

A REVIEW AND ANALYSIS OF THE RISS-WÜRM SACCOPASTORE SKULLS, CAN THEY PROVIDE EVIDENCE IN REGARD TO THE ORIGIN OF NEAR EASTERN NEANDERTHALS ?

by

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In July 1929, in the course of excavation of a quarry at a place called Saccopastore near Rome, Italy, a well-preserved human skull was uncovered. Several years later, in 1935, while visiting this same quarry which had ceased functioning a number of years earlier, A.C. BLANC and H. BREUIL discovered a second fossilized skull which jutted out from beneath the ground. Like the fossil discovered earlier, this second fossil, called Saccopastore 2, was entrusted to S. Sergi for study. During the year following this second discovery, a multi-disciplinary excavation was undertaken by the Italian Institute of Human Paleontology, the Anthropological Institute of the University of Rome and the University of Pisa in order to determine the age of these important fossil specimens and to gather all available information concerning the environment in which the Saccopastore individuals lived.

Since the first discoveries, the stratigraphic section of the Saccopastore site has been analyzed several times in detail (A.C. BLANC, 1935, 1938-39, 1948, 1958; R. KOEPPPEL, 1933-34; A.G. SEGRE, 1948, 1983, 1984). The deposit of Saccopastore constitutes a fragment of the pleistocene terrace of Latium, composed of two clearly distinct discordant parts. The entire stratigraphic sequence is comprised within a period of between 80,000 and 150,000 years. The discordant superior part has been related to the beginning of the Würm and the inferior part, in which the crania were contained, has been dated to the last interglacial. The attribution of the Saccopastore crania to a more recent period has been due to a misunderstanding of this discordance. Studies of the faunal remains (A.C. BLANC, 1938-39), of fossil flora (E. TONGIORGI, 1938-39) and pollens (M. FOLLIERI, 1983), and of stone tools (A.C. BLANC, 1958; M. PIPERNO and A.G. SEGRE, 1982) support the dating of the fossil specimens to the last interglacial. Moreover, data related to the absolute dating of the Pleistocene of Rome (J.F. EVERNDEN and G.H. CURTIS, 1965; F.P. BONADONNA and G. BIGAZZI, 1970; P. BASILONE and L. CIVETTA, 1975; I. BIDDITTU and *alii*, 1979; V. CONATO and *alii*, 1980), as well as their correlation with the fluctuations of the sea level in comparison with contemporary levels and the comparison with the oxygen isotope curves (N.J. SHACKLETON, 1969; N.J. SHACKLETON and N.D. OPDYKE, 1976) demonstrates that the Saccopastore fossils are indeed situated in the last interglacial. They are located in oxygen isotope stage 5, and more exactly at the very beginning (5e) of this stage, in other words between 127,000 and 115,000 B.P.

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To this day the Saccopastore crania, along with the Bourgeois-Delaunay specimens (from France), constitute the most complete and the most precisely dated fossil material of the European Riss-Würm. Indeed, Saccopastore 1 is nearly complete; only the supraorbital region and the zygomatic process are damaged. Saccopastore 2 is less complete than Saccopastore 1 but it provides the morphological information absent from this latter specimen. The Saccopastore crania thus represent exceptional fossil material providing information in regard to the immediate predecessors of classic (Würm) Neanderthals.

Although the Saccopastore crania had already been studied (S. SERGI, 1944, 1948 a, 1948 b, 1948 c), a number of new European discoveries dating from earlier periods made necessary a new description and interpretation of these fossils. Moreover, at the time of the study undertaken by S. SERGI fossils prior to classic Neanderthals were represented in Europe solely by Steinheim, since all the Krapina remains were considered to be of the Würm period, and thus the differentiation between archaic (plesiomorphous) and Neanderthal (apomorphous) features could not be made. In addition to this, the absence of fossils for comparison led to a consideration of Neanderthal features as archaic. The Neanderthals thus represented an archaic phase of human evolution (A. HRDLICKA, 1927).

Today, thanks in part to numerous discoveries both within and outside of Europe, the Neanderthals are now known, geographically and chronologically, as a population constituting only a moment in the human record of Europe and the Near East. In this context, some Neanderthal features are today considered to be specialized features, the evolutionary origins of which can be traced in Europe. Indeed, perhaps as early as the Mindel period (with the Arago remains), and with greater certitude beginning in the Riss period, there is a progressive augmentation of Neanderthal features up until the emergence of fully-evolved Neanderthals in the Würm. Curiously, the morphological pattern of Riss-Würm human remains was quite poorly known.

