

The stratigraphy and the division into periods of the Rumanian Palaeolithic as well as the connections which can be established with the geochronology of the Palaeolithic in the neighbouring countries arouse every day more and more interest. Taking into account the serious attempts made, especially in the Czechoslovak Socialist Republic¹, in the Polish People's Republic² and in the Hungarian People's Republic³, as well as the attention attached at present to this important problem in the U.S.S.R.⁴, we shall try to give a general picture of the results of our various working hypotheses and of the conclusions we drew following our field studies.

In Rumania too, the proofs of material culture, the sediments themselves, both those in the open and those in caves, with their flora and fauna associations, have always had a say in this matter.

Some of our preliminary excavation reports have set forth the first attempts at a geochronological integration of our Palaeolithic finds within the general anthropozoic development. Later on, after extensive excavations and numerous observations made during the Palaeolithic expeditions at the Ceahlău, in the Bîrsa Land and the Oaş Land, because of the superposition of the loessal clay deposits on the terraces and the spacing out in time of some periglacial phenomena of the mammals associations, of Gastropoda, as well as of the flower associations, we reached a fairly clear understanding of the sub-aerial deposits

¹ Jiří Neustupný, *Chronologie préhistorique de la Tchécoslovaquie*. Musée National de Prague, Département de Préhistoire, Prague, 1956; C. S. Nicolăescu-Plopşor, *Cronologia preistorică a Cehoslovaciei, epoca paleolitică*, in SCIV, IX 2, 1958, pp. 381–384.

² L. Sawicki, *Warunki klimatyczne akumulacji lessu młodszego w świetle wyników badań stratigraficznych stanowiska paleolitycznego lessowego na Zwierzyńcu w Krakowie*, in «Inst. Geol. Biul.», 69, Z badań czwartorzędu w Polsce 2,5–52, 1952.

³ M. Gabori, *Les résultats des recherches sur les*

stations du lœss de Hongrie, in Conférence Archéologique des Sciences, Budapest, 1955, p. 54–66; L. Vértes, *Untersuchungen der Ausfüllung der Höhle von Istalloskö, Zeitbestimmung*, in ActaArch, V, 3–4, 1955, pp. 239–260.

⁴ Академия Наук СССР, Комиссия по изучению четвертичного периода при ОГГН, Институт Археологии, *Рабочее совещание по принципам периодизации и стратиграфии палеолита Восточной Европы*. Тезисы докладов. Moscow, 1959.

of the last glaciation, with its stages and interstages, which made it possible for us to assign a place within that scheme⁵ to the acropalaeolithic cultures.

The discoveries regarding the Middle Palaeolithic within caves, in association with a rich mammal fauna facilitated the understanding of the natural factors in which the Meso-Palaeolithic development was to take place.

The stratigraphical interpretation of the Valea Lupului Clactonian finds, more particularly those at Mitoc⁶, helped us to reach down to the last interglaciation, while the geomorphological, sedimentological and palaeontological considerations on the Dirjov Valley Eopalaeolithic (Pebble-culture) enabled us to approach the early part of the Anthropozoic, and even suggested the right geochronological placing of the oldest Palaeolithic in Rumania⁷.

Our research was however focussed only on the stratigraphy of the anthropozoic deposits in which we found palaeolithic traces, and only rarely did we investigate other natural openings so frequent in Rumania, and this only when we made palaeontological finds in these sections. This was an obvious gap in our research which will have to be liquidated in future expeditions.

The necessity of elaborating a chronological schedule to place our palaeolithic finds within the development of the Anthropozoic is more and more acutely felt. The conference on the principles of periodization and stratigraphy of the Eastern Europe Palaeolithic, held in Moscow in October 1959⁸, as well as the Conference on the chronology of pre-history in Czechoslovakia, held in 1956⁹, are a justification of our taking up this question again in its general lines, on the basis of the new generally accepted periodization principles. We shall now try, on account of our previous research and observations, to outline a periodization-scheme for the Rumanian Palaeolithic as a basis for future discussion and investigation.



As a starting point we think it necessary briefly to remind some facts connected with the history of the evolution of stratigraphical studies of the Anthropozoic in Rumania.

From the very beginning we must recall an older remark of ours that the study of the Anthropozoic did not enjoy in the past particular attention from our geologists, as its deposits were far from having the practical economic importance of older geological periods¹⁰. Nevertheless, some thorough work was performed as early as the beginning of geological research in Rumania. Thus, in 1866, Ion Ionescu de la Brad sketched the first stratigraphic section of some anthropozoic deposits in north-eastern Moldavia¹¹, while Gregoriu Ștefănescu published in 1872 a short note on the Rumanian Anthropozoic and on some

⁵ C. S. Nicolăescu-Plopșor, *Les phénomènes péri-glaciaires et la géochronologie du paléolithique supérieur en Roumanie*, in «Dacia», N. S., II, 1958, pp. 383–391.

⁶ Idem, *Cercetările de la Mitoc*, in «Materiale», VI, 1959.

⁷ C. S. Nicolăescu-Plopșor, N. N. Moroșan, *Sur le commencement du paléolithique en Roumanie*, in

«Dacia», N. S., III, 1959, pp. 9–33.

⁸ Академия Наук СССР, Комиссия...

⁹ Jiří Neustupný, *op. cit.*; C. S. Nicolăescu-Plopșor, *Cronologia preistorică...*

¹⁰ Idem, *Introducere în problemele paleoliticului în R.P.R.*, in «Probleme de Antropologie», I, 1954.

