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NOCTURNAL LEPIDOPTERA FROM THE ENTOMOLOGICAL COLLECTION OF NATURAL SCIENCES MUSEUM COMPLEX GALAŢI (ROMANIA)

Mihaela CRISTESCU*

Abstract. *The scientific heritage of the Natural Sciences Museum Complex of Galaţi includes over 83.000 pieces, of which more than 70.800 belong to the entomological heritage. Lepidoptera Order represents 30% from the entomological heritage. The Lepidoptera come from acquisitions, changes, donations and research undertaken by the specialists of the museum over time. In the present paper we investigate data for 111 moths species from the acquisition Marin Voicu and also from field research carried out in Galaţi, Buzău, Tulcea, Constanţa, Vrancea, Prahova, Braşov counties.*
Key words: *entomological heritage, moths, Natural Sciences Museum Complex Galaţi.*

Rezumat. *Patrimoniul ştiinţific al secţiei muzeu numără peste 83.000 de piese, dintre care mai bine de 70.800 reprezintă patrimoniu entomologic. Ponderea Ordinului Lepidoptera în patrimoniul ştiinţific este de aproximativ 30%. Provenienţa lepidopterelor din patrimoniu este din achiziţii, schimburi, donaţii, precum şi colectări de teren realizate de către specialiştii muzeului, pe parcursul timpului. În această lucrare sunt valorificate date ce aparţin la 111 specii de lepidoptere nocturne, provenite din achiziţia Marin Voicu, precum şi din colectări de teren efectuate pe raza judeţelor Galaţi, Buzău, Tulcea, Constanţa, Vrancea, Prahova, Braşov.*
Cuvinte cheie: *patrimoniu entomologic, lepidoptere nocturne, Complexul Muzeal de Ştiinţele Naturii Galaţi.*

Introduction

The analysed material in this paper is part of the lepidopterological collection of the Museum department of the Natural Sciences Museum Complex of Galaţi and comes from acquisitions and field research made between 1966-2016. There were analysed 111 species belonging to different superfamilies: Bombycoidea, Geometroidea, Cossoidea, Drepanoidea, Lasiocampoidea and Noctuoidea.

The biological material from Galaţi consists of data collected from the field by museum specialists, where as the material from Iaşi was retrieved from Marin Voicu acquisition. This collection includes identified and unidentified insects that belong to many groups such as: Order Diptera (most of the insects), Order Hymenoptera, Order Coleoptera, Order Hemiptera and Mecoptera.

The acquisition was made in 2002 from Marin Voicu from Iaşi and includes over 16.800 specimens that were gathered between 1965-1995, mainly in the North Moldova, respectively Iaşi, Suceava and Neamţ.

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The unidentified species from the collection (Diptera, Hymenoptera) may be an interesting study material for the specialists in the field.

The present paper aims to highlight the scientific importance of the entomological heritage of the museum and to create a data base that can be useful to complete the literature with faunistical data.

Material and methods

The nocturnal lepidopterans analysed in this paper are conserved in insect boxes taxonomically classified preserved in the Entomological warehouse of the museum department.

The species are presented with the data and place of collection and the number of specimens. Their name was updated according to Fauna Europaea and the protection status to all species according to "*Verzeichnis der Schmetterlinge Romäniens"* (Rákosy *et al.* 2003).

The following abbreviations were used: leg.: legator; leg.C.M.: Cristescu Mihaela; leg. M.M: Mihai Mihaela; leg. P.G: Patriche Gabriela; leg. P.M: Popescu Mariana; leg.V.M.: Voicu Marin.

Results

The present study lists 111 species from the total species of the collection and the other part of the collection will be presented in a future paper. The species belong to eleven families from six superfamilies: Bombycoidea, Geometroidea, Cossoidea, Drepanoidea, Lasiocampoidea and Noctuoidea. 69 species belong to M. Voicu collection.

The best represented is Noctuidae family with 43 species, followed by Geometridae family with 24 species and Erebidae family with 24 species. Saturniidae Family and Drepanidae families are represented only by one species each.

