and further inland, our composite Greek landscape is dominated by forbidding ridges of Alpine limestone (Color Plate 1.3a), sometimes transformed by subterranean geological processes into dense marbles. Frequently at the interface between hill land and mountain altitudes occur much older rocks: tectonic folding and faulting after the Alpine mountain-building phase has tipped up the original limestone terrain, bringing to light earlier geological formations of the Palaeozoic or pre-Alpine Mesozoic eras. They were joined by post-Orogeny localized eruptive deposits. These are dense crystalline rocks such as schists, slates, and serpentines, whose bright colors and sharp edges trace the borders between the towering grey masses of limestone and the gentler hill lands of Tertiary sandstones or flysch which make up much of the Greek intermediate elevations. The intervention of such impermeable rocks even as thin bands at the foot of limestone massifs commonly forms a spring-line, neatly lying between good arable below and good grazing land above, a prime location for human settlement. The recent volcanic deposits can be fertile arable land, if sufficient rainfall frees their rich minerals to support soil development and plant growth. Finally, in some regions of Greece, mainly the Northeast Mainland, the Orogeny played a limited role, and the mountain massifs are much older dense crystalline rocks.

Climate

As with its geology, Greece does not have a single climate (Admiralty 1944, Bintliff 1977). Our image of long dry summers and mild winters with occasional rain reflects the focus of foreign visitors on the

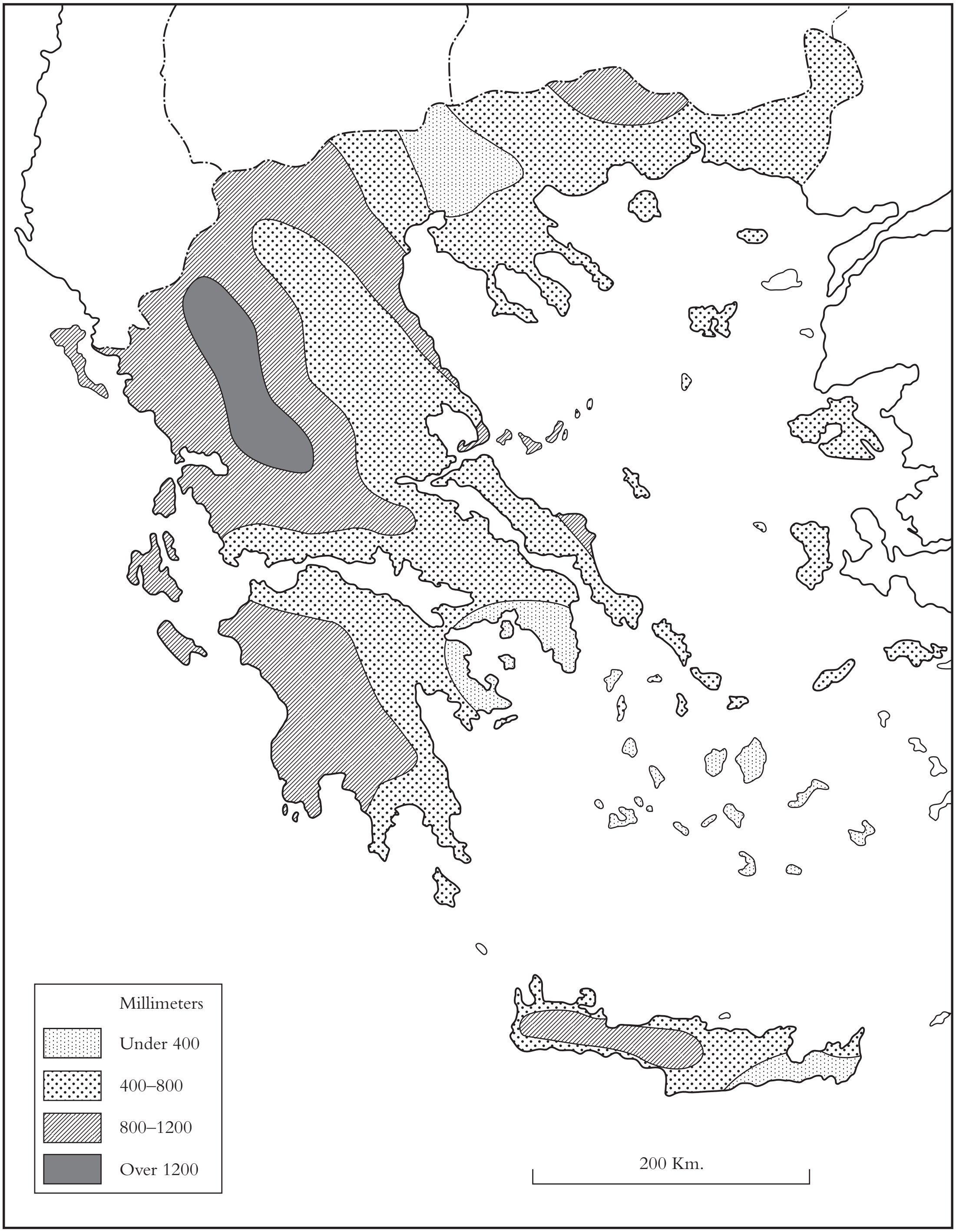

Figure 1.3 Average annual rainfall in Greece.
H. C. Darby *et al.*, *Naval Geographical Intelligence Handbook, Greece*, vol. 1. London: Naval Intelligence Division 1944, Figure 59.