¹¹ Ion Ionescu de la Brad, *Agricultura română din jud. Dorohoi*, Bucharest, 1866.

mammal fossils belonging to that period¹². Later on, in 1885, the same Gregoriu Ștefănescu made stratigraphical observations on the anthropozoic deposits in the former Botoșani and Dorohoi districts where he also discovered the first proofs of palaeolithic settlements¹³. In the same year, L. Cosmovici dealt on «diluvial» deposits around Iași¹⁴. From their superficial explorations, as described in various notes and papers, our geologists began to dwell longer upon problems connected with anthropozoic deposits. The works of the geologist Romulus Sevastos who, between 1903 and 1915, published a series of studies on the fauna and stratigraphy of the Quaternary deserve special mention as he was the first to deal with the loess chronology¹⁵. It was the geologist G. Murgoci who, attracted by certain loess sections, with interpolated layers of buried fossil soils, was the first in Rumania to raise the question of climatic oscillations during the Anthropozoic, of the origin of loessal clay and sand deposits and, in connection with this, the problem of the evolution of the natural conditions which led to the oscillations of the vegetation zones¹⁶.

As for loess chronology, C. Brătescu was the scientist who dealt more closely with this question. Taking up W. Sörgel's theory¹⁷, that every loess layer represents a glaciation and every palaeosoil an interglaciation, he devised certain criteria for establishing the age of terraces and plains. Admitting the existence of four loess layers, corresponding to the four glacial periods, «climatic periods favourable to this aeolian deposit», C. Brătescu reached the conclusion that «the number of loess layers shows without fail the age of dry land». This criterion led him to a number of considerations concerning the palaeo-geographical evolution of Rumania's plains, the chronology of river-terraces and loess-deposits in the sections of the Black Sea cliffs¹⁸.

Brătescu's method was later used by the geographers N. Rădulescu¹⁹ and Petre Coteț²⁰; they reached thus some generally accepted conclusions. Obviously, this outlook on loess sedimentation led to assumptions on the existence of loess deposits in Günz and Mindel and thus to a wrong dating of both the plains and the terraces, which were thought much older than they really were.

¹² Gr. Ștefănescu, *Sur le terrain quaternaire de la Roumanie et sur quelques ossements de mammifères tertiaires du même pays*, in «Bull. Soc. Géol. Fr.», I, série 3, Paris, 1872, pp. 119–122.

¹³ Idem, *Relațiune sumară de lucrările Biroului Geologic în campania anului 1885*, III, Bucharest, 1888.

¹⁴ L. C. Cosmovici, *Depozitele diluviale dimprejurul Iașului*, Iași, 1885, p. 13.

¹⁵ Romulus Sevastos, *Sur la faune pléistocène de la Roumanie*, in «Bull. Soc. Géol. Fr.», III, sér. 4, 1903, pp. 178–181; Idem, *Prundul vechiu și Pleistocenul din Moldova*. Ext. din Arhis, 1906, 12, p. 10, Iași, 1906; Idem, *Descrierea geologică a împrejurimilor orașului Iași*, in AGIR, 2, 1911, p. 261., p. 301; Idem, *Depozitele cuaternare din Țesul Prutului și al Jijiei*, in AGIR, 1915–1920, Bucharest, 1922, pp. 401–420.

¹⁶ G. Murgoci, *The climate in Rumania and vicinity in the late quaternary times*. Die Veränderung des Klimas seit dem Maximum der letzten Eiszeit, in «C. R. C^{le} Congrès int. géol.», Stockholm, 1910, pp. 153–165; Idem, *Clima și solurile în România în decursul erei cuaternare*, in «Biblioteca Societății Agronomilor», Bucharest, 1920, pp. 1–4.

¹⁷ W. Sörgel, *Lösse. Eiszeit u. Paläolithische Kulturen*, Jena, 1919, p. 177.

¹⁸ C. Brătescu, *Profile cuaternare în falezile Mării Negre*, in BSG, LII, 1913; Idem, *Criterii pentru determinarea vârstei teraselor cuaternare*, in *Omăgiu lui C. Kirilescu*, 1936; Idem, in AnD, 1938; Idem, *Oscilațiile de nivel ale apelor și bazinul Mării Negre în cuaternar*, in BSG, LXI, 1942.

¹⁹ N. Rădulescu, Al. Vrancea, *Geografie fizică și umană*, Bucharest, 1937.

²⁰ P. Coteț, *Cîmpia Olteniei*, Bucharest, 1957.

It was the geologist and archaeologist N. N. Moroșan who made a frontal attack on the problem of the chronology of the Pleistocene and the river-terraces in a number of papers and in a valuable synthetic work on geological deposits in north-eastern Rumania. Based on very minute studies of the loessal formations, of the flora, fauna and material cultures which developed during the Middle and Upper Anthropozoic, and relying on a vast literature, he reached, as early as 1932, conclusions which are still valid. We may call him the founder of Rumanian Palaeolithic geochronology ²¹.

The mechanical application of Deperet's scheme for establishing the chronology of the Anthropozoic terraces with respect to their relative height, did not lead to good results, because the general eustatic causes did not make the same impact on Rumania's water courses as they did in other parts of the world. The reason of it is that, during that period, the Black Sea was sometimes isolated from the oceanic level and some regional epirogenetic movements disturbed the uniform development of terraces all over the country. Hence, the number of terraces of Rumania rivers and their relative height vary substantially from one region to another, ranging in number between 3 and 13; from the viewpoint of their relative height they vary from submerged or only a few meters high to more than 200 m high.

Nevertheless, roughly speaking, an agreement was reached, in the sense that low, uncovered terraces, with loess deposits, belong to the Holocene, whereas the middle and upper terraces, covered with loessal deposits attesting glacial and periglacial influences, belong to the Pleistocene. But, with regard to the problem we are interested in, this is unsatisfactory. Thanks to the research-work which has been carried out throughout the last ten years, tangible progress was made in the knowledge of the very complicated problems connected with the investigation of terraces: their number according to zones, their relative height, lateral extension, structure and age. Moreover, a map was drawn-up, showing the distribution of terraces, and their varying number along the course of the same river, a fact which facilitates a better understanding of the palaeogeographical evolution of Rumania's territory during the Anthropozoic, as well as of the chronology of terraces ²². However, though Vilsan raised the problem of a coastal platform in Dobrudja ²³ and C. Brătescu studied the level oscillations of the Black Sea water ²⁴, the super-elevated beaches and the marine terraces of the Dobrudja have not so far been investigated, the map of terraces in the R.P.R. being, as a whole, devoid of the least indication of such terraces on the Dobrudjan coastline ²⁵. Yet, clear traces of a strong marine transgression are