Regarding the protection status, the species present different degrees of endargement:

-4 Endangered species (EN): *Periphanes delphinii* (Linnaeus, 1758), *Hyssia cavernosa* (Eversmann, 1842), *Plusia putnami* (Grote, 1873), *Lasiocampa trifolii* (Denis & Schiffermüller, 1775).

-7 Vulnerable species (VU): *Acherontia atropos* (Linnaeus, 1758), *Saturnia pyri* (Denis & Schiffermüller, 1775), *Lycia zonaria* (Denis & Schiffermüller, 1775), *Chelis maculosa* (Gerning, 1780), *Aedia leucomelas* (Linnaeus, 1758), *Calophasia opalina* (Esper, 1793), *Agrotis crassa* (Hubner, 1803).

-22 Near threatened species (NT).

Plusia putnami (Grote, 1873) is a rare species, mentioned only from Muntenia and Crişana (Rákosy *et al.* 2003). The species belongs to M. Voicu acquisition and was collected in Podu Iloaiei, Iaşi.

Collecting sites:

1) Galaţi: Galaţi, Gârboavele Forest, Parc CFR, Botanical Garden, Hanu Conachi, Breana-Roşcani Forest, Lower Prut Foodplain –Şovârca.
2) Iaşi: Podu Iloaiei, Leţcani, Breazu.
3) Suceava: Ponoare.
4) Neamţ: Vânători, Agapia, Nemţişoru, Schitul Vovidenia, Poienari.
5) Vrancea: Vulturu, Zboina, Lepşa.
6) Tulcea: Sulina, Canal Madgearu, Greci, Tulcea, Măcin-Pricopan.
7) Buzău: Buzău, Siriu.
8) Prahova: Buşteni - traseu Urlătoarea.
9) Braşov: Valea Bârsei - Piatra Craiului.
10) Constanţa: Cheile Dobrogei.

The species list is presented below:

Superfamily Bombycoidea

Family Saturniidae

Subfamily Saturniinae

Saturnia pyri (Denis & Schiffermüller, 1775): 2 specs.,Vulturu, Vrancea, 5.VI.2004, 6.VI.2004, leg. C.M. **Protection status:** Vulnerable (Rákosy *et al.* 2003).

Family Sphingidae

Subfamily Macroglossinae

Macroglossum stellatarum (Linnaeus, 1758): 1 spec., Galaţi, 21.VII.2004, leg. M. M.

Subfamily Smerinthinae

Deilephila elpenor (Linnaeus, 1758): 1 spec., Zboina, Lepşa, Vrancea, 10.VII.2009, leg. C.M.; 1 spec., Iaşi, 7.VII.1978, leg.V.M. **Protection status:** Near threatened (Rákosy *et al.* 2003).

Deilephila porcellus (Linnaeus, 1758): 1 spec., Podu Iloaiei, Iaşi, 30.VI.1975, leg.V.M.

Laothoe populi (Linnaeus, 1758): 1 spec., Zboina, Lepşa, Vrancea, 10.VII.2009, leg. C.M.; 1 spec., Podu Iloaiei, Iaşi, 30.VI.1975, leg.V.M.

Mimas tiliae (Linnaeus, 1758): 1 spec., Vânători, Neamţ, 24.VI.2004, leg. M.M.; 1 spec., Iaşi, 24.V.1978, leg.V.M.

Smerinthus ocellata (Linnaeus, 1758): 1 spec., Can. Madgearu, Sulina, Tulcea, 27.VII.2004, leg. P.G.

Subfamily Sphinginae

Acherontia atropos (Linnaeus, 1758): 1 spec., Buzău, 28.X.2004, leg. P.M. **Protection status:** Vulnerable (Rákosy *et al.* 2003).

Sphinx pinastri (Linnaeus, 1758): 2 specs., Buşteni, traseu Urlătoarea, Prahova, 11.V.2004, leg. M.M.; 2 specs., Zboina-Lepşa, Vrancea, 10.VII.2009, leg. C.M.