Southeast Mainland, the Aegean islands, and lowland Crete, where this description is appropriate.

The two key factors in the Greek climate are the country's location within global climate belts, and the dominant lines of Greece's physical geography. Greece lies in the path of the Westerly Winds, so that autumn and spring rainfall emanates from the Atlantic, but is much less intense than in Northwest Europe. The Westerly rainbelt decreases in strength the further south and east you go in the Mediterranean. Most of Modern Greece has the same latitude as Southern Spain, Southern Italy, and Sicily, making all these regions strikingly more arid than the rest of Southern Europe. In summer the country lies within a hot dry weather system linking Southern Europe to North Africa. In winter cold weather flows from the North Balkans.

The internal physical landforms of the country also have a major effect on the distribution of rainfall, snow, and frost, and temperatures through the year. The Alpine Orogeny stamped the Mainland with mountain blocks running Northwest to Southeast. On Crete these ranges swing East-West toward Anatolia, so its high mountains form an island backbone on this alignment, but the relative depression of the Aegean Sea caused a tilting of the island, leaving its western third far more elevated. These Alpine obstacles, rising in the west and central sectors of the Greek Mainland and Crete, force the Westerly rains to deposit the major part of their load along the West face of Greece and in Western Crete, making the Eastern Mainland, the Aegean Islands, and Eastern Crete lie in rainshadow, thus restricting the available rainfall for plants and humans (Figure 1.3).

Temperature, rainfall, and frost-snow also vary according to altitude, and Greece is a land of rapid altitudinal contrasts. No part of the broadest landmass, the Northern Mainland, is more than 140 km from the sea, whilst for the Peloponnese the most inland point is 45 km distant, yet in these short spans one can move (sometimes in a few hours), from sea level to the high mountain zone. With height come lower temperatures and more snow-frost, milder summers, and more severe winters than experienced in the favored summer and winter tourist destinations of the Aegean Islands and coasts of the Southeast Mainland, but in compensation, there is less risk of drought and life-threatening heatwaves. In the drier zones of Greece drought is a constant threat to crop cultivation and animal-raising, and is frequent enough to pose an adaptive challenge for any past Greek society with a dense population and elaborate division of labor.

The powerful effects of geology and climate in creating the diverse landscapes of Greece are also dominant in the mosaic of natural and artificial vegetation belts which one meets in traveling from South to North, or East to West, and even more clearly from coast to inland mountains.

Vegetation

Climbing to higher altitudes in the Mediterranean produces effects comparable to traveling northwards toward the Arctic, passing out of Mediterranean into temperate, then continental and finally to subarctic climates (Admiralty 1944, Bintliff 1977, Rackham 1983, Kautzky 1993). Average annual temperatures decline, and although summers can be hot they are milder than in coastal lowlands; autumn, spring, and winter are colder and rainier; finally, winter frost and snow increase with height above sea level. The position of the uplands relative to rain-bearing autumn and spring Westerlies modify these effects, also true for the winter cold climate cells which derive from the Balkans. Thus when traveling west and north from the Mediterranean climate zone of the Southeast Mainland coast and its offshore islands, or merely inland and up into the hill land and then mountains, we observe a succession of natural vegetation zones which are related to the main vegetation zones of Europe from its far south to its far north.

Evergreen trees (oaks, olives) give way to mixed evergreen and deciduous trees and shrubs, then deciduous vegetation is gradually displaced by hardy coniferous trees, until finally in the highest or rockiest mountain peaks trees decline and Alpine grasses and low plants dominate. However, this is a picture of typical conditions throughout Greece in the middle of an Interglacial period, and for the Holocene this has been much modified by human impact.

Since people colonized the Greek landscape in large numbers, from the Late Neolithic (ca. 5000 BC), they have modified natural vegetation to assist their farming-herding economy, whilst from the mature

