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Sommaire

ARTICLES ET ÉTUDES

NOTES ET DISCUSSIONS

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Amber Deposits in Romania, with Particular Emphasis on Those Located on the Eastern Side of the Carpathians (Bibliographical Considerations and a few Field Investigations)

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Abstract: During the archaeological excavations of 2002, in the Palaeolithic site of Poiana Cireșului (north-eastern Romania) was discovered a fragment of amber in the first Gravettian layer. Recent investigations in this settlement have revealed four archaeological layers: one Epigravettian layer and three Gravettian ones. The first Gravettian layer, which is contemporary with the Last Glacial Maximum, has provided the richest habitation of the site, being dated around 20,000 B.P. In order to identify the provenance of this raw material, the research included several phases. The first stage of our research involved a re-evaluation of the amber deposits described in Romanian geological literature, beginning with the oldest mentions that had been sometimes overlooked or completely forgotten. The second stage involved carrying out field investigations with a view to verifying the deposits located in the vicinity of the Poiana Cireșului site. The results of these two stages are to be described in this article, while the physico-chemical analyses will be published in a future study.

Keywords: Gravettian, Romania, symbolic objects, amber, raw material

Introduction

In Romania, amber ('*chihlimbar*' in Romanian) is more commonly known as '*ambră*' or even '*succin*' and, paradoxically, less under the name of '*rumanit*', used particularly by geologists. The name *rumanit* was given to the amber of Colți, Buzău County, by Otto Helm in 1891 (quoted by C. Istrati, 1895a, b; G. Murgoci, 1902; 1903; O. Protesco, 1937) (table 1). The interest in this mineral among archaeologists came about with the

first discoveries of amber artefacts or of mere raw material samples found in archaeological contexts. Today, there is a large number of such finds in Romanian prehistory and the Middle Ages and the efforts of Romanian archaeologists to determine the sources of origin of this raw material type are highly commendable for they have resorted to the most modern physico-chemical methods of investigation. There is an entire literature, particularly valuable in this respect, which we shall appeal to in a future study.

NAME	THE DEPOSIT WHICH PRODUCE THE NAME	THE AUTHOR OF THE NAME
Rumanit	Colți (jud. Buzău)	O. Helm (1891)
Almashit, Almașita	Valea Almașului (jud. Neamț)	G. Murgoci (1924)
Schraufit	Vama (jud. Suceava)	I. V. Schröckinger (1875); O. Protesco (1937)
Muntenit	Olănești (jud. Vâlcea)	C. I. Istrati, M. Mihăilescu (1923); G. Murgoci (1924); O. Protesco (1937)
Telegdit	Săsciori (jud. Alba)	L. Zechmeister și V. Vrabely (1927); O. Protesco (1937)

Tab. 1- Specific names of amber varieties from Romania

Our research on amber sources in Romania has been prompted by the discovery of a fragment of amber in the Palaeolithic site of Poiana Cireșului. The settlement is located in north-eastern Romania (more specifically in the city of Piatra Neamț), on the right side of the Bistrița valley. Recent investigations have revealed four archaeological layers: one Epigravettian layer and three Gravettian ones. The first Gravettian layer, which is contemporary with the Last Glacial Maximum, has provided the richest habitation of the site, being dated around 20,000 B.P. A number of adornments and art objects that come from this layer have turned Poiana Cireșului into an important settlement which helps understand the symbolic behaviour of Palaeolithic communities in Romania.

The amber piece was found in the first Gravettian level, in section IV excavated during the research campaign of 2002. It is 4.5 cm long and 3.5 cm wide. The colour is reddish, particularly expressive. It has exfoliations on its surface and, as it is fragmented, we cannot say with precision what they represent. In fact, amber is known to be a raw material that has been rarely found in Palaeolithic sites and there are few finished objects made of this material. Due to the preservation manner, the presence of amber in settlements is mostly in the form of pieces or fragments, without a clear morphology, though its symbolic and special character is evident.

In Romania, amber was first mentioned in a Palaeolithic site by J. Teutsch (1914) when he published the results of the 1911 excavations of Sita Buzăului, Cremenea point; he remarked, without giving details, that J. Graff had harvested a small piece of amber from the culture layer. The classification of materials as Aurignacian was made only based on the typology of tools, with no absolute dating. The amber piece discovered at Poiana Cireșului is the only one of this type found in a definitely Palaeolithic stratigraphic context in Romania. Also, in Eastern Europe, most of the Palaeolithic amber findings are concentrated in Mezinian settlements from Ukraine, dated around 14,000-15,000 BP: Gontsy, Dobranichivka, Mejiriche, Semenivka 2, Ioudinovo, Chulatovo 2, Mezine, Osokorivka (level 2), Kaistrova balka 2 (all located on the Dnieper) and Barmaki (located in Volhynia) (L. Iakovleva, 2016, p. 10). Apart from these, older finds are very scarce in Eastern Europe. In addition to Poiana Cireșului, we may also mention an amber pendant from the Cosăuți site (P. Noiret, 2009, p. 270), found in level 3a dated around the age of 17,000, and a few other pieces, two of which appear to be fragments of

pendants, found in layer I from Mira I (Ukraine), dated 27,000 years (V. N. Stepanchuk, 2005, p. 37; J. Hoffeker at al., 2013, p. 63).

The provenance of amber found in several archaeological contexts in Romanian sites was identified by comparing the physico-chemical analyses to samples from two significant raw material sources: Baltic amber and *rumanit* amber from Buzău area. The predominant comparison with these two sources started from the assumption that they are the richest deposits, therefore prehistoric communities had easier access to them, either directly or through exchanges. As regards prehistory, particularly the Palaeolithic, such perception is not the most appropriate, for in these very remote periods even poorer deposits could satisfy the needs of those communities. It has already been demonstrated that the Palaeolithic people would exploit raw material sources extremely pragmatically due to their remarkable abilities in recognising the properties of the various rocks. Such a situation may have very well occurred all the more so as these were exotic raw materials, like amber, silicified wood etc., in addition to unusual objects (fossils, curiously coloured rocks) often introduced in the site as forms of symbolic manifestation.

Starting from these observations, the first stage of our research involved a re-evaluation of the amber deposits described in Romanian geological literature, beginning with the oldest mentions that had been sometimes overlooked or completely forgotten (fig. 1). At least for Neamț County, where the site of Poiana Cireșului is located, we deemed this attempt as essential, before reflecting upon the remote supply sources, less accessible during the Palaeolithic, when exchange networks were probably not so well established as in later periods. The second stage involved carrying out field investigations with a view to verifying the deposits located in the vicinity of the Poiana Cireșului site. The results of these two stages are to be described in this article, while the physico-chemical analyses, which are underway and which are meant to help identify the provenance of amber, will be published in a future study.

Amber deposits in Romania

In this subchapter, we shall refer only to the identification of deposits from a geological point of view and less to the physico-chemical analyses, carried out especially in recent times.

The most famous region, in terms of the richness of amber deposits in Romania, is located in the Buzău area, characterised by numerous fossiliferous points mentioned long ago. Due to the large occurrence of amber in the Buzău area, this region has come to be assimilated with the notion of Romanian amber (fig. 1).

There are countless records showing that local people were familiar with the Buzău amber, which they used to call *succin*, such as the numerous contributions made particularly by C. I. Istrati (1895a) and G. Murgoci (1902). Apparently, the oldest written attestation occurred due to Legeune's translation of S. Raicevich's work, *Descriptione de la Moldavia et de la Valachia,* 1777 (p. 104) - *Voyage en Valachie et en Moldavie* (p. 47): "J'ai vu dans les mains de quelques particuliers des *morceaux d'ambre jaune trouvés sur la superficie des vallons*" (C. Istrati, 1895a, p. 60). As regards the attestation of amber in Romania, the name of Count A. de Demidoff is invoked. On page 178 of his work *Voyage dans la Russie meridionale*, published in 1854, he would mention the *succin* or yellow amber of Colți and Boilor village that he had become acquainted with while journeying through Wallachia in 1837. Similarly, in 1844 (*La Roumanie,* Paris), Count J. A. Vaillant would mention the yellow amber of Sibiciu, Colți and Boilor village (Buzău County) and the black one of Câmpina and Telega (C. Istrati, 1895a). However, one should not rule out earlier attestations of amber around the Buzău area. Objects made of black (or rather dark brown) amber of Buzău, such as cigarette cases, beads or chaplets, were known in Constantinople as well. It is certain that the brown and black amber of Sibiciu was present at the 1867 Paris exhibition. As for the Buzău amber, of older testimonies of its existence, the opinions of some foreign specialists of those times seem more relevant to us. For example, C. Zinchen, who had visited the Vienna exhibition in 1873, would publish, ten years later in Leipzig, the work *Die geologischen Horizonte der fossilen Kohlen*. Here, under the name *Bernstein*, he established the inclusion of Romanian amber into the group of the *succin*, which is said to be "yellow-brown and transparent, yellow-brown and translucent to black, harder