In undertaking the re-examination of the Saccopastore crania we will first analyze the morphological similarities between these specimens and the classic Neanderthals in order to identify Saccopastore's Neanderthal and archaic features. In addition to this analysis, our re-examination has a second, broader purpose. The study of these remains provided information regarding the origin of Neanderthals of the Near East, which are well represented by the fossils of Amud, Tabun, Kebara (Israel), Shanidar (Iraq) and Teshik-Tash (Uzbekistan). Today there are two different hypotheses concerning the origin of this population, one formulated since 1978 by B. VANDERMEERSCH (1981 b, 1985) and supported by A. THOMA (1965, 1985), envisaging an expansion of the pre-Neanderthal population from Europe toward the Near East. This hypothesis thus explains the less complete development of Neanderthal features among the Near Eastern population, since this population would derive from a group which had not yet attained the kind of Neanderthal morphology that may be observed on the European fossils of the Würm. The other hypothesis, advanced above all by E. TRINKAUS (1983, 1984, 1986), argues in favor of an evolution of the Neanderthals within the Near East itself starting from the Mughareh-el-Zuttiyeh fossil (the Galilee Skull), whose age is attributed to the early last interglacial (I. GISIS and O. BAR-YOSEF, 1974). According to this hypothesis, the evolution of the Neanderthals of the Near East would thus occur later than that of European Neanderthals, which would explain the less complete development of Neanderthal features among the population of the Near East.

After determining the features present on the Saccopastore remains we will thus attempt to compare the morphology of the Near Eastern Neanderthals with that of the Saccopastore Riss-Würm fossils. Moreover, the rough contemporaneity of Mughareh-el-Zuttiyeh and Saccopastore makes it possible to determine whether the same Neanderthal features are present on the existing fossil regions of both specimens.

THE MORPHOLOGICAL FEATURES OF SACCOPASTORE MAN

Our morphological study has led us to recognize three types of features on the Saccopastore fossils: features which are Neanderthal beyond any doubt, archaic features, and attenuated Neanderthal features or, in other words, characteristics which have not yet attained their full development.

Neanderthal Features

On the frontal bone the supraorbital torus is continuous (Saccopastore 2). All of its sections are joined, and there is thus no division between the *arcus superciliaris* and the *arcus supraorbitalis*. The torus corresponds to the definition of a typical Neanderthal supraorbital torus proposed by D.J. CUNNINGHAM (1908). The parietal bones (Saccopastore 1) are flat. Their maximal width is situated in an intermediary position, which contributes, along with the slightly convergent mastoid process, to the shape "en bombe" of the skull in *norma occipitalis*. The occipital bone (Saccopastore 1) shows a transverse occipital torus constituted by two symmetrical arcs which are joined at the midsagittal sagittal plane. In a superior view this torus displays two points of maximum projection separated by a depressed area. Above the torus, there is a suprainiac fossa composed of one principle fossa at the bottom and one smaller fossa on top.

Archaic Features

The skull is small. The endocranial capacity is weak, about 1,250 cm (Saccopastore 1). The temporal bone displays a strongly developed mastoid process, which is distinctly separated from the rest of the bone. The mastoid process projects more inferiorly than the occipitomastoid crest (Saccopastore 1 and 2). The posterior tubercle of the zygomatic process is either absent (Saccopastore 2 and the right side of Saccopastore 1) or very small (the left side of Saccopastore 1) and does not participate in the mandibular fossa. The anterior tubercle of the zygomatic process is well developed (Saccopastore 2). The articular tubercle of the mandibular fossa is prominent. The mandibular fossa is deep and not very wide (Saccopastore 1 and 2). On the nuchal plane of the occipital bone the crista occipitalis externa is well marked throughout its length (Saccopastore 1). On the sphenoid bone, the greater wing is very wide; the infratemporal crest is absent, and the change in orientation from the *facies temporalis* to the *facies infratemporalis* is determined by an angulation of the bone; the *facies orbitalis* is very large and the superior orbital fissure formed by the two wings, like in the *Sinanthropus* (F. WEINDENREICH, 1943), consists chiefly of the medial portion.

