

# The Biological Foundations of Hellenic Civilization

BY NORMAN R. PHILLIPS

One of the most intriguing problems ever to agitate the mind of man has been the quest for an adequate explanation of the amazing cultural efflorescence that occurred in ancient Greece in the period between the sixth and the third centuries B.C. Perhaps the most impressive characteristic of this cultural blossoming was the high productivity of genius in relation to the relatively small size of the Greek population—especially of its most creative segment, the Ionian Greeks. Sir Francis Galton even went so far as to estimate that the Athenian population was as much above the English in ability as the latter were above the African primitives.<sup>1</sup> While this seems a great exaggeration, it is illustrative of the tremendous impression that the Greek achievement has made upon the scholarly mind.

Various environmentalist explanations have been offered but these seem to be grossly inadequate, for other cultures have had even greater environmental advantages without equalling the Greeks, such as for instance the Renaissance culture of central and northern Italy. For a more truly adequate explanation it seems essential to examine the biological factors that were involved.

These biological factors can be classified into the categories of race and kith. In the past, writers have often attempted to account for Hellenic cultural productivity by postulating the existence of an ancient Greek racial type ideally suited in terms of aptitudes and abilities to make great intellectual and artistic contributions. Both the Nordacists and the exponents of Mediterranean racial superiority have made claims on behalf of their respective racial types. Others invoking the factor of hybrid vigor have claimed that Greek civilization was the product of a unique and ideal racial blend of several Caucasoid races.

The factor of kith should also be examined. As defined by Ellsworth Huntington, a kith is a freely intermarrying group possessing a common language and culture.<sup>2</sup> Such groups are sometimes of more importance than racial groups because they have often been subjected to intensive processes of either favorable or unfavorable genetic selection whereby people of certain special types of ability and temperament have survived at the expense of others.

<sup>1</sup> Sir Francis Galton, *Hereditary Genius*, Macmillan and Company, London, 1892, p. 330.

<sup>2</sup> Ellsworth Huntington, *Mainsprings of Civilization*, John Wiley and Sons, New York, 1945, p. 102.

It will be my purpose in this paper to examine first the racial structure of the ancient Greeks in relationship to their modern successors and then to discuss the factor of genetic selection among the ancient Greeks. This will be done in the light of our present scientific and historical knowledge, in the hope of reaching some significant conclusions.

Thanks to the work of J. Lawrence Angel, the physical characteristics of the typical ancient Greek are now reasonably well known. He was a man of short stature with a mesomorphic body build. His head was mesocephalic and of medium size. He had a low, broad forehead without much slope. His face was very short and moderately narrow—the proportion giving the viewer a deceptive impression of broadness. His nose was usually either concavo-convex or concave in profile, high bridged and strongly salient. He had very broad jaws and laterally prominent cheekbones.<sup>3</sup> The Athenians did not differ significantly in these respects from the other Greeks.<sup>4</sup> All in all, it is evident from the foregoing that we are dealing with a racially mixed population conforming to no one single racial type in its total characteristics. A detailed description of the various racial variations encountered in this group should enable us to be more specific as to the constituent elements involved in the blend.

Beginning with the Neolithic period (3000-2800 B.C.), we find three major constituent types, the Basic White, the Mediterranean and the Alpine, in that order, as the major contributing elements. The Basic White type is essentially a coarse-featured short-faced Mediterranean type with a straight to concave nose and a strong chin. Unfortunately, Angel lumped this type together with the tall, long-faced Atlanto-Mediterranean type, but it is actually quite distinct. Because of the evident affinities of the Basic White type to the strong-featured small-faced Mediterranean types of North Africa, I think it would be more meaningful to designate it as the Robust Mediterranean race, since it is characterized by relatively heavy facial and bodily features. This is one of the basic types in the Jewish blend and seems to be predominant among the Egyptians. In Europe the type is sporadic in Spain, Portugal and southern Italy. The historical origins of the type are a mystery. However, some scholars believe that the metal age had been introduced into Crete by migrants from Egypt and Palestine, in which case the Robust Mediterranean might be descended from a northward migration of these Egyptian and/or Palestinian migrants from Crete.

<sup>3</sup> J. Lawrence Angel, "A Racial Analysis of the Ancient Greeks," *The American Journal of Physical Anthropology*, Vol. II, 1944, pp. 329-376, especially pp. 335, 338 and 358.