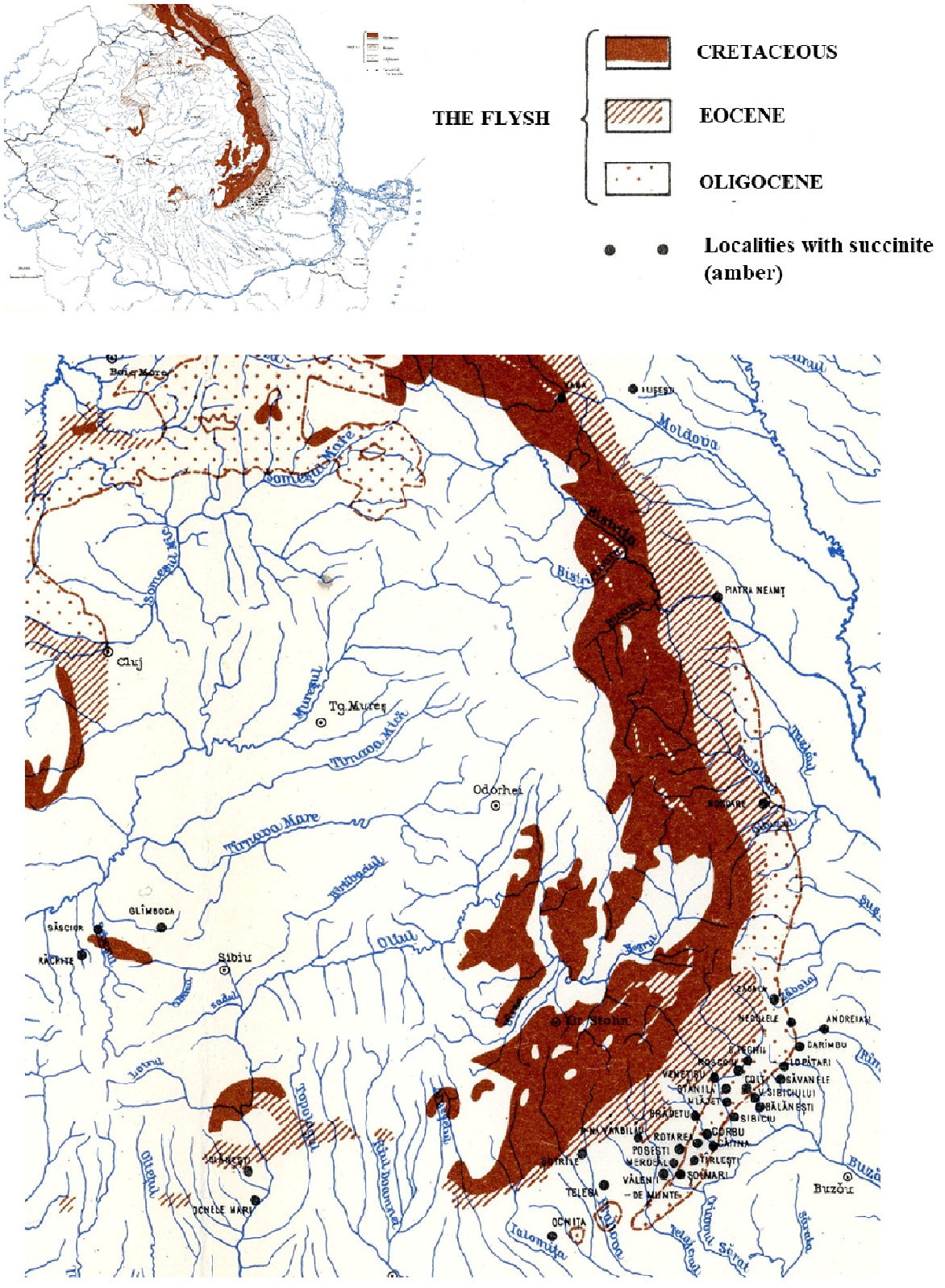


Fig. 1 - Amber deposits in Romania (modified after G. M. Murgoci, 1957)

than the *succin* from the Baltic Sea" ("galben-brun și transparent, galben brun și translucid până la negru, mai dur decât succinul din marea Baltică") (C. Istrati, 1895a, p. 62). In his turn, on seeing the Constantinople objects made of Romanian black amber, known here under the name of *gagat*, A. Frenzel would state, in 1878 in *Naturw. Beiträge zur Kenntniss des Caucasusländer* von Dr. Scneider, Dresden (p. 140), that this was, in fact, some kind of lignite and that, in Romania, what could be found was actually "light-brown to dark-brown and grey, yellow and transparent" *succin* ("culoare brun deschis până la brun închis și cenușiu, galben și transparent) (C. Istrati, 1895a, p. 62).

Among the Romanian geologists, the first one to speak about the Buzău amber was Gr. Ștefănescu in his *Curs elementar de Geologie* ('Elementary Course of Geology'), published in Bucharest in 1890 (G. Murgoci, 1902; O. Protesco, 1937).

Here are, as follows, the locations around the Colți deposits where amber was more or less systematically exploited in 1895, as mentioned by C. Istrati (1895a, p. 65-66):

- Colți commune – on the valley of the Colți and especially on its tributaries, the Boului and Alunișului valleys;
- Nehoiașu commune - Venetișului valley, a tributary of the Bâsca Rosilei river;
- Gura Teghei commune – the valley of the Roșcoiu, a tributary of the Bâsca Rosilei river;
- Goidești commune – Frasinu headwater, a tributary of the Sărățelul Bălănești lor river, particularly at Curmătura Purecilor;
- Cătina commune – Corbului headwater, a tributary of the Bâsca Chiojdului river.

In his turn, G. Murgoci (1902) increased the number of places from the Carpathian Curvature by such mentions regarding the presence of amber as: Vălenii de Munte, on Zâmbroaia valley, in the localities of Medealu and Frânghesci; near Corbu village, in most of the outcrops provided by the ravines along the Bâsca Chiojdenilor river and its tributaries Budarul, the ravine of the Ghinder nearby Cătina commune, on the valley of the Moșoiu, Mănăilă valley and Ana valley at Rotarea (where amber occurs in a slightly hard yellow clay). The amber deposits of Corbu-Cepturașu-Cătina-Rotarea-Posești-Tîrlești-Șoimari-Văleni de Munte are located at the extension of those of Mlăjetu-Sibiciul: it is those occurrences on the margin of the Oligocene anticline of Vălenii de Munte. At Corbu, whenever amber is found in a layer of clay, there is also a layer of bituminous coal, too. Similarly, at Izvorul Budarului, the amber deposit lies in menilithic schists in which there is always bituminous black coal. In the environs of Colți commune, there are additional points such as Poiana, Motoca, Măgădaru, the bank of the Lăstun, Boziorului valley in Găvanele commune (very large-sized samples) Cornetu hamlet. Towards Râmnicul Sărat, amber is mentioned on the Martinului brook, in such points as Căpățâna Zimbrului, Carâmbu-Șoimăria, Piatra Penei, Groapa cu paltini, Purcelu, Ariniș, Stejicu, Piatra lungă, Vulturul. Towards the Putna valley, it occurs at Piscul Costei, on the Zârnov brook, the Zăbalei river and the Nereju hill. In these regions, amber deposits occur in sandy grey clays inside the sulphurous layers which are very rich in flint pebbles as well. The thin layers of white sandstone with fine granulometry, from the deposits of Colți, Sibiciu and Mlăjet area, contain fine intercalations of black polished bituminous coal and conchoidal fracture which, whenever they join, are a good indicator of the existence of amber. Geologically, G. Murgoci (1902) sees some kind of outcrop lines of amber in a primary position, which is actually either partially eroded anticlines, as at Niculele-Lopătari-Găvanele-Sibiciu, Colți-Mlăjetu and Stănila, or synclines that are attributed to the Upper Oligocene, for instance along the valley of the Băsca. The existence of amber *in situ* in Oligocene deposits of this type seems a certainty for this area. The recovered samples are substantial, of considerable sizes, with shapes suggesting a solidified viscous matter, with some kind of cortex conserved as a testimony of the fact that samples were not transported through reworking processes. The discovery of amber in clays and sandstones, alongside laminar sediments of bituminous coal, shows that amber samples could be transported over short distances and deposited in calm watery areas, along with vegetal residues that would later turn into coal.