Superfamily Cossoidea

Family Cossidae

Subfamily Zeuzerinae

Cossus cossus (Linnaeus, 1758): 1 spec., Gârboavele Forest, Galaţi, 1-17.VI.2012, leg. C.M.

Phragmataecia castaneae (Hübner, 1790): 4 specs., Can. Madgearu, Sulina, Tulcea, 27.VII.2004, leg. M.M.; 1 spec., Leţcani, Iaşi, 10.V.1998, leg.V.M.

Superfamily Drepanoidea

Family Drepanidae

Subfamily Thyatirinae

Habrosyne pyritoides (Hufnagel 1766): 1 spec., Galaţi, 02.VIII.2005, leg. C.M.

Superfamily Geometroidea

Family Geometridae

Subfamily Ennominae

Abraxas grossulariata (Linnaeus, 1758): 1 spec., Leţcani, Iaşi, 10.V.1998, leg.V.M. **Protection status:** Near threatened (Rákosy *et al.* 2003).

Angerona prunaria (Linnaeus, 1758): 1 spec., Zboina, Lepşa, Vrancea, 10.VII.2009, leg. C.M. **Protection status:** Near threatened (Rákosy *et al.* 2003).

Ascotis selenaria (Denis & Schiffermüller, 1775): 2 specs., Breazu, Iaşi, 15.06.1976, leg. V.M.

Biston betularia (Linnaeus, 1758): 1 spec., Breazu, Iaşi, 05.VIII.1978, leg.V.M.

Chiasmia clathrata (Linnaeus, 1758): 1 spec., Podu Iloaiei, Iaşi, 28.VI.1998, leg.V.M.; 1 spec., Gârboavele Forest, Galaţi, România, 16.VI.1975, leg.V.M; 3 specs., Podu Iloaiei, Iaşi, 28.VI.1998, leg.V.M.

Colotois pennaria (Linnaeus, 1761): 1 spec., Leţcani, Iaşi, 10.V.1998, leg.V.M.

Ematurga atomaria (Linnaeus, 1758): 1 spec., Valea Bârsei-Piatra Craiului, 25.V.2004, leg.M.M.; 1 spec., Leţcani, Iaşi, 10.V.1998, leg.V.M.

Isturgia arenacearia (Denis & Schiffermüller, 1775): 1 spec., Leţcani, Iaşi, 10.V.1998, leg.V.M. **Protection status:** Near threatened (Rákosy *et al.* 2003).

Lycia hirtaria (Clerck, 1759): 3 specs., Leţcani, Iaşi, 10.V.1998, leg.V.M. **Protection status:** Near threatened (Rákosy *et al.* 2003).

Lycia zonaria (Denis & Schiffermüller, 1775): 2 specs., Leţcani, Iaşi, 10.V.1998, leg.V.M. **Protection status:** Vulnerable (Rákosy *et al.* 2003).

Lomaspilis marginata (Linnaeus, 1758): 2 specs., Zboina, Lepşa, Vrancea, 10.VII.2009, leg. C.M.

Pseudopanthera macularia (Linnaeus, 1758): 2 specs., Nemţişoru, Neamţ, 22.VI.2004, leg. M.M.; 1 spec., Valea Bârsei-Piatra Craiului, 26.V.2004, leg. M.M.; 4 specs., Gârboavele Forest, Galaţi, 06.V.1968., leg. C.M.

Siona lineata (Scopoli, 1763): 4 specs., Schitul Vovidenia, Neamţ, 22. VI.2004, leg. M.M.

Subfamily Larentiinae

Epirrhoe tristata (Linnaeus, 1758): 1 spec.,Valea Bârsei-Piatra Craiului, 28.V.2004, leg. M.M.

Eupithecia centaureata (Denis & Schiffermüller, 1775): 1 spec., Leţcani, Iaşi, 10.V.1998, leg.V.M.

Odezia atrata (Linnaeus, 1758): 4 specs., Agapia, Neamţ, 23.VI.2004, leg. M. M. **Protection status:** Near threatened (Rákosy *et al.* 2003).