<sup>4</sup> J. Lawrence Angel, "Skeletal Material from Attica," *Hesperia*, Vol. XIV, 1945, pp. 279-363, especially pp. 283-284. Angel has done more than any other single investigator of my acquaintance to clarify the ancient Greek racial picture.

The second basic type in Neolithic Greece was an ordinary Ibero-Mediterranean of the type which predominates in Spain, Portugal and other sections of southwestern Europe today. This type was apparently introduced into Europe during the Neolithic period by immigrants from North Africa.

The third type is the Alpine, which dates back in Europe at least to the Mesolithic period. It is therefore probable that the Alpine was the first *sapiens* race in Greece. In addition to its pure form, the Alpine has mixed in Greece with the Mediterranean types to form the Dinaric and Mixed Alpine blends. These types were of minor importance during the Neolithic period, but were to be of considerably greater importance in later Greek history.

Ever since Byron O. Hughes completed his classic study of the Armenians, many physical anthropologists, Angel among them, have accepted the idea that the Dinaric and Armenoid races are the products of racial hybridization between the Mediterraneans and the Alpines—the Dinaric differing from the Armenoid basically in the nature of the Mediterranean element involved. Carleton S. Coon has estimated the Alpine contribution to the mixture to be around one-third of the total.<sup>5</sup> Angel's "Dinaric-Mediterranean" type, which was the only Dinaric type that he distinguished in his Greek surveys, was not really a full-fledged Dinaric type but rather a Mediterranean with Dinaric tendencies. In its Greek form its most distinctive characteristic was the famous "classical" profile so often depicted on Greek statues. This consisted of the combination of a very prominent nose with virtual nasal-forehead continuity. Another fairly distinctive trait was the sloping, narrow, flat-curved forehead. In addition, the Dinaric-Mediterranean type was long-faced and somewhat broader skulled than the Hellenic average. It is probable that this type was formed by a mixture of the Atlanto-Mediterranean with the Alpine.

The Mixed Alpine is of still greater interest. Of all the Greek types, the Mixed Alpine had the largest cranial capacity. Furthermore, the Mixed Alpine was characterized by the possession of a high, broad, capacious forehead with little slope. These features are more generally characteristic of the élites of the world's cultures than of the generality. As we shall see later, the Greek élite was no exception to this rule.

Other distinctive traits of the Mixed Alpine include a short, broad face, a low-bridged straight nose, a nearly brachycephalic head form, and very orthognathous jaws. Like the Dinaric-Mediterraneans, the Mixed Alpines were a hybrid mixture of Mediterranean and Alpine elements, but were less Alpine and more Mediterranean than the Dinarics. In addition, the basic Mediterranean elements

<sup>5</sup> For a general discussion of the formation of the Dinaric type, see Carleton S. Coon, *The Races of Europe*, The Macmillan Company, New York, 1939, pp. 430 and 601-602.

involved apparently did not include the Atlanto-Mediterranean but consisted of the short-faced Robust Mediterranean and Ibero-Mediterranean strains.<sup>6</sup>

During the Neolithic period the only known immigration into Greece of any importance was of people from Asia Minor. These people occupied Cyprus, Crete, the Cyclades and the eastern shores of the Greek mainland about 3000 B.C., and additional contingents continued to pour into Greece until about 2600 B.C. Their true racial significance is doubtful, for Asia Minor was racially very heterogeneous and relevant skeletal material is rare.

About 2500 B.C. a cruder people showing evidences of the possession of an Indo-European culture penetrated Macedonia and Thessaly from the north. If the suppositions of scholars are correct that these were Indo-European speakers, then they were almost certainly of Nordic type, since this type seems almost invariably associated with the spread of the Aryan languages. Additional northern immigrants of the same basic culture infiltrated into central and southern Greece between 1900 and 1600 B.C.

