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MARIA CRĂCIUN
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ANCA GOGĂLTAN
IOSIF KIRALY
DAN-EUGEN RAȚIU

HORIA ION CIUGUDEAN
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ILEANA PINTILIE-TELEAGĂ
RADU G. PĂUN

VLAD BEDROS
IOANA BOTH
MARIN CONSTANTIN
CONSTANȚA VINTILĂ-GHIȚULESCU
ANA-MARIA GRUIA

Editor: Irina Vainovski-Mihai

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New Europe College
Str. Plantelor 21
023971 Bucharest
Romania
www.nec.ro; e-mail: nec@nec.ro

Tel. (+4) 021.307.99.10, Fax (+4) 021.327.07.74



HORIA ION CIUGUDEAN

Born in 1954, in Aiud

Ph.D. in History, Institute of Thracology Bucharest (1997)

Dissertation: *The Early Bronze Age in Central and South-West Transylvania*

Senior Researcher, National Museum of Alba Iulia

Associate Professor, "Lucian Blaga" University of Sibiu

Mellon Research Fellowship, The American School of Classical Studies at Athens (2002)

RELINK grant, New Europe College, Bucharest, (1997-2000)

Soros Foundation for an Open Society Grant, Hungary, October (1996)

Grant of Römisch-Germanischen Kommission des Deutschen Archäologische Instituts, Frankfurt/Main, Germany (1992)

Research Support Grant of Central European University – Prague (1992)

Public lectures in the universities of Heidelberg, Berlin, München and Budapest

Papers presented at international conferences and symposia in Germany, Great Britain, Italy, Norway, Hungary, Slovenia, Slovakia, Bulgaria, Romania

Author of three books on archaeology and more than 60 articles on prehistory,
ancient history and heritage conservation

LANDSCAPE ARCHEOLOGY IN SOUTH-WEST TRANSYLVANIA: ANCIENT GOLD MINING IN THE BUCIUM-ZLATNA REGION

1. Introduction

1.1. Argument

It has long been recognized that because the nature of landscape change in the Apuseni Mountains (Transylvania) has historically been gradual and piecemeal, when compared with the countries of northern and western Europe, the region is still rich in visible archaeological sites and monuments. The number of pre-Roman and Roman mining sites is extremely high, but its full number is yet to be estimated. These and other archaeological remains are an essential but non-renewable component of Romanian heritage and the landscape. The archaeological resource is inter-linked with other resources that fall under the term “cultural heritage”, such as history, folklore, mythology and place-name studies. There is a need to adopt a landscape approach to the management and sustainability of the archaeological resource in the rural landscape of Romania. From a cultural heritage perspective, this approach is seen internationally as representing best practice. At a time of major landscape change in Romania it is essential to conceptualize the management of the archaeological resource in landscape terms.

This paper provides an overview of the work and approach of the Archaeological Project in Bucium.¹ The basis of the project is that the recognition of archaeological landscapes should be an important aspect of any proactive management strategy for the Transylvanian archaeological resource. The project should be set against the background of the impact of current and future landscape change on the archaeological resource. Since the late 1990s there has been a dramatic increase in mining activity

due to the Roșia Montană Gold Corporation project. Gabriel Resources, a Canadian mining company,² intends to develop Europe's largest open cast gold and silver mine in the Transylvanian town of Roșia Montană. Future mining development will affect the neighboring Bucium valley and at least three of its villages: Poieni, Izbita and Sasa (fig. 3). The open-pit mines will also destroy some of the most important Roman gold mines in Europe. Regarding their scale and state of preservation, the Roman mines at Roșia Montană (ancient *Alburnus Maior*) rank first among the former provinces of the Roman Empire, outmatching finds in Spain, Portugal, Gaul and Britain. In December 2002, Gabriel Resources started drillings in the Bucium valley area, paying no attention to the rich archaeological heritage of the region. For as long as this very important area is threatened by Gabriel Resources' planned mining projects, it is imperative that extensive and independent archaeological research be carried out in the valley, in order to gather the basic information required for heritage protection.

The project had a number of key objectives. These included a decision on the definition of an "archaeological landscape" to be applied in Romania. It was also seen as critical that there should be discussion of the relevance and complementarity of Historic Landscape Characterization as developed in Britain³ to the recognition of archaeological landscapes. The project also included an assessment of the extent to which archaeological landscapes are protected under existing designations in Romania. Central to the project was the compilation of a preliminary regional inventory of archaeological landscapes using agreed criteria. Case studies of selected archaeological landscapes in the Bucium-Zlatna area were carried out to illustrate the potential of proposing a national park in this region. The final part of the report contains recommendations regarding heritage management strategies for the sustainable development of the area.

1.2. Archaeological landscapes and landscape archaeology: an overview

As already noted, archaeology has traditionally incorporated attention to space and landscape, particularly in what is called settlement archaeology. The difference is that what was once theorized as a passive backdrop or forcible determinant of culture is now seen as an active and far more complex entity in relation to human lives. In part, the change stems from archaeologists' expanding their interpretative gaze beyond

the isolable “hot spots” termed sites, to consider a more comprehensive distribution of human traces in and between loci, now often termed “places of special interest”.⁴ The resulting perspectives are variably termed siteless archaeology,⁵ off-site archaeology,⁶ distributional archaeology,⁷ and several approaches that fall under the rubric of landscape archaeology.⁸ In practice, these diverse approaches facilitate the study of diffuse human remains – such as field systems, farms, industrial sites, roads, and the generally more ephemeral traces of non-sedentary peoples – that never fit comfortably within traditional operational definitions of “sites”. In so doing, they also remind archaeologists of how complicated and often subtle people’s interaction with the land can be. At the same time, growing recognition of the social meaning of space as *place* mandates examination of what Western scholars often classify as “natural” places of significance, such as caves, mountain peaks, woods, rivers and springs, or even physically “empty” spaces.⁹ Ascribing significance to a specific configuration of natural or geographic features is never self-evident but rather culturally determined.¹⁰ More important, taking a holistic landscape perspective compels us to stress the *interrelationships* among people and such traces, places and features, in space and through time.

According to the Oxford Companion to Archaeology,¹¹ landscape archaeology is concerned with both the conscious and unconscious shaping of the land; with the processes of organizing space or altering the land for a particular purpose, be it religious, economic, social, political, cultural, or symbolic; with the unintended consequences of land use and alteration; with the role and symbolic content of landscape in its various contexts and its role in the construction of myth and history; and with the enactment and shaping of human behavior within the landscape.

Several fields besides archaeology have grappled with landscape issues, informed increasingly by concerns rooted in social theory. Not surprisingly, geographers became involved quite early with studying the meaningful constitution of landscapes. Carl Sauer first formulated the concept of a “cultural” landscape as fashioned from the “natural” landscape in 1925.¹² Human geographers now seek meaning in the landscape as a “repository of human striving”,¹³ and postmodernist perspectives visualize the landscape as a “cultural image” whose verbal or written representations provide images or “texts” of its meaning or “reading”.¹⁴ Emerging inquiries by social and cultural anthropologists have yielded rich insights.¹⁵ Prominent among these studies are phenomenological approaches and linguistic

perspectives, emphasizing “landscape” as constituted by humans’ dwelling in it, a set of potentials instantiated by human choice and action. In Hirsch’s view, landscape is a “process” yielding a foregrounded, everyday social life from a background range of potential social existence.¹⁶

The archaeological study of landscapes is particularly lively at the current time,¹⁷ and we may expect such studies to continue expanding in interpretative potential. Barbara Bender’s volume offered the first critical study of landscapes to include archaeologists as well as geographers and anthropologists: the contributors examined landscapes from a subjective, locally situated perspective as something that not only shapes but is shaped by human experience.¹⁸ Tilley’s influential study was concerned explicitly with the phenomenology of landscape as experience, but focuses on monuments rather than more ephemeral traces of human activity.¹⁹

It is important to recall explicitly at this juncture the pronounced differences in archaeological theory and interpretation that exist among intellectual traditions, and particularly between processualist and postprocessualist approaches.²⁰ The debates between practitioners of the American and British “schools” of thought were productive, but often became heated confrontation rather than constructive engagement. Archaeologists of diverse backgrounds pursue studies of socially constituted, meaningful landscapes. In so doing, they have tended, not surprisingly, to address the audiences of their closest theoretical peers, and consequently to frame their inquiries in particular epistemic contexts and with reference to interpretative issues most salient in their own traditions. Within the archaeologies of landscape, we see considerable diversity but also many underlying commonalities of concern and approach.

Before turning to a presentation of the results of our project, however, we will first look briefly but closely at the concept of landscape. “Landscape” is variously defined by archaeologists, anthropologists, geographers, historians, social theorists, and philosophers.²¹ Three examples illustrate archaeological definitions for this common-sense term. Drawing on her long involvement with historical ecology, C. Crumley defines landscape succinctly as “the material manifestation of the relation between humans and the environment”.²² J. Barrett is more expansive: landscape thus becoming the entire surface over which people moved and within which they congregated.²³ That surface was given meaning as people acted upon the world within the context of the various demands and obligations which acted upon them. Such actions took place within a certain *tempo*

and at certain *locales*. Thus landscape, its form constructed from natural and artificial features, became a culturally meaningful resource through its routine occupancy. Going even further, R. Johnston's approach refuses to distinguish between "real" and "perceived" landscapes, and maintains that "there is still no answer to what landscape is [:] it is still very much a case of 'what it can be.' Landscape is, in the broadest sense, contextual".²⁴ Although even this trio of definitions offers clearly divergent perspectives, all recognize or imply the human, social nature of landscape.

Previously, archaeologists tended to view the human landscape mainly in terms of demography, social interaction, economic resources and risks.²⁵ That is, they focused on topography, technology, resources and land use, on what people did to the land and how it aided or constrained them, rather than what they thought or felt about it.²⁶ Models of landscape partitioning, which considered the correlation of mounds and monuments with the spread of farming and village life,²⁷ were derived from inferences about territorial claims. The social aspects of these inferred claims, in their reifying of group identities through material connections to the land, began to turn archaeological thinking more pointedly toward social relations, with the land as the medium of social expression.²⁸ The coincident rise of archaeoastronomy turned archaeological thoughts toward another interpretatively promising trajectory, namely to the potential for assessing ancient cognition through the landscape.²⁹ In these studies, however, landscape was still viewed primarily as a relatively passive index of technology and belief, a background vellum on which stories of the active sky were written.

Ancient peoples were conceived of largely as undifferentiated societies and cultural systems, providing the analytical units of processual archaeology in the 1970s and 1980s.³⁰ Postprocessual critiques have significantly restructured the debate outside the Americas, focusing attention on the active role of individuals in constructing and interpreting the world around them, and in continually reshaping culture and society. Symbolic expression is central to maintaining communication and social integration, but these shared symbols become reworked in individual use. As important with respect to landscape, local physiographic features are recognized increasingly as the source and subjects of these symbols, often linked to ancestral beings.³¹ In the archaeologies of landscape, the effect has often been to regard such features and their meanings as mediating the selection, use, modification or avoidance of particular locales.

Indeed, archaeologists seem to be moving toward actively recognizing what Keith Basso calls “interanimation”: the constant mutual molding of landscapes and the people who dwell in them.³² While we may never know the precise content of stories told from ancient landscapes, we can increasingly infer some of the contours of their telling and the social impact that they had.

Landscape as actively inhabited space, and particularly landscape as the arena for ritual or ceremonial activity, is already a prominent theme in archaeology.³³ And whereas an ideational or conceptual landscape might also be a “sacred” landscape, it is also a stage constructed in the mind to convey meaning to those who inhabit it.³⁴ A landscape embodies more than a neutral, binary relationship between people and nature along any single dimension. Space is both a medium for and the outcome of human activity: it is recognized by means of specific places and, in this sense, does not exist apart from that activity.³⁵ Individuals and communities conditioned by different social, politico-economic and ideological forces project differing configurations of meaning onto the landscape, thus implying that, measurable economic impacts notwithstanding, no *landscape* – aesthetic, poetic, moral, material, or surreal – has an objective appearance or significance independent of the beholder.³⁶

After much discussion and review of the quantitative approaches to the definition of archaeological landscapes, it was decided to adopt a qualitative definition of what an archaeological landscape is, accepting all the methodological and practical issues that this implies. It should be noted that instead of the term “archaeological landscapes”, terms such as “cultural landscapes” or “historic landscapes” could just as easily be used.³⁷

An archaeological landscape is defined as a place or area where:

- The scale and integrity of the archaeological evidence is such that it represents the history of human activities within a defined locality either for a particular, identified period in the past or over many different periods.
- Significance is much more than just the recognition of a concentration of features or sites. It is the inter-connections between the components, whether these are chronological, spatial, social or functional, which provide the essential character of an archaeological landscape. The space between visible monuments is fundamental to an understanding of their importance and their integrity.