As regards the Buzău County amber, it is considered that the samples found do not exceed 4-5 kg in weight, have a density that ranges between 1.048 and 1.105, hardness is over 2.5 without

reaching 3, the fracture is irregular conchoidal, its colour is extremely diverse, varying from transparent light yellow to dark red, even garnet, or from smoky to black, and less green or dark blue. Very often, several colours combine in only one piece (C. Istrati, 1895a). The chemical analysis of a sample taken from the Buzău area, black, with bituminous aspect and high content of hydrogen (13.28 %) and carbon (81.17 %), pointed to the presence of a bituminous kind of amber in this region (C. I. Istrati, 1897; 1898).

In 1902, G. Murgoci would describe the Buzău '*rumanit*' as containing approximately the same percentage of succinic acid as that from the Baltic Sea; it is usually brown, even red and black, very often with green or blue glows, transparency with brown fractures, hardness between 2.5 and 3, melting at higher temperatures than the Baltic amber. Local people curiously refer to altered samples as "burnt" or "frostbitten"; they have many fractures, they crash into pieces and are red. What distinguishes the Buzău *succin* is the kind known as the nacre, which stands out through its beauty and brightness that is due to some particular structure (G. Murgoci, 1902). There are several opinions that the Buzău *succin* is, by its beauty and variety of colours (about 160 nuances), far more superior to the Baltic amber (C. I. Istrati, 1901; G. Murgoci, 1924).

Genetically, the Buzău amber is similar to that from the Baltic Sea region, in that it formed in the same geological period, as a result of the existence of forests dominated by the pine species called *Pinus succinifera* (in reality, the formation of the so-called *succin* was also due to the presence of other species of pine and even spruce, etc. - see O. Protesco, 1937); therefore, it contains about the same proportion of succinic acid, hardness and melting point are similar, specific weight 1.06-1.10, index of refraction of 1.4377 and higher melting point, of 300°-350° C. Instead, it is darker in colour, from light yellow to red and garnet or black, more rarely green or with bluish tints. It has irregular, generally conchoidal, fracture (C. I. Istrati, 1895 a, b; G. Murgoci, 1902). As regards the structure and physico-chemical composition of various amber deposits, G. Murgoci (1902) would reach several conclusions that were surprising for the period in which they were formulated. The various amber varieties would not result from the primordial nature of the original resin, but are rather the result of external factors. The initial resin was a mixture of components and inputs of carbohydrates whose composition changed so considerably and differently by fossilisation that it is difficult to find criteria of differentiation of the various amber deposits. Consequently, the physico-chemical properties are not sufficiently revealing features to allow the classification of this mineral in a series of varieties.

The importance of the amber deposits from Buzău County and particularly of those from the Colți area has not ceased to draw the geologists' interest up to recent times. The various studies have contributed to a better understanding of the features of deposits here (D. Grigorescu, 1925; 1930 a, b; 1931; 1932; V. Ghiurcă, 1999; V. Ghiurcă, L. Drăgănescu, 1986; V. Ghiurcă, N. Vavra, 1990; Neacșu A., 2006; Neacșu A., Dumitraș D. G., 2008).

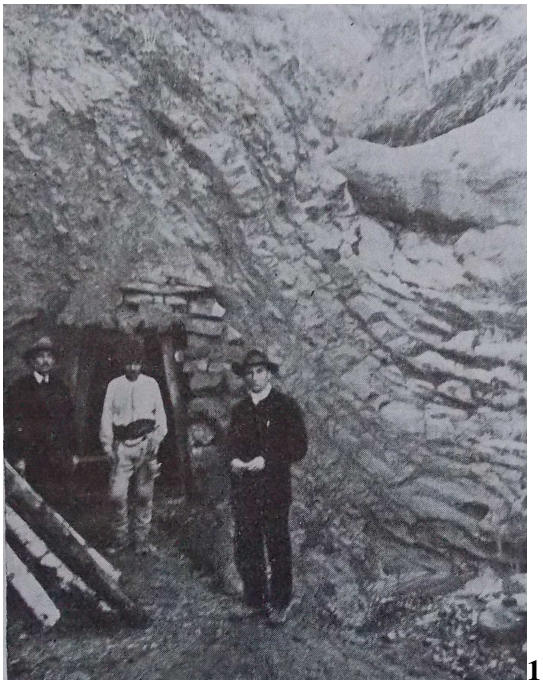
The amber on the outer rim of the Carpathians can usually be found in the Oligocene either in a siliceous sandy layer, often with pure quartz grains, known as the Kliwa sandstone, or in a number of dark brown-dark blue marly clay layers called menilithic schists or bituminous schists (G. Murgoci, 1924).

Romanian *rumanit* or *succin* was also reported in the Teleajen valley (C. Istrati, 1898). According to G. Murgoci (1903), in this area, the amber mentioned by C. I. Istrati (1895b) at Poiana (Verbilău), Chiojdanca and Șoimari, where it was discovered during excavations for oil, dates from the Eocene epoch. North of Câmpina, at Șotrile, an amber sample was recovered from an oil well; it was 15/10 cm in size, blue-green and yellow (on the soil surface) (C. Istrati, 1895a). The Câmpina amber, if not mistaken for the ozocerite, may have been resedimented in the alluvia transported from the flysch area (G. Murgoci, 1903). In 1888, H. Crémer would speak about the existence of amber in the valley of the Cricov river; similarly, in Dâmbovița County, small amounts of amber may have been found at Ocnița, during the excavations of oil wells (C. Istrati, 1895a). It can only be in a secondary position because here we have a saliferous anticline that is far from the flysch area (G. Murgoci, 1902).

The Telega black amber was reportedly mentioned for the first time in 1844 by J. A. Vaillant, later in 1888 by H. Crémer in *Richesse minerale de la Roumanie*, Liège (p. 17), as being a

fragile amber, that could not be processed. In 1895, following his own investigations, C. I. Istrati (1895a) would doubt the existence of amber at Telega, assuming it might have been mistaken for the charcoal from salt, which was in the form of lignite compact nodules. The presence of amber at Telega might, however, be justified because it is here that the Vălenii de Munte Oligocene peninsula extends (G. Murgoci, 1903).

As regards the Buzău amber, in 1882 one could only speak about the exploitation of a few dozens of kilograms a year (C. Istrati, 1895b). In 1890, there were controlled exploitations at Colți and Stănila hamlet (Mlăjet commune) as well, where apparently a larger amount than that of Colți was being extracted. The galleries were small-sized; at Colți they were 6-7 m deep, 1.5 m high and roughly 1 m wide, without protection systems for declines. It appears that the galleries of Stănila were somewhat safer, for they were protected by beams. The galleries were dug in marls less than 10 cm thick and thicker sandstones interlaid with yellow thin layers and others of only a few millimetres thick, shiny black, made up of a substance similar to coal, containing 64.12 % carbon. This structure is extremely important because it usually signals the existence of amber. On the whole, the amounts extracted during this period were indeed modest at the end of the year: Colți = 50 kg, Roșcoiu = 6 kg, Frasinu = 8 kg, Venetisu = 4 kg, Corbu = 4 kg, and gravels of other rivers = 10 kg. A systematic exploitation would have probably resulted in greater quantities (C. I. Istrati, 1895a).



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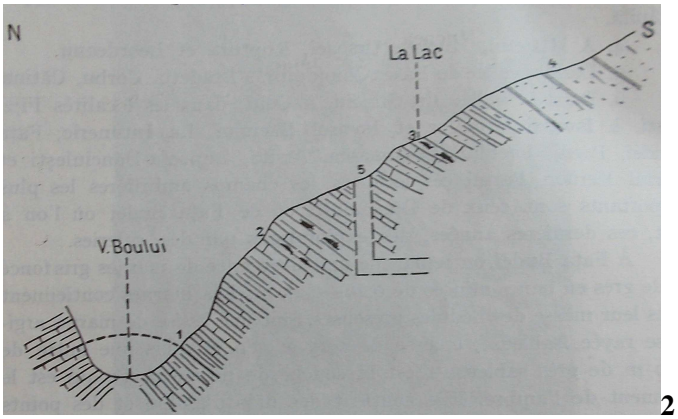

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Fig. 2 - A gallery carved into the Oligocene layers from Fața Budei point at Colți, and a stratigraphic profile from Boului valley, at La Lac point, with the following sequence: 1. sandstones and dark clays; 2. dark gray marl with greenish shades, sandstones and shales with nest of amber; 3. sandstones and gray-brown clay with amber; Kliwa sandstones; well and horizontal gallery made for the exploitation of amber (after O. Protesco, 1937).