Incompletely Developed Neanderthal Features

In a lateral view the skull does not show a well-defined "chignon" comparable to classic Neanderthals. The occiput is not angled like on the archaic fossils, but it displays a rounded occiput (Saccopastore 1). The external auditory meatus of the Saccopastore skulls is not situated at the level of the zygomatic process root — is not, in other words, in a high position — as is the case with Neanderthals, yet it is not located in a position as low as that either of fossils earlier than Saccopastore or of modern humans. Furthermore, the roof of the mandibular fossa is lower than that of earlier fossils and also of modern humans, but higher than that of classic Neanderthals. Nonetheless, the largest number of incompletely developed Neanderthal traits is displayed on the face of the cranium. Indeed the zygomatic bone, which is partially intact on Saccopastore 1 and present in its entirety on Saccopastore 2, shows a horizontal and a vertical convexity on the body of the bone; the temporal process and the body of the bone form an angle. The zygomatic bone is thus not located at as high a level as is the case with Neanderthals.

The Neanderthal nasal bones project noticeably toward the exterior in front of their

neurocranium; the nasion is deeply set. On Saccopastore the nasal bone does not project directly from the nasion, but can be subdivided into two segments, the superior segment is nearly vertical and the inferior segment shows the projection observed on Neanderthals. This same orientation appears on the frontal process of the maxilla, where only the inferior segment is erect toward the exterior seen from above to below. Although the extent of midfacial projection is difficult to determine in the two Saccopastore specimens, it appears to be more marked than on the earlier fossils or on modern man — but less marked than on classic Neanderthals. The Neanderthal maxilla does not display a canine fossa and it is characterized by a total absence of the three concavities (horizontal, sagittal, and infrazygomatic). On the Saccopastore skulls these three concavities are much less accentuated than on earlier fossils or on modern human crania, although not totally absent, as is the case with Neanderthals. There is no canine fossa but the maxilla shows a slight concavity.

PHYLOGENETIC POSITION OF THE SACCOPASTORE CRANIA

By the presence of Neanderthal characteristics Saccopastore skulls can be considered to be Neanderthal. However, they are also distinguished from classic Neanderthals by the presence of a great number of archaic features, as well as of a large quantity of incompletely developed Neanderthal traits. These latter traits concern the facial morphology (zygomatic bone, nasal bone, and maxillary bone) and the temporal morphology (mandibular fossa, mastoid process, position of zygomatic process).

Thus, in the Riss-Würm the principle Neanderthal features were already acquired. However, the definitive development of the cranial structure occurred between the Riss-Würm and the Würm. A large augmentation of the cranial capacity, accompanied by an accentuation of the Neanderthal facial traits, gave rise in the Würm the "extended" facial structure of classic Neanderthals (S. SERGI, 1948 b). It is probable that the particular position of the external auditory meatus and that of the mandibular fossa, also observable during the Würm, are related to this development of the facial structure.

Due to the particular features observed during the Riss-Würm, these fossils should be removed from the Neanderthal samples for the purpose of comparison.

COMPARISON OF SACCOPASTORE CRANIA WITH THAT OF MUGHARET-EL-ZUTTIYEH

The study of the fossil Mugharet-el-Zuttiyeh, which includes only a frontal bone, a zygomatic bone, a sphenoid bone, and a ethmoid bone, was undertaken in 1927 by A. KEITH. In this study, KEITH emphasized the resemblance between this fossil specimen and Neanderthals, while admitting certain particularities in regard to Mugharet-el-Zuttiyeh. In contrast to the results of this study, more recent examination of this fossil specimen by J.J. HUBLIN (1976) and B. VANDERMEERSCH (1981 b) revealed the absence on it of Neanderthal characteristics as well as the presence of a large number of archaic traits. Our comparative study of the Saccopastore crania, which we assume to be roughly contemporary with the Zuttiyeh skull (see above), enables us to specify that certain archaic characteristics observed on Zuttiyeh are the same as those found on Saccopastore. Indeed, on the sphenoid bone the width of the temporal face is very large and is traversed by numerous crests; the infratemporal crest remains absent; the orbital face is also very large. The body of the zygomatic bone is horizontally and vertically convex.

However, other archaic features which do not exist on Saccopastore skulls are found on Zuttiyeh. For instance, on the frontal bone a supraorbital sulcus is deeply marked throughout the entire length.