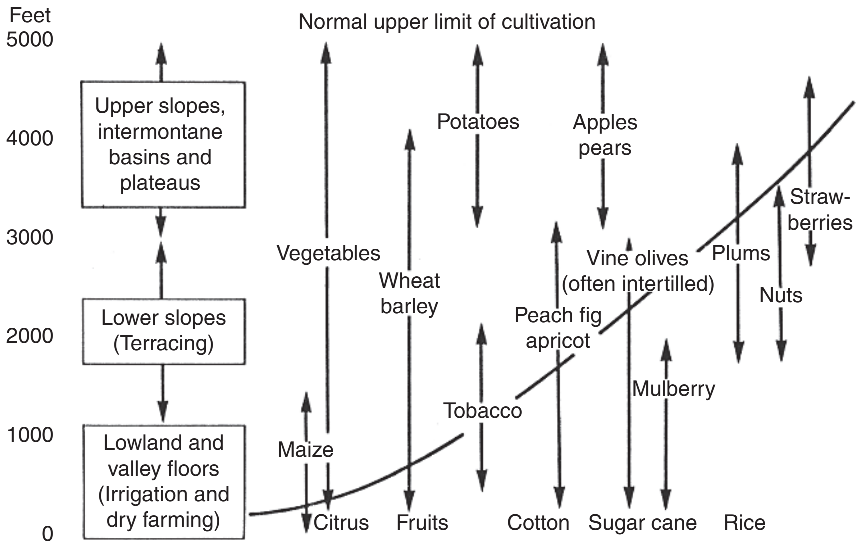

Figure 1.4 The vertical zonation of crops in the Mediterranean lands.
J. M. Houston, *The Western Mediterranean World*. London 1964, Figure 28. Courtesy of J. M. Houston.

Iron Age onwards (ca. 800 BC) intensified mining and timber extraction has increased human impact. In some regions and periods in the past, natural woodland disappeared or was reduced to a patchwork amid a landscape of fields, pastures or mere wasteland. Photographs for much of Greece from the late nineteenth to early twentieth centuries frequently portray treeless, almost lunar landscapes. Fortunately the Greek government in recent decades has implemented increasingly effective reafforestation and woodland preservation programs. Redirection of the economy away from extensive sheep and goat raising has dramatically allowed uplands to regenerate tree cover. European Union agricultural policies, and internal pressure to focus Greek farming on highly commercial forms of land use, are also creating divergent paths in the previously cultivated landscape. Open lowlands and areas with plentiful pumped irrigation water are now intensively farmed throughout the year for multiple crops. In contrast, vast areas of hill country where motor and irrigation access are restricted, and fields small, are swiftly reverting to scrubland and bushes. Areas suitable for archaeological landscape survey are increasingly confined by this polarization of land use.

However, human impact from later prehistoric times onwards has always been regionally diversified, as the "agropastoral" (farmer-herder) economy adapted to local climate and topography (Figure 1.4). In the lowlands and hill lands, to several hundred meters above sea level, natural Mediterranean evergreen woodland, alternating with dry steppe and shrubs where stoniness or aridity prevented tree cover, has become a cultivated "woodland" of evergreen olives, figs, vines, and (after Medieval importation) citrus fruits. Natural grasses and bulbs have been replaced by the favored bread grasses wheat, barley, and the root crops beans, lentils, and melons. From the sixteenth to seventeenth centuries AD onwards, the versatile exotic maize and exotic commercial shrubs cotton and tobacco spread widely. In the cooler hill lands, fruit and nut trees, which were a natural component of the European mixed deciduous-evergreen vegetation, have been favored, such as apples, whilst the milder, wetter climate suited native vegetables and Early Modern imports such as potatoes. In the higher uplands more open landscapes due to climate, culminating in high level grass-bulb landscapes, have been drastically enhanced by human clearance (by fire, axe, and grazing) to make pasturelands, where cooler summers compared to the lowlands have encouraged specialist herders to bring seasonally transhumant domestic flocks.

Vegetation

The zonal vegetation map of Greece (Color Plate 1.4) demonstrates that topography, geology, and climate collaborate to produce a clear trend in the distribution of typical natural vegetation during a warm period such as our current Interglacial. The drier coastlands and islands, mainly in the South and especially the Southeast, display Mediterranean evergreen, drought-resistant plants. If unaffected by fire, grazing, and cultivation (a minority of the landscape!) one would find savannah or woodland composed of trees like evergreen oak, Aleppo pine, and wild olive. Moving away from the Southeast Mainland coasts and islands, north and west, higher rainfall and often higher relief support mixed Mediterranean evergreen and deciduous woodland species, deciduous oaks, beech, and chestnut. Such mixed vegetation would in the natural state typify higher land in the South and much of the lower land in the North. Within the great upland zones which constitute Mainland Greece's rugged interior, Mediterranean vegetation disappears and we find deciduous and increasingly with altitude more continental tree species, such as hardy conifers, the latter dominant as we ascend the mountains. Even without human interference there would be small zones in the uppermost mountain belts with Alpine, non-tree grassland and other low plants. Given the fact that in Greece one can move within a short distance from the dry coastland up into fringing mountains, it is often possible in many parts of Greece to walk in a day from Mediterranean evergreen brushland through deciduous, then coniferous, woodland and see ahead the bare Alpine-plant zone on the crests of the mountains.