Scotopteryx chenopodiata (Linnaeus, 1758): 1 spec., Zboina, Lepşa, Vrancea, 08.VII.2009, leg. C.M.

Xanthorhoe fluctuata (Linnaeus, 1758): 1 spec., Podu Iloaiei, Iaşi, 08.VII.1980, leg.V.M.; 1 spec., Podu Iloaiei, Iaşi, 16.VII.1976, leg.V.M.

Subfamily Sterrhinae

Idaea ochrata (Scopoli, 1763): 1 spec., Poienari, Neamţ, 18.VI.1979, leg.V.M. **Protection status:** Near threatened (Rákosy *et al.* 2003).

Idaea rusticata (Denis & Schiffermüller, 1775): 1 spec., Podu Iloaiei, Iaşi, 16.VII.1976, leg.V.M. **Protection status:** Near threatened (Rákosy *et al.* 2003).

Lythria purpuraria (Linnaeus, 1758): 1 spec., Parc CFR, Galaţi, 25.VI.1974. **Protection status:** Near threatened (Rákosy *et al.* 2003).

Rhodostrophia calabra (Petagna, 1786): 1 spec., Greci, Tulcea, 13.VI.2004, leg. M.M. **Protection status:** Near threatened (Rákosy *et al.* 2003).

Scopula ornata (Scopoli, 1763): 1 spec., Gârboavele Forest, Galaţi, 19.VI.1974.

Superfamily Lasiocampoidea

Family Lasiocampidae

Subfamily Lasiocampinae

Lasiocampa trifolii (Denis & Schiffermüller, 1775): 2 specs., Leţcani, Iaşi, 10.V.1998, leg.V.M. **Protection status:** Endangered (Rákosy *et al.* 2003).

Macrothylacia rubi (Linnaeus, 1758): 1 spec., Botanical Garden, Galaţi, 17.V.2005, leg. C.M. **Protection status:** Near threatened (Rákosy *et al.* 2003).

Subfamily Malacosomatinae

Malacosoma neustria (Linnaeus, 1758): 11 specs., Podu Iloaiei, Iaşi, 07.VII.1980, leg.V.M.; 16 specs., Podu Iloaiei, Iaşi, 06.VII.1980, leg.V.M. **Protection status:** Near threatened (Rákosy *et al.* 2003).

Subfamily Pinarinae

Gastropacha quercifolia (Linnaeus, 1758): 1 spec., Leţcani, Iaşi, 10.V.1998, leg. V.M. **Protection status:** Near threatened (Rákosy *et al.* 2003).

Superfamily Noctuoidea

Family Erebidae

Subfamily Arctiinae

Amata phegea (Linnaeus, 1758): 1 spec., Hanu Conachi, Galaţi, 31.V.2016, leg. P.M.; 2 specs., Hanu Conachi, Galaţi, 31.V.2016, leg. P.M.; 21 specs., Gârboavele Forest, Galaţi 17.VI.1967, leg. P.M.

Dysauxes famula (Freyer, 1836): 1 spec., Cheile Dobrogei, Constanţa, 14.VI.2004, leg. M.M.

Arctia caja (Linnaeus, 1758): 1 spec., Zboina, Lepşa, Vrancea, 08.VII.2009, leg. C.M.

Arctia villica (Linnaeus, 1758): 1 spec., Gârboavele Forest, Galaţi, 1-10.VI.2012, leg. C.M.

Callimorpha dominula (Linnaeus, 1758): 2 specs., Zboina, Lepşa, Vrancea, 10.VII.2009, leg. C.M.; 1 spec., Poiana Budescu, Lepşa, Vrancea, 8.VII.2009, leg. C.M.

Chelis maculosa (Gerning, 1780): 5 specs., Gârboavele Forest, Galaţi, 21-28.V.2012, leg. C.M.; 4 specs., Gârboavele Forest, Galaţi, 1-10.VI.2012, leg. C.M. **Protection status:** Vulnerable (Rákosy *et al.* 2003).

Coscinia striata (Linnaeus, 1758): 1 spec., Breana-Roşcani Forest, Galaţi, 10.IX.2010, leg. C.M. **Protection status:** Near threatened (Rákosy *et al.* 2003).