None of the Neanderthal characteristics present on Saccopastore are found on the Zuttiyeh skull. Thus on Zuttiyeh the supraorbital torus is well developed, although it shows a

distinct arcus superciliaris. While on the sphenoid bone of Saccopastore 2 there is a significant increase of volume of the clinoid process (S. CONDEMI, 1983, 1985), the morphology of this region of Zuttiyeh resembles that of archaic fossils (Arago XXI).

No incompletely developed Neanderthal characteristics are observable on the Zuttiyeh skull. Rather than in a low position as with Neanderthals, or in an "intermediary" position, like the Saccopastore crania, the zygomatic bone of Zuttiyeh is in a high position, and it is located on the frontal plane as with archaic fossils and modern humans.

On the basis of our data of comparison, the Mugharet-el-Zuttiyeh skull — for those regions which have been preserved — does not seem to us to be at the same evolutionary stage as the Saccopastore crania. Whatever similarities exist concern only the archaic (plesiomorphous) traits. Where in the Near East the Zuttiyeh skull does not display any Neanderthal trait (completely or incompletely developed), in Europe in the early last interglacial, as we have seen, the Saccopastore crania are already clearly Neanderthal. Our research in progress on the Bourgeois-Delaunay specimens, which have been radiometrically dated to around 135,000 BP (A. DEBENATH et H.P. SCHWARCZ, 1979), confirms our assumption of the presence of Neanderthal traits in Europe in this period.

Considering the age of Zuttiyeh, and the absence on this specimen of Neanderthal traits, there is no evidence to suggest that Zuttiyeh is in the Neanderthal lineage. Since only the derived (apomorphic) features make possible the reconstitution of a lineage, it would hardly be justified to place this fossil among the Neanderthals only on the basis of its plesiomorphous traits. Recently, B. VANDERMEERSCH (1981 b) has proposed that Zuttiyeh be situated in the proto-Cromagnon lineage. For this author, indeed, Zuttiyeh would already display the traits of a *Homo sapiens sapiens*. A discussion of this latter hypothesis, however, would reach beyond our present topic.

COMPARISON OF THE SACCOPASTORE CRANIA WITH THE NEANDERTHALS OF THE NEAR EAST

Usually the Near Eastern Neanderthals are reputed to be contemporary to classic Neanderthals (W.R. FARRAND, 1971, 1979). Recently, E. TRINKAUS (1983) has proposed a new chronology for the long stratigraphic sequence of the Shanidar cave. For him, certain fossils among the Shanidar Neanderthals are contemporary to classic Neanderthals (Shanidar 1 and 5), and others are older (Shanidar 2 and 4). The age of these latter fossils has been placed at the early last glacial. If we accept this chronology, Shanidar 2 and 4 would be the oldest Neanderthals of the Near East, and somewhat more recent than the Saccopastore specimens. All of the other fossils (Shanidar 1, 5, Amud 1 and Tabun 1) would be contemporaneous with classic Neanderthals in Europe. We will compare the Saccopastore specimens first with Shanidar 2 and 4, and then with the other Near Eastern Neanderthals.

We will not re-examine in detail the features present on Shanidar 2 and 4, which have been carefully studied by E. TRINKAUS (1983), but will only call attention to certain traits. In comparison to the classic Neanderthals, the skull of Shanidar 2 shows, like Saccopastore 1, less occipital projection in lateral view. Although incomplete, the occipital region displays a well-developed torus which, as on Saccopastore 1, extends well beyond that of classic Neanderthals. As with Saccopastore 2, the temporal region of Shanidar 2 is robust and the external auditory meatus is at a lower level than the zygomatic process root; the anterior tubercle is well differentiated. The mastoid process is well-developed and — similarly to Saccopastore 1 and 2 — more projecting than the occipitomastoid crest. The upper facial skeleton is preserved not only on Shanidar 2, but also partially on Shanidar 4. Shanidar 2 displays considerable thickness at midorbit, more so than on European Neanderthals, and the face is less projecting than classic Neanderthals. The zygomatic bone shows horizontal and vertical convexity and on the maxilla there is no canine fossa but, in comparison with classic

Neanderthals, the maxilla shows slight concavity. The morphology of the maxilla is the same on Shanidar 4. All of these facial traits resemble those found on the Saccopastore specimens.

In conclusion, Shanidar 2 and 4 are distinguished from classic Neanderthals by the presence of incompletely developed Neanderthal features (on the face), and of archaic features (on the temporal and the occipital bones). All of these features have already been examined on Saccopastore in relation to classic Neanderthals and thus demonstrate the similarity of Shanidar 2 and 4 to the Saccopastore specimens, a similarity which is also suggested by metric data.