For typical, mostly natural, tree species see Figure 1.5. In the Greek lowlands original woodland

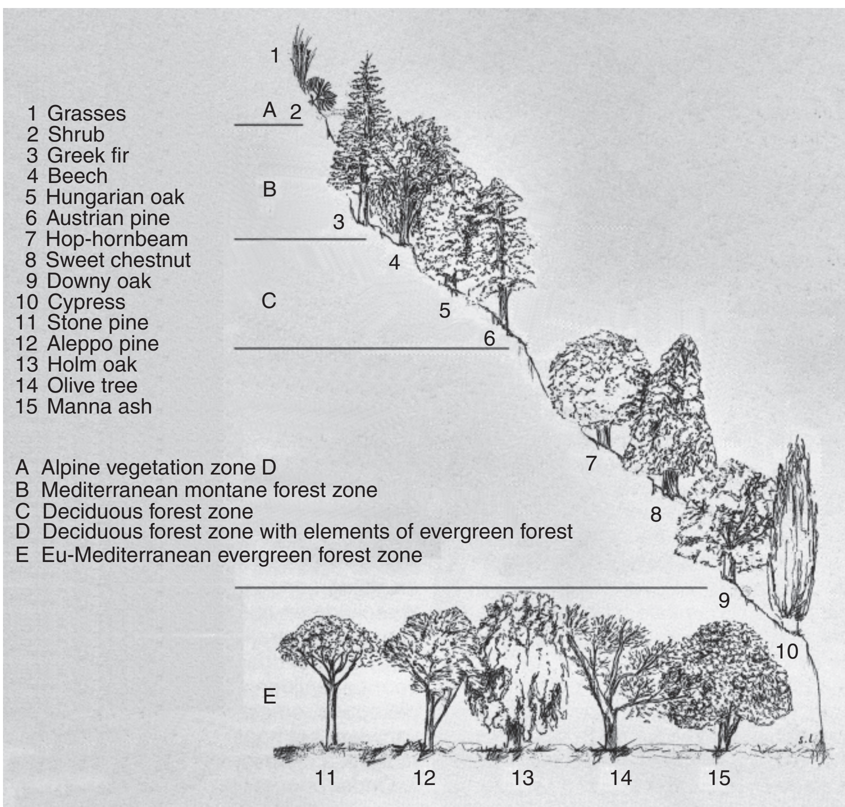

Figure 1.5 Vegetation sequence in Greece, from Mediterranean lowland (right) to inner mountain peaks (left). Modified from J. Kautzky, *Natuurreisgids Griekenland. Vasteland en Kuststreken*. De Bilt 1995, diagram on p. 23.

cover was first removed on a large scale by later Neolithic and Bronze Age times, and the cultivable landscape is considered to have already possessed its Early Modern appearance by Classical Greek times (Bintliff 1977, 1993): a mosaic of open land (dominated by grain crops) and cultivated olive and fig orchards and vineyards. In place of woodland, where agriculture is not found, human impact by fire and grazing, or natural climatic aridity, give rise to three levels of sub-woodland vegetation, in decreasing order of size and ground surface cover (Rackham 1983): degraded evergreen woodland becomes low shrubland ("maquis"), predominantly prickly oak bushes. More heavily degraded land, or where bare rock is very prominent, supports thin grassland mixed with spiky plants ("steppe"). Finally in the least vegetated zones, the result of maximum human impact or the dominance of bare rock, we find very low, widely-spaced "phrygana" or "garrigue" vegetation, notable for aromatic fragrances and valued by bees and humans for nourishment and cuisine respectively (sage, thyme).

Pollen analysis documents the evolution of vegetation in Greece, taken from lake and coastal corings. A prediction for a warm epoch or Interglacial, such as our Holocene period, without human interference, comes from a deep boring at Philippi in Northeast Mainland Greece which covers the last million years (Wijmstra *et al.* 1990). A warm, wet early phase, with mixed deciduous and evergreen open woodland, would by mid-interglacial in the lowlands give way to a drier Mediterranean climate, encouraging denser evergreen woodland, then be succeeded, as the era moves toward a new glacial, by a cooler and wetter climate encouraging a rise in deciduous vegetation. This reconstruction agrees with early-mid Holocene pollen cores from the drier Southern Greek climate. Here Bottema (1990) noted increasingly drier climate through the early farming eras of the later Neolithic and Bronze Age, in Middle Holocene times (more pronounced from 5000 to 4000 BC), then a postulated rise in rainfall, or aridity decline, in Late Holocene times (from the Iron Age on, ca. 1000 BC). Nonetheless, since the Middle-Late Holocene era coincides with several phases of major human impact on the landscape, through woodland clearance and the expansion of cultivated crops and managed grazing, it becomes difficult to separate out vegetational changes due to climate and those under anthropogenic (human-inspired) influence. Combinations of natural and human factors, as with soil erosion, seem preferable to comprehend Greek landscapes for these recent millennia (Rackham 1982, Atherden and Hall 1994).