Dysauxes ancilla (Linnaeus, 1767): 1 spec., Gârboavele Forest, Galaţi, 11.VII.1975, leg. M.M.

Hyphantria cunea (Drury, 1773): 1 spec., Leţcani, Iaşi, 10.V.1998, leg.V.M.

Parasemia plantaginis (Linnaeus, 1758): 1 spec. Funduri, Neamţ, 24.VI.2004, leg. M.M.; 1 spec., Poiana Budescu, Lepşa, Vrancea, 8.VII.2009, leg. C.M

Phragmatobia fuliginosa (Linnaeus, 1758): 1 spec., Podu Iloaiei, Iaşi, 08.VII.1980, leg.V.M.

Spilosoma lubricipeda (Linnaeus, 1758): 1 spec., Podu Iloaiei, Iaşi, 30.VI.1975, leg.V.M.

Subfamily Erebinae

Catocala elocata (Esper, 1787): 1 spec., Galaţi, 09.IX.2005, leg. Perieteanu A. **Protection status:** Near threatened (Rákosy *et al.* 2003).

Catocala nupta (Linnaeus, 1767): 1 spec., Galaţi, 500m, 13.VII.2004, leg. M.M. **Protection status:** Near threatened (Rákosy *et al.* 2003).

Catocala promissa (Denis & Schiffermüller, 1775): 1 spec., Gârboavele Forest, Galaţi, România,1-17.VI.2012, leg. C.M. **Protection status:** Near threatened (Rákosy *et al.* 2003).

Euclidia glyphica (Linnaeus, 1758): 2 specs., Agapia-Neamţ, 23.VI.2004, leg. M.M.; 1 spec.,Valea Bârsei-Piatra Craiului, România, 25.V.2004, leg.M.M.; 3 specs., Gârboavele Forest, Galaţi, 6.V.1968, leg.M.M.; 1 spec., Podu Iloaiei, Iaşi, 16.VII.1979, leg.V.M.; Breazu, Iaşi, 29.IV.1979, leg.V.M.

Grammodes stolida (Fabricius, 1775): 2 specs., Măcin, Pricopan, Tulcea, 13.VI.2004, leg. M.M.; 1 spec., Gârboavele Forest, Galaţi, 20.VII.2004, leg. M.M.

Paracolax tristalis (Fabricius, 1794): 1 spec., Nemţişoru, Neamţ, 22.VI.2004, leg. M.M.

Subfamily Hypeninae

Hypena proboscidalis (Linnaeus, 1758): 1 spec., Zboina, Lepşa, Vrancea, 10.VII.2009, leg. C.M.; 1 spec., Leţcani Iaşi, 10.V.1998, leg.V.M.

Subfamily Lymantriinae

Lymantria dispar (Linnaeus, 1758): 1 spec., Lower Prut Foodplain, Şovârca, Galaţi, 27.VII.2016, leg. C.M.; 1 spec., Podu Iloaiei, Iaşi, 21.VII.1978, leg.V.M.

Penthophera morio (Linnaeus, 1767): 1 spec., Agapia, Neamţ, 23.VI.2004, leg. M.M. **Protection status:** Near threatened (Rákosy *et al.* 2003).

Subfamily Phytometrinae

Trisateles emortualis (Denis & Schiffermüller, 1775): 1 spec., Iaşi, 23.V.1979, leg.V.M.

Subfamily Rivulinae

Rivula sericealis (Scopoli, 1763): 1 spec., Breazu, Iaşi, 05.VIII.1978, leg.V.M.

Subfamily Scoliopteryginae

Scoliopteryx libatrix (Linnaeus, 1758): 1 spec., Leţcani, Iaşi, 10.V.1998, leg.V.M.

Family Euteliidae

Subfamily Euteliinae

Eutelia adulatrix (Hübner, 1813): 1 spec., Gârboavele Forest, Galaţi, 1-17.VI.2012, leg. C. M. **Protection status:** Near threatened (Rákosy *et al.* 2003).