The comparison of later Near Eastern Neanderthals (Tabun 1, Amud 1, Shanidar 1 and 5) with classic Neanderthals demonstrates, as has often been noted, that the Neanderthals of the Near East form a distinct group in relation to classic Neanderthals (F.C. HOWELL, 1951, 1957; W.E. LE GROS CLARK, 1955; J. PIVETEAU, 1957, 1973; W.W. HOWELLS, 1975, 1978; H. SUZUKI and F. TAKAI, 1973; B. VANDERMEERSCH, 1981 a, 1981 b; E. TRINKAUS, 1983, 1984; C.B. STRINGER and E. TRINKAUS, 1981; A. THOMA, 1965, 1985; E. TRINKAUS and F. SMITH, 1985).

However, within the group of Near Eastern Neanderthals there do exist certain differences. Thus, if Shanidar 1 resembles classic Neanderthals by the presence of a "chignon", Amud 1 and Tabun 1 (this region is absent on Shanidar 5) are nonetheless more like Saccopastore 1 and Shanidar 2 in that they lack this feature. Similarly, Shanidar 1 and Tabun 1 display a less projecting mastoid process than the occipitomastoid crest, yet Shanidar 5 and Amud 1 have a well differentiated mastoid process, as is the case with Shanidar 2 and the Saccopastore specimens. On all of these Neanderthals, the morphology of the mandibular fossa (where present) is deep, and the articular tubercle is prominent; the roof of the mandibular fossa is lower than that of earlier fossils, but higher than that of classic Neanderthals. The external auditory meatus is not situated at the level of the zygomatic process root, as on classic Neanderthals, but is also not in a low position as in the case of modern humans; the anterior tubercle of the zygomatic process is well differentiated. All of these features are similar to those we have described on Saccopastore. According to J.J. HUBLIN (1978), the morphology of the occipital bone on Near Eastern Neanderthals resembles that of the pre-Neanderthals of the Riss-Würm. The facial skeletons of Amud, Shanidar 1 and 5 (the face of Tabun is considerably damaged), differ from that of classic Neanderthals by the morphology of the maxillo-zygomatic region. On Amud 1 the zygomatic bone displays a horizontal and vertical convexity on the body of the bone; this bone is not located at as high a level as on Neanderthals. On Shanidar 1 and 5 the cheekbone is not as flat as the typical of classic Neanderthals, but it is flatter than that of Amud. As A. TRINKAUS has noted (1983): "In *normal facialis*, Shanidar 1 appears to lack the highly inflated maxillae considered typical cheekbone of the Neandertals. The interior surface of the maxillae are slightly concave, but do not exhibit canine fossae. In addition the lateral margins of the maxillae are concave laterally between the zygomatic bones and the alveoli, suggesting the morphology ... present among early Neandertals but absent from the Neandertals" (p. 78). According to this author, the face of Shanidar 5 would be more Neanderthal-like.

In spite of the individual variation among the later Near Eastern Neanderthal specimens, we notice once again that the morphology of this group is different from that of classic Neanderthals. The existence of such a difference can be maintained, even if we remove from the samples Shanidar 2 and 4, which for E. TRINKAUS are earlier. This difference can be attributed to three osseous regions: the facial skeleton (zygomatic bone and maxilla), the temporal bone (mastoid process, mandibular fossa, and the position of the external auditory meatus), and the occipital bone (less projecting in lateral view). It is precisely these same three groups of traits that made it possible for us to distinguish the Saccopastore crania in relation to classic Neanderthals. As in the case of Saccopastore, it is here a question of archaic traits and of incompletely developed Neanderthal characteristics. Yet, in regard to metromorphic data the Saccopastore crania are closest to Tabun 1; they are somewhat further from Amud 1, Shanidar 1 and 5.

CONCLUSIONS REGARDING THE NEAR EASTERN ORIGIN OF NEANDERTHALS

As we have seen, the comparison of the Saccopastore crania with the skull from the Near East, Zuttiyeh has shown that while both of these contemporary specimens share archaic (plesiomorphous) traits, Saccopastore alone displays Neanderthal (derived or apomorphous) characters. This obliges us to exclude Zuttiyeh from the Neanderthal lineage. Given the absence of pre-Neanderthals outside of Europe, and on the basis of currently available chronological data, this provides evidence that Europe is the cradle of Neanderthal development.