From the Bronze Age till Medieval times, the natural climate seems to have been mostly warm and dry. The Mesolithic hunter-gatherers (see Time Chart in Introduction) would experience the rather different climate of the early interglacial model, whilst the Neolithic farmers would experience a transition to increasingly drier conditions. Although the Earth had probably not begun to shift definitively toward a late interglacial climate, before human-induced Global Warming overrode any natural cyclical patterns, climatologists argue that during the last 2000 years the Earth has experienced several shorter phases of wetter, colder climate. The classic example is the Little Ice Age between Late Medieval and Early Modern times (Bintliff 1982, Grove 2004). Furthermore, within the warm, dry mid-interglacial mode, and the early wetter but warm mode, climatologists have also identified large-scale episodes of intense drought, around 6200 and 2200 BC, both considered as particularly significant for the Eastern Mediterranean region (Weiss 1993, Rosen 2007).

The vegetation of the Aegean has certainly altered over the last 10,000 years, in the first place responding to global climatic changes. These changes form long-term cycles, over which are superimposed smaller interruptions. Human impact, through progressive clearance, but also cyclical, as human populations waxed and waned, are a further factor impacting on the degree of natural vegetation and its type, but we now see that visible alterations may be as much due to natural as to anthropogenic causes, most frequently it seems a combination of these.

Soils

Greece's semi-arid climate limits its soils (Figure 1.6) from developing a great depth or elaborate mature profiles. Greek soils often remain thin, accumulating slowly, and largely reflect the parent rock and sediment they develop on. Geology is therefore fundamental for soil type distribution. Thus the scattered volcanic districts are echoed by characteristic *Volcanic Soils*, mostly not too fertile as they border the dry Aegean Sea. Far commoner, hard crystalline limestone produces characteristic derived soils (*Limestone Soils*), thin and none too fertile, often patchy between rugged rock. The intermediate hill land of Greece once possessed fertile deep woodland soils, but due to human impact those parts occupied the longest, and farmed continuously, have developed thin stony soils, here mapped along with similar naturally thin soils of the interior mountains (*Stony Mountain Soils* and bare *Rock*); *Terra Rossas* and *Rendzinas* have similar properties and origins (for the former, see Color Plate 1.3a). Only in some zones do better, deeper soils survive extensively (*Brown Forest Soils* and *Mediterranean Dry Forest Soils*) (Color Plate 1.3b). Coastal plains and the drier inland basins, with alluvial and colluvial sediments, have their own fertile but sometimes marshy soils (*Alluvial*, *Marsh*, and *Meadow Soils*) (Color Plate 1.2b).

The overall picture reflects the rocky, mountainous topography of Greece, the limited expanses of rocks that make rich soil, the confined zones of plain (excepting Northern Greece), and the dry climate. Greece is not a naturally rich country for farming, reminding us why the Greeks in many eras imported food, notably grain. However, even if we assume that in regions with dense prehistoric and ancient settlement the once deeper soils have been reduced to a thinner form, due to woodland clearance and erosion, these soils can still provide plentiful harvests at subsistence level (Shiel 2000), though hardly for sustained, large-scale export of wheat, barley or vegetables. Moreover, in some areas, soil impoverishment based on a model of constant environmental decline may not hold true at all (James *et al*. 1994). In compensation, the abundant exposures of steep and rocky, thin soils in a dry climate with low frosts make ideal growing conditions for two classic Mediterranean crops, the olive and the vine, the former vital to enrich the diet, and both excellent trade crops. Even the "wasteland" of scrub and thin woodland formed till recently a sustainable, fruitful extension of food and raw materials for rural communities (Rackham 1982, Forbes 1997).

Erosion

Ever since it was commented on by the Classical philosopher Plato, the erosion of Greece and the resultant lowland sedimentation in valleys and plains was envisaged as a continuous process of landscape transformation, and condemned as negative and anthropogenic in origin (van Andel *et al*. 1986, 1990). With the advent of farming and herding commenced widespread woodland clearance, gaining momentum from prehistoric times into Greco-Roman antiquity. Soils were supposedly stripped or impoverished, sloping landscapes degraded to grazing or even rock. Ports declined as river alluvium bringing eroded debris of hinterland clearance spilled around them, creating a seawards retreating coastline. Even where sensible farmers built terraces to reduce soil loss, cycles of human depopulation apparently led to their neglect, releasing protected soil to flow into rivers.

However, the last 40 years of scientific research into Holocene geomorphology in Greece has revealed a more complex picture than that just depicted, and one where human impact is matched by natural processes (Bintliff 2000, 2002). Firstly, in parts of Greece geology or hyperarid climate restrict woodland cover. Soils here undergo natural weathering, or were always thin. Secondly, in the early Holocene, till 5000 BC, an evolving Interglacial climate stimulated more open landscapes with enhanced natural erosion. Human impact is undoubtedly registered from the later Neolithic period (ca. 5000 BC) onwards, in cycles of woodland clearance followed by regeneration, and in the high population, full land use half of each cycle, such open landscapes also favored soil erosion. But now comes a vital factor, the immediate cause of erosion, which is the weather. Studies have demonstrated that severe erosion is often linked with unusual rainstorms or other highly abnormal weather conditions. Extreme storms may occur once in a lifetime or at even longer intervals.