Family Noctuidae

Subfamily Acontiinae

Acontia lucida (Hufnagel, 1766): 2 specs., Podu Iloaiei, Iaşi, 07.VII.1980, leg.V.M.

Aedia leucomelas (Linnaeus, 1758): 3 specs., Podu Iloaiei, Iaşi, 15.VII.1980, leg.V.M.; 1 spec., Podu Iloaiei, Iaşi, 28.VI.1998, leg.V.M.; 1 spec., Podu Iloaiei, Iaşi, 07.VII.1980, leg.V.M. **Protection status:** Vulnerable (Rákosy *et al.* 2003).

Subfamily Cuculliinae

Cucullia umbratica (Linnaeus, 1758): 1 spec., Podu Iloaiei, Iaşi, 15.VII.1980, leg.V.M.; 1 spec., Podu Iloaiei, Iaşi, 16.VII.1979, leg.V.M.

Subfamily Heliothinae

Heliothis maritima (Graslin, 1855): 1 spec., Iaşi, 20.V.1979, leg.V.M.

Heliothis viriplaca (Hufnagel, 1766): 1 spec., Măcin, Greci, Tulcea, 13.VI.2004, leg. M. M.; 1 spec., Cheile Dobrogei, 14.VI.2004, leg. M. M.; 1 spec., Podu Iloaiei, Iaşi, 07.VII.1980, leg.V.M.

Periphanes delphinii (Linnaeus, 1758): 1 spec., Măcin, Greci, Tulcea, 13.VI.2004, leg. M.M. **Protection status:** Endangered (Rákosy *et al.* 2003).

Protoschinia scutosa (Denis & Schiffermüller, 1775): 3 specs., Podu Iloaiei, Iaşi, 28.VI.1998, leg.V.M.; 1 spec., Iaşi, 20.V.1979, leg.V.M.

Subfamily Metoponiinae

Tyta luctuosa (Denis & Schiffermüller, 1775): 2 specs., Podu Iloaiei, Iaşi, 28.VI.1998, leg.V.M.; 1 spec., Podu Iloaiei, Iaşi, 30.VI.1975, leg.V.M.

Subfamily Noctuinae

Actinotia polyodon (Clerck, 1759): 1 spec., Podu Iloaiei, Iaşi, 12.VIII.1980, leg.V.M.

Agrotis crassa (Hubner, 1803) : 1 spec., Leţcani, Iaşi, 10.V.1998, leg.V.M. **Protection status:** Vulnerable (Rákosy *et al.* 2003).

Agrotis ipsilon (Hufnagel, 1766): 5 specs., Leţcani Iaşi, 10.V.1998, leg.V.M.

Agrotis segetum (Denis & Schiffermüller, 1775): 1 spec., Podu Iloaiei, Iaşi, 30.VI.1975, leg.V.M.; 4 specs., Leţcani Iaşi, 10.V.1998, leg.V.M.; 1 spec., Ponoare, Suceava, 25.VI.1975, leg.V.M.

Anarta trifolii (Hufnagel, 1766): 6 specs., Ponoare, Suceava, 25.VI.1976, leg.V.M.; 2 specs., Podu Iloaiei, Iaşi, 11.VIII.1980, leg.V.M.; 1 spec., Podu Iloaiei, Iaşi, 08.VII.1980, leg.V.M.; 4 specs., Podu Iloaiei, Iaşi, 07.VII.1980, leg.V.M.; 1 spec., Leţcani, Iaşi, 10.V.1998, leg.V.M.

Axylia putris (Linnaeus, 1761): 2 specs., Podu Iloaiei, Iaşi, 28.VI.1998, leg.V.M.

Cerapteryx graminis (Linnaeus, 1758): 1 spec., Zboina, Lepşa, Vrancea, 10.VII.2009, leg. C.M.

Cosmia trapezina (Linnaeus, 1758): 1 spec., Breazu, Iaşi, 09.VIII.1978, leg.V.M.; 1 spec., Zboina, Lepşa, Vrancea, 10.VII.2009, leg.C.M.