²¹ N. N. Moroșan, *Quelques observations sur le Quaternaire du NE de la Moldavie*, in « C. R. Inst. Géol. Roum. », XIX, 1930–1931, p. 70. Bucharest, 1933; Idem, *Contribution à l'étude du Quaternaire de la Moldavie du NE*, in « Bull. Acad. Roum. », Bucharest, 1931; Idem, *Nouvelles observations sur le Pléistocène dans le NE de la Moldavie*, in « Inst. Géol. Roum. », XX, 1931–1932, Bucharest, 1935, p. 81; Idem, *Le pléistocène et le paléolithique de la Roumanie du Nord-Est*, in AIGR, XIX, 1938, pp. 1–60.

²² T. Morariu, V. Mihăilescu, I. Rădulescu,

H. Grumăzescu, L. Badea, Al. Roșu, V. Gîrbacea, *Le stade actuel des recherches concernant les terrasses fluviales dans la R. P. Roumaine*, in « Recueil d'études géographiques », Bucharest, 1960.

²³ G. Vilsan, *Sur une plate-forme littorale en Roumanie*, in BSG 1936.

²⁴ C. Brătescu, *Oscilațiile de nivel...*

²⁵ T. Morariu, V. Mihăilescu, I. Rădulescu, H. Grumăzescu, L. Badea, Al. Roșu, V. Gîrbacea, *op. cit.*

fairly obvious in the limestone cliffs at Casian, in the Casimcea Valley, in the Cheia defile of the Gehelengicul Valley, as well as in the lagoonal caves of that part of the Dobrudja²⁶. The Limanu cave itself is undoubtedly due to the Black Sea water.

The number of glacial phases in the Rumanian Carpathians is still being discussed. Older observations on moraines and glacial corries, accounting but for two glacial phases, generally attributed to the last glaciations seem to be obsolete now. Recent investigations on certain Retezat and Făgăraș glacial reliefs and particularly on the three morainic waves in the Răduteasa Valley of the Godeanu range, seem to have convinced Rumanian geographers of the existence of the three Würmian stages²⁷. Not even the last investigations however, discovered glacial traces older than the Riss glaciation; the well-known hypothesis according to which the Carpathians had not yet reached before that glaciation a height propitious to the formation of glaciers²⁸, remains thus valid.

However, no correlation was so far attempted between the glacial reliefs (and, more particularly, the river-glacial deposits), and the glacial and inter-glacial deposits from the plains, from off the terraces and in the caves²⁹. Still, it has been lately proved that these very deposits, given their complexity offer richer and more valuable information on this point. One of the latest attempts at establishing the glacial phases in the Bucegi range is based on certain sediments in the Ialomița cave. Nevertheless we think this attempt an utter failure, since the limestone crusts on which the hypothesis is constructed are much too recent, belonging, as they usually do, to the Holocene³⁰.

The numerous contributions to the problem of the Periglacial in Rumania³¹, published during the last few years, are of no help as yet in our research. Most of those studies refer to the processes which gave birth to the last periglacial forms — such as they are frequently met with from a height of four hundred to five hundred meters on — and which have so much influenced the relief. Because of this special outlook, the papers published so far do not help at specifying the number of periglacial phases which worked on our territory. The only attempt so far at ranging into tiers such phenomena of the last glaciation still remains the author's work on periglacial phenomena and the geochronology of the Palaeolithic in Rumania³², which has been taken into consideration by our geographers in their studies of Rumania's Glacial³³ and the Periglacial³⁴ and even of the problem of the terraces³⁵.



²⁶ C. S. Nicolăescu-Plopșor, Al. Păunescu, N. Harțuchi, *Cercetări paleolitice în Dobrogea*, in «Materiale», VI, 1959.

²⁷ Gh. Niculescu, E. Nedelcu, Silvia Iancu, *Nouvelle contribution à l'étude de la morphologie glaciaire des Carpathes roumaines*, in «Recueil d'études géographiques», Bucharest, 1960.

²⁸ *Ibidem*.

²⁹ *Ibidem*.

³⁰ Valeria Micalevich, *Cîteva elemente noi cu privire la stabilirea fazelor glaciare din masivul Bucegi*, in «Probleme de Geografie», 6, 1959.

³¹ T. Morariu, V. Mihăilescu, Ș. Dragomirescu, Gr. Posea, *Le stade actuel...*

³² C. S. Nicolăescu-Plopșor, *Les phénomènes périglaciaires...*

³³ Gh. Niculescu, E. Nedelcu, Silvia Iancu, *op. cit.*

³⁴ T. Morariu, V. Mihăilescu, Ș. Dragomirescu, Gr. Posea, *op. cit.*

³⁵ Lucian Badea, Gh. Popa, *Contribuții la studiul teraselor Bistriței și depozitelor de terasă din sectorul Galu-Bicaz*, in «Probleme de geografie», VIII, Bucharest, 1961.

To understand the criteria on which the attempts at achieving the stratigraphy of the Rumanian Anthropozoic rested, this introduction was necessary; let us now get to the core of the matter.

In Rumania, the lower limit of the Anthropozoic must be that one, on which general agreement was reached at the International Geological Congress in London, in 1948. The basis of the Anthropozoic lays with the Villafranchian deposits, which are superimposed on the last Pliocene deposits³⁶. In this sense, although they are theoretic, the Rumanian geologists' last contributions as to the limit of the Plio-Pleistocene are welcome.

From a theoretical point of view, the problem in itself seems easy to solve. Practically however, a whole series of difficulties arise. This is where interpretation of faunal finds can be of great help. But here, too, particularly great caution is required, since warm climatic Pliocene elements continue to evolve in the Pleistocene as well. If we fail to take this fact into account, the attempts at stratigraphical emplacement on the basis of isolated elements will have no scientific value.