- Each archaeological landscape has its own individual, intrinsic value. The comparisons and contrasts between landscapes can highlight both the historic dynamism and the present diversity of the landscape.

1.3. Ancient gold mining

1.3.1. Prehistoric gold

Together with copper, gold was another major new material to appear in the Balkans of the fifth millennium BC. Gold objects have been found at contemporary sites across the Balkans in settlement as well as mortuary contexts. Perhaps the most extraordinary gold object is a circular gold appliqué, which was part of a group of gold artefacts found in the Moigrad region of Transylvania. At 750 g, it is the heaviest of any of the Romanian prehistoric gold objects.³⁸ Although Neolithic gold appears in many of the same contexts as copper objects (i.e. burials), it does so in quite different forms and is limited, almost exclusively, to the additional decoration either of bodies, clothes or tools. As with copper, part of the message in the use of gold may have resided as much in the medium as in the identifiable forms of the objects made. Furthermore, as with copper, gold (in raw or finished form) was a fifth millennium novelty in terms of both the inherent expressiveness of its medium and the restricted location of its natural occurrence as an ore.³⁹

Work on the sourcing of gold and on gold processing technologies on sites has not proceeded apace with the corresponding research on copper.⁴⁰ Eluère and Raub suggest that, for the large gold-decorated dish from Varna, the raw material was obtained from river or stream deposits.⁴¹ D. Popescu and M. Rusu supposed the same origin for the Bronze and Early Iron Age gold objects in Transylvania.⁴²

The first textual evidence regarding the exploitation of gold in the Carpathian Basin comes from Herodotus, who described the gold fields in the 5th century BC.⁴³ But the mining of the Carpathian gold is most likely much older, and it may turn out that Roman mining was nothing more than a reorganization and enlargement by improved technology of earlier mining activity in this area. Evidence of such is common at other sites (Rio Tinto, Cyprus, Feinan, Timna). The prehistoric exploitation of gold in the Transylvanian Mountains was postulated at the end of the 19th century,

when Téglás published some grooved hammerstones.⁴⁴ He also claimed that gold high in silver originated from the “Golden Quadrangle”. Similar observations were made by Hartmann.⁴⁵ In his investigation of prehistoric gold in Europe, he defined several groups of Bronze Age gold artefacts with high silver contents, which, according to some analyses from the beginning of the 20th century,⁴⁶ were considered typical of the ores from this area. Some authors seem to take the prehistoric exploitation of these gold deposits for granted.⁴⁷

By the middle of the third millennium BC at the latest, the Transylvanian region seems to be involved in a long distance gold trade, the golden hair-rings found in the Early Bronze Age tumulus of Ampoița being similar to those found in the Early Helladic cemetery of Leukas, in the Ionian Sea, and at Velika Gruda, on the Dalmatic shore.⁴⁸ Though imports were occasionally interrupted, they reappear as soon as the region settled down. In the late Iron Age, the Dacians extended their gold production, the Roșia Montană mines being already in use by the 3rd century BC, as recent ¹⁴C analysis has shown for the Cîrnic mines.⁴⁹

1.3.2. Roman gold mining

The abundance of gold in this area was certainly one of the major reasons behind the two large military expeditions undertaken by the Romans at the beginning of the 2nd century AD. Dacia had a reputation for fabulous wealth, much like El-Dorado or “a California of the Antiquity”, as Vasile Parvan, a famous Romanian scholar, named it.⁵⁰ By August, AD 106, the war was over and Dacia was set up as a Roman province. The emperor Trajan celebrated his triumph, announced 123 days of games and with the spoils of Dacia built his Forum and Column in Rome. The booty must have consisted of hoarded gold, like Caesar’s in Gaul. Whether or not we reject as absurd the figure of 5,000,000 lbs of gold and 10,000,000 lbs of silver given by Johannes Lydus, we know that the price of gold in the Empire sank during the following years: in AD 97 one pound of gold cost 3,962 dr.; by AD 127 it cost at most 3,800.⁵¹

After the province of Dacia was integrated into the Roman Empire, enormous mining activities were established in the area of “*Aurariae Daciae*”. The gold mines, once a monopoly of the Dacian kings, became a monopoly of the Roman emperors, who administered them, under lease, through a vast bureaucracy of over-seers, registrars, bookkeepers etc. As

early as the time of Trajan, two tribes of skilled miners from Dalmatia, the *Pirustae* and *Baridustae*, were brought in to work the mines. Administrative responsibility for all the gold mines in Dacia lay with the imperial official, the *procurator aurariorum*, who had his headquarters at *Ampelum* (today Zlatna). The town probably became a *municipium* by 200 AD.⁵² The most important gold mines were in *Alburnus Maior* (today Roşia Montană), Bucium, Almasu Mare, and Brad. The most interesting information about Roman mining, and its organization under the supervision of the “procurator aurarium”, was revealed by 40 wax tablets with Latin inscriptions found in the 18th and 19th centuries inside the ancient mines.⁵³ These date from AD 131 to AD 167 and were hidden in the mine galleries during the panic of Marcus Aurelius’ Marcomannic wars. Their subjects are various: contracts of purchase and sale, mine-rental, receipts for loans repaid, the details of the dissolution of a burial society. Though the wax tablets stop in 167, the inscriptions continue, and show that the mines continued to be worked, albeit at lower levels. The last evidence of Roman exploitation of the mines dates from AD 215.

At Alburnus Maior, as the ancient Roşia Montană was called, gold was exploited on a massive scale both by opencast and underground mining.⁵⁴ Relics of firesetting as well as hammer and chisel work are still visible today in many ancient workings discovered during modern mining activities, and Roman mining tools were found inside the mines. Obviously, the Romans did not spare any effort in setting up a sophisticated drainage system within the mines. This is visible from the several bucket wheels found at depths of up to 60 m.⁵⁵ The Roman mining activity within the primary ore bodies of Dacia is manifold and well dated by archaeological and textual evidence.⁵⁶ Unknown, however, is the real age of the supposed Roman placer workings visible along the rivers and streams of the “Golden Quadrangle”. There is no indication of hydraulic mining of the type well known e.g. from Roman gold mining in the Iberian Peninsula.⁵⁷

The finest and most extensive Roman mining works are those still to be found at Roşia Montană and Bucium, on which mediaeval and modern mining had very little impact. The techniques employed to extract gold and silver are far more impressive than those found in Spain or Portugal. While the Roşia Montană region is better known for older or recent archaeological excavations,⁵⁸ the Bucium valley remains practically unexplored, despite Roman finds being reported here in the 19th and first half of the 20th century.⁵⁹

2. Geographical and Geological Background of the Bucium-Zlatna Project

2.1. Project location

The Bucium area lies within the Southern Apuseni Mountains in the Transylvanian region of Romania, 400 km northwest of the capital city of Bucharest. The area is located about 80 km to the northeast of the town of Alba Iulia, the capital of Alba county, and about 10 km east-southeast of the town of Abrud (fig. 1). Administratively, the land in this area belongs to the commune of Bucium, which comprises several villages (Bucium Cerbu, Bucium Muntari, Bucium Sasa, Bucium Poieni, Bucium Izbita) and partially to the town of Zlatna. The gold deposits in the Bucium area are located toward the north-eastern extremity of the so-called “Golden Quadrilateral”, in the so-called Roşia Montană-Bucium metallogenetic district, southeast of the well-known Roşia Montană gold deposit. The area is accessible from the Alba Iulia-Abrud road or the Brad-Abrud road, which is known as National Road (DN) no. 74. There is a relatively good network of secondary roads along the main rivers.

2.2. Geological background

Romania is home to some of the largest gold mineralizations in Europe, and mining in the country dates back to prehistoric times. The gold deposits are found in three major districts: a) the Baia Mare area in the north, b) the so-called “Golden Quadrangle” in the Apuseni metalliferous mountains, and c) in the south central Carpathians (Fig. 2). The list of deposits was compiled from different authors.⁶⁰ One problem with the literature on Romanian gold deposits is that there are normally three names for each deposit, one German, one Hungarian and one Romanian, which causes confusion for the reader.

The “Golden Quadrangle” in the Apuseni Metalliferous Mountains was the main source of gold in Europe. Epithermal veins and disseminations are housed in volcanic rocks such as at sites, dacites and rhyodacites of Tertiary age. Breccia pipes and subvolcanic intrusions typically host rocks and display strong hydrothermal alteration and hydraulic fracturing. Porphyry copper type deposits are widespread and known to contain considerable amounts of gold. Mineralogically this area is best known

for the Au-Ag-Te minerals, outstanding samples of which are found in some of the mines.⁶¹

The most characteristic feature of native gold from Roşia Montană is the relatively high silver, mercury, and tellurium contents. In addition, some other elements such as S, Te, Cu, Ni, Fe, and As occur with associated mineral phases.⁶²

The chemical characteristics of melted gold from Roşia Montană seem to be silver contents of 20-25 %, copper contents of up to 0.4 %, and tellurium contents of up to 0.1 %. Given that Hartmann's detection limit for Te seems to have been in the order of 0.01 %, it is therefore somewhat surprising that he only found one gold object from the Danubian region in his investigations of prehistoric gold artefacts containing measurable amounts of tellurium.⁶³ This raises the question as to whether Roşia Montană was indeed an important source of prehistoric gold in south-east Europe, as is frequently held. Hartmann suggested, for instance, that the gold of his A3 group, which is, on average, characterized by 25% Ag, 0.3% Cu and occasionally small contents of tin, may have its origin in Transylvania. This is mainly to be found in artefacts of the Early and Middle Bronze Age, and Hartmann also suggested that this type of gold may be the earliest derived from hard rock mining.⁶⁴ It is tempting to relate this group to the native gold of Roşia Montană, but Hartmann did not detect tellurium and the authors did not detect any tin. At this stage we must concede that too few samples have been analyzed to be able characterize the elemental range of minor elements within an ore deposit. It is therefore still possible that gold with a lower tellurium content and with some tin may also occur at Roşia Montană, Bucium, or other deposits within the Golden Quadrangle. At present the question of the prehistoric gold source must remain unanswered, albeit recent advances in mining archaeology have shown that underground mining for copper was already well known in the European Bronze Age,⁶⁵ so it is more than likely that gold was also mined in this way. The Golden Quadrangle thus remains a very good candidate in this respect.

2.3. Metallogenetic setting of the Bucium-Zlatna Area

The Bucium gold deposits are located within the Bucium volcanic complex, in the northernmost volcanic belt of the Golden Quadrangle (fig. 4). This complex is similar in size and geology to the nearby Roşia

Montană complex. It contains similar types of epithermal style gold-silver and porphyry style gold-copper mineralization associated with dacitic and andesitic intrusions, respectively. The Bucium complex, which measures approximately 6 x 3 km in plan, has a NW-SE elongated orientation and comprises several distinct subvolcanic intrusions aligned along three separate NW-trending zones sub-parallel to the major Neogene tectonic trend of the Golden Quadrilateral. Gold +/-silver, base metals +/- gold and porphyry copper mineralizations develop in the area and they are related to the Neogene volcanic activity. The gold mineralization is related to the subsequent volcanic dacitic activity in the Badenian period in the Rodu-Frasin and Contu areas.⁶⁶ It develops as veins (Rodu, Frasin, Contu), cross-cutting veins (so called “chairs”, at Rodu) and stockworks (Rodu).

It should be noted that the metallogenetic fields of Contu, Arama, and Vulcoi-Corabia are related to a major fracture system developing NNW-SSE over approximately 8km in length. Some authors believe that during Antiquity this fractural vein system represented, at least at a certain moment, the most important mining field of the Apuseni Mountains.