It is interesting to note that during the period from 2000 to 1400 B.C. the "Nordic-Iranian" type suddenly became the most numerous type in Angel's series, constituting 33.33 per cent of his sample for that period. This type was largely a local form of the Nordic type, differing from other Nordic types chiefly in the possession of a rectangular facial form. The latter was more precisely the result of the combination of a broad forehead and jaws with a narrow mid-facial region.<sup>7</sup> It is significant that Polemo, a Greek of the second century B.C., described the tall, blond type in Greece as being square faced.<sup>8</sup>

During the same period there was also a marked increase in the occurrence of the Mixed Alpine type, which increased from 6.98 per cent of the Neolithic series to 16.67 per cent. This can be attributed to increased mixing between the Alpine and the Mediterranean elements. The actual percentage of Alpine skulls declined from 16.28 per cent to 11.12 per cent.<sup>9</sup>

In the Late Helladic period, from 1400 to about 1150 B.C., there were two significant migrations—that of the Minoan founders of dynasties in various Hellenic cities (about 1400 B.C.), and the invasions of the Dorians and associated Iron Age groups at the end of the

<sup>6</sup>For additional material on the Dinaric-Mediterraneans and the Mixed Alpines, see J. Lawrence Angel, "A Racial Analysis of the Ancient Greeks," *op. cit.*, pp. 344-347, 352-353 and 362.

<sup>7</sup>*Ibid.*, p. 349.

<sup>8</sup>John Linton Myres, *Who were the Greeks?* University of California Press, Berkeley, 1930, p. 568.

<sup>9</sup>J. Lawrence Angel, "Skeletal Material from Attica," *op. cit.*, p. 361. The data which is cited for Hellas as a whole in this article is more complete than in Angel's article on the Greeks as a group.

period. The latter were especially important for they had a lasting effect on the racial structure of the Greeks.

The Dorians were Indo-European Greek speakers who evidently migrated from the north. As to their racial type, we have some very important clues. The Sphakiots of Crete, who are considered to be the partial descendants of the Dorians, differ markedly from the surrounding population. They are very tall, brachycephalic, large-headed, with faces that are large in both length and breadth measurements. In general they resemble the Montenegrins of southern Yugoslavia much more than the Cretans. Like the Montenegrins, they are Dinarics but differ from other Dinaric groups in that the major agency of brachycephalization was apparently Atlantic rather than Alpine.<sup>10</sup>

The Spartan caricatures of the Early Iron Age help us to confirm this impression because the Spartans, who were Dorians, were depicted as virtually identical in physical type to the Montenegrins and Sphakiots of today.<sup>11</sup> This clearly substantiates the Sphakiot claim to Dorian descent.

There are, however, complicating factors which prevent us from being completely certain that the Dorians were just Montenegrin-like Dinarics. For one thing, most Montenegrins have medium brown to auburn hair, whereas Greek literature indicates clearly that the Spartan élite was probably blond. Thus, in the fifth century B.C., Bacchylides described the Spartans as a whole as being fair.<sup>12</sup> Also, the Spartan women had a reputation for being blond.<sup>13</sup> This can be explained away by offering the possibility that to a dark people like the Greeks all hair colors lighter than dark brown might seem blond. The fact that the Dorians were Indo-Europeans indicates, however, that in all probability there was a Nordic strain as well as the Dinaric strains in their blend, at least among their leaders.

With the coming of the Iron Age to Hellas, Angel found a very significant increase in the Dinaric-Mediterranean element, which expanded from 4.48 per cent of the total series in the Mycenaean period to 16.67 per cent of the Early Iron Age group. At the same time there were also significant increases in both the Alpine and the Nordic-Iranian elements.<sup>14</sup> On the other hand, the Athenian group failed to manifest significant increases in either the Dinaric or the Alpine types.<sup>15</sup> This is in agreement with the historical fact that Attica was one of the few areas not penetrated by the Dorians.

<sup>10</sup> Carleton S. Coon, *op. cit.*, p. 608. The Atlantic race has also been called the Brunn-Borreby race and the Faelic type. Coon considers it to be a heavier, more rugged relative of the Alpine. It is interesting to note that there are both broad-headed and narrow-headed varieties of this type.

<sup>11</sup> John Linton Myres, *op. cit.*, p. 72.

<sup>12</sup> *Ibid.*, p. 195.

<sup>13</sup> Hans F. K. Günther, *The Racial Elements of European History*, Methuen and Company, London, 1927, p. 166.

<sup>14</sup> J. Lawrence Angel, "Skeletal Material from Attica," *op. cit.*, p. 361.