As it was established, the moment when the Villafranchian begins is that one when new species of mammals — *Elephas*, *Equus* and *Bos* —, which indicate a somewhat cooler climate than the tropical Pliocene one, make their appearance. A number of discoveries and contributions of our palaeontologists enabled us to specify stratigraphically the point at which the climate began to change, from later warm Pliocene, when warm-climate elements were teeming, to the beginnings of the first glaciation, in which big mammals, such as the gigantic mastodons, tried to adapt themselves and survive along with the new ones. The mammal association of Berești-Mălușteni, the Măluștean³⁷, in which we meet the *Mastodon borsoni*, *Mastodon arvernensis*, *Hipparion gracile*, *Macacus florentinus* and the *Dolichopitecus*, gradually turns into the anthropozoic association of Frătești, the Frăteștean, in which *Mastodon arvernensis* subsists and, alongside it, *Elephas meridionalis* and *Equus stenonis* appear.

Whereas in the past, the stratigraphical position of fossil remains of old Quaternary mammals seemed of little interest, investigations made this year at Bettia, near Oradea and at Bugiulești-Tetoi and their neighbourhood in Oltenia begin to bring serious specifications as to the stratigraphy and the evolution of pre-Russian mammal associations.

Considering the above-mentioned facts as to the geochronological emplacement of the Palaeolithic stages of development, the results are as follows:

The Eopalaolithic (Pebble-culture):

At the beginning of the Anthropozoic, the Carpathian chain was subjected to a new upheaval, this time strong and gradual, of more than 1 000 meters. The

³⁶ International Geological Congress, Report of the Eighteenth Session, Great Britain, 1948, Part IX, in Proceedings of Section H. The Pliocene-Pleistocene Boundary, London, 1950.

³⁷ Emil Liteanu, *Despre problema limitei superioare*

a terțiarului în Depresiunea Valahă, in «Studii și cercetări de Geologie», V, pp. 343–360 and G. Murganu and co-workers, *Stadiul actual al problemelor de stratigrafie a terțiarului în R.P.R.*, in «Studii și cercetări de geologie», V, 2, pp. 338–340.

lakes stretching over a good part of Oltenia, Muntenia, Lower Moldavia, Transylvania and the Pannonic Plain, withdrew to lower and lower regions. The torrents thus becoming much more active, began filling the place with pebbles, sands and silt in which, because of the rising of the earth's crust, the running waters deepened their valleys. Thus the plateaux, hills and terraces were born, which the winds and the waters decked with a cover of glacial and periglacial grist and loessoid dusts ³⁸.

Gradually, concurrently with the raising of mountains and the drainage of lakes, a division of the country's territory into distinct geographical regions occurred. The fauna of inland lakes began to grow different as early as the Pliocene and gradually, as the Anthropozoic developed, the regional mammal associations began to take shape. The cartography of some of the more characteristic fauna elements could fully show us this.

As a starting point and in regard of the necessity of emplacing the finds which belong to the Dîrjov Valley gravel culture, near Slatina, we sketched on the map the distribution of these elements south of the Carpathians only ³⁹. Drawn up thus, the map helped us understand generally, the palaeo-geographical evolution of the filling stages of the anthropozoic lake and ascertain, for the first time, the outline of the zones of Villafranchian deposits. Thus mastodons, Tertiary elements, appear only in the northern half of Oltenia, on remains of the huge dejection cone of the Danube, yoked to that of the Jiu and its tributaries, and in northern Muntenia, on the dejection cones of both the Olt and the Argeş with their tributaries, who, as early as the Pliocene, had begun to help the expansion of solid land at the expense of the continually retreating waters of the lake. In the southern part of this expansion limit, old elephants such as *Elephas planifrons* and *Elephas meridionalis* begin to occur; in this zone stray mastodons are also found, who obviously penetrated up the Eoanthropozoic, within the Villafranchian. In the southern part, no mastodons were found, except at Frăteşti and Tuluceşti ⁴⁰, associated to older elephants; old elephants alone were found in a zone which cannot but represent the penetration of the dejection cones of such Balkan waters as the Lom, the Iantra and the Ogost, into the anthropozoic lake.

The filling of the pliocene lake and then of the pleistocene one by Carpathian and Balkan torrents began towards the end of the Levantine and went on for a long time in the Anthropozoic. That is why we ceased to admit that the Cîndeşti stones strata belong to the Villafranchian alone and those of Frăteşti to the Saint-Prestian only, and we started attributing to the Pliocene the distribution zones of the mastodons, to the Villafranchian the zone of mastodons in which old elephants also appear, and to the Saint-Prestian the zone in which no mastodons appear alongside the old elephants. Thus, on the basis of the distribution of the fossil remains of Proboscidea, taken as leading chronological elements in a spatial stratigraphy, we established the zones occupied by the Villafranchian deposits, these limits enabling us to emplace our eo-

³⁸ I. Simionescu, *Fauna vertebrată de la Măluşteni*, in AIGR, IX, 1922, pp. 451–455; Idem, *Les vertébrés pliocènes de Bereşti*, in «Bul. Soc. Rom. Geol.», 1932, I.

³⁹ *Istoria României*, I, Chapt. I, Ed. Acad. R.P.R., Bucharest, 1960.

⁴⁰ C. S. Nicolăescu-Plopşor, N. N. Moroşan, *Sur le commencement...*

palaeolithic finds from the Dîrjov Valley towards the latter stage of the Villafranchian ⁴¹.

We reached the same conclusion by interpreting the succession of loess deposits and of the interpolated palaeosoils, as compared to the relative height of the Olt terraces. We likewise reached a chronological emplacement of the pebbles of the Gettic plateau near Slatina in the Upper Villafranchian as well ⁴², by establishing a chronology of the Olt terraces.