3. Landscape Archaeology in the Bucium-Zlatna Area

3.1. History of research

In the 19th century, geological and archaeological research recognized the existence of outcropping gold veins north of the mining town of Zlatna, by identifying some very ancient human works, still visible in many places under woodland, as ancient opencast gold mines.⁶⁷ By the end of the 19th and beginning of the 20th century, B. Lukacs and G. Téglás had excavated several Roman burial mounds on the saddle between Corabia and Boteș. Téglás even drew the first archeological map of this area (fig. 8) and invited the famous British scholar H. Sanders to visit the Corabia opencast mines.⁶⁸ Other Roman cremation graves were excavated by O. Floca in 1938, but no attention was paid to the study of the ancient mining workings.⁶⁹

3.2. Vulcoi-Corabia mining field

The Vulcoi-Corabia metallogenetic field represents the south-eastern end of the major vein system mentioned previously that develops between

the Contu and Vulcoi mountains (fig. 7). This metallogenetic field consists of a major NNW-SSE vein, called Corabia (Ieruga), with some vein splays (Letiului/Paha, Vana Bisorului, Letiului, Surduci etc.) and diagonal NE-SW connection veins (Trancaloaia, Mazare, Segen-Gottes, Pompei, Ortul Homanilor, Buhaiului etc.) and several subsidiary sub-parallel veins, developing especially towards the west (Baisan, Sateana, Floresti, Ceteras, Crasnici etc.). A poorly developed NNE-WSW subsidiary vein system (i.e. Liliecilor vein) is also present.⁷⁰ It appears that the vein material ("ore") can be broadly separated in two main categories: a) clay dominated; b) quartz-carbonate.

The gold is present, generally, as free gold, developing as insulated grains and flakes or grain nests. It should be noted that even in the material from the hanging wall of the Corabia-Ieruga vein, over 30% of the gold is represented by free gold, as suggested by a laboratory processing test performed in the early 1980s. It should be also noted that in many cases the fill-back material of some old galleries is quite rich in gold (several grams per tonne), developing as free gold grains included in quartz, invisible or barely visible to the naked eye. This may suggest that only certain ore types (clay-dominated ore, with visible free gold and probably very high grades) were mined and processed at certain moments of the mining activity in the area, especially during Antiquity.

3.3. Archaeological surveys

In attempting to identify and estimate the archaeological landscapes of Bucium, I rely largely on fieldwork performed in past years. Preliminary work started in 2002, with the study of old literature, ancient maps and photos.⁷¹ During the 2003 and 2004 field seasons, a geoarchaeological team⁷² performed surveys at two major ancient sites: Bucium and Zlatna (formerly *Ampelum*). At Bucium two distinct areas were examined: Corabia and Boteș mountains. The southern part of Corabia corresponds to a huge opencast mine, accompanied by other smaller excavations (fig. 7). On the northern slope, ancient underground works have been identified in the so-called "Baia Domnilor". Ancient opencast mines were located on the top of the Boteș mountain, together with burial mounds. In the Zlatna area we examined a prehistoric site at "Colțul lui Blaj" and the Roman site at "Poduri", in the upper part of the Morilor valley.

Before attempting any excavations, the first task was to record and systematically map the archaeological sites. The mining inventory currently numbers around ten ancient gold mines spread over the southern and northern slopes of the Vulcoi-Corabia mountain. Field surveys were accompanied by aerial prospection, a complex hydraulic network being identified after the study of aerial photos. Archaeological prospection and the inventory of mining sites represent the starting point and basis of this research, although the approach will be incomplete without moving to excavation in the near future.

3.3.1. Bucium-“Corabia” site

There are specific references to ancient mining activity in this area in the archaeological literature of the 19th and 20th century.⁷³ They refer to both surface and underground mining activity. As a general observation, it should be noted that the veins were exploited mainly by surface mining works in the southern part and by underground mining works in the northern part.

During our field surveys we located several mining excavations, some large in size, on the southern slope of the Corabia mountain (fig. 11). The largest excavation, which started from the top of the mountain (at 1349 m), is called “Ieruga” (fig. 13). Mortars and grinding stones were collected from this area (fig. 29). The ancient miners set to work on an opencast quartz vein, and to the deeper levels they drove a huge adit, more than 600 m long and 40 m deep. It should be noted that this huge excavation had already been noticed and drawn by 19th century archaeologists (fig. 10). It could be seen more clearly up to the middle of the 20th century, today most of the area being covered by forest (fig. 13).

A second impressive ancient excavation called “Gaura Perii” (fig. 18) stretches over the south-western slope of the Corabia hill. Several mortars and grinding stones were collected by our team from this area. They clearly show the area to have also been mined in the 2nd-3rd century AD.

Apart from the larger excavations, some of them outlined on the existing maps, the aerial surveys offered new data on the mining and ore treatment areas. The photographs show many other smaller trenches and pit-like excavations spread over a relatively large area (fig. 9).

Ancient mining works on the Corabia mountain appear as long excavations, from 10 to 100 m long, 5 to 40 m wide, and 3 to 15 m deep.

As the veins crop out, mining was always started as opencast. As usual, the waste had been dumped near the excavations. Piled up in mounds at the sides of the opencast mines, these dumps gradually subsided inside the mining works after the cessation of mining activity. The subsidence of these dumps has contributed to the partial filling of the interiors of these opencast mines, completely hiding the entrances to possible underground works.

In the ancient opencast mines, ore extraction may have been performed by firesetting. This technique consists of heating the rock surface with a wood fire built against the face. The rock fissures and breaks under the thermal stress. As of yet, we have not found clear evidence of this type of operation at the Bucium mines. On the other hand, some faces do bear traces of pickaxes. This is a specialized iron miner's tool with the shape of a hafted chisel, the end of which the miner would strike with a sledge hammer. This sort of mining tool is well known from ancient to late medieval mines. Unfortunately, an opportunity to discover any miners' tool in the Bucium mines is yet to arise. It appears the chisel cutting technique was the main method used, either carried out on its own or in combination with prior firesetting, traces of which would have been destroyed by the final cutting operation.

Ore treatment areas were installed all along the eastern edge of the opencast mine of "Ieruga", which can be easily seen from the aerial photos (fig. 12). They comprise long trenches cut into the slope, and ending in a small pond.

3.3.2. Bucium-"Boteș" site

During the 2004 field surveys we were able to locate several surface excavations in the area of the Boteș vein group, just south of the Pietrele de Moara peak (fig. 25-26). It is very likely for at least a part of these excavations to be ancient and they may be related to the Roman cemetery excavated here in the late 19th and middle of the 20th century.⁷⁴ Roman miners were cremated and their ashes buried under burial mounds (fig. 32), together with pottery, clay lamps and small ornaments. From the funerary customs, it seems the miners originated from Illyricum, a similar situation as with Alburnus Maior (Roșia Montană).⁷⁵

3.3.3. Underground works: the Peter and Paul mine

The northern parts of the veins from the Corabia metallogenetic field were exploited mainly by underground mining works (galleries, blind shafts, inclined plans). In the archives of the 19th century, the mine called “Petru și Pavel” (Peter and Paul) has always been mentioned as a network of “ancient works”. Consequently, we tried to locate it during our field surveys in the Vulcoi-Corabia area. Thanks to the old maps and the support of some old local miners,⁷⁶ we were able to locate the mine on the north-western side of the Corabia mountain, although its entrance was almost completely filled in (fig. 19).

Due to the vegetation and fallen rocks, it was quite hard to clear the entrance, another difficult problem being the drainage of the water, which created a small lake inside the gallery. In spite of all these difficulties, part of the main gallery was made accessible to the study (fig. 19-20).

The gallery has the following dimensions:

- accessible length of 21 m;
- average height of 1.60 m;
- average width of 1.40 m (from 2.20 m at the entrance to 1.40 m inside);

The gallery was excavated in a rock of high hardness, that is andesite. It was opened by sharp tools and in spite of the modern (19th century) mining, the gallery still retains traces of iron tools on the walls (fig. 21), which confirm its excavation before the age of powder usage (17th century). The crown also bears traces of sharp tools in the entrance to the collapsed area. The gallery has the characteristic trapezoidal section, also known from other Roman mines in Roșia Montană.⁷⁷

We also identified several lamp niches cut into the left wall of the gallery (fig. 21). They show well the progression of the working space and the progressive deepening of the gallery. The vestiges are of a very good quality and their features allowed for rapid identification. The presence of lamp niches usually indicates Roman period techniques.⁷⁸

Probably the most remarkable feature of the “Peter and Paul” site is the conservation of the original Roman entrance, although the mine was worked till modern times. This network deserves to be excavated in depth in order to check for old works related to the gallery further inside the massif. To do this, it will be necessary to take out the water by drainage or pumping and then to advance by releasing the filling.

3.3.4. Zlatna-“Poduri” site

The field survey suggested to us that most of the material mined from the Corabia excavations was piled along the “Podurile” ridge. According to the geologist, most of the stone blocks observable on the ground are relatively newly volcanic and at least apparently barren. Very few quartz blocks were noted. Once extracted, the auriferous quartz was crushed and ground down to dust. Mortars, crushing-tables and grinders used for these operations were discovered in the dumps filling the excavations, probably dating from Roman times. These stone tools were made out of local rocks, such as andesite. Similar tools are known from the late La Tène sites of Les Fouilloux and Gros-Galet-nord in France⁷⁹ as well as in Spain.⁸⁰

After the ore was ground, the gold-bearing fines were washed in water to concentrate and recover the gold particles. The ancient site of Poduri has washing areas. Some of these washing areas were situated immediately adjacent to the opencast mines. They comprise small trenches cut into the slope in stony ground, and ending in a small pond (fig. 12). The miners would have fitted these trenches with wooden cleats or even sheep-skins to catch the gold particles carried in the slurry. Because of its high density, gold tends to be carried in the lower part of the stream.

A complicated drainage system and water-collecting ponds can still be observed in the area of the Zlatna-“Poduri” site (fig. 24). The ancient miners used a large quantity of water, stored nearby in several ponds. For each operation, they mixed the gold sands with water and let the mixture flow down the trench. At the end the muddy mixture collected in the terminal basin would have been recovered and recycled many times to extract the majority of the gold. A gold-bearing concentrate is retained in the trench by the traps. It appears that the miners preferred to perform this enrichment of the ore directly at the pit-head, rather than by the small stream running down from the mine. This demonstrates a wish to keep gold production as close as possible to the place where the ore was extracted.

It should be noted that Roman ceramics from the 2nd-3rd century AD (fig. 28) were found at the bottom of several canals (called “*corrugi*” in the ancient Latin sources). A topographical work was begun in the autumn of 2004, in order to produce a 3D map of the complex Roman hydraulic network still found on the Poduri plateau (fig. 15).

The observations made during the 2004 field campaign suggest that part of the mined ore material was probably of clay type. Taking into

account the presence of the aforementioned water drainage and storage systems, and given that in this type the gold is present as free gold grains and flakes (sometimes concentrated in nests), we can suppose that the main processing method was gravitational concentration using water (panning, sluicing). The presence of a straight, relatively steep water channel in the western side of the piled material suggests that “ground sluicing” (hatching) was probably used as a “secondary” recovery method of the gold from the lower grade material.

3.4. Evolution of mining techniques

The history of mining in the Bucium-Zlatna region probably dates to the Late Bronze Age. Several golden earrings belonging to this period have been found on the Vulcoi mountain.⁸¹ Silver Dacian coins (fig. 27) were found on the Corabia mountain, apparently in the ancient mines.⁸² Ancient miners worked veins and veinlets of gold bearing quartz and, mainly, auriferous quartz hydrothermal lodes outcropping in the southern part. The host rock of these auriferous veins are metamorphic rocks such as andesite or dacit. The width of the veins can reach tens of centimeters and even, albeit rarely, over a meter. Most of these veins and veinlets cropped out, which made their early discovery possible. The ancient opencast mines appear in the landscape as long and deep excavations, following the main veins (fig. 23).

The field surveys conducted at the mining sites provided the possibility of clarifying the Iron Age and Roman mining techniques used in the Bucium-Zlatna region from the late Iron Age to the 3rd century AD. At these sites, characterized by large opencast mines, the earliest works from La Tène were found sited at the edge of the later, larger works. These were saved from later reworking because they were worked for only a short time. The discovery of types of mining remains, older surface works and more recent deep works, allows us to demonstrate the evolution of mining techniques used in the Bucium region from the Iron Age to Roman times.

3.5. Communication patterns: Roman roads in the Zlatna-Bucium mining area

We have examined mining sites, the landscape around them, the important places in that landscape, and the technological framework

within which all these features were arranged. It now only remains to examine the physical links between all these elements: the communication pattern. In this chapter we shall look at land transport in particular.