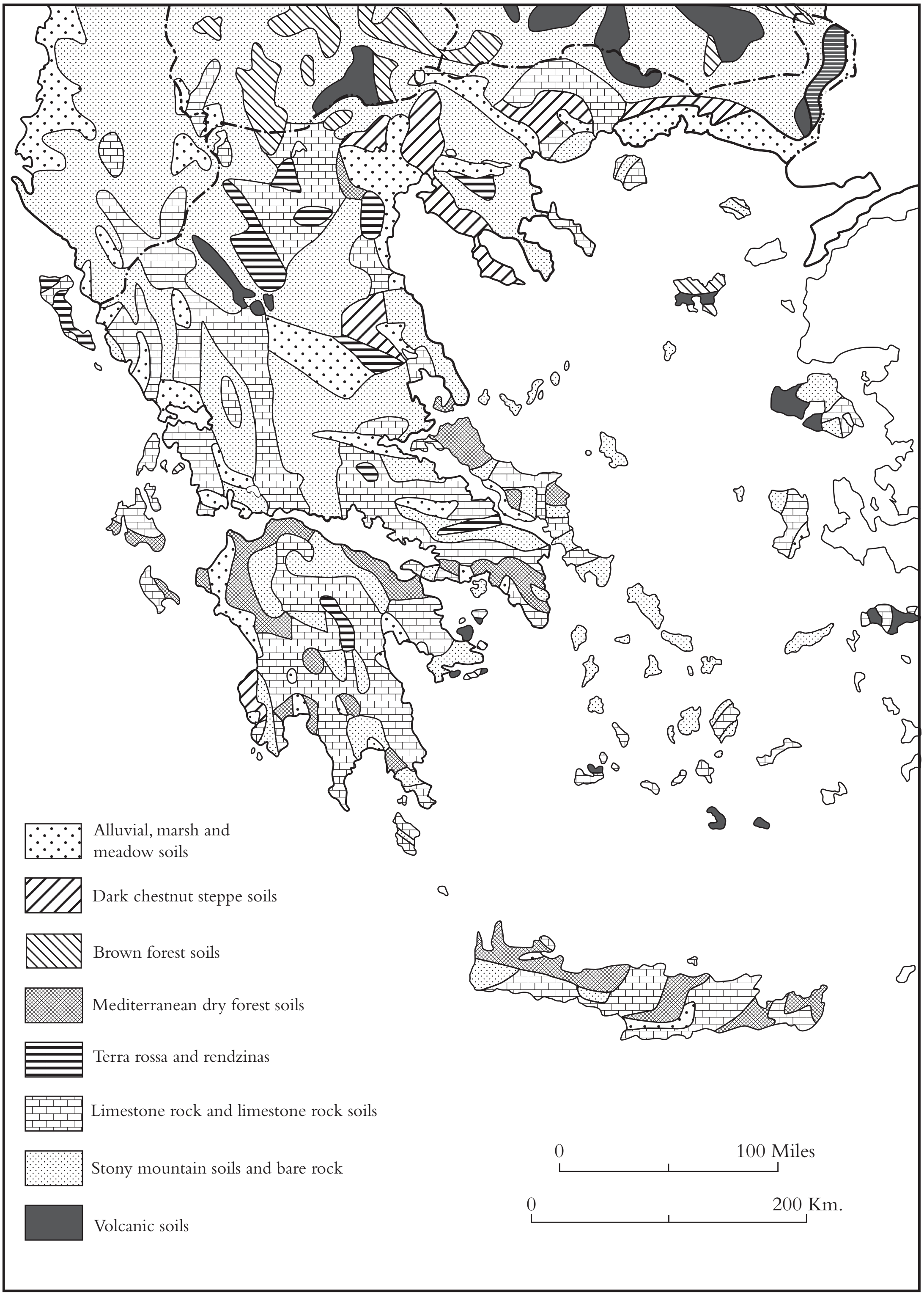

Figure 1.6 Soils of Greece.
H. C. Darby *et al.*, *Naval Geographical Intelligence Handbook, Greece*, vol. 1. London 1944, Figure 7.