<sup>15</sup> *Ibid.*

During the Classical period (650-150 B.C.) the Ibero-Mediterranean (23.53 per cent), the Nordic-Iranian (23.53 per cent) and the Robust Mediterranean (20.00 per cent) types predominated in the Greek series as a whole. The Dinaric was by this time scarce (5.88 per cent), while the Alpine and the Mixed Alpine elements were moderate in strength.<sup>16</sup> The Athenian group differed from the total group in showing nearly equal strength for all the major racial elements except for a scarcity of Dinarics. However, the Athenian series for the Classical period amounted to only 25 skulls as compared to 85 for Greece as a whole.<sup>17</sup>

It seems highly probable from the relatively even ratios reported for the racial elements in both the total Greek series and the Athenian group that racial blending had now reached its maximum. Thus, the era of the flowering of Hellenic genius was also evidently the era of the most thoroughly extensive racial mixing. This would help to substantiate the theory that Greek civilization owes its intellectual fecundity to hybrid vigor.

Slavery provided Greece with its only known large-scale importation of foreign elements during the Classical period. Most of the Greek slaves were either foreigners or of foreign descent. The sources of supply included Syria, Asia Minor and Thrace. The latter was considered to be an especially important source. The slaves recruited from Thrace must have been largely of the Atlanto-Mediterranean type which is still important in present-day Bulgaria, and which must have been even more important in those days—before the invasions of the Bulgars and the Slavs. The slaves from Asia Minor and Syria must have been a pot-pourri of racial types common in the Middle East.

Their contribution to the racial structure of contemporary Greece must have been an important one. Thus, out of the 315,000 people estimated to have lived in Athens during the Periclean age, over one-third are estimated to have been slaves. About a century and a half later the slaves made up the vast majority of the population.<sup>18</sup> Similar increases in the proportion of slaves have been noted in other Greek cities. The basic cause was probably a birth-rate differential between the slave and free classes.

By Roman times noticeable increases were evident in the Alpine contingent while the Robust Mediterranean and the Nordic declined noticeably. This became even more apparent in the "Byzantine-Medieval" period,<sup>19</sup> and today the Greeks are much more strongly Alpinoid in their characteristics than their ancient predecessors. There are several possible causes for the steady increase in the

<sup>16</sup> *Ibid.*

<sup>17</sup> *Ibid.*

<sup>18</sup> Nathaniel Weyl and Stefan T. Possony, *The Geography of Intellect*, Henry Regnery Company, Chicago, 1963, p. 104.

<sup>19</sup> J. Lawrence Angel, "Skeletal Material from Attica," *op. cit.*, p. 361.

frequency of the Alpine type from Roman times to the present. For one thing, mixtures between the Alpine race, on the one hand, and Nordics, Ibero-Mediterraneans or Robust Mediterraneans, on the other hand, would tend to result in a predominance of Alpine characteristics in the offspring, because most of the chief Alpine characteristics apparently behave as genetic dominants in such crosses. Such characteristics would of course be phenotypical rather than genotypical in their prevalence. In addition, the Alpine was, as I have pointed out, an ancient submerged element in the Greek population which, like other such elements, may have reemerged through higher birth-rates, assortative mating and migrations from the isolated interior areas to which invaders tend to confine autochthonous peoples. Finally, we might mention the fact that many of the slaves came from Asia Minor, a region which was probably even more Alpine racially in ancient times than today. We can assume that all three of these were contributing causes. The question that we cannot answer is to explain which of these was primary.

With regard to differences in the social class distribution of racial types among the early Greeks, the published anthropometrical material is very sketchy. Some indication can however be given from early Greek artistic and literary material.<sup>20</sup> From this evidence we can infer that low-browed, concave-nosed prognathous types were fairly common among ordinary Greeks but noticeably uncommon among the Greek celebrities. The latter tended to be high-browed, broad-faced and broad-headed, with strikingly orthognathous jaws. Racially, this would indicate that the Robust Mediterranean type was much commoner among the masses than among the élite, while the Mixed Alpine hybrid type was noticeably frequent among the intellectual and political leaders of Greece.

This should occasion no surprise for it is true in populations generally that low-browed coarse-featured types gravitate to the lower end of the social scale. Whether this indicates a mere difference in phenotype or an actual racial difference between the Greek masses and the élite cannot be answered categorically. The Hellenic aristocracy which was dominant in Classical times arose very late—long after the Dorian invasions were over. This would appear to militate against the existence of an actual racial difference. But we should not rule out the possibility that the new élite might have been constituted out of remnants of its predecessors.