Documents can be of help in reconstructing earlier road patterns, and, of course, place names (together with field and local names) provide further references. There are numerous local names referring to roads and paths, of which "Calea Bătrânilor", or "Old Men's Road", between Bucium and Abrud, is the most obvious.⁸³

Excavation in general is of little use in this area of enquiry, although it can produce evidence of goods and commodities being moved around in the landscape which can best demonstrate trading links, and, by implication, the routes used. Most early roads were not "constructed" as such; their surfaces wore down and hence any directly associated datable material is usually either eroded or out of context.

Fieldwork is immensely useful in any study of early routes. Abandoned routes can be recognized as holloways – the characteristic worn-down lanes with steep sides which are common at medieval sites and can often be traced up hillsides and through woods. On steep hillsides, numerous holloway routes may be seen and here, as elsewhere, alternative lines often exist: as one lane became boggy or impassable, another was opened up.

When gold was produced and exported on a large scale, as it was during the Roman era, a fully functional and simple system of communications was essential. Whenever metal production exceeded the local or regional scale, mining communities were perforce linked into interregional networks of communication and exchange.

No information has been found among ancient sources concerning the Roman road that linked Apulum and Ampelum. Most researchers of the Roman period have nonetheless pleaded for the existence of a Roman road between Apulum and Ampelum. M. Macrea mentions this route – "a road led from Apulum to Ampelum, along the Ampoi Valley and deep into the auriferous region. From Ampelum it linked up across the mountains with the road that connected the mining settlements of Abrud and Alburnus Maior (Roşia Montană). This latter route went down the Arieş Valley and reached Potaissa."⁸⁴

The most important settlements along the Roman road in the gold mining area are Ampelum and Alburnus Maior. A Roman town developed in the narrow Ampoi Valley at Ampelum. It was the residence of the Roman procurator who supervised all mining activity in the Apuseni Mountains.

An important center of gold mining, the town was guarded by troops belonging to a *Numerus Maurorum Hispanorum*.⁸⁵ The ruins of the town lie south-east of Zlatna, in the Ampoi Valley, while the remnants of the Roman mines can be seen today from the Iadului and Pietrele valley to the top of the Corabia mountain.

There are numerous hypotheses concerning the Zlatna-Bucium portion of the Roman road. G. Téglás explored the region and concluded that the road follows the Ampoi Valley to Dumbrava Ampoiului, where mercury was extracted. It then goes up the Arin or Ruda valley to the Corabia-Vulcoi mountain. From there the Roman road crosses the Sudoareș Hill, passing along the Southern ridge of the Corabia peak and further on to Slăveșoia. The Roman road is noticeable on the crest of the Boteș Mountain. From there it follows Izbita Valley, passing through Stânișoara, Izbicioara and Gura Izbitei before finally reaching Bucium.

I. T. Lipovan has explored a shortcut that linked the two mining centers of Ampelum and Alburnus Maior. It climbs Troianu Hill to Dumbrava. It then crosses the Muncel ridge, passing by Tisa peak before reaching Dâmbul Pădurilor, where it is noticeable on the surface for about 1 km. From there, the road passes by Fântâna Străjii. Once it reaches the mining area of Vulcoi-Corabia, it follows the route described above to Roșia Montană.

V. Wollmann describes the Roman road as having the course determined by G. Téglás and I. T. Lipovan, who prospected the Zlatna-Bucium area (fig. 30).

We were able to locate the itinerary proposed by I. Lipovan and to study mainly the sector close to the “Poduri” site, where the road crosses another Roman cemetery before reaching the plateau (fig. 31).

The portion between Zlatna and Bucium of the Roman road is 16 km long and heads north. From Bucium the route goes up the Corna Valley and reaches Roșia Montană. According to V. Wollmann, it goes round the Țarina Hill and passes by Pădurea Popii, which is close to the Lower Ferdinand Mine, the possible site of a Roman mining settlement. The portion of the Roman road between Bucium and Roșia Montană is approximately 5.5 km long and has a SE-NW orientation.

It should be noted that the road does not reach Abrud and Roșia Montană by way of the Abrud Valley. Although a Roman *castellum* existed in Abrud, the Roman road connects Bucium and Roșia Montană directly. A Bucium-Abrud *deverticulum*, which then met the Arieș Valley route, may have existed.

4. Industrial and Ideational Landscape in the Bucium-Zlatna Area

4.1. The mining landscape

In my study I looked specifically at mining sites and prominent features within the striking mining landscape of the Bucium-Zlatna region. The abandoned mines, massive heaps, and regenerated forests that exist today impacted significantly, and over time, on the ideational landscape of this area. Our understanding of the industrial landscape of both prehistoric and historic Bucium has been enhanced by the interdisciplinary surveys and exploration currently being undertaken by the Zlatna-Bucium Project. Places such as Corabia mountain are often imbued with immense ideological and economic significance: here the landscape impacts on both personal and cultural identities. It is important to relate archaeologically-visible mining “settlements”, such as *Poduri*, to the abstract concept of mining “communities”. Situated out of necessity in close proximity to ore bodies, such communities also required water, timber, agricultural land, and a viable transport system. Although primary production took place in close proximity to the mines, other factors may have affected the various sequences of social production, political expediency, and economic demand: these might include access to the ores; micro-environments for effective smelting, beneficiation, and the like; the organization of the labor force; and the role of rural sanctuaries in the system overall.

The materiality of the mining experience is a major factor in the social construction of a mining community and, by extension, the mining landscape. The mines gave villagers a sense of their own economic and social identity: this remarkable human modification of the landscape altered the traditional agricultural character of Bucium and served to reconstruct it as a village with a mixed agricultural and industrial economy. The dominant spoil heaps in this region reflect the daily grind of mining; in time they assumed social significance as part of the industrial landscape that configured everyday life.

Similarly, a vein of gold bearing quartz in an outcrop of rock may have a special significance for someone involved in the mining and production of gold, be they a prospector, miner, or farmer producing food for a mining community. In the eyes of the mining community, certain aspects come to the fore in the appropriation of a local landscape: natural

resources; agricultural land; places for working and spaces for dwelling; communications; and, in some cases, the ideology of mining practice. But gossans and ores are by no means the only components of a mining landscape, ancient or modern.

Because mining galleries usually need pit-props, and smelting needs fuel, inevitably the production of metal needs forests. The denuded landscape of certain areas on the Corabia and Boteș mountains (fig. 24, 26), not far from the Bucium-Poieni village, must have resulted at least in part from 2,500 years of gold, silver and copper mining and production.

The relationship between mining, settlement, and landscape varies according to the scale and organizational level of production. For example, the intermittent small-scale, localized production of the medieval period in the Bucium valley contrasts markedly with the larger-scale industries and major labor forces typical of the Imperial Roman period. Invariably this development would have impacted on the mining landscape in the form of imports, migrant labor, and possibly even new settlement patterns in the face of other socio-structural change.

4.2. Ideational landscapes

Only recently have archaeologists begun to pay close attention to a domain frequently called “*sacred landscapes*.” This is only one of several terms used to highlight non-economic perspectives on human-land relations. Whatever the labels used, study of these landscapes is hampered by ambiguity in the material clues to social meaning: we know from modern peoples that meaning in a landscape is not directly related to how obtrusively it has been marked in material, archaeologically detectable ways.

The *ideational landscape* of the Transylvanian Metaliferi Mountains was intimately linked to mining activities and the Iron Age and Roman elites, who exploited their perceived knowledge in exchange for control over the appropriation, distribution and consumption of labor, land and raw materials, especially gold and copper. Whereas archaeologists have typically discussed the parameters of authority in the ancient Transylvanian landscape by referring to the construction or development of monumental architecture in urban centers, we should not ignore the strategic, symbolic value of ritually defined sacred space in rural settings, or any other aspect of the unbuilt landscape.

How then can we envision the “sacred” landscape of the Bucium-Zlatna region? First, I would define the landscape as ideational rather than sacred, and would argue that people collectively develop and maintain certain places, or even regions, in ritual, symbolic or ceremonial terms. These places, in turn, create and express social identity. Within the landscape, people enact the “sacred” and symbolic, which in turn helps to establish their social identity and ideological authority and to reinforce socio-economic or religious institutions. Landscape features, monuments, sanctuaries and shrines serve as social spaces where public or ceremonial activities are carried out and where local history is generated and maintained. The ideational landscape helps to create specific social, cultural, and politico-economic configurations. Archaeologists interested in “sacred” space need to understand how such elements in the landscape impact upon human relations, and how processes of legitimization and empowerment are played out in spatial and temporal terms.

All of this material, from tumulus and altars to mining and archaeometallurgical installations and rural “sanctuaries,” forms part of the ideational landscape. And within that landscape, individuals – as members of groups – have negotiated differing interests and manipulated their socio-spatial world: this is the closest link we can make between mind, meaning, and symbolism in the ancient context.

5. Cultural Landscape, UNESCO and the European Landscape Convention: A Future for the Bucium-Zlatna region

5.1. Defining and protecting cultural landscape

The archaeological notion of a *cultural landscape* assumes that past patterns have somehow created or influenced the present through a predictable continuity (or “association”). There have been some commendable attempts to bring together cultural (i.e. archaeological or historical) and natural (i.e. ecological and aesthetic) approaches to landscape – for example, in the discipline of landscape ecology – but they still remain rare.⁸⁶

The landscape record may be modified, confused or destroyed by the dynamic interplay between natural and human factors. This realization

led UNESCO to categorize and define “outstanding” cultural or “natural” landscapes in an attempt to identify and preserve them. One main category defined by UNESCO – the *organically evolved landscape* – includes a “subspecies” (relict) “...associated with industries such as mining, quarrying and the production of metals,...”⁸⁷ Reference is made to classical Greek silver mines at Lavrion, and to 19th- and 20th-century gold-rush regions of western North America and Australia. This category seems to be equivalent to what the US National Park Service defines as a “historic vernacular landscape;” the National Register lists specific criteria to help identify, define, and evaluate the historical significance and integrity of these typically rural landscapes.

Most importantly, the publication of Europe-wide instruments (first a *Council of Europe Recommendation on Cultural Landscape in 1995*, now the new *European Landscape Convention*)⁸⁸ opens new doors for a wide-ranging comprehensive debate on the future of the European landscape to which archaeological heritage managers can make a significant contribution.

The European Landscape Convention offers a new framework for bringing landscape and its archaeological aspects into the mainstream of European heritage and social policy. The Convention establishes the principle that all of Europe’s landscape is a common cultural resource, and that an important aim of European policy is to maintain a landscape’s diversity for reasons of local and regional identity and economic and social health.

In the context of the cultural objectives of the European Union there are any number of suitable themes for collaborative international research and heritage management within a European framework. The *Europae Archaeologiae Consilium* (EAC) has declared as its primary mission to support the management of archaeological heritage throughout Europe and to serve the needs of national archaeological heritage management agencies. It will do this by providing a forum for organizations to establish closer and more structured cooperation and exchange of information, as well as by working together with other bodies that share the aims of the EAC.

5.2. Protecting the landscape of the Bucium-Zlatna area: the future agenda

Old mine sites are an integral part of Europe’s cultural heritage and thus should be treated with the same respect as the other remaining features of

Europe's past. Rather than destroying mining features, their preservation offers opportunities for education, appreciation and cultural tourism.

The Bucium valley is closely linked to the Zlatna area and together they definitely form a *cultural landscape*. This comes as a result of the Roman intervention in the territory over a period of two centuries (2nd-3rd centuries AD) and the changes experienced in this territory up to the present day. Its importance, however, goes beyond the monumental remains of Roman gold mining, as it is the product of historical changes of all types that this exploitation and domination implied.

In my view, the Bucium -Zlatna region fits into the UNESCO category of "organically evolved landscape". So far, there are no such classified archaeological sites in the Bucium valley. Once the area is assigned the status of a cultural landscape, as a space combining natural and cultural values, it may then in the future become an explicitly recognized heritage site of world renown.

This will be firstly for its *historical significance*: as a witness of the change in the exploitation of resources and the way of life of the local communities during Antiquity. On the one hand, this was one of the largest opencast mines in the entire Roman Empire, with mining clearances reaching one kilometer at their maximum extension and more than 40 meters deep. Bucium valley is, above all, also an exceptional example of a historical process. It is one of the best examples, though not the only one, of the profound change Roman gold-mining brought to the communities inhabiting southeast Europe.