The difficulty in exploiting amber in Romania lies precisely in the geological structure of the Oligocene and, generally, of the Carpathian flysch. On the Baltic Sea coast, the layers containing amber are horizontal, while in our country, due to folding, these layers are inclined at approximately 75° and tend to sink deep so that it becomes difficult, expensive and uneconomic to trace the possible streaks. On Baltic shores, the amber layers are at the surface, sometimes against the waves that dislocate it from outcrops and disperse it on the beach. Even under such conditions, G. Murgoci

(1902) points out the efforts made by the local people from the Carpathian Curvature area to obtain amber. At Catina a society called "*Chilimbarul*" was set up to exploit amber at Izvorul Budarului, where approximately one kilogram of amber, more rarely even three, resulted from one cubic metre of sediment. This production was not to be neglected and was not far inferior to that from the Baltic area (G. Murgoci, 1924).

Other times, square-shaped wells were made about 10 m and even over 15 m deep, from which 2.5 kg/square metre were often recovered in the form of "nests" or fissured and dispersed pieces. More rarely, attempts to exploit through horizontal galleries were made (O. Protescu, 1937) (fig. 2). At Colți, after WWI, there was a better organised exploitation company called "Ambra", which would exploit the deposit here rationally and methodically, having leased 700 hectares at Colți, Mlăjet, Gornet etc. (G. Murgoci, 1924). In 1923, "Ambra" company extracted 67 kg, and in 1924 it reached 130 kg (P. A. Ianculesco, 1928). Given the systematic exploitation of amber and the occasional recovery of smaller samples, especially from ravines and river valleys, annual recovery might have been about 500 kg (G. Murgoci, 1924).

Moving westwards, we find that there are no amber deposits between the Ialomița and the Olt rivers because the flysch is very limited. The occurrence of Eocene and Oligocene strata west of the Olt river accounts for the existence of isolated amber deposits, such as those near Olănești (G. Murgoci, 1902). The Olănești amber is first mentioned by C. Zinchen in *Die geologischen Horizonte der fossilen Kohlen*, in which he describes it as a darker *succin*. In 1888, H. Crémer also mentioned it in *Richesse minerale de la Roumanie*, Liège. In 1867, the presence of transparent yellow amber was reported in dark-blue clay on the left side of the road entering Olănești, as well as at Cheia, in the north part of the town (C. Istrati, 1895a). The Olănești amber underwent a number of chemical analyses which were historically important for the period in which they were carried out, as they revealed a high content of carbon (85.42 %) (C. I. Istrati, M. Mihăilescu, 1923). These analyses come to complement similar ones performed and published by Paul Dahms in 1901 (O. Protesco, 1937).

G. Murgoci (1902) found the Olănești amber only in lenticular shape, no more than 10 cm long and 3 cm thick, with slight consistency, breaking down into pieces with an oily aspect. It is yellow, with red-tinted cracks, high fluorescence with dark-olive shades. Its beauty lies in the colour of the inner parts which, in transparency, are yellow, while the peripheral parts and even the cracks are cherry-red. It generally has the aspect of 'burnt' amber which is often easily breakable. It is as hard as the Buzău amber, namely over 2.5, but it melts at a lower temperature, 165° C. Through its chemical structure, the Olănești amber resembles the *copalite*, in that it has a high content of carbon (over 85%); and if we rule out its fluorescence and optical anomalies, its physical properties bring it closer to the *gedanite*, a friable variety which softens and then melts at temperatures of 140°-180°. The Olănești amber lies in a sandy layer above a layer of sandstone with nummulites (G. Murgoci, 1902). Through its general features, it is clearly different from *succin* and *rumanit*. Due to these differences and to its particular chemical composition, the Olănești amber got a special name – the *muntenit*. According to a number of authors, such as G. Murgoci (1924), O. Protesco (1937) etc., the name *muntenit* was given by C. I. Istrati and M. Mihăilescu in their work published in 1923. Unfortunately, the name *muntenit* given to the Olănești amber is not to be found in the mentioned work. Not far from Olănești, at Ocnele Mari, L. Mrazec and W. Teisseyre (1902) would report the presence of pieces of (Oligocene) *succin* in a secondary position, in Miocene salt deposits. A. Rabichon (1938) would state that the amber in this area was forming in the Titești-Brezoiu-Olănești depression. The amber deposit was reportedly stretching about 12 km beyond Cozia, as far as the contact with the Carpathian Crystalline and over a distance of 10 km from the Olt river to the west.

Should one move to Moldavia, following the Carpathian flysch line, one would ascertain the rather significant presence of amber, especially in those areas where the Eocene and Oligocene crop out. The discovery of *rumanit* at Mosori (= Mosoare, a locality that nowadays is part of the town of Târgu Ocna), 4,600 m north of Tg. Ocna, is quite certain, as those samples (one of which reaching even 30 cubic metres), found during the construction of a tunnel for the Tg. Ocna - Moinești railway, were chemically analysed by

C. I. Istrati (1897) and described as being fine amber, glassy in aspect, yellow with darker portions and greenish reflections, quite hard and with conchoidal fracture. It was also mentioned that it was rich in carbon and sulphur perhaps because it had been discovered in the same layer as the ozocerite. Actually, the amber here was found in the 8 metre-thick deposit attributed to Kliwa sandstones (G. Murgoci, 1902). Furthermore, it was specified that small amber pieces had been recovered from the Tg. Ocna mines, while in Andrieși village, 40 km far from Odobești, during the excavation of some wells, a bucket of amber lumps, reaching 3-4 cubic metres, had been discovered at a depth of approximately 20 metres (C. I. Istrati, 1895a; P. Poni, 1900). Because the village of Andrieși is located outside the flysch limit, it seems plausible to assume that the samples are reworked, maybe even in the alluvia brought by the rivers emanating from the flysch (G. Murgoci, 1902).

In Bacău County, according to A. Rabichon (1938), amber is found between Slănicul Moldovei and the valley of the Tazlăului Sărat, upstream of the Zemeș brook.

In 1875, at Vama, located in the valley of Moldova between Gura Humorului and Câmpulung Moldovenesc town, a fossil resin was mentioned to have been found in the Carpathian sandstone; its discoverer I. V. Schröckinger (cited by O. Protesco, 1937) named it *schraufit* in memory of one of his professors from Vienna (G. Murgoci, 1902). The amber found at Vama is blood red, garnet, brown or blackish-red, translucent, with a semi-conchoidal fracture. Its carbon content is lower than other samples, of only 73.33 %. Hardness is between 2.0 and 2.8, specific weight 1-1.2, melting at 326° C. One should not exclude the possibility that this is a much degraded sample. The *schraufit* has a very thick, coarse, dark-brown or red alteration crust which sometimes affects an entire sample. The amber is often fissured, friable and breakable, hard to process. Due to these characteristics, it is considered burnt *rumanit* (G. Murgoci, 1924). In the Neogene deposits from Bukovina, the presence of amber was first reported in 1854 by F. Herbich (cited by O. Protesco, 1937) near Cernăuți at Ciuca (Zuczka) and west of Suceava at Ilișesci, considered by G. Murgoci (1902) to be reworked.

Amber deposits in Neamț County

During the interwar period, the deposits in Neamț County were important enough, so that a phrase was coined, "ambră de Piatra" (i.e. "Piatra amber"), in order to distinguish it from the Buzău amber. In fact, the Neamț amber is somewhat different from that of Buzău, in that it might always be found in the Kliwa sandstone and the menilithic schists, often extremely metamorphosed schists (G. Murgoci, 1924). There are opinions according to which the amber of Neamț County may have actually formed during the Cenomanian and the Senonian and later, following processes of overthrusting, were transported to Paleogene deposits, from which they cropped out on the valleys of the Calu-Iapa and Almaș (A. Rabichon, 1937).