From a morphological standpoint the comparison of the Saccopastore crania with all of the Near Eastern Neanderthals displays shared archaic features and the same incompletely developed Neanderthal traits. As we have stressed, this does not exclude the presence of certain individual variations that we have indicated. The similarities would seem most significant in regard to Shanidar 2 and 4. Since archaic traits are common to all early fossils, it is not these traits but above all the presence of shared Neanderthal characteristics which suggests an analogous evolutionary stage of development for both Saccopastore and the Near Eastern Neanderthals. In this regard our results would tend to support, and to extend, the earlier conclusions of B. VANDERMEERSCH (1978, 1981 b). This hypothesis, in the absence of fossils prior to the early last glacial, assumes a pre-Neanderthal expansion in Europe toward the Near East. Moreover, this hypothesis could be supported by the results of E. TRINKAUS (1981, 1986). As he has shown, certain features of the Near Eastern Neanderthals — such as the relative proportions of the limb bones — while somewhat different from the traits of the European Neanderthals, nevertheless result like them from adaptation to a cold climate. Since the Near East has never had a cold climate comparable to that of Europe, this adaptation could only have occurred in Europe.

It is difficult to determine why a part of the pre-Neanderthal population might have moved toward the Near East. We might suppose that changes in climatic conditions at the beginning of the Würm played an important role. In the Near East, the Neanderthals developed their own particular features, for example the marked height of the cranial vault, while the European Neanderthals followed their own evolutionary path leading toward the classic Neanderthals.

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BIBLIOGRAPHY

- BIDDITTU I., CASSOLI P.F., RADICATI F., SEGRE A.G., SEGRE-NALDINI E., VILLA I., 1979. Anagni, a K-Ar date lower and Middle pleistocene Site, Central Italy: preliminary report. *Quaternaria*, XXI, pp. 53-71.
- BONADONNA F.P., BIGAZZI G., 1970. Datazione dei tufi intertirreniani della zona di Cerveteri, Roma, mediante il metodo delle tracce di fissione. *Boll. Soc. Geol. It.*, LXXXVIII, 3, pp. 463-473.
- BLANC A.C., 1935. Saccopastore II. *Rivista di Antropologia*, 3,, pp. 479-482, Rome.
- BLANC A.C., 1938-39. Il giacimento musteriano di Saccopastore nel quadro del pleistocene laziale. *Rivista di Antropologia*, 32, pp. 1-16, Rome.
- BLANC A.C., 1948. Notizie sui ritrovamenti e sul giacimento di Saccopastore e sulla sua posizione nel Pleistocene laziale. *Paleontografia Italica*, 42, pp. 3-23, Rome.
- BLANC A.C., 1958. Torre in Pietra, Saccopastore, Monte Circeo; On the position of the Mousterian Culture in the Pleistocene Sequence of the Rome area. In: KOENIGSWALD G.H.R. von (ed.), *Hunder Jahre Neanderthaler, 1856-1956*, pp. 175-181, Böhlau Verlag, Köln-Graz.
- CONATO V., ESU D., MALATESTA A., ZARLENGA F., 1980. New Data on the Pleistocene of Rome. *Quaternaria*, XXII, pp. 131-176.
- CONDEMI S., 1983. Comparaison des sphénoïdes des hommes de Saccopastore I, II et de Gibraltar I. *C.R. Acad. Sc. de Paris*, t. 296, série II, pp. 665-668, Paris.
- CONDEMI S., 1985. *Les hommes fossiles de Saccopastore (Italie) et leurs relations phylogénétiques*. Thèse Université de Bordeaux I, 180 p.
- CUNNINGHAM D.J., 1908. The evolution of the eyebrow region of the forehead, with special reference to the excessive supraorbital development in the Neanderthal Race. *Transaction of the Royal Society of Edimburg*, 46, pp. 283-311, London.
- DEBENATH A., SCHWARCZ H.P., 1979. Datation absolue des restes humains de La Chaise-de-Vouthon (Charente) au moyen du déséquilibre des séries d'uranium. *C.R. Acad. Sc. Paris*, t. 288, Série D, Paris.
- EVERNDEN J.F., CURTIS G.H., 1985. The K-Ar dating of late Cenozoic rocks in Africa and Italy. *Curr. Anthropol.*, VI, pp. 131-176.
- FARRAND W.R., 1971. Late Quaternary Paleoclimates of the eastern Mediterranean area. In: *The Late Cenozoic Glacial Age*; edited by K.K. TUREKIAN. New Haven: Yale University press, pp. 529-564.
- FARRAND W.R., 1979. Chronology and Palaeoenvironment of Levantine prehistoric sites as seen from sediment studies. *Journal of Archeological Science* 6, pp. 369-392.
- FOLLIERI M., 1983. Il contributo della paleobotanica alla ricostruzione dell'ambiente di vita dell'uomo di Saccopastore. In: *Celebrazione del centenario di C. DARWIN, L'uomo di Saccopastore e il suo ambiente. I Neanderthaliani del Lazio*, pp. 19-20, Università di Roma, Rome.
- GISIS I., BAR-YOSEF O., 1974. New Excavation in Zuttiyeh Cave, Wadi Amud, Israel. *Paléorient*, 2, pp. 175-180.
- HOWELL F.C., 1951. The place of Neanderthal Man in Human Evolution. *Amer. Journ. of Physic. Anthropol.*, 9, n° 4, pp. 379-415.