Secondly, this will be because all these transformations – those we can appreciate and understand directly in situ, making this in part a relic or fossil landscape – gave rise to new realities that determined its use up to the present day. This is not a static landscape, for it has always been in a state of permanent dynamism. The historical process did not end with the Roman era, it continued during Mediaeval and Modern times.

The Bucium valley could become a **Cultural Park**, a dynamic reality in which the fossilized remains are articulated within a living landscape, that of our time, leading the visitor to today's territory into the territory of the past. The tourist potential of old mines has been recognized in many parts of the world.⁸⁹

The guiding principles of the future Bucium Cultural Park will be: knowledge, care and communication:

- *Knowledge* is seen as a keyword. Bucium Cultural Park will approach this from two angles: deepening our knowledge through the promotion of research, and spreading it through various public relations activities. Knowledge about the history of a landscape is essential to the interests of its actual inhabitants, to their pride and wish to care for and protect the historical monuments within the landscape. On the other hand, lack of knowledge, lack of interest and lack of respect can easily lead to a destruction and loss of heritage.
- *Care* and protection of the physical archaeological remains – scrub-clearance, fencing, regulated grazing and scything. There are certain problems relating to visual condition and protection. Landscapes change rapidly, and similarly the visual character of sites and monuments is changed by overgrown bushes and trees, making archaeological sites less interesting for cultural education purposes and also for other scientific reasons. This is especially true of post-Soviet countries. An important future aspect was to find solutions for the permanent care of monuments. The risk of damage to monuments by visitors was taken into consideration in the planning of the cultural paths.
- *Communication*, which means bringing the public to the cultural heritage site and the monuments in the landscape by establishing cultural paths, marked trails leading to the sites, and producing informative brochures to guide visitors to the monuments. Additional measures such as reconstructions, exhibitions and school programmers were also included. The aim was to cater for the needs of both people living in the areas involved and cultural tourists from elsewhere.

One possible model of heritage management in the field of cultural landscape is that of the European Cultural Paths, a partnership between projects dealing with heritage in five countries (Sweden, Denmark, Norway, Germany and Estonia). This project intended to provide a model for co-operation between archaeologists and management in the preservation of cultural landscapes. It was funded by the RAPHAEL programme of the European Commission with financial support from states and local municipalities (European Cultural Paths 1998).⁹⁰

A pilot Cultural Path has already been promoted in the Roşia Montană-Corna-Bucium area under the name of “Drumul Aurului” (The

Golden Way).⁹¹ Several physical paths were created and signposted in the landscape, and multilingual full-color brochures introducing the paths were printed, helping visitors to learn about the archaeological sites and monuments that were all well looked after. All information concerning the Bucium Project and the related heritage sites was made available via a Web site (www.buciumland.ro). One of the most important results of promoting a Cultural Path in the Bucium-Zlatna area will be the interest of European tourists for the region.

The guiding principle of a future Bucium-Zlatna protected area is to prevent major human change and particularly, future mining projects in this region. The future inclusion of the Bucium valley in the National Heritage List represents a challenge, not only for those responsible for its protection or the local inhabitants, but for all of us. We must remember that Bucium valley is not a renewable property and that we must all become involved if this is to become a *lasting asset*.

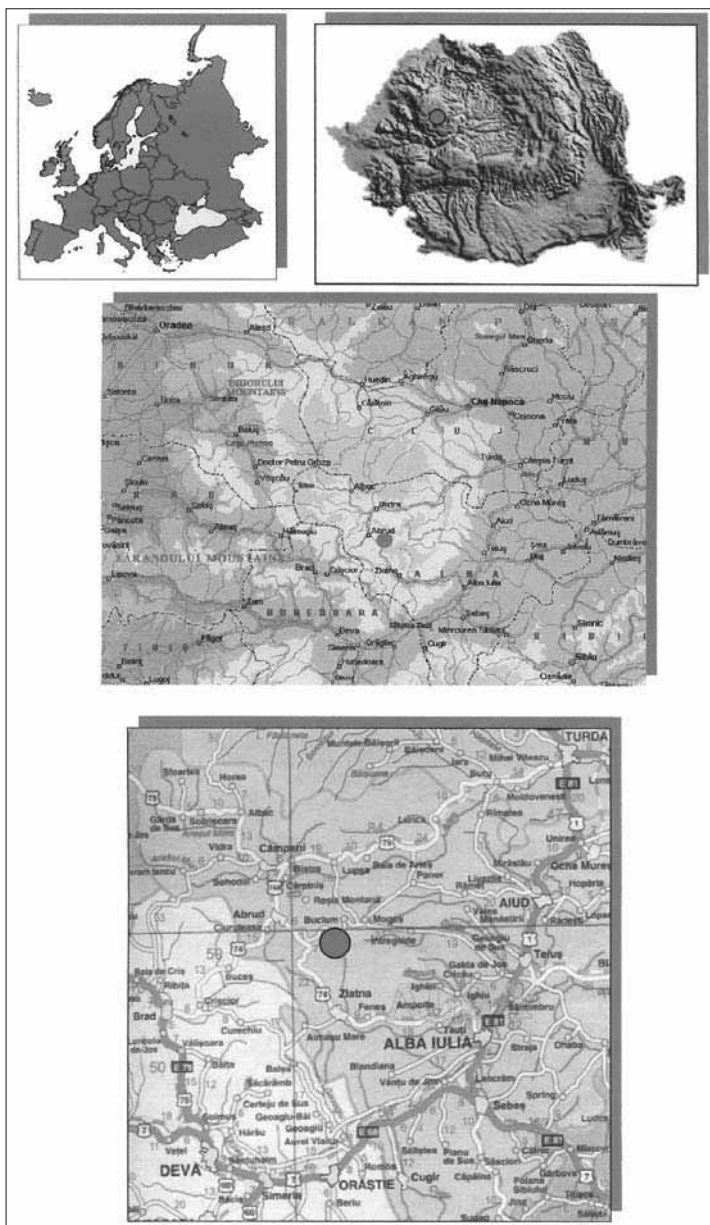


Fig. 1. Location of the Bucium – Zlatna Archaeological Project

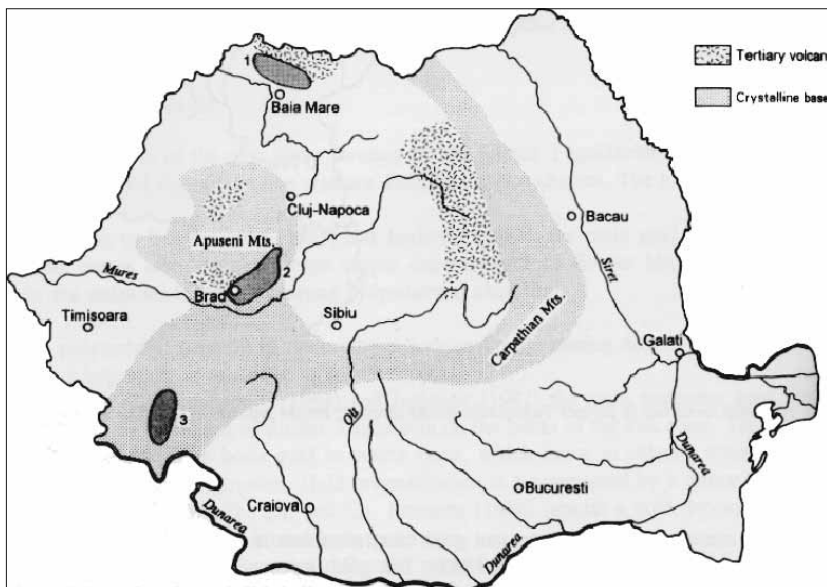


Fig. 2. Major gold mining districts (dark pattern) of Romania;
 1: Baia-Mare and Baia Sprie,
 2: "Golden Quadrangle", Apuseni Mountains,
 3: South Carpathian metamorphic zone.

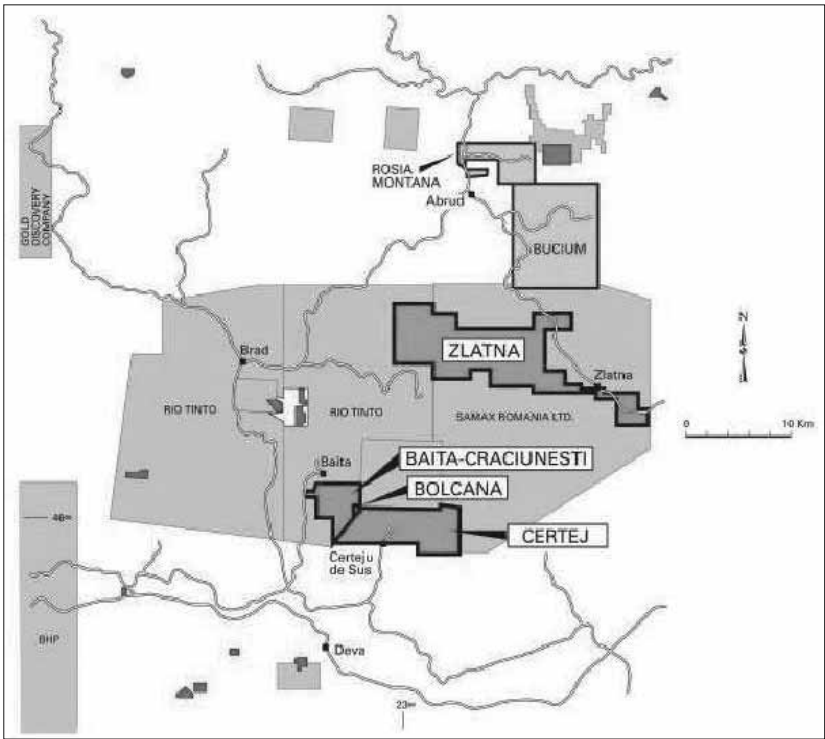


Fig. 3. Map with the future gold mining projects in the “Golden Quadrangle”

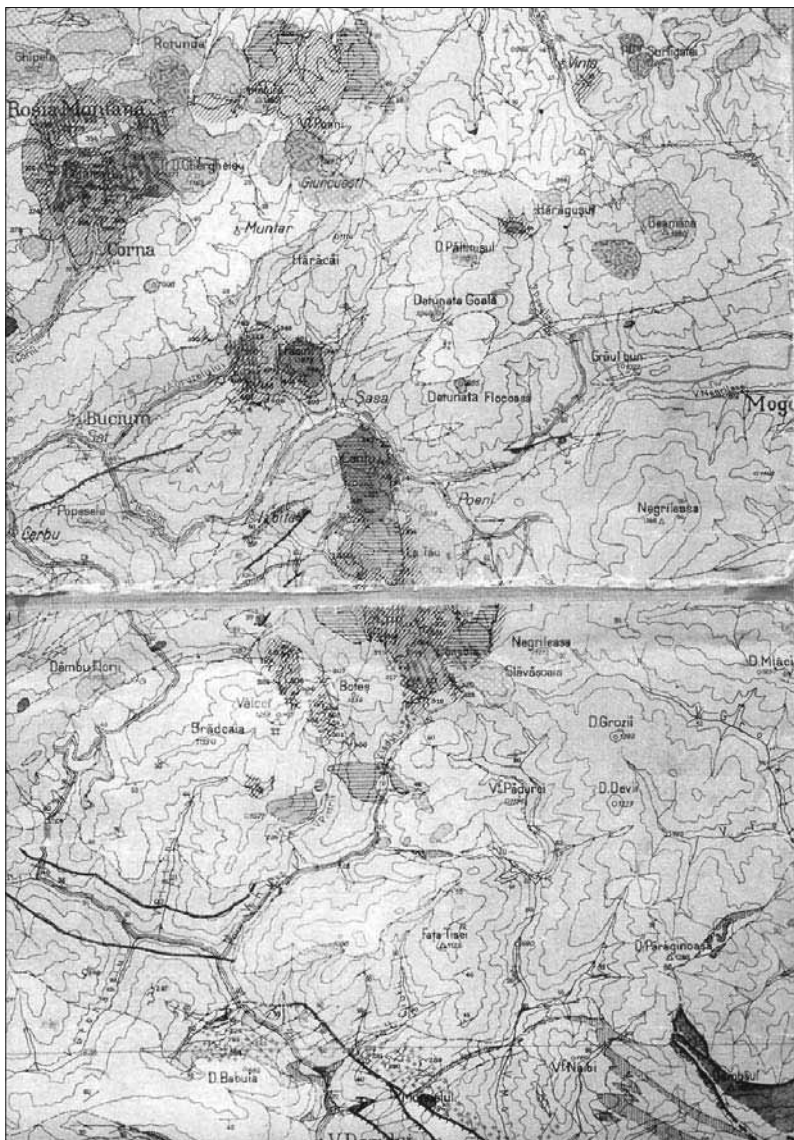


Fig. 4. Geological map with the location of the gold deposits from Bucium – Zlatna – Roșia Montana (*apud* Ghițulescu and Socolescu 1941)