In the Almaș valley, G. Murgoci (1923) mentioned the existence of amber during the Oligocene and related it to the presence of Kliwa sandstones, the conglomerates and the extremely metamorphosed menilithic schists here, as well as to the fact that amber samples, which were sometimes green, were accompanied by bituminous charcoal. G. Murgoci was apparently so impressed with the amber here that he felt compelled to give it an eponymous name, *Almashit* (G. Murgoci, 1924; L. J. Spencer, 1931). A. Rabichon (1938) would call it *almașita.* If green, the *almashit* in the Almaș valley contains 82.15 % carbon, while the black one contains 79.45 %, thus falling into the category of ambers with a high content of this chemical element. In the Almaș valley, the *almashit* was recovered from Groapa Malaia area. The yellow samples, similar to those from Buzău area, underwent profound changes in this region, resulting in two varieties that are characteristic of this area. There is a type of amber which is greenish-blue or greenish-brown, even black, with a conchoidal fracture, glassy aspect and high fluorescence with red or ruby reflections, a hardness that is superior to that from the Carpathian Curvature, still very easy to process. When broken, it gives off a bitumen smell. The second kind of *almashit* has a dark black chocolate colour and a highly glassy glow, conchoidal fracture, quite brittle and friable, even though it is of medium hardness. Generally, it is difficult to process. The *almashit* is nothing but a 'burnt' variety of *succin* or *rumanit* (G. Murgoci, 1924).

A. Rabichon (1938) would say about the amber in the Almaș valley that is "somewhat better that of Buzău County and gives off a bitumen and sulphur odour. The lustre is beautiful, green and blue colours are reflected in fluorescence. Its red and crimson glows shine like the diamond" ("ceva mai bun decât cel din județul Buzău și degajează un miros de bitum și de pucioasă. Lustrul are o înfățișare frumoasă, culorile verzi și albastre se resfrâng prin fluorescență. Focurile sale luminate în roș și în purpuriu, strălucesc ca diamantul")(p. 22).

There are opinions according to which amber deposits can also be found in the upper valley of Cracău (A. Rabichon, 1938).

Aurel P. Iancoulesco noted in 1928 that in Neamț one can find "l'ambre très beau d'une nuance verte qu'on ne trouve nulle part ailleurs, ainsi qu'un ambre noir qui est très friable". Green amber from Neamț County can be easily processed, although it is harder than that of Buzău. Its presence was reported at Negulești, in the Iapa valley and, as previously mentioned, in the Almaș valley (A. P. Iancoulesco, 1928, p. 230). It is certain that amber was exploited during the interwar period, as Virgil N. Madgearu mentions in a 1940 work "we also have *amber* that is being exploited in Buzău County – where we produce the most important material (in terms of its beauty) – and in Neamț County" (p. 116). At Groapa Malaia, there were even attempts at a systematic exploitation made by a company under the supervision of a specialist, an engineer, Roșca, a former student of our great geologist George Munteanu Murgoci. Exploitation could no longer continue apparently because of the quite high hardness of rocks, among which the menilithic schists, especially since amber here was laminated and crushed (G. Murgoci, 1924). According to V. Al. Ionescu (1935), amber was also found at Dobrinul, a locality that we identify as similar to the present-day commune of Dobreni, located at the confluence of the Horăița and Almaș rivers. It is important to mention that both the Horăița and the Almaș originate from the Oligocene deposits, so the inclusion of Dobreni on the amber map of Neamț County would not be unjustifiable.

Small samples of amber, only a few cubic millimetres, were gathered by Professor P. Poni of Iași University from Dealul Cozla, north of Piatra Neamț, from a type of calcareous sandy clay, during some research on mineral springs in the area that he was carrying out. In 1884, at Culmea Pietricica, separated from Cozla by the Cuejdiu rivulet, Leon C. Cozmovici, a physiology professor at Iași University, recovered an amber sample of a half of cubic centimetre from a "less bituminous blackish limestone, which belongs to some strata that are probably identical to Măgura sandstones" (C. I. Istrati, 1895a, p. 65; 1901; G. Murgoci, 1902; P. Poni, 1900).

Amber deposits in Neamț County are supposedly poorer and more sporadic because the geological deposits in which they formed are buried and the soil surface is much more forested than at the Carpathian Curvature (G. Murgoci, 1902).

The deposit in the Iapa valley is to be encountered in the geological literature quite late, in 1970 (I. Humă, 1970), and later particularly due to the studies of T. Brustur and his collaborators (T. Brustur, M. Georgescu, D. Grinea, V. Matei, D. I. Stamate, G. Grigoriu, 1986; T. Brustur, V. Matei, D. Grinea, M. Georgescu, D. I. Stamate, 1988).

A very interesting study has been published recently, which deals with the Iapa valley amber and especially the deposit nearby Duraș waterfall (T. Brustur, D. Grinea, A. Briceag, M.-C. Melinte-Dobrinescu, 2017). The authors mention that the Duraș waterfall outcrop was uncovered in 1992 by a local man - Vasile Cociorvă, while the jewellers Flor Andronic and Lulu Donciu from Bucharest started the amber exploitation in the Iapa valley in 1936, managing to obtain a significant amount (around 150 kg) of red and black amber. In 1981, have been made geological prospection, and the drillings (artificial outcrops) led to the intersection of amber layers shaped like lenses 6.5-7 m long and 1.5-8 cm thick. A careful study of palaeofauna in those layers made it possible to determine the age of amber here as belonging to the Eocene. Amber might be found in the lower half of the Lucăcești formation, under a level of green-grey clay. The existence of the primary amber deposit at Duraș waterfall in the Iapa valley (Negulești commune, Neamț County) has entailed defining this region as a *Moldavian Amber Province* in the Eastern Carpathian area of Romania (T. Brustur, D. Grinea, A. Briceag, M.-C. Melinte-Dobrinescu, 2017).

Fig. 3 - Field research to identify amber deposits on Iapa Valley: 1. image of the Valley; 2-3. Kliwa sandstones; 4. the interbedding of bituminous layer; 5-7. amber deposit; 8. very friable weathered ("burn") amber.

Other references regarding the existence of amber

Certain foreign authors stated that at Aluniș monastery, in the Danube valley, there were small quantities of black and yellow *succin* (C. Istrati, 1895a). According to G. Murgoci (1902), if these mentions regarding the presence of amber were real, it could only be reworked. However, he noted that there was no clear indication pointing to the existence of amber in this area.

In 1826, P. Partsch (quoted by O. Protesco, 1937) asserted that amber had been found in a sand and blue marl deposit of coals in Săsciori commune, Sibiu County (currently in Alba County). The coals apparently belonged to the Upper Cretaceous (O. Protesco, 1937). In 1927, L. Zechmeister and V. Vrabely (quoted by O. Protesco, 1937) would describe it under the name of *telegdit*, comparing it to the amber found in Hungary in layers of coals from the Upper Cretaceous. Also, in 1855, M. J. Ackner (quoted by G. Murgoci, 1903 and O. Protesco, 1937) would announce the discovery of amber at Răchita (Alba County) in lignite deposits, in the Tertiary and even Quaternary sandstones, clays and sands, therefore reworked. Other localities, such as Lasztafalva (in Hunyad county, currently Hunedoara County), Weisskrich (present-day Viscri in Brașov County), and Voscovca dale at Fuésca, are also mentioned (G. Murgoci, 1903). Although these localities were mentioned early, further and more consistent information regarding these deposits cannot be found in subsequent studies one (C. I. Istrati, 1895 a, b; G. Murgoci, 1924). Except perhaps the fact that, with no other explanations, G. Murgoci (1903) would add, on the amber map of Romania, one more point at Glîmboca, in the same area as the two previously-mentioned points.