Summarizing the material on the racial composition of the ancient Greeks, we can characterize them collectively as being largely Mediterranean in the broad sense of the term (including largely the Ibero-Mediterranean and the Robust Mediterranean strains), modified by Nordic and Alpine admixture. Briefly, during the Middle Bronze Age, the Nordic was the most numerous type, but

<sup>20</sup> John Linton Myres, *op. cit.*, pp. 68-69.



at other times its rôle was only secondary. All in all, the complexity of the Greek racial mixture and the fact that it was evidently most fully blended during the period of the efflorescence of Hellenic culture would tend to give some plausibility to the argument for hybrid vigor as the biological base for the fecundity of Greek achievement. It is quite possible that a blend had been formed in Greece of suitable racial elements in the right proportions to give rise to a maximum productivity of genius. The well known fact of the temporary duration of hybrid vigor may in turn help to account for the precipitous deliquescence of Hellenic culture.

How much have the Greeks changed in their racial composition since the Classical period? Many groups have settled in Greece since that time but it is very doubtful that they really had much effect on the Greek racial character. The Albanians and the Turks differed from the Greeks too much in religion and culture for much intermarriage to be very likely. The Vlachs are found in only a few parts of Greece, and this race of nomadic shepherds probably differ *too much from the Greeks in their way of life for any widespread intermixing to be feasible.* The Slavs probably did mix widely with the Greeks but so far no distinctly Slavic racial type has been noticed among the modern Greeks. Yet the present Greeks do differ significantly from their predecessors.

Contemporary Greeks are much taller than the Hellenes. This could be a result of improved nutrition so that it may not be too significant in itself. There are, however, other differences which are more significant. Present-day Greeks have a higher cephalic index, a much lower nasal index, longer facial measurements and a higher cranial vault.<sup>21</sup> In addition, straight noses predominate among them rather than the concavo-convex noses of the Hellenes. Furthermore, the classical profile common among the ancients is exceedingly rare in modern Greece, although instances of it can still be occasionally observed in the Greek islands.

Analysis by physical anthropologists has revealed the predominance of two racial types among the Greeks of today—the Atlanto-Mediterranean and the Alpine, although I suspect from an analysis of anthropometric statistics and from personal observation that the Robust Mediterranean is still an important element. The Nordic type is extremely rare on the Greek mainland but seems commoner in Crete.<sup>22</sup>

Evidently, the most important difference racially between the Hellenes and contemporary Greeks is the importance of the Atlanto-Mediterranean element today. This may have been introduced by the Greek slaves, many of whom came from Thrace—an area where

<sup>21</sup> Long faces do not necessarily accompany tall stature. The present-day people of Turkey are similar in height to the Greeks; yet they have shorter faces.

<sup>22</sup> The material on modern Greeks is ably summarized in Carleton S. Coon, *op. cit.*, pp. 604-609.



Atlanto-Mediterranean types are still very common. The Alpine type has of course increased greatly in frequency—probably for the reasons given earlier in this paper. On the other hand, the Ibero-Mediterranean and the Nordic types have declined sharply. Dinaric types still are common in Greece but they are very different in type from the Dinaric-Mediterraneans noticed by Angel among the Hellenes. All in all, it is my impression that the modern Greeks are a blend of ancient Greek types with non-Hellenic elements which, I would surmise, were probably brought into Greece with the slave trade. In some areas, notably on some of the Greek islands, the Hellenic types seem commoner than on the Greek mainland.

The problem of selectivity as applied to the Hellenic kith must not be overlooked in a survey of this type. As to the initial selection of the Greek invaders, I can find no evidence to indicate that it was more stringent than that of the invaders of many other nations, but our knowledge on this point is admittedly scanty. There is, however, some important evidence of selection which may not explain Greek achievement as a whole but certainly can be utilized to explain Ionic intellectual dominance.

When the Dorian invasion occurred, large numbers of the upper classes of the various conquered Greek towns fled to Athens. Later, when Athens became too overcrowded, many of their descendants moved to the coast of Asia Minor. In fact, according to Thucydides, Athens served as a continual refuge from invaders for the leading men of other parts of Greece. This was due to the infertile nature of Attica which made it seem undesirable to potential invaders.<sup>23</sup> These factors would explain the Ionic predominance in Hellenic culture, for it is a highly significant fact that most of the great Hellenic cultural achievements have been made by persons coming from Attica (itself basically Ionian) and the Ionic coast of Asia Minor, and the descendants of such people. Yet the Icelanders, the Puritans and other such peoples have been the products of similar selective processes without matching the Ionic achievement. This would lead to the supposition that the Greek stock may have been unusually gifted to begin with.