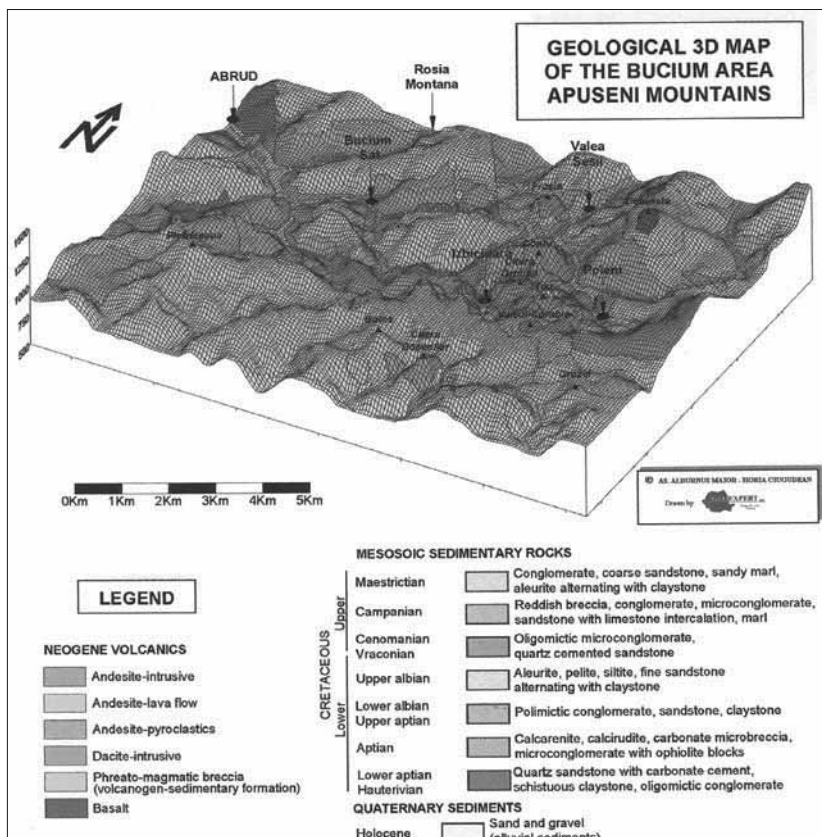


Fig. 6. 3D geological map of the Bucium valley, Apuseni Mountains

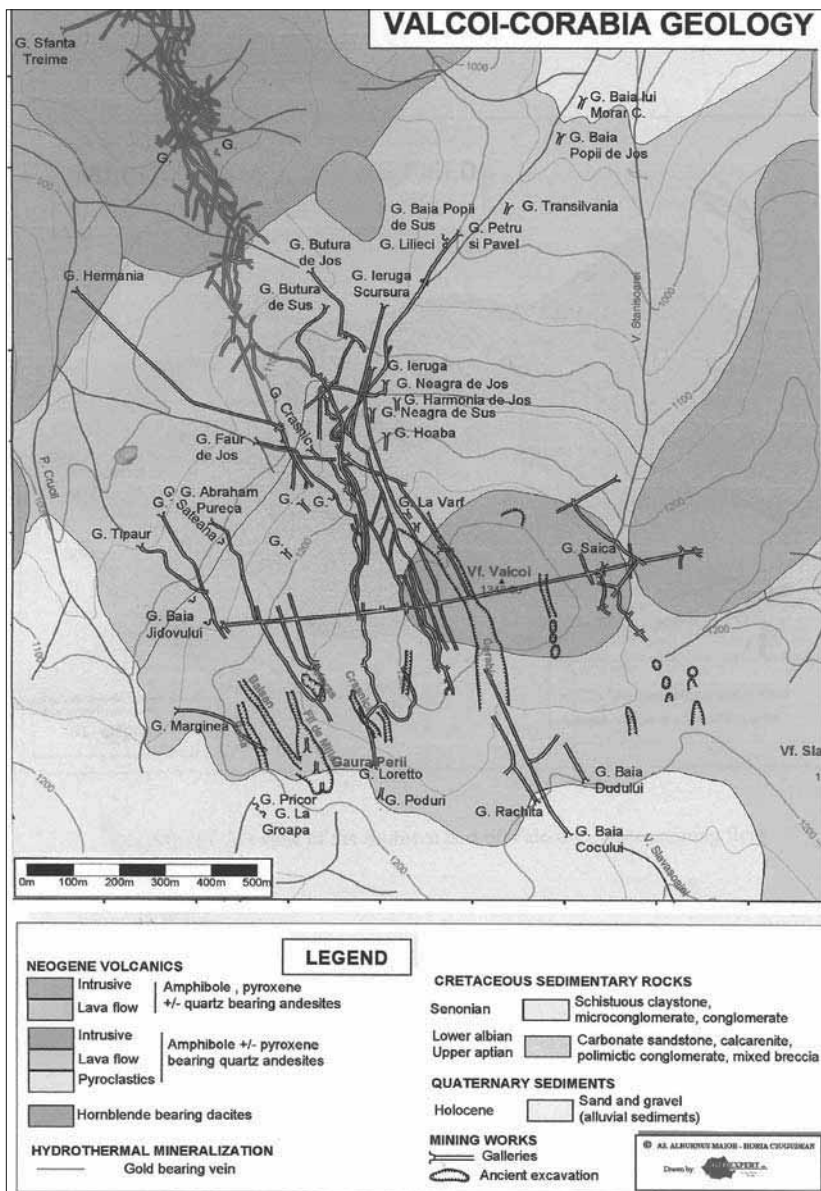


Fig. 7. Ancient and modern mines in the Vulcoi – Corabia area

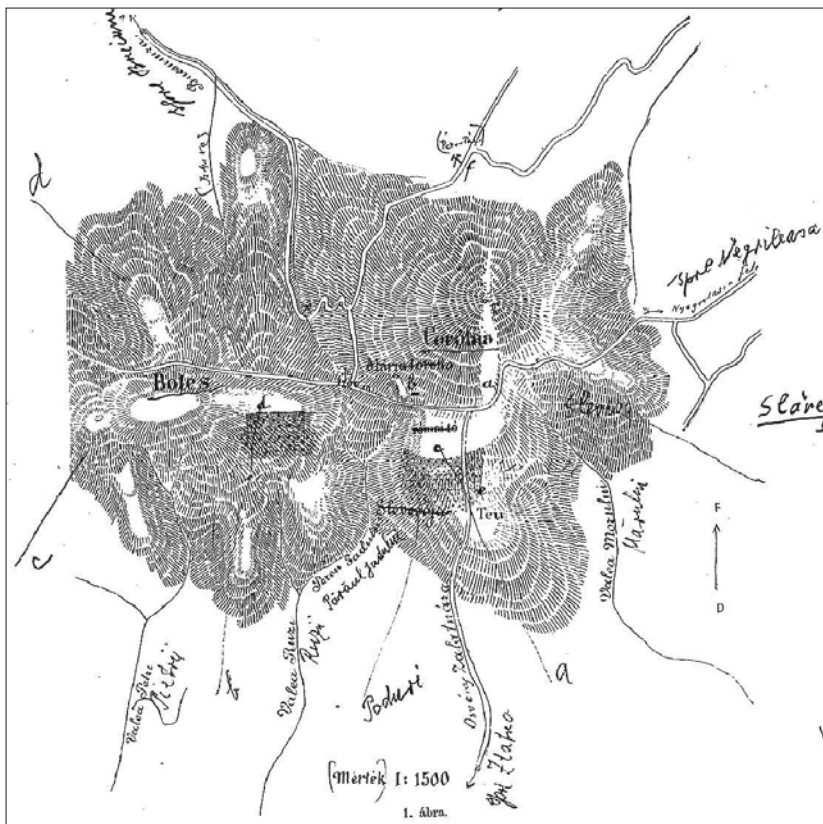


Fig. 8. Gabor Téglás' map (19th century) with corrections made by O. Floca in 1938



Fig. 9. Aerial photo with the Corabia Mountain

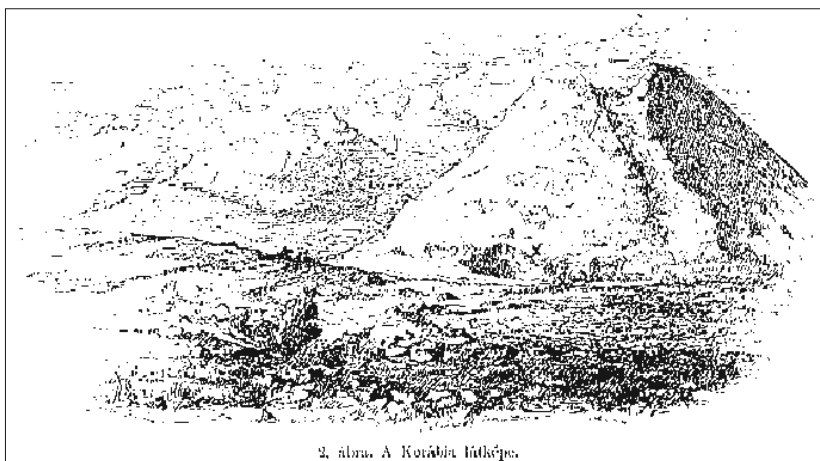


Fig. 10. 19th century drawing with the Corabia mountain and the ancient Ieruga opencast mine



Fig. 11. Present-day view of the Corabia mountain



Fig. 12. Aerial photo with the leruga opencast mine and adjacent ore treatment areas

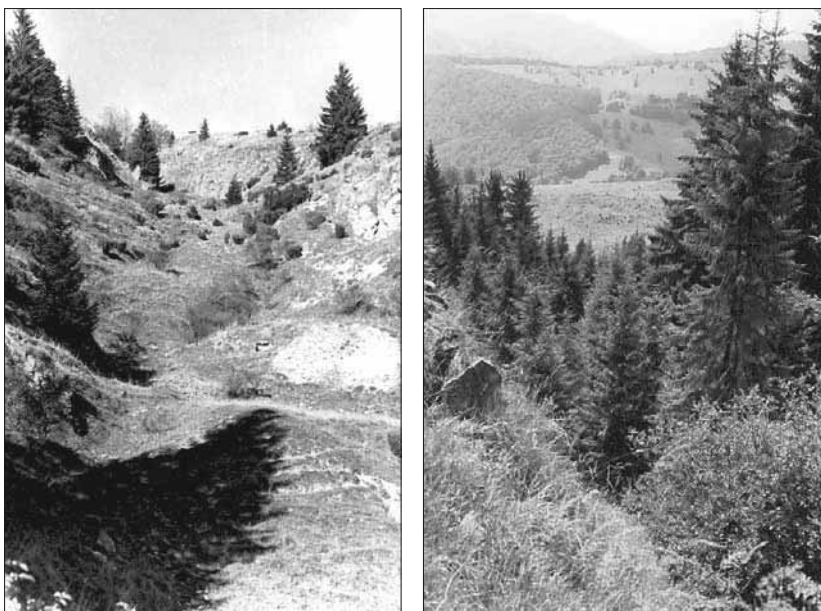


Fig. 13. Old (mid 20th century) and present-day view of the leruga opencast mine



Fig. 14. Zlatna: Aerial view of a Roman pond (*piscina*) on the Poduri plateau

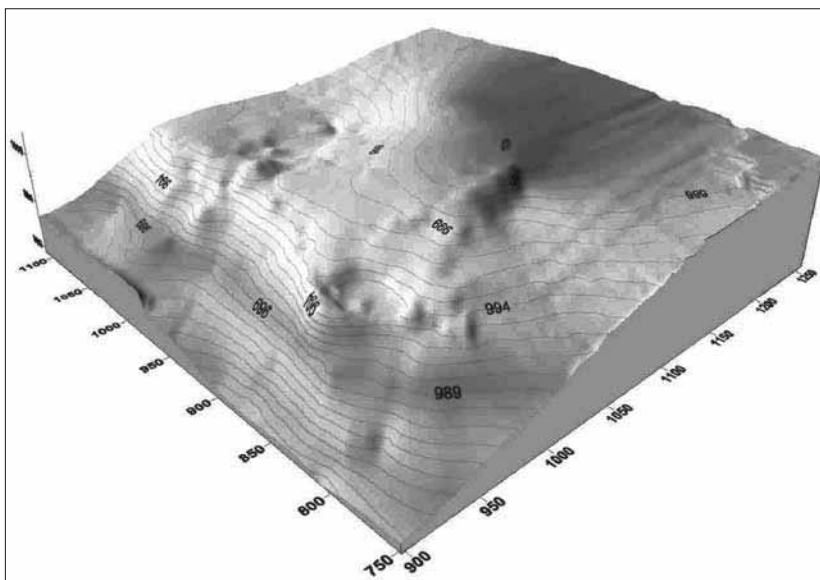


Fig. 15. Zlatna – “Poduri” site: 3D map of the Roman pond and collecting chanells