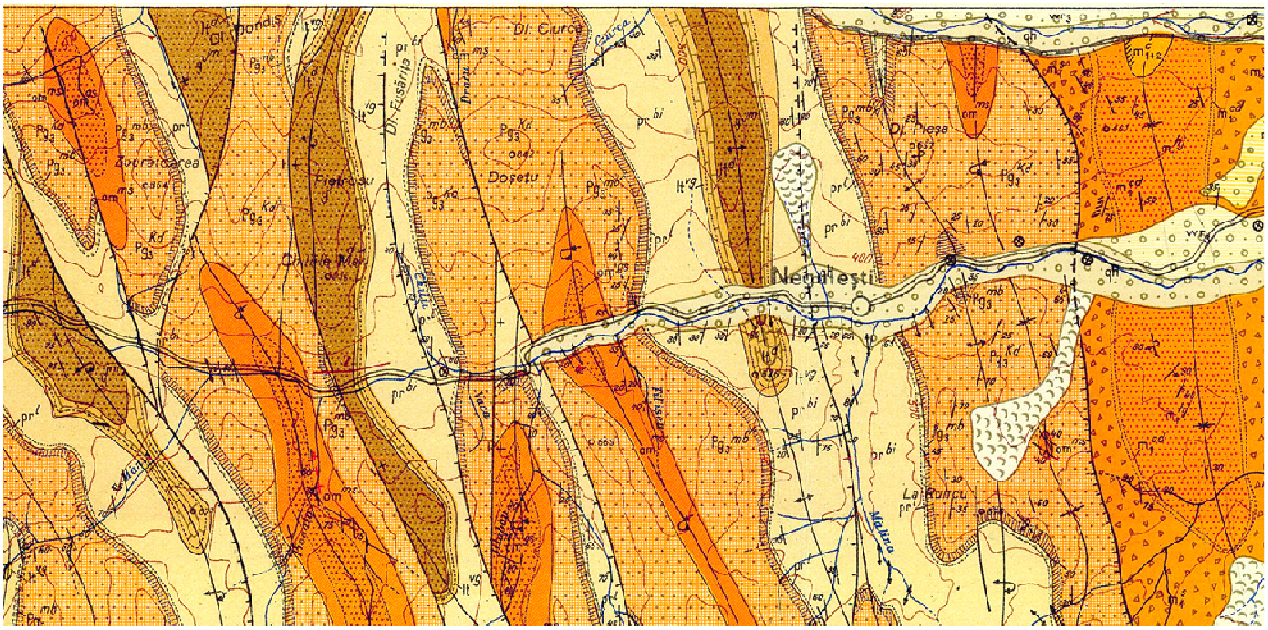
Armand Rabichon (1938), an engineering geologist at Buzău amber exploitation facilities, would also mention the presence of amber in Transylvania, between Tărtăria, Pian, Sebeșul-Săsesc, Petrifalău and Mercură, specifying that the Sebeșul-Săsesc amber had "a well-defined shape, being scattered sporadically in beads, grains and clusters… Its surfaces are uneven and smoky. It is black, reddish-brown, honey-yellow and clear yellow. It is transparent and translucent. It is hardly breakable" ("formă bine definită împrăștiat sporadic în picături, grăunțe și ciorchine.....Are suprafețele inegale și afumate. Este colorat în negru, brun-roșiatic, galben-miere și galben-clar. E transparent și translucid. Se sparge anevoie") (p. 17-18). He also stated that *retinita*, much less hard, only 1.5-2 cm, melting at rather low temperatures, could be found in this area. It is reddish-brown, grey, yellow and olive-green, semi-transparent and even opaque. The amber located between Orăștie and Sebeșul Săsesc was attributed to the Cretaceous (the Cenomanian and the Campanian) and the early Pliocene (the Danian), underlying the crystalline schists from where it was transported to a Miocene or Pliocene synclinal crossed by the rivers Pian, Sebeș and Mureș (A. Rabichon, 1937).

The amber pieces found in the Sarmatian sands of Sărățelu-Bălănești, those from the salt massif of Mânzălești-Plavățu should be considered reworked (O. Protesco, 1937).

In 1901, C. Istrati reported that he had come into the possession of a yellow amber sample, very similar to the *romanit*, which originated from the Black Sea coast sands, not far from the sanatorium of Techirghiol. The author assumed it might have originated from a deposit that was outcropping not far from the shore, in the marine waters. On the other hand, G. Murgoci (1902) asserted that this was reworked amber, transported by the Danube into the sea and further by the coastal currents.

Field research

Our field research started in the summer of 2015, when the first investigation was carried out in the Negulești area (Piatra Șoimului commune, Neamț County), more precisely in the Iapa valley (fig. 4). Along the valley, upstream of Duras waterfall (fig. 3/1), Kliwa sandstones occur in compact packages, inclined on both banks (fig. 3/2-4). It is in such outcrop, on the right versant of Iapa valley, that we identified a first amber deposit (fig. 3/5-7). Unfortunately, the samples are very friable, easily breakable, probably some kind of 'burnt' amber (fig. 3/8). The short time available did not allow us to continue our research that year, but gave us hope to increasingly believe in the possibility of the real existence of amber in Neamț County. This was also the starting point for a very thorough investigation of all data and especially of geological bibliographical resources, some of them rather old and hardly accessible. The very important information we obtained prompted us to



CAPTION:

MIDDLE MIOCENE LOWER MIOCENE	11	MARGINAL FOLDS UNIT Sandy gray marls, clay marls, silts, calcareous sandstones, arenaceous sediments Gray formation. a gypsum.
	12	Gray-red marls, silts, green and gray sandstones-Hîrja layers.
LOWER MIOCENE	13	Feldspathic sandstones, clays, gray marls-Condor sandstone.
	14	Argillaceous breccia with salt and potassium salts, clay breccia, gypsum-Salt formation. a-gypsum.
OLIGO-MIOCENE	15	Green and gray sandstones, conglomerates with green elements, silts, bituminous schists-Gura Șoimului layers.
	16	Disodiles and upper menilites a- tufa; b-reed and green clay.
OLIGOCENE	17	Disodiles, quartzitic sandstones – Lower Disodiles and Kliwa Sandstone.
	18	Brawn bituminous marls and lower Menilites with "ardeziform" shales and the Fierăstrău sandstone at the base.
PRIABONIAN	19	Globigerina Marls and quartzous sandstone (Lucăcești sandstone).
	20	Marls and gray clays with interlayers of calcareous sandstones, sideritic marly limestones-Bisericani layers.
LUTETIAN	21	Green and red clays with interlayers of quartzous sanstones.
	22	Micritic limestones with silicifications and rudaceous quartz-Doamna limestones.
YPRESIAN	23	Sandstones, silts, marls-Jgheabu Mare layers.

Fig. 4 - Geological map, scale 1:50,000, along the Iapa Valley, around the Negulești village (modified after M. Micu, 1983)

Fig. 5 - Amber deposit exploitation area at Negulești on the Iapa Valley

resume our research with a view to recovering samples from at least a few deposits mentioned by the geological literature and even identifying new points. Thus, in addition to the sources mentioned in the specialised literature, one of the authors of our study (Crina Miclăuș) had already discovered a new point on the amber map in Neamț County, namely at Văleni, near Piatra Neamț town.

In 2017, we returned to Neamț County in order to try to check some bibliographical data on the deposits mentioned in this area.

The justification for continuing the investigations in the Iapa valley, upstream of Negulești, after consulting the bibliographical sources, lies in the very geological structure of the area. On the geological map, scale 1:50,000, one may notice how the Iapa valley intersects the Oligocene and Eocene deposits made up of two distinct formations. At the basis lie brown bituminous marls, lower menilites with clay schists

in the base, while on top there are lower dysodilic shales and the Kliwa sandstone (M. Micu, 1983). Because the Iapa valley, upstream of Neguleşti, intersects a succession of Eocene and Oligocene deposits (fig. 5), there is no surprise that an amber deposit was discovered here long ago and was exploited, in a more or less organised manner, by the local people and even systematically in certain periods.

The amber deposit of Neguleşti, on the Iapa valley, is indeed located slightly downstream of the Duras waterfall, where Oligocene deposits, including the Kliwa sandstone, lie in a vertical position and at river level (fig. 4-5). The amber was found in the sandstone packages, at the contact with the dysodilic strata. That is why amber exploitation was carried out by following the sandstone bed, which was in vertical position, going up this front apparently in steps as it intersected the streak or, more precisely, the lenses or the amber nests. In the 1930's, according to data provided by local people, there was also a narrow railway track on which wagons would carry the gangue downstream, along the river as far as Frasin chalet. Amber exploitation here was resumed in the 1980's, but after 1989 any such action ceased. Along the valley, we have noted several places where the Kliwa sandstone crops out, which increases the chances to discover other amber spots. Several amber samples were recovered from the Neguleşti deposit; generally, they are small-sized, variously coloured, ranging from yellow-red to black (fig. 6). Some of them will be used for physico-chemical analyses.