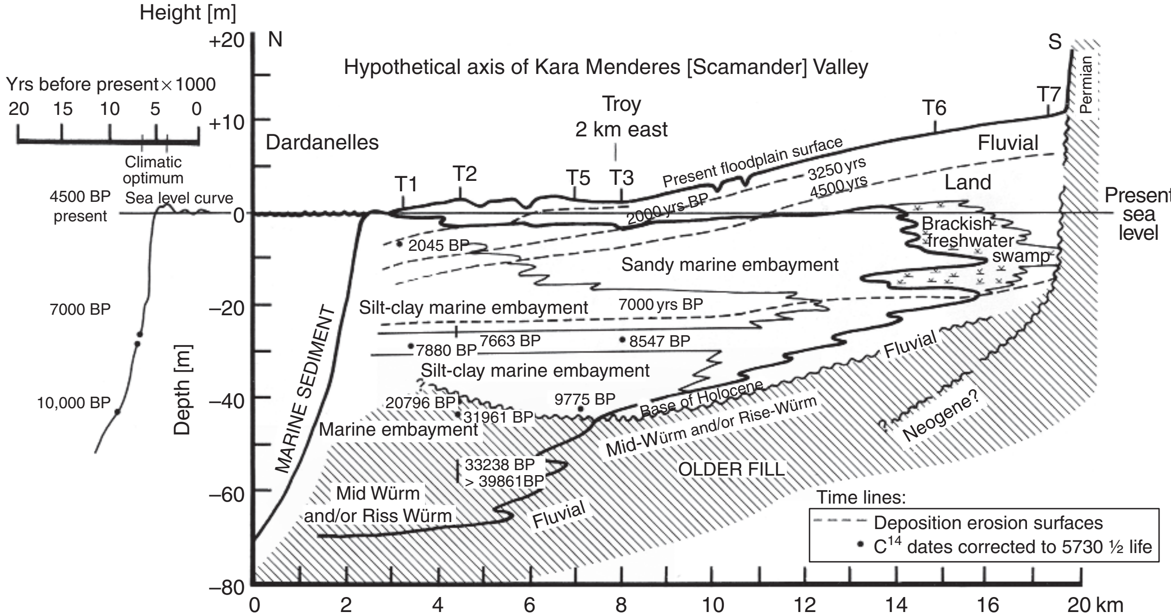

Figure 1.7 Cross-section of the infill of the Plain of Troy, Northwestern Anatolia, since the last glacial era. Note the dominance of marine deposits and of river sediments laid down in a former sea inlet almost to the innermost part of the plain, and the late and superficial progradation (advance) of the modern dry land plain alluvia.
Author after J. C. Kraft *et al.*, "Geomorphic reconstructions in the environs of ancient Troy," *Science* 209 (1980), 776–782, Figure 3. Reproduced by permission of American Association for the Advancement of Science.

Let us predict how these complex processes might register in the Greek geomorphological (land surface) record. For Early Holocene erosion processes we expect little human responsibility, then in Middle and Late Holocene times (later Greek prehistory till today), cycles of high human population would be irregularly punctuated by erosion phases, whilst even in low population phases occasional, irregular erosion episodes could appear. Most of the time, even during population climaxes, major erosion would be absent. A final qualification is required: pollen analysis shows that considerable expanses of upland Greece remained wooded, with low human populations, till the Early Modern period (Bottema 1974), chiefly in the Northern Mainland. The accumulating Holocene landscape record for Greece corresponds closely: erosion in prehistoric through ancient to Medieval times occurs as a series of irregular, short-lived episodes, set against longer periods of landscape stability marked by soil development (what is called a "punctuated equilibrium" model). Rare phases of landscape instability, apart from Early Holocene examples, lie within periods of dense human occupation, but fail to correlate with every population climax (Pope *et al.* 2003).

Finally we must rethink our scenarios for coastline change. Firstly, it is widely forgotten that hill erosion benefits the lowlands through deposition of fertile alluvia and colluvia. Secondly, we must be critical of the view that the frequently observed advance of river deltas into the sea during historic times is clear evidence for ecological mismanagement of the hinterland of the Aegean coasts, due to human deforestation and poor soil conservation. Scientific research reveals a more complex interplay between natural Interglacial processes and human impact. Boreholes through the larger coastal plains of the Greek and Turkish Aegean coasts give comparable cross-sections, illustrating how these plains have been built up since the last glacial period (Figure 1.7). During the last Ice Age, sea levels 130 meters below present, and prolonged millennia of open landscape with highly erosive climate, produced deep slope and plain sedimentation in the coastlands and well beyond into the present marine shallows (categorized as "Older Fill" in the Figure). In the Early Holocene, swift global ice-sheet melting caused rapidly rising sea levels, outpacing the laying down of eroded sediments in river deltas, which was also drastically reduced in volume as the hinterland became increasingly wooded. Till 4000 BC the sea encroached on coastlines, and although continued natural, and human-related, erosion still brought sediments downstream, these were poured into advancing submarine bays. From this point onwards, two linked processes interacted to reverse this general trend: sea level rise globally slowed down or ceased, with subsequently only minor fluctuations in height, and human clearance from Late Neolithic times onwards became a major, if cyclical, force which exposed large hinterland terrains to potential erosion. Taken together these effects have favored coastal plains advancing on the sea. Historical references certainly match sediment cores for Aegean coastal plains (Brückner 2003, Kraft *et al.* 1977, 1980, 1987), showing dramatic gains in the land even over a few centuries during the last 2500 years. However in cross-section the depth of these historical-era natural-anthropogenic sediments is rarely great, coating a superficial skin on top of much deeper, naturally caused, delta deposits of the earlier Holocene and Ice Age millennia.