Fig. 16. Present-day view of a Roman pond (*piscina*) on the Poduri plateau

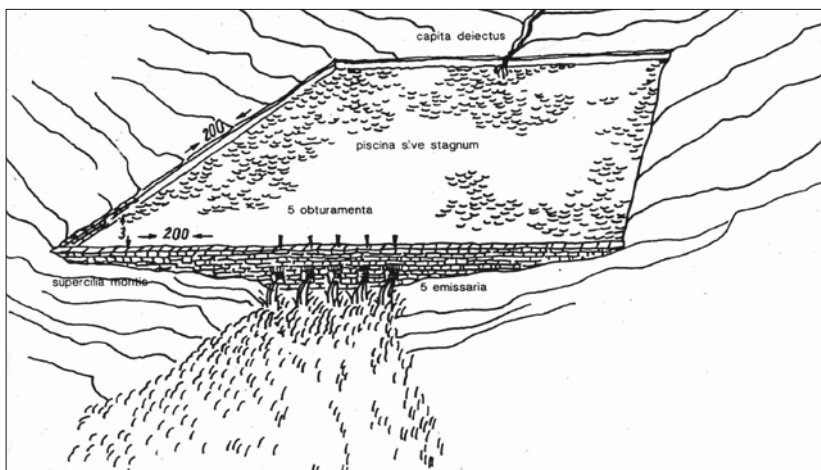


Fig. 17. Graphical restitution of Roman pond (*piscina sive stagnum*) according to Vitruvius description (*apud* Wollmann 1996)



Fig. 18. Old (mid 20th century) and present-day view of the Roman opencast mine „Gaura Perii”



Fig. 19. Peter and Paul mine with the original Roman entrance and inside main gallery

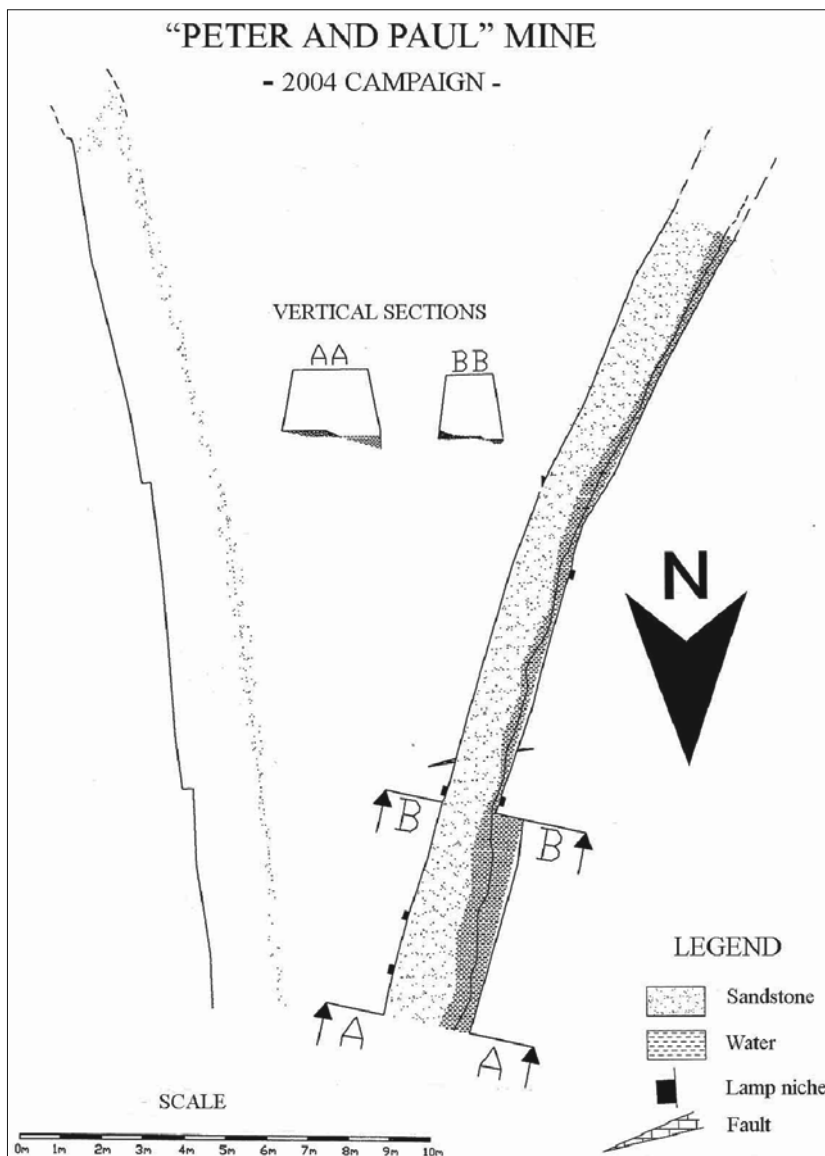


Fig. 20. Peter and Paul mine: Plan of accessible Roman gallery

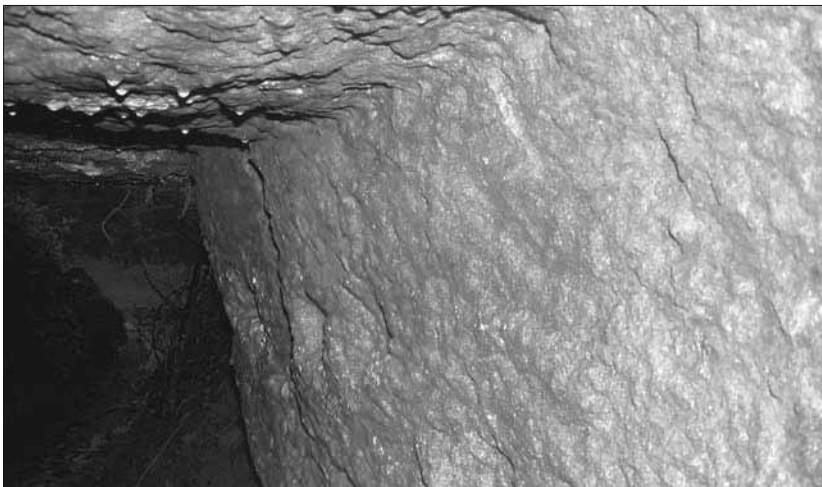


Fig. 21. Peter and Paul mine: detail of the eastern wall with pickaxe traces and several Roman lamp niches

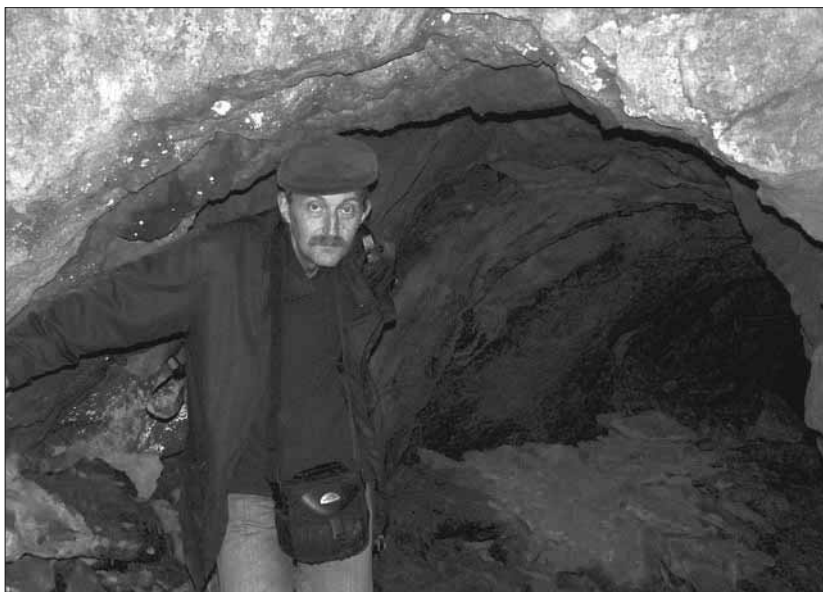


Fig. 22. The author inside a late Middle-Age gallery, open by gunpowder

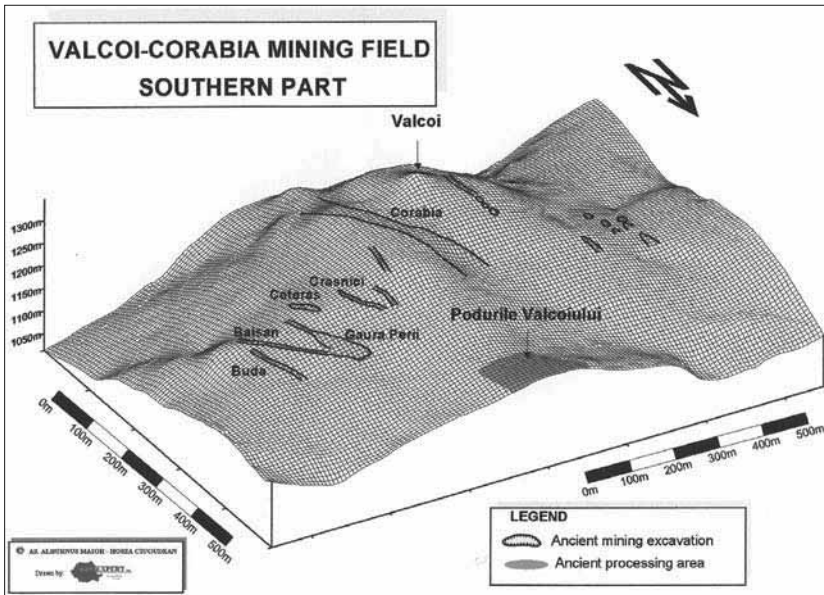


Fig. 23. 3D view of the southern slope of the Corabia mountain with several opencast mines and ore concentration areas

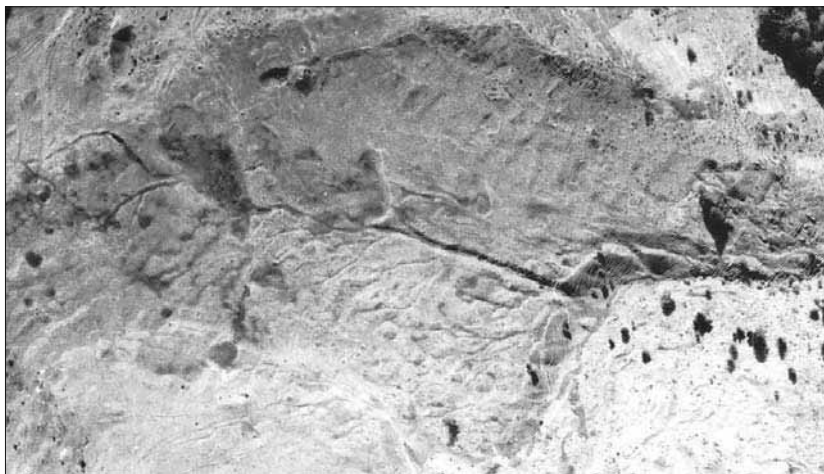


Fig. 24. Zlatna – “Poduri”: aerial and field views of one of the Roman canals (*corrugi*)