Another element in the selection of the Athenian élite was the fact that strict rules of marriage prevailed among this group for several centuries before the Age of Pericles. Even half-castes were not accepted into the ranks of the aristocracy. But aristocratic exclusiveness is a common phenomenon which was once quite widespread throughout the world, so that this could hardly be considered a determinant of Athenian achievement. I mention this only because other writers have chosen to regard it as an important factor.

On the basis of the material cited in this paper we can certainly conclude that ample foundations exist for a biological explanation of

<sup>23</sup> See Ellsworth Huntington, *op. cit.*, p. 587. See also Ellsworth Huntington, *Civilization and Climate*, Yale University Press, New Haven, 1924, pp. 23-24.

Greek achievement. We have found that the early Greeks were an unusually complex racial mixture which was most harmoniously blended during the period of the apex of Greek intellectual creativity; that the Greek élite differed somewhat in its physical characteristics from the masses; that the modern Greeks are evidently only partially Hellenic in descent; and that a strong selective factor operated among the Ionian Greeks. Both hybrid vigor and kith selection appear to have been important factors.<sup>24</sup>

Much work still remains to be done to clarify the genetic structure of the Hellenes, for admittedly much of the material is vague and merely suggestive. In particular, it would help to have much more detailed information on the geographical and class distribution of Greek racial types during the Classical period. But this must await the discovery of additional skeletal material and a change in the attitude of many physical anthropologists who shy away from studies of this type under the psychological pressures engendered by the environmentalistic dogmatists.

<sup>24</sup> It is interesting to note that the Jews, who resemble the Hellenes in their ability to produce brilliant personages out of all proportion to their population, are similarly hybrid. Important strains in the Jewish blend include the Robust Mediterranean, Cappadocian Mediterranean, Irano-Afghan, Alpine and Nordic (although some of the Middle Eastern Jewish groups appear to be without the latter two strains). The Armenoid type noticed among the Jews is probably the result of a combination of Robust Mediterranean, Alpine and Irano-Afghan strains.

# The Arab World

## A Study of Biogenetic Disintegration

BY NATHANIEL WEYL

In the Middle East, stretching from Agadir to Afghanistan, about 80 million Moslems live outside of history. This Arab world is a cultural desert, one that has been suffering from intellectual desiccation for at least five centuries. By the fifteenth century the immense scientific, philosophical and literary achievements of Islam had withered. It is revealing that one of the last of Islam's truly distinguished minds, Ibn Khaldun (1332-1406), was preoccupied with the problem of the decline and fall of Moslem political power.

This intellectual retrogression was not the consequence of any disastrous political retreat. On the contrary, the period from 1400 to 1700 was, in many respects, one of Islamic military expansion. Constantinople fell in 1453; Java and India were conquered or converted in the following century; Ottoman armies seized most of Hungary and established a ring of tributary states encircling the Black Sea between 1526 and 1543; and a Turkish military host under the vigorous leadership of Mohammed Koprulu laid siege to Vienna for the second time in 1683.

The cultural decline has been attributed by some historians to the schism between Sunni and Shi'a and the triumph of an intolerant religious orthodoxy and fanatical Puritanism, which suppressed science and philosophy, frowned on sensual poetry, reduced literature to ornament devoid of serious substance and thus virtually forced the creative minds of Islam to concentrate on architecture and painting.<sup>1</sup> Without dismissing this view of the matter out of hand, it is worth observing that the religious wars which engulfed Christendom during the same period and which also generated intolerance, fanatical orthodoxy and Puritanism did not prevent the science, philosophy and literature of the West from experiencing vigorous growth. Hence, other and more important factors must have been at work.

Very little need be said about the period stretching from 1700 to the present. Accelerating intellectual decline was reinforced by military defeat and political disintegration. Then, in the twentieth century, nationalist movements throughout the region seemed harbingers of a new intellectual awakening. As Arab states obtained increasing oil royalties, public education was extended and with it improved medical care and other aspects of modern civilization. Despite these stimuli, this vast Moslem world has produced no one,

<sup>1</sup> William H. McNeill, *The Rise of the West*, University of Chicago Press, Chicago, 1963, pp. 618-633.