Ethnoarchaeology

The study of "traditional" Greek society as a source for reconstructing everyday life in ancient and prehistoric Greece has long been popular. When Western Travelers began to visit Greece in significant numbers, during the eighteenth and early nineteenth centuries AD, their reaction to Greek countryfolk was frequently negative (Tsigakou 1981, Angelomatis-Tsougarakis 1990). Manners, dress, houses, and education disappointed the visitor seeking the descendants of Pericles or Plato. But whereas those Travelers were educated into a colonial and imperialist condescension toward the rest of the World, by the turn of the twentieth century growing disillusionment with Western achievements encouraged intellectuals to admire a lost past of pre-capitalist, pre-industrial lifestyles. If the painter Gauguin sought this in Tahiti, others stayed at home and tapped into folk traditions within Western Europe itself (language, music, dress, folklore), a movement developing since the birth of the Romantic Movement around the start of the nineteenth century.

Now Western scholar-travelers were more inclined to cherish the characteristics of conservative society in rural Greece, previously deplored. Simple peasant life, close to an unchanging nature, its spontaneity and semi-pagan rituals, appeared preferable to Modern Life, and surely also suggested a direct insight into the world of the ordinary people of the Classical or Bronze Age landscape. This led Sir Arthur Evans for example, excavator of the Minoan palace at Knossos, to construct a Golden Age in Bronze Age Crete, which later scholarship has difficulty extricating itself from (Bintliff 1984, MacGillivray 2000). Throughout the twentieth century, observations of traditional lifeways in Greece seemed logically linked to our picture of the remoter past, and even in the 1970s and 1980s anthropologists were attached to archaeological teams (cf. Jameson 1976), not just to bring the story of a landscape into the present day, but in the expectation that traditional practices could be extrapolated to the long-term past.

A belief in direct historical continuity played a central role. Only a minority of scholars were attracted by Fallmerayer's nineteenth-century theory that Modern Greeks were largely descended from Slav colonization in post-Roman times. Most assumed that Classical Greek populations survived and dominated ethnically throughout the Medieval and Early Modern eras. The discovery in the 1950s that Late Bronze Age populations, at least on the Mainland, spoke Greek, allowed Greek ethnicity to extend even further back. Renfrew's hypothesis (1987) that the most significant populating of the Aegean occurred with Neolithic farming colonization around 7000 BC, would envisage ancestral Greeks in parts of the country from an astonishingly early date. With such an embedded ethnicity, and the concept that "traditional" Greek countryfolk in the Early Modern period possessed limited horizons, focused on their village and a nearby market town, could one not reasonably suppose that the practices of farming, house-building, social behavior, and ritual could have changed little over the centuries or even millennia?

However, during the late twentieth century, Post-Colonial thinking (Said 1980), and a growing interest in globalization, led historians and anthropologists to question how untouched and authentic "traditional" societies could be. Almost none was remote enough to escape significant impact from the expansion of colonialism and capitalism. For Greece, Halstead (1987, 2006) challenged the assumption that lifeways had changed little since the Bronze Age.

On my own Boeotia Project, cultural anthropologist Cliff Slaughter radically deconstructed the "traditional" nature of life in the villages where our fieldwork was based (Slaughter and Kasimis 1986). Although the Askra villagers are notorious today as in the poet Hesiod's lifetime in the same valley community (ca. 700 BC), for legal disputes about estate boundaries, ties between antiquity and the present day remain limited and superficial. Farmers depart at dawn for scattered smallholdings, but village incomes chiefly derive from factory work, intensive irrigation using deep machine-pump wells, massive low-interest bank loans, and income earned abroad. It is noteworthy that most Boeotian villagers are descendants of Albanian colonization in the fourteenth and fifteenth centuries AD (Kiel 1997, Bintliff 1995, 2003), and conversations amongst the oldest residents are in Greek laced with this "Arvanitic" dialect, which most rural Boeotians used as their primary tongue into the early twentieth century.

This questioning of "tradition" has nonetheless produced positive effects. Observations from Early Modern Greece can still provide a series of possible ways of life, against which the empirical data for a particular period of antiquity or prehistory can be compared or indeed contrasted (Efstratiou 2007). This is currently the basis for global ethnoarchaeology and experimental archaeology. A common way of managing field crops, such as alternate fallow years, might have been practiced at certain stages of population density in the past, especially when the appropriate technology had become available, but for the same reasons would be unlikely in other periods. Likewise the well-known large-scale transhumance of sheep, goats, and cattle (seasonal long-distance movement of herds especially between uplands and lowlands), a familiar practice in many parts of the Mainland and Crete, developed in the post-Medieval era in intimate relation to proto-capitalist and later capitalist markets for textile manufacture, and to modern forms of communication enabling long-distance trade in pastoral products. It becomes necessary to account for alternative economic circumstances in earlier periods (such as palace economies), which could have stimulated and supported such an elaborate lifeway in the remoter past, rather than assume, as was the case up to the 1980s, that Aegean transhumance was an unchanging feature of rural life ever since prehistory.

On this historically-contextualized basis, Greek ethnoarchaeology has entered a new phase of indispensable insight-production for researchers into the pre-Modern eras. At the same time, it has given more depth to our understanding of the specific nature of the Early Modern period itself, which has till recently been characterized as an unchanging society representing ancient lifeways rapidly pulled into Western modernity.

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