- HOWELL F.C., 1957. The evolutionary significance of variation and varieties of "Neanderthal" Man. *Quarterly Review of Biology*, 32, pp. 330-347.
- HOWELLS W.W., 1975. Neanderthal Man: Facts and Figures. *Paleoanthropology, Morphology and Paleoecology*, pp. 389-407, Mouton ed., The Hague.
- HOWELLS W.W., 1978. Position phylétique de l'homme de Néanderthal. In: *Les origines humaines et les époques de l'intelligence*, col. int. Fondation Singer-Polignac 1977 Paris, 99. 217-237, Masson ed. Paris.
- HRDLICKA A., 1927. The Neanderthal Phase of Man. *Journ. Roy. Anthropol. Inst.*, 57, pp. 249-274, London.
- HUBLIN J.J., 1976. *L'homme de Galilée*. Mémoire de D.E.A, Université de Paris, VI, 15 p., Paris.
- HUBLIN J.J., 1978. *Le torus occipital transverse et les structures associées. Evolution dans le genre Homo*. Thèse Université de Paris VI, 176 p., Paris.
- KEITH A., 1927. A Report on the Galilee Skull. In: TURVILLE-PETRE F., *Researches in Prehistoric Galilee, 1925-26*. British School of Archaeology in Jerusalem, pp. 53-106.
- KOEPPPEL R., 1933-34. Stratigrafia e analisi nella cava di Saccopastore e della regione circostante in riguardo alla posizione del cranio Neanderthaliano scoperto nel maggio 1929. *Rivista di Antropologia*, 30, pp. 475-476, Rome.
- LE GROS CLARK W.E., 1955. *The Fossil Evidence for Human Evolution (an Introduction to the Study of Paleoanthropology)*. Chicago University Press, 181 p.
- PIPERNO M., SEGRE A., 1982. The Transition from Lower to Middle Palaeolithic in Central Italy: an example from Latium. In: RONEN A. (ed.): *International Symposium to Commemorate the 50th Anniversary of Excavations in Mount Carmel Caves by D.A.E. GARROD*, University of Haifa October 1980, pp. 6-14.
- PIVETEAU J., 1957. *Traité de Paléontologie. VII: Primates, Paléontologie Humaine*, 675 p., Masson ed. Paris.
- PIVETEAU J., 1973. *Origine et destinée de l'homme*, 173 p., Masson éd. Paris.
- SEGRE A.G., 1948. Sulla stratigrafia dell'antica cava di Saccopastore presso Roma. *Rend. Sc. Fis. e Nat. Accad. dei Lincei*, IV, pp. 743-751, Rome.
- SEGRE A.G., 1983. Posizione e stratigrafia di Saccopastore. In: *Celebrazione del centenario di C. DARWIN, L'uomo di Saccopastore e il suo ambiente - I Neanderthaliani del Lazio*. Università di Roma, pp. 11-18, Rome.
- SEGRE A.G., 1984. Considerazioni sulla cronostratigrafia del pleistocene laziale. *Atti della XXIV riunione scientifica (il Paleolitico e il Mesolitico nel Lazio)*, Istituto Italiano di Preistoria e protostoria (8 - 11 October 1982), pp. 23-30.
- SERGI S., 1944. Craniometria e craniografia del primo paleantropo di Saccopastore. *Ricerche di Morfologia*, 20-21, pp. 733-791, Rome.
- SERGI S., 1948 a. Il cranio del secondo paleantropo di Saccopastore. *Palaeontografia Italica*, 42, pp. 25-164, Rome.
- SERGI S., 1948 b. Sulla morfologia della *facies anterior corporis maxillae* nei paleantropi di Saccopastore e del Monte Circeo. *Rivista di Antropologia*, 35, pp. 401-408, Rome.