Taking into account the connection existing between the recent alluvia in the Dîrjov Valley in which the pebble culture was discovered and the Cîndești pebble deposits of the Gettic platforms in the Slatina zone, from the first investigations on did we come to the conclusion that the tools found in recent alluvia could only have come from off the Gettic plateau deposits, as neither the upper loessal deposits, nor the lower ones (clays, silts and Levantine sands) showed the faintest traces of stones. Our hypothesis on the origin of those tools was strengthened by investigations of the following years, as tools were found even in the non-disturbed Cîndești pebble, similar to those existing in the present alluvia of the Dîrjov.

The Archaeopalaeolithic (Abbevillean, Acheulean, Clactonean)

Both the map of the distribution of Proboscidea and our interpretation based on the loessal deposits on the Olt terraces led us to dating the alluvia of the Gettic platform towards the end of the Günz glaciation; on this foundation, the Dîrjov pebble culture was emplaced in the Upper Villafranchian. Unfortunately, as for the rare finds which categorically belong to the Abbevillean and Acheulean culture in the Dîrjov Valley, we have no stratigraphical indications whatever; we could only emplace them there theoretically: the first – the Abbevillean – in the first interglacial; whereas the Acheulean, between the second and fourth glaciation, a time in which, along with these cultures, a strong Clactonean splinter culture also develops.

As for the Clactonean, it has so far appeared in two precise stratigraphical positions as well. The first find was that of Valea Lupului where a Clactonean splinter was found in a secondary position, in the basic alluvia of the lower terrace of the Bahlui. Considering that over these alluvia there are two alternating strata of loess and two of palaeosoil and also that these alluvia, known in geological literature as Cîric sands, have given fossil remains of *Elephas primigenius* Blum. and *Rhinoceros antiquitatis* Blum., we may place these sands in the first glacial stage of the last glaciation. That same splinter piece, although discovered in the alluvial sands, has no marked rolling traces; accordingly, we concluded that it had been carried away by the neighbouring waters, probably off the middle terrace, in which fossil remains of *Elephas antiquus* and *Corbicula fluminalis* appeared, belonging in our opinion to the last interglaciation.

⁴¹ I. Z. Barbu, *Catalogul vertebratelor din România*, in ARMSI, IIIrd series, VII, Bucharest, 1931.

le commencement...; Idem, *Cercetări privitoare la paleoliticul inferior*, in «Materiale», VII, 1960.

⁴² C. S. Nicolăescu-Plopșor, N. N. Moroșan, *Sur*

The Clactonean of Mitoc on the Prut Valley, appeared in a much clearer stratigraphical position during our excavations here. These excavations brought out some of the most interesting stratigraphical sections of the Palaeolithic in Rumania ⁴³.

From the stratigraphical viewpoint, the Mitoc clay deposits are spread on a terrace roughly 30 m high. The virgin rock of these deposits of clay, sand and loess, is only made up of silex boulders, piled up without connection inside the mass of cretaceous limestone in which they built up. Prut waters in their flow, dissolved the limestone, the silex boulders alone were either left on the spot or dragged away. We have here a strong action of interglacial erosion which, due to the strong flow of the Prut waters, carved this terrace into the Mesozoic limestones. Accumulation deposits of stones and sands, two meters deep, — certainly alluvia of the Prut — spread later on, obviously in a glacial period, on this step. A proof of this is the presence of fresh-water Gastropoda such as *Planorbis* (*Gyraulus*) *albus* Müll., *Lithoglyphus naticoides* c. Pfeiffer, *Hidrobia* sp.

The following layers are spread over the pebbles and sands which rest on the virgin rock: a layer of dark-coloured buried fossil soil, then an old diluvial soil about 0.40 m thick, on top of it a series of horizontal deposits of inundation clays, including a few strata of buried fossil soils. The clay strips are blue coloured, having very fine sands in their composition, while the strata of fossil soils are reddish yellow. These are deposits or drifts alternating with strips of clays and sands, and they represent ever slighter overflows of the Prut. On top of these deposits of diluvial fossil soils and inundation strips there follow strong deposits of aeolian or diluvial loess, uniform in regard of colour and texture, interpolated with diluvial strata of a slightly darker colour, or comprised in limestone impregnations with a pseudo-mycelial aspect, then a layer of sand strips alternating with clays and the upper layer of black earth ⁴⁴.

As for the age of the Prut terraces N. N. Moroşan using besides the usual criterion of the relative height, documents of a palaeontological and archaeological nature, emplaced the lower 5 to 15 m terrace — rich in *Elephas primigenius* — in the Riss glaciation. He considered some of the upper terraces as belonging to the lower Pleistocene and even to the Pliocene ⁴⁵. Bearing in mind that the Ghireni stream flows into the Prut at a height of about 87 m and that the Yellow Bank has a height of about 115 m, we find ourselves, according to N. N. Moroşan, on a middle terrace of the Prut, attributed to the Riss glaciation.

The Mitoc Clactonean only appeared in buried fossil soils layers, alternating with strips of inundation clay. From the first deposit of fossil-soil on and almost up to the upper part of these deposits we also found an association of Gastropoda, which usually live in a warmer, moist climate, such as: *Vallonia costata* Müll., *Vallonia pulchella* Müll., *Cohlicopa lubrica* Müll., *Succinea oblonga* Dram. and *Vitrea crystallina* Müll.

Taking into account the relative height of the terrace, the association of Gastropoda which prefer a milder climate, as well as the aspect and alternation of deposits typical of an interglacial, we placed the Clactonean of Mitoc-Malul-

⁴³ Idem, *Sur le commencement . . .*

Mitoc . . .

⁴⁴ C. S. Nicolăescu-Plopşor, *Cercetările de la*

⁴⁵ *Ibidem.*

Galben (Yellow Bank) in the last interglaciation. This emplacement implies that the carving of the terrace took place in the Mindel-Riss interglacial and that the pebbles and sands of the basic alluvia were accumulated in Riss ⁴⁶.