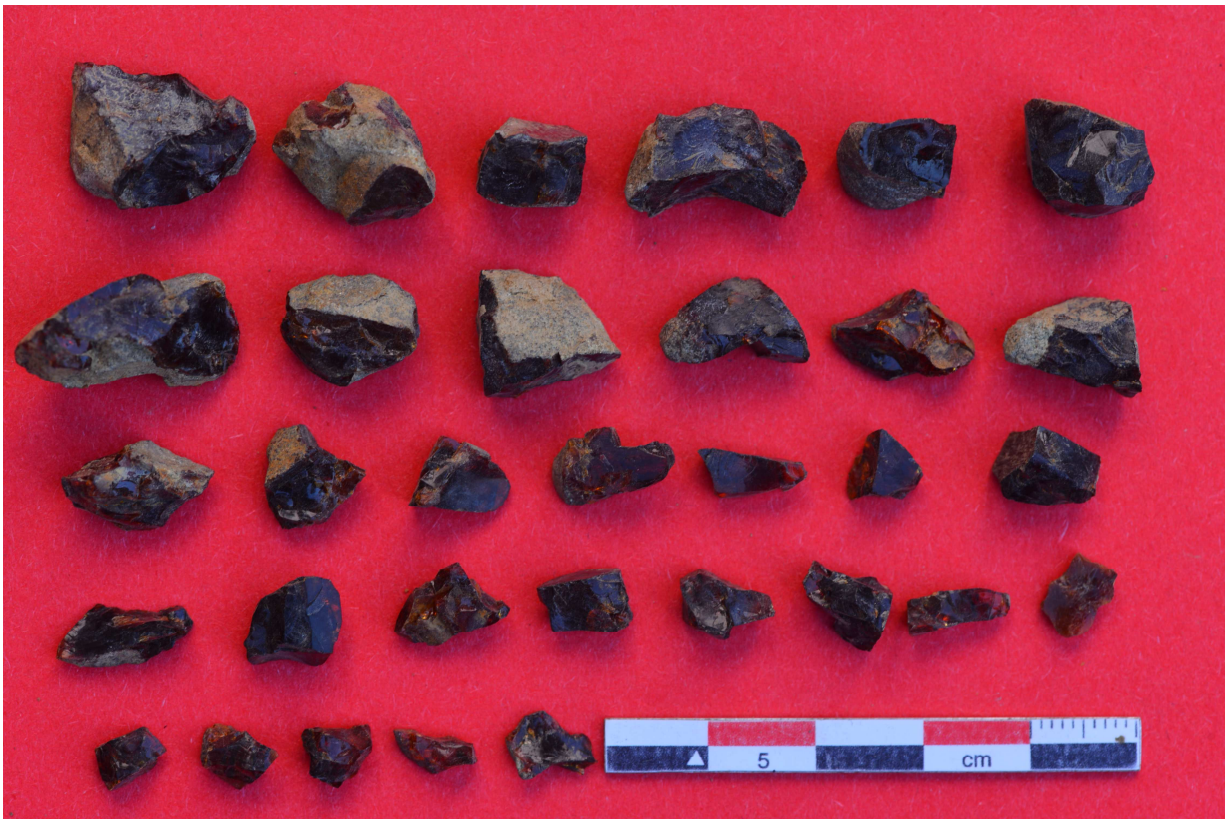
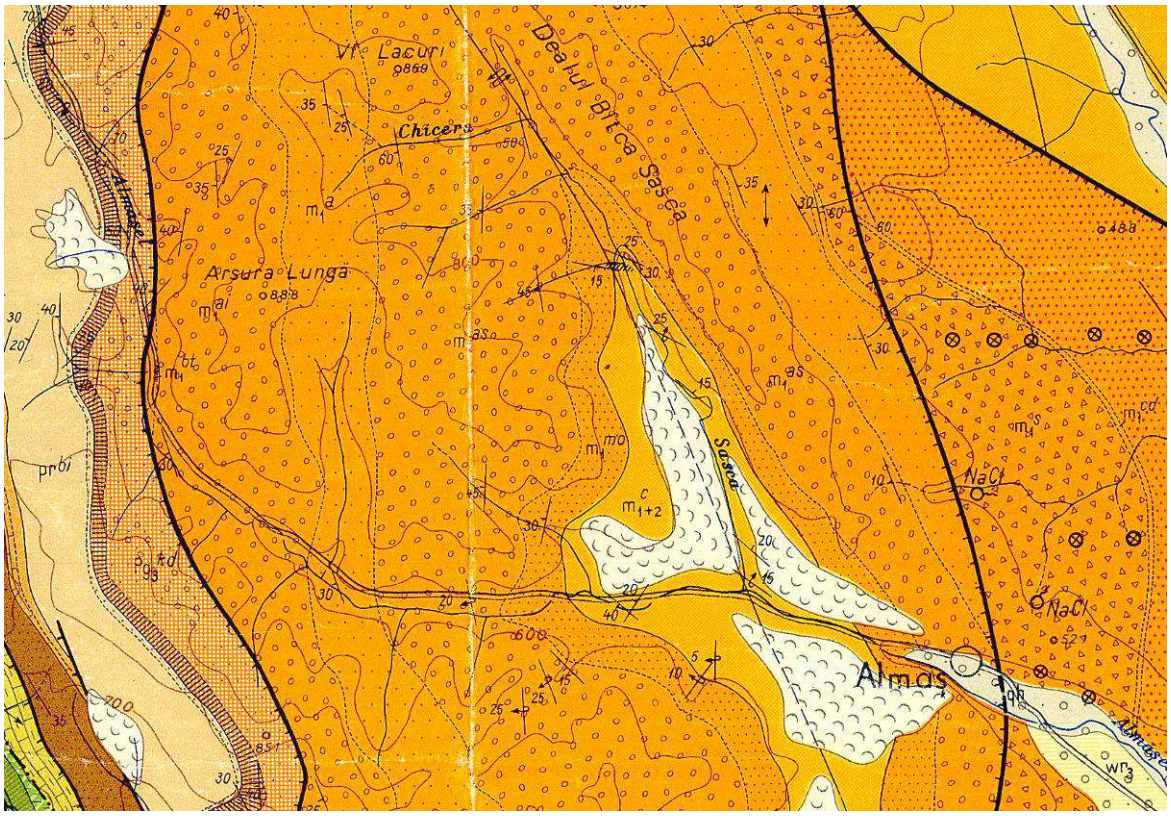


Fig. 6 - Amber samples from Iapa valley deposit at Duraş waterfall

Consulting the geological map, scale 1:50,000, we have observed that Oligocene deposits crop out towards the east-northeast of Almaş, being intersected by the valley of the same name approximately 4 km from the village (fig. 7) (M. Micu, 1976 a).

In the Almaş valley, the idea of the existence of amber, located between the Almaş monastery and "Bradul Botezat" point, is still ingrained in local people's minds. Our research prompts us to believe that we have located it downstream of the toponym "Bradul Botezat", which is, in fact, an



MIDDLE MIOCENE ?

12 m_{1+2}^{c} a

LOWER MIOCENE

13 mo, g, aș, f, hj, a, e, at, d, b, cd, bt, a, c

14

FLISCH AREA
MARGINAL FOLDS UNIT
Sandy gray marls, clay marls, calcareous micaceous sandstones, arenaceous sediments-Gray formation. a-gypsum

g. Green fine-grained sandstones, silts, microconglomerates with green elements-Moișa sandstone
f. Conglomerates with elements of green schists, quartzites, phyllites, organogenic limestones of Mesozoic and Paleogene ages – Almașu Upper Conglomerates
e. Green gritstones, silts slabs, microconglomerates with green elements – Almașu sandstone
d. Conglomerates with elements of green schists, quartzites, phyllites - Almașu Lower Conglomerates
c. Green sandstones, silts, microconglomerates with green elements – Bălțătești sandstone
b. Gray-reedisch marl, green and gray sandstones - Hîrja layers – Reed Formation
a. Feldspathic sandstones, gray marls-Condor sandstone
Argillaceous breccia with salt and potassium salts, clay breccia, gypsum-Salt formation

OLIGO-MIOCENE

15 gs, b, om, msg, om, ms, om, a, c

Disodiles, upper menilites and (?) Gura Șoimului layers
Green and gray sandstones, conglomerates with green elements, bituminous schists-Gura Șoimului layers
Disodiles and upper menilites

OLIGOCENE

16 $P_{g_3}^{kd}$ a

17 $P_{g_3}^{me}$

Quartzitic sandstones (Kliwa sandstone), disodiles
a. Conglomerates with elements of green schists
Lower menilites brawn bituminous marls

PRIABONIAN

18 pr

19 pr bi

Quartzous sandstone and Globigerina Marls (Lucăcești sandstone)