- SERGI S., 1948 c. I piegamenti della base nei paleontropi di Saccopastore e del Monte Circeo. *Rend. Sc. Fis. Mat. e Nat. Accad. dei Lincei*, ser. 8, n° 5, pp. 306-313, Rome.
- SHACKLETON N.J., 1969. The Last Interglacial in the marine and terrestrial records. *Proceedings of the Royal Society of London*, B 174, pp. 135-154.
- SHACKLETON N.J., OPDYKE N.D., 1976. Oxygen isotope and paleomagnetic stratigraphy of Pacific core V (25-239): Late Pliocene to Latest Pleistocene. In: CLINE R.M. and HAYS J.D. (eds.), *Investigations of Late Quaternary Paleooceanography and Paleoclimatology. Geol. Soc. Amer., Memoire 145*, pp. 449-464.
- SUZULI H., TAKAI F., 1970. *The Amud Man and his Cave Site*. The University of Tokyo, 439 p.
- STRINGER C.B., TRINKAUS E., 1981. The Shanidar Neandertal crania. In: STRINGER C.B. (ed.): *Aspects of Human Evolution*, pp. 129-165, Taylor and Francis, London.
- THOMA A., 1965. La définition des Néanderthaliens et la position des hommes fossiles de Palestine. *L'Anthropologie*, 69, n° 5-6, pp. 519-533, Masson ed. Paris.
- THOMA A., 1985. *Eléments de Paléanthropologie*. Université Catholique de Louvain, Institut Supérieur d'Archéologie et d'Histoire de l'Art, Document de Travail n° 18, 230 p., Louvain-la-Neuve.
- TONGIORGI E., 1938-39. La flora fossile di Saccopastore. Il suo significato nella storia della vegetazione laziale. *Rivista di Antropologia*, 32, pp. 232-242, Rome.
- TRINKAUS E., 1981. Neandertal limb proportions. In: STRINGER C. B. (ed.): *Aspects of Human Evolution*, pp. 187-224, Taylor and Francis, London.
- TRINKAUS E., 1983. *The Shanidar Neandertals*. Academic Press, 502 p., New York-London.
- TRINKAUS E., 1984. Western Asia. In: SMITH F. and SPENCER F. (eds.): *The Origins of Modern Humans: A World Survey of the Fossil Evidence*, pp. 251-293, Alan R. Liss Inc., New York.
- TRINKAUS E., 1986. Les Néandertaliens. *La Recherche*, n° 180, pp. 1040-1047.
- TRINKAUS E., SMITH F., 1985. The fate of the Neandertals. In: DELSON E. (ed.): *Ancestors: the Hard Evidence*. Proceedings of the Symposium held at the American Museum of Natural History, New York 6-10 April 1984, pp. 325-333, Alan R. Liss Inc.
- VANDERMEERSCH B., 1978. Quelques aspects du problème de l'origine de l'homme moderne. In: *Les origines humaines et les époques de l'intelligence*, col. int. Fondation Singer-Polignac 1977 Paris, pp. 251-260, Masson ed. Paris.
- VANDERMEERSCH B., 1981 a. Les Hommes fossiles de Qafzeh (Israël). *Cahiers de Paléontologie (paléanthropologie)*, Ed. du C.N.R.S. Paris, 319 p.
- VANDERMEERSCH B., 1981 b. Les premiers *Homo sapiens* au Proche-Orient. In: FEREMBACH D. (ed.): *Les processus de l'homonisation*. Ed. du C.N.R.S. Paris, pp. 97-100.
- VANDERMEERSCH B., 1985. The Origin of the Neandertals. In: DELSON E. (ed.): *Ancestors: The Hard Evidence*. Proceedings of the Symposium held at the American Museum of Natural History, New York 6-10 avril 1984, pp. 306-309, Alan R. Liss Inc.
- WEIDENREICH F., 1943. The skull of *Sinanthropus pekinensis*. A Comparative Study on a Primitive Hominids. *Palaeontologica Sinica*, D, n° 127 (10), 485 p.