Fig. 25. Ancient opencast mines on the top of Boteș mountain



Fig. 26. General and close views of ancient excavations
on the top of the Boteș mountain



Fig. 27. Dacian silver coin and Roman altars found on the Corabia mountain in the 19th century (*apud* Téglás 1890)



Fig. 28. Roman pottery (2nd – 3rd century AD) discovered during the field surveys in the Bucium “Corabia” site

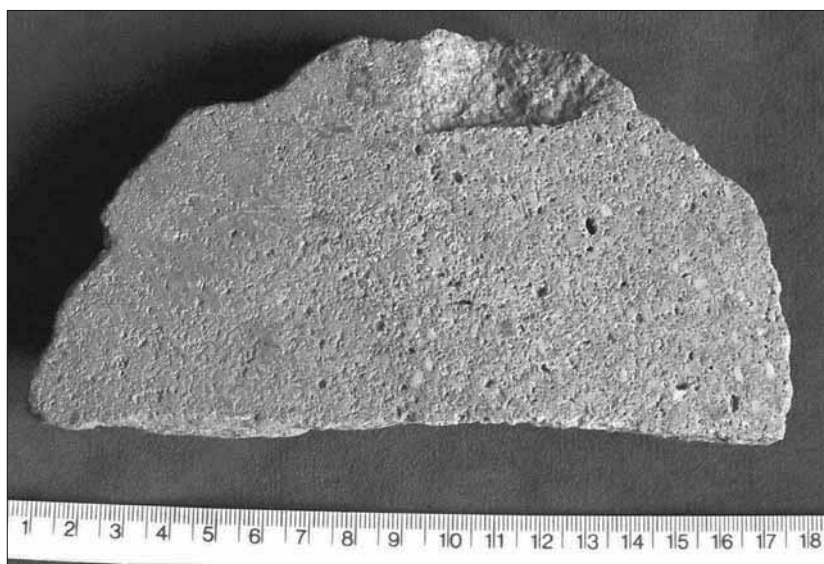
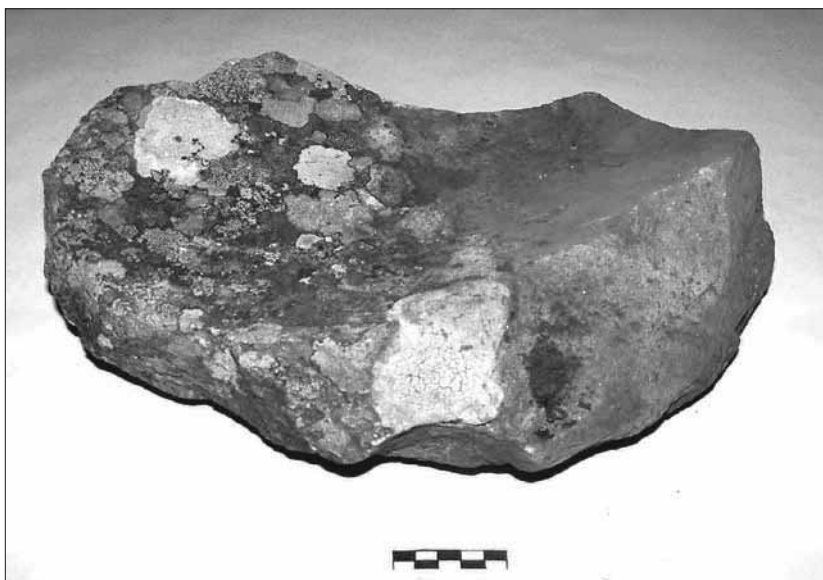


Fig. 29. Roman crushing table and grinder found at the site of Corabia – “Ieruga”

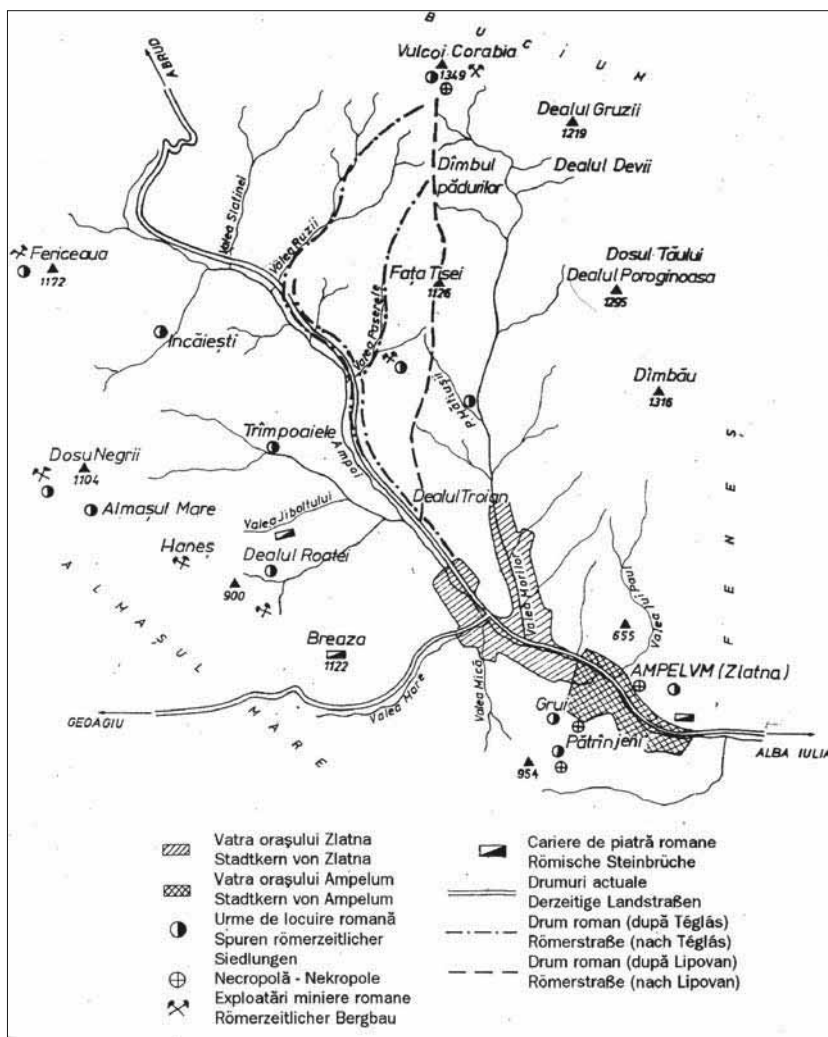


Fig. 30. Map of the Roman roads in the Bucium – Zlatna region
(*apud* Wollmann 1996)



Fig. 31. Roman road reaching the Zlatna – “Poduri” site



Fig. 32. Burial mounds belonging to Roman miners in the Boteș cemetery (2nd - 3rd century AD)

NOTES

- 1 It should be noted at the outset that the project developed out of a pilot study which the author was commissioned to conduct by the Alburnus Maior Association and Pro Patrimonio Foundation (UK) in 2004. Later, important research in the library and archives of Bergbau Museum Bochum was supported by the New Europe College Bucharest. The present study is the result of the GE-NEC grant awarded to the author for 2005-2006.
- 2 See www.gabrielresources.com.
- 3 Fairclough 1999; Fairclough et al. 1999; Dyson Bruce et al. 1999
- 4 Cherry *et al.* 1991.
- 5 Dunnell 1992.
- 6 Foley 1981.
- 7 Ebert 1992.
- 8 Gosden and Head 1994; Knapp 1997; Rossignol and Wandsnider 1992; Yamin and Metheny 1996.
- 9 Carmichael et al. 1994 : 1; Hirsch 1995 : 4.
- 10 Hirsch 1995; Saunders 1994: 172.
- 11 Fagan 1996: 384.
- 12 Sauer 1925.
- 13 Tuan 1971: 184.
- 14 Daniels and Cosgrove 1988: 1; Head 1993: 489-90.
- 15 Feld and Basso 1996; Hirsch and O'Hanlon 1995; Rappaport 1989.
- 16 Hirsch 1995.
- 17 Barrett *et al.* 1991; Bender 1993; 1998; Carmichael *et al.* 1994; Knapp 1996a; Parcero Oubifia *et al.* 1998; Tilley 1994; Townsend 1992.
- 18 Bender 1993.
- 19 Tilley 1994.
- 20 Patterson 1990; Preucel 1991; Shanks and Hodder 1995; Knapp 1996b.
- 21 Knapp 1997: 14-18.
- 22 Crumley 1994: 6.
- 23 Barrett 1991: 8.
- 24 Johnston 1998: 56.
- 25 Carneiro 1970; Sanders 1977; Steward 1955; Willey 1953.
- 26 Bender et al. 1997: 148.
- 27 Renfrew 1973.
- 28 McAnany 1995.
- 29 Aveni 1980; Hawkins 1965; compare Martlew and Ruggles 1996; Renfrew 1982.
- 30 Fritz 1978; Schmidt 1983.
- 31 Morphy 1995: 186-8.
- 32 Basso 1996: 55.

- 33 Alcock 1993; Bradley 1993; Derks 1997; Stein and Lekson 1992; Thomas
1991; 1993.
- 34 Ashmore 1998.
- 35 Tilley 1994: 10, 23; compare Casey 1996.
- 36 Fitter 1995: 8-9.
- 37 See broader discussion in Knapp and Ashmore 1999.
- 38 Comşa 1974; 1991 : 87.
- 39 Bailey 1999: 218-222.
- 40 But see Eluère 1989; Eluère and Raub 1991; Hartmann 1978.
- 41 Eluère and Raub 1991: 20.
- 42 Popescu 1956 ; Rusu 1972.
- 43 Herodotus IV.104.
- 44 Téglás 1888.
- 45 Hartmann 1970.
- 46 Schumacher 1912.
- 47 Bacskey 1985.
- 48 Ciugudean 1991: 94; Primas 1996: 75-91.
- 49 Cauuet *et al.* 2003: 506.
- 50 Pârvan 1926: 595, 597.
- 51 Carcopino 1924.
- 52 Ardevan 1998: p. 51-55.
- 53 Posepný 1868.
- 54 Wollmann 1996.
- 55 Wollmann 1996: 114-119; Wollmann and Ciugudean 2005:102-103.
- 56 Wollmann 1996; Cauuet *et al.* 2003a ; 2003b.
- 57 Domergue 1990.
- 58 Damian 2003.
- 59 Téglás 1890; Floca 1938.
- 60 Udubaşa *et al.* 2001.
- 61 Huber and Huber 1983.
- 62 Neuninger *et al.* 1971.
- 63 Hartmann 1970.
- 64 Ibidem.
- 65 Weisgerber and Pernicka 1995.
- 66 Leary *et al.* 2004.
- 67 Ackner 1856 : 13; Téglás 1889: 260, 332 ;
- 68 Wollmann 1996: 17.
- 69 Floca 1938.
- 70 Ghiţulescu and Socolescu 1941.

- 71 I was able to complete my research in the Blegen Library of the American
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- 72 The team members were: Dr. Horia Ciugudean (senior researcher, Alba
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chartered by the National Agency for Mineral Resources, Deva).
- 73 Téglás 1889 ; Wollmann 1996: 140-142
- 74 See note 63.
- 75 Bărbulescu 2003: 410-413.
- 76 I would like to express my gratitude to Eugen Crîsnic and Ioan Oaida, former
miners from Bucium-Poieni.
- 77 Cauuet 2003 : 261.
- 78 Wollmann 1996: 112; Cauuet et al. 2003a: 259.
- 79 Cauuet 1991: 179; 1992: 21; 1994: 24.
- 80 Romero 2002: 348-350.
- 81 The ornaments were found in the 19th century and are now on display in
the Naturhistorische Museum in Vienna (Roska 1942: 308).
- 82 Téglás 1890.
- 83 Information kindly supplied by Voicu Macavei (Bucium – Saşa).
- 84 Macrea 1969: 154.
- 85 Petolescu 2002: 137-138.
- 86 Selman 1994.
- 87 Cleere 1995: 66.
- 88 Council of Europe 1995; 2000.
- 89 In the UK there are presently over twenty underground tourist mines and at
least ten other mining museums. There was a large growth in mine tourism
in the early 1980s. Visitor numbers to mines in the UK range from 2,000
p.a. to nearly 100,000 p.a. (average 38,000 p.a.). For more information, see
Critchley 2003.
- 90 Kraut 2002.
- 91 See www.drumulaurului.ro

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