The Mesopalaolithic (Levalloisean, Mousterian)

The Levalloisean. As early as 1929, N. N. Moroșan discovered at Ripiceni-Izvor in the Prut Valley some tools belonging to the upper Levalloisean. On the basis of probes it was established that these tools came from the alluvia of the lower Prut terrace, the conclusion being that these items were found on the beach, drawing the attention of the Mousterians who used them in the state in which they were or with some small modifications. In N. N. Moroșan's geochronological conception, these pieces belonging to the Levalloisean, should be emplaced in Würm I, as he considered they were synchronic with the Lower Mousterian as yet undiscovered in Moldavia. According to N. N. Moroșan too, the alluvia of the lower terrace of the Prut are rich in fossil remains of *Elephas primigenius* Blum. and have few remains of *Rhinoceros antiquitatis* and *Elephas trogontherii* Pohl, as well as remains of *Bos*, *Equus* and *Cervus*; in a single case, in the lower sand layers on the left bank of the Prut, at Gherman-Dumeni, the fragment of a molar of *Elephas antiquus* appeared. That is why we agree with the emplacement of these alluvia early in the last glaciation.

The *Upper Mousterian*, with the hand-axes of Ripiceni-Izvor, was discovered in the deposits of a marshy-fossil-soil belonging to the early period of the withdrawal of the Würm I glacial, these deposits following over the alluvia of the lower Prut terrace. Considering the flora, fauna and climate of the Pleistocene, N. N. Moroșan emplaces this culture at the beginning of the Würm I – Würm II inter-stage. The presence of the genus *Pinus* as well as of mammoth, Siberian rhinoceros, stag, auroch and urus fossil remains justified him to do so ⁴⁷. But our expedition this year shows that the upper Mousterian found here goes down to the beginnings of loessal deposits of the last but one glacial.

As for the emplacement in caves, taking into account the cryophilic fauna association and the sedimentological traits of the culture strata, we reached the conclusion that it began together with the first glacial stage of the Würm ⁴⁸. Our excavations at Baia-de-Fier and Boroșteni in Oltenia, at Ohaba-Ponor, Nandru and Peștera in Transylvania, as well as at Cheia in the Dobrudja ⁴⁹, proved that the occupation of caves by the Mousterians corresponds to a cold climate period. The fauna association, which includes the mammoth, the Siberian rhinoceros, the reindeer, the gulo, the bear, the lion and the cave hyena, as well as the presence of coals from the hearths, which attest the descent of conifer forests, are sound proof justifying such an emplacement.

Taking into account the thickness of Mousterian settlement-layers at Baia-de-Fier, where they reach 1.40 m, and at Ohaba-Ponor and Nandru, where

⁴⁶ N. N. Moroșan, *Nouvelles observations sur le pléistocène* . . .

⁴⁷ C. S. Nicolăescu-Plopșor, *Cercetările de la Mitoc* . . .

⁴⁸ N. N. Moroșan, *Nouvelles observations sur le pléistocène* . . .

⁴⁹ *Istoria României*, I, Chapter I.

they reach 2 m, the changes which occurred during the sedimentation and the appearance of a superior technique in the bifacial chipping of the hand axes, we came to the conclusion that our Mousterian Würm I stage in almost unchanged shapes and with almost the same fauna transcises the inter-stages Würm I – Würm II to reach even the beginnings of Würm II. In the deposits of the Würm I – Würm II inter-stage, at Peștera Spurcată of Nandru ⁵⁰, the first foliaceous forms, which some archaeologists consider to belong to the Szeletian culture appeared in a purely Mousterian medium; however we think it is rather a more advanced evolution stage of the bifacial chipping technique of the evolved Upper Mousterian, still preserving by tradition the technique of Abbevillean-Acheulean bifacial chipping, which preluded to the appearance of the Szeletian technique.

The collapse layers of all the caves investigated, corresponding to cold climate periods when frost action could give rise to such phenomena, also came to our assistance in geochronological emplacement. Thus, the second Mousterian stratum in Peștera-Curată, as well as the Mousterian layer with forms worked in the Szeletian technique found in Peștera Spurcată at Nandru, are covered by a strong collapse-layer in which fossil remains of *Hyaena spelaea* also appeared, a circumstance which allowed us to attribute these sterile deposits to the Würm II stage.

In all the caves excavated by us, we met no deposits older than Würm II. The lack of such deposits led us to the assumption that owing to the increase in the flow of the waters during the last interglacial, it again reached the level of the underground waters which wrought the caves, sweeping away all that lay in their path.

We know of older deposits than Würm I, especially by a cave near Brașov ⁵¹, (completely ransacked in the past and now destroyed), and by the finds at Betfia ⁵², where a strong association of mammals (the middle-Cromerian = the Betfian), was discovered at the bottom of some old caves. In none of these places were there any traces of human activity, which, in our opinion, is due to the fact that investigations were made in a hurry by amateurs or palaeontologists, who paid no attention to such proofs, sometimes working even with the aid of dynamite.

On Rumanian territory, like in Central Europe, the open-air settlements developed throughout the last glaciation, while in the caves, palaeolithic settlements are richer during the glacial stages, the caves being as a rule abandoned during the inter-stages.

The Acropalaeolithic

Lower Aurignacian. In the open-air settlements, wherever the extent of the excavations allowed more minute observation, we drew the conclusion that the deposits of the Würm I – Würm II inter-stage represent a period of

⁵⁰ C. S. Nicolăescu-Plopșor, *Rezultatele principale ale cercetărilor paleolitice în ultimii patru ani în R.P.R.*, in SCIV, II, 1–2, 1956, p. 7–35; Idem, *Le paléolithique dans la République Populaire Roumaine à la lumière des dernières recherches*, in « Dacia », N.S., I, 1957, pp. 42–60.

⁵¹ C. S. Nicolăescu-Plopșor, *Raport preliminar asupra cercetărilor paleolitice din anul 1956*, in « Materiale », V, 1958.