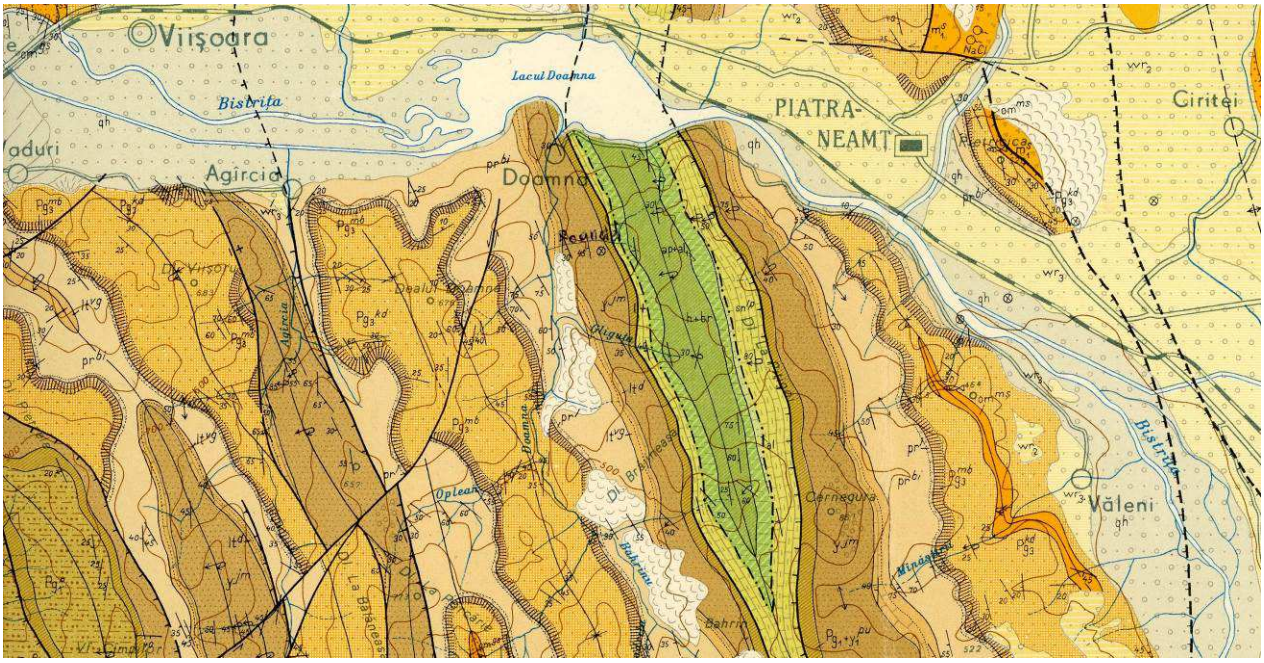
Marls and gray clays with interlayers of calcareous sandstones, sideritic marly limestones-Bisericani layers

Fig. 7 - Geological map, scale 1:50,000, along the Almaș Valley (modified after M. Micu, 1976 a)

1

2

Fig. 8 - Almaș valley and the alleged deposit of amber



FLISCH AREA
MARGINAL FOLDS UNIT

MIDDLE MIOCENE ?

Sandy gray marls, clay marls, silts, calcareous micaceous sandstones, arenaceous sediments-Gray formation. a-gypsum

LOWER MIOCENE

g. Green fine-grained sandstones, silts, microconglomerates with green elements-Moișa sandstone
f. Conglomerates with elements of green schists, quartzites, phyllites, organogenic limestones of Mesozoic and Paleogene ages – Almașu Upper Conglomerates
e. Green gritstones, silts slabs, microconglomerates with green elements – Almașu sandstone
d. Conglomerates with elements of green schists, quartzites, phyllites - Almașu Lower Conglomerates
c. Green sandstones, silts, microconglomerates with green elements – Bălțătești sandstone
b. Gray-reedisch marl, green and gray sandstones - Hîrja layers – Reed Formation
a. Feldspathic sandstones, gray marls-Condor sandstone
Argillaceous breccia with salt and potassium salts, clay breccia, gypsum-Salt formation

Green gres-o-conglomeratic Formation

OLIGO-MIOCENE

Green and gray sandstones, conglomerates with green elements, silts, bituminous schists-Gura Șoimului layers
Disodiles and upper menilites

OLIGOCENE

Quartzitic sandstones (Kliwa sandstone), disodiles
a. Conglomerates with elements of green schists
Lower menilites brawn bituminous marls

PRIABONIAN

Quartzous sandstone and Globigerina Marls (Lucăceşti sandstone)

Marls and gray clays with interlayers of calcareous sandstones, sideritic marly limestones-Bisericani layers

Fig. 9 - Geological map, scale 1:50,000, in the Văleni-Piatra Neamț area (modified after M. Micu, 1976 a)

1

2

Fig. 10 - Oligocene bituminous marl downstream of the dam from Văleni-Piatra Neamț

Fig. 11 - Amber recovered from Oligocene bituminous marl located in the Bistrița valley at Văleni-Piatra Neamț: 1. large sample; 2-4. nugget embedded in marl; 5. insect fragment embedded in amber; 6. details

intersection between the forest road along the Almaș valley and a side road to the right of the water flow. The "deposit" is characterised by the presence of an incipient gallery which develops between two Kliwa sandstone packages positioned vertically. The gallery formed through the caving of the dysodilic deposits between them (fig. 8). As a matter of fact, the geological map shows that we are in the area in which the Almaș valley runs right on the Oligocene deposits (fig. 7). The short time available as well as the lack of adequate equipment, such as chisels or hammers solid enough to break the hard Kliwa sandstone, prevented us from recovering at least a few samples of the *almashit* that is typical of this region.

Văleni is now a district of the city of Piatra Neamț. Just downstream of the dam here, right in the former bed of the Bistrița river, a package of Oligocene bituminous marls crops out (fig. 9, 10). They stand out through the preservation of skeletons of various fish species, nuggets and even some bigger amber samples (fig. 11). Oligocene bituminous marls with amber embedded in them are located very close to the Gravettian settlement of Poiana Cireșului, at approximately 2.5 km. Palaeolithic communities found it very easy to reach the area of bituminous marls of Văleni going along the Bistrița valley, which means that they could recover amber right from the riverbed.

Conclusions

In 1924, Murgoci would remark with satisfaction that if Romanian amber had long been known as a beautiful ornamental stone, superior to all fossil resins, after the war it became unanimously recognised and well appreciated in many countries, particularly France and Germany, and also on the American continent.

The amber or *ambra* in Romania, called *rumanit*, present in approximately 360 points (fig. 1-2), is usually attributed to the Paleogene, lying in its two subunits – the Eocene and the Oligocene. According to old estimates, only the Olănești and Cheia deposits in Vâlcea County and maybe that from Șotrile (Prahova County) and from Teleajenului valley would belong to the Eocene; in addition, latest studies point to the Iapa valley deposit, from Duraș waterfall (Negulești commune, Neamț County) as well. All the others, located at the outer side of the Carpathians, from Suceava County as far as the Ialomița valley, are supposed of Middle and Upper Oligocene origin, represented by the Kliwa sandstones and the menilithic complex. The numerous amber deposits attributed to the Oligocene are closely related to the dark-grey clay-schistose marls and the reddish-brown sandstones belonging to the menilithic complex (O. Preotesco, 1937).

Another assumption, to which Romanian geologists, particularly G. Murgoci (1902; 1903; 1924), made an important contribution, is that according to which amber did not result exclusively from the resin of only one species (*Pinus succinifera*), as believed initially, but that of other coniferous species as well.

V. Al. Ionescu (1935) described - not necessarily from the point of view of the geologist, but of the forest engineer who was well acquainted with surface phenomena - the way amber was being exploited in the Buzău area. He said that after each heavy rainfall or flood in the region, "the villagers rush to the bank of rivulets and closely pursue the amber pieces floating on the water or stop by the bend where the water speed is lower… As easy as it is to gather the amber dug out by waters through erosion, as difficult it is to extract it from mines…" ("populația satelor năvălește pe marginea pârâelor și urmărește cu mare atenție, bucățile de chihlimbar, care plutesc pe apă, sau se opresc la cotituri, unde viteza apei e mai redusă.....Pe cât de ușor se recoltează însă chihlimbarul săpat de apele torențiale prin eroziune, pe atât de greu se extrage din mine...") (p. 864). There is no reason to believe that this very plastic description of the empirical manner of exploiting this mineral in historic times could not have very well applied, perhaps even more successfully, to Palaeolithic populations, given their definitely superior ability to recognise the properties of rocks, which were the basis of their tools or which had a symbolic significance defined by their traits.

As for Gravettian populations of Poiana Cireșului, one has to bear in mind that amber deposits, which we identify nowadays, could have been richer 20,000 years ago, or perhaps outcrops

were directly affected by the watercourses they crossed, or the amber lenses could come out in totally different places than current ones. To all this one should add the Palaeolithic man's special ability to recognise the rocks with all their particular features. If we occasionally look for the sources of lithic materials used by the Palaeolithic man, he clearly was in permanent contact with them and the rate of his success in recovering them was infinitely higher, even when some of them were quite rare. Therefore, we believe it is very important, when we want to identify the Palaeolithic man's sources of amber supply, to take into consideration all the mentions regarding this material, even if the present-day deposits are very poor. This does not mean that we shall give up the multiple physico-chemical analyses which we have already used to specify the origin of amber artefacts. As regards the sample found in the Gravettian of Poiana Cireșului, such an approach will be the subject of a separate study.

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