⁵² J. Ehik, *Präglaziale Fauna von Brassó*, in « Földtani Közöny », XLIII, 1913.

heavy rainfall which enabled the torrents to carry away from the slopes and deposit on the slightly sloping lower terraces finer or heavier allochthonous materials, according to their haulage force. The strips of clay, sands and even fine clay strata indicate here, nearly always, an inter-stage. The torrential deposits have precise features and cannot be mistaken. We met such interstadial torrential layers in almost all the terraces we excavated in the Bistrița Valley, at Bofu, Cetățica, Dîrțu, Podiș and Bistricioara ⁵³.

In these deposits in the Bistrița Valley, notably at Cetățica, we found the first traces of the Upper Palaeolithic, in which, alongside the new lamellar technique, tradition has preserved also older Mousterian and Clactonian forms and even the Szeletian bi-facial chipping technique ⁵⁴.

Middle Aurignacian

Owing to the excavations in the Bistrița Valley, its stratigraphic position is quite well known at present. It always appears in the basic part of the Würm II loessal deposits, usually affected by a strong congelifluction. The presence of such conifers as *Abies alba*, *Abies pectinata* and *Pinus silvestris*, as well as the *Pupilla muscorum* L., *Truncatellina opistodon* Reich., *Succinea oblonga* Drap., *Clausilia pumilla* Pfeif., *Vallonia ennienis* Gredler and *Trichia sericea* Drap. Gastropoda association elements, which are characteristic of a xerothermic regime, (some of them having today a boreal distribution), as well as the congelifluction at the base, enabled us to emplace these reddish-yellow loessal deposits in the Würm I stage. The same period is indicated also by the presence of cryophilic elements such as the mammoth, whom we met at Podiș, and the reindeer, whom we found at Bistricioara.

The Evoluted Middle Aurignacian

A more evoluted Aurignacian, which we considered to be a pre-Kostenkian Aurignacian, appeared towards the middle of the loess discoveries, belonging to the Würm II stage ⁵⁵.

Kostenkian

At the lower part of the Würm II loessal deposits, sometimes with rhythmic sedimentation, inter-crossed by ice wedges the Kostekian culture appeared, which evolves throughout the last inter-stage, formed of a reddish-brown fossil soil, representing a loaming zone with vertical prismatic detachment, penetrating not only in the last dusty-yellow loessal deposits belonging to the Würm

⁵³ Th. Kormos, *Püspökfürdői Somlyóhegy*, in « M. Kir. Földt. Int. », 1913. évi jelentése, Budapest, 1914.

⁵⁴ C. S. Nicolăescu-Plopșor, *Les phénomènes péri-*

glaciaires . . .

⁵⁵ C. S. Nicolăescu-Plopșor and co-workers, *Șantierul arheologic Bicăz*, in « Materiale », VI, 1959; *ibidem*, VII, 1960.

II stage, but even in the holocene deposits met both at Ceahlău in the Bistrița Valley and at Cremenea in the Buzău Valley, with the earliest Neolithic in Romania, considered to be a proto-Criș⁵⁶.

The Kostenkian is only rarely found in caves. It was discovered at Ripiceni in all its development phases, in a kind of cave, and at the Gura Cheii cave, near Rîșnov, in the deposits of the last glacial oscillation⁵⁷.

Whereas in the mountain valleys, the loessal deposits belonging to the last glaciation are rather shallow, in the plains and on the terraces of the big rivers they developed much more powerfully, sometimes reaching a thickness of dozens of meters. Things are different in the hill zone when the settlements are found on hillocks, on which the action of aeolian deflation and streaming had a bigger impact. Thus, the loessal deposits on the lower Danube terrace, at Malul Roșu, near Giurgiu⁵⁸, are four to five meters thick and that in the Würm III stage alone, in the upper part of which a prolonged Middle Aurignacian developed, contemporary with the Kostenkian in the north-eastern part of the country, in the Bîrsa Land and the Oaș Land; while at Lapoș⁵⁹ and Boinești⁶⁰, the difference between the culture strata, which are crammed in only several dozen centimeters, is almost imperceptible, because of the continuous deflation.

The Epipalaeolithic

Azilian. As concerns the Azilian hearths in Peștera Hoților at Băile Herculane, attributed by some researchers⁶¹ either to the pre-ceramic Neolithic, or to a so-called *Mesolithic*, we demonstrated, on the basis of the Rodentia association, that the human shelters to which the hearths in these caves belonged, date back to the early epiglacial⁶². Indeed, three of these Rodentia species are stenotope species found in high places, which can today be found in the Retezat and Făgăraș mountains at much bigger heights: *Microtus nivalis*, occupying a zone comprised between 1 800 and 2 200 m, *Microtus subterraneus*, between 2 000 and 2 400 m and *Clethrionomys glareolus*, which goes down to 700 m.

The trifling height differences among the places where these species live today compared with their ancestors, who lived at Băile Herculane, are telling enough. The descent of Alpine elements to only 200 meters shows that this was their characteristic biotope: the mountain gap was near and on the present gap eternal snows still persisted, a proof that the Carpathian glaciation had not yet come to an end⁶³.

⁵⁶ *Ibidem*.

⁵⁷ C. S. Nicolăescu-Plopșor, Al. Păunescu, I. Pop, *Săpăturile din peștera Gura Cheii-Rîșnov*, in « *Materiale* », VIII, 1962, 113–118.

⁵⁸ C. S. Nicolăescu-Plopșor, P. Coteț, I. Ilie, *Noi observații geocronologice la Malul Roșu*, in « *Materiale* », IX (in the press).

⁵⁹ Florea Mogoșan, *Șantierul de la Lapoș*, in « *Materiale* », VIII, 1962, 145–150.

⁶⁰ C. S. Nicolăescu-Plopșor, Elena Kovács, *Cercetările paleolitice din regiunea Baia Mare*, in « *Mate-*

riale », VI, 1959.

⁶¹ D. Berciu, *Neolitic preceramic în Balcani*, in SCIV, IX, I, 1958, pp. 91–100; *Idem*, *Asupra protoneoliticului Europei sud-estice*, in « *Omagiul lui C. Daicoviciu* », Bucharest, 1960; *Idem*, *Quelques problèmes communs de la préhistoire de la Roumanie et de celle de la Bulgarie*, in « *Izvestiia-Institut* », XXIII, 1960.

⁶² C. S. Nicolăescu-Plopșor, *Discuții pe marginea paleoliticului de sfârșit și începuturilor neoliticului nostru*, in SCIV, X, 2, 1959, pp. 221–237.

⁶³ *Ibidem*.

In support of this assertion comes the fact that these hearths are placed right under the dusty deposits, which are for us a "seal of the Palaeolithic". As, following stratigraphic research in caves, these deposits were attributed to the second epiglacial phase, notably the Alleröd, the Herculane hearths were emplaced in the older Dryas.

As to the Băile Herculane hearths, recently certain analogies were established for them with the layers VIII–IX of Crvena Stijena in Montenegro: not only the material culture in which the bevelled, arched blade tip is the guiding element of the complex, but also the fauna association of the Rodentia (in which the *Microtus nivalis* is present, as well as of other Mammals (from which the *Ursus spelaeus* is missing), all point to the early Holocene. The fact that the Crvena Stijena cave is 2° Lat. southward, is compensated by the height, which is 700 meters above sea-level ⁶⁴.

As for the geochronological emplacement of the Swiderian in the Ceahlău range, in the absence of establishments and analyses, we applied to it the geochronological scheme obtained by vaster observations in the Bistrița Valley, and to draw the conclusion that the camp of Swiderian hunters occupied Poiana Scaunelor during the early withdrawal period of the Würm III glacier, therefore in the epiglacial, when the Pleistocene merged into the Holocene ⁶⁵. The attempt to attribute the Băile Herculane hearths to a preceramic Neolithic ⁶⁶ and the unnatural emplacement of the Rumanian Azilian and Swiderian in a so-called "Mesolithic" period ⁶⁷, prove an utter failure, lacking any scientific foundation.

The Pre-Neolithic

As far as the Campignan is concerned, which recently began to be of interest to us, it appears in a later phase of the Holocene as a typical proto-Campignan, which then penetrates in the early Neolithic, and, what is more, the Campignan tradition is preserved up to the Cucuteni painted pottery culture.

As for the chronological links between the Palaeolithic of Rumania and the Palaeolithic of neighbouring countries we have roughly ascertained that over a fairly extended area around Rumania, namely from the Don to Central Europe, the chronology of the Middle Palaeolithic and Acropalaeolithic development stages is about the same ⁶⁸. But, as there can be no question of perfectly synchronic and synstadial cultures over such a vast area, it is only by means of micro-stratigraphy that we may obtain a more thorough understanding of the various migrations and influences.

⁶⁴ A. Benac, M. Brodar, *L'Abri Rouge*, 1956 and I. Racovek, *Les mammifères pléistocènes de l'abri « Crvena Stijena » près de Petrovici, Monténégro*, in « Glasnik-Sarajevo », XIII, 1957, p. 75, pl. XXVII.

⁶⁵ N. N. Moroșan, *Nouvelles observations sur le pléistocène* . . .

⁶⁶ D. Berciu, *Neolithic preceramic* . . . ; Idem, *Asupra protoneoliticului* . . . ; Idem, *Quelques problèmes* . . .

⁶⁷ *Istoria României*, I, Chapter I.

⁶⁸ H. Delaporte, *Notes de voyage leptolithique en Tchécoslovaquie*. in « Rivista di scienze preistoriche », XIV, 1959, pp. 19–57; H. Gross, *Die geologische Gliederung und Chronologie des Jungpleistozäns in Mitteleuropa und den angrenzenden Gebieten*, in « Quartär », 9, 1957, p. 3; Karel Valoch, *Lösse und paläolithische Kulturen in der Tschechoslowakei*, in « Quartär », X–XI, 1958/59, pp. 115–149.

Taking into account the fact that climatic variations during the Anthropozoic, however slight, left a sure imprint on the deposits contemporary to them, we shall be able, by investigating and interpreting them, to obtain an emplacement, more restricted in time, of the development stages of the Palaeolithic in Rumania and, thus, to the establishment of the precise relationship with the neighbouring Palaeolithic.

Owing to the geographical position of Rumania this is the first periglacial zone, so that the loess, with its different formations, covers large areas of the country. And, since, according to some observations, loess stratigraphy becomes increasingly clear towards the Centre and East of Europe, compared with the West, where the loessal deposits suffered more from erosive and conglufluctual actions⁶⁹, the loess in Rumania – which has so much to tell – is waiting yet for investigation and understanding.

Future investigations will have to follow as often as possible the succession of the associations of malacological fauna, – which have proved of real use in establishing the geochronology of loessal deposits – in the loess sections, no matter whether these contain remains of the Palaeolithic culture or not.

Stress will also have to be laid upon Rumania's anthropozoic travertine deposits, so rich in mollusc shells and plant prints, which have not yet been studied minutely.

Only thus will it be possible to obtain a synoptic table of Gastropoda associations, corresponding to the various deposits or calcareous or loessal tuffs, valid for the various regions and in accordance with the latitude and height of the investigated zones.

Likewise, the huge limestone ranges of Rumania pierced by numberless caves, prompt us to study them and interpret their sediments with the aid of all allied sciences which can be of help to us. Rumania is one of the countries which are richest in caves, having at the same time the smallest number of caves investigated from an archaeological viewpoint.

The sporo-pollinic research, so far restricted to the study of peat-bogs, must be insistently carried out on deposits containing Palaeolithic elements and on those found in caves and in the open air.

The anthracothomical measurements and the tests concerning granulometry, calcium carbonate contents, heavy minerals and humus will soon also contribute to a better understanding of the geochronology of the deposits in which Palaeolithic testimonies are preserved in Rumania.

C. S. NICOLĂESCU-PLOPȘOR

⁶⁹ H. Gross, *op. cit.*