Dicycla oo (Linnaeus, 1758): 6 specs., Gârboavele Forest, Galaţi, 1-10.VI.2012, leg. C.M. **Protection status:** Near threatened (Rákosy *et al.* 2003).

Helotropha leucostigma (Hübner, 1808): 1 spec., Leţcani, Iaşi, 10.V.1998, leg.V.M. **Protection status:** Near threatened (Rákosy *et al.* 2003).

Hoplodrina blanda (Denis & Schiffermüller, 1775): 1 spec., Podu Iloaiei, Iaşi, 07.VII.1980, leg.V.M.

Hyssia cavernosa (Eversmann, 1842): 1 spec., Leţcani, Iaşi, 10.V.1998, leg.V.M. **Protection status:** Endangered (Rákosy *et al.* 2003).

Lacanobia suasa (Denis & Schiffermüller, 1775): 2 specs., Podu Iloaiei, Iaşi, 12.VIII.1980, leg.V.M.; 7 specs., Ponoare, Suceava, 25.VI.1976, leg.V.M.; 1 spec., Leţcani, Iaşi, 10.V.1998, leg.V.M.; 8 specs., Podu Iloaiei, Iaşi, 11.VIII.1977, leg.V.M.

Lacanobia w-latinum (Hufnagel, 1766): 2 specs., Podu Iloaiei, Iaşi, 07.VII.1980, leg.V.M.; 1 spec., Podu Iloaiei, Iaşi, 08.VII.1980, leg.V.M.; 2 specs., Leţcani, Iaşi, 10.V.1998, leg.V.M.

Leucania comma (Linnaeus, 1761): 1 spec., Leţcani, Iaşi, 10.V.1998, leg.V.M

Mythimna l-album (Linnaeus, 1767): 1 spec., Leţcani Iaşi, 10.V.1998, leg.V.M.; 1 spec., Podu Iloaiei, Iaşi, 30.VI.1975, leg.V.M.; 1 spec., Podu Iloaiei, Iaşi, 08.VII.1980, leg.V.M.

Mythimna conigera (Denis & Schiffermüller,1775): 1 spec., Zboina, Lepşa, Vrancea, 10.VII.2009, leg. C.M.

Mythimna ferrago (Fabricius, 1787): 1 spec., Podu Iloaiei, Iaşi, 16.VII.1979, leg.V.M.

Mythimna pallens (Linnaeus, 1758): 9 specs., Podu Iloaiei, Iaşi, 30.VI.1975, leg.V.M.

Mythimna turca (Linnaeus, 1761): 1 spec., Podu Iloaiei, Iaşi, 16.VII.1979, leg.V.M.

Noctua fimbriata (Schreber, 1759): 1 spec., Siriu, Buzău, 5.VI.2009, leg. C.M.; 1 spec., Leţcani, Iaşi, 10.V.1998, leg.V.M.

Noctua pronuba (Linnaeus, 1758): 1 spec., Podu Iloaiei, Iaşi, 28.VI.1998, leg.V.M.; 1 spec., Breazu, Iaşi, 18.08.1978, leg.V.M.

Orthosia cruda (Denis & Schiffermüller, 1775): 1 spec., Leţcani, Iaşi, 10.V.1998, leg.V.M.; 3 specs., Podu Iloaiei, Iaşi, 28.VI.1998, leg.V.M.

Orthosia incerta (Hufnagel, 1766): 1 spec., Leţcani, Iaşi, 10.V.1998, leg.V.M.; 1 spec., Podu Iloaiei, Iaşi, 07.VII.1980, leg.V.M.

Polia nebulosa (Hufnagel, 1766): 1 spec., Leţcani, Iaşi, 10.V.1998, leg.V.M.

Phlogophora meticulosa (Linnaeus, 1758): 1 spec., Leţcani, Iaşi, 10.V.1998, leg.V.M.

Trachea atriplicis (Linnaeus, 1758): 1 spec., Podu Iloaiei, Iaşi, 07.VII.1980, leg.V.M.; 1 spec., Podu Iloaiei, Iaşi, 30.VI.1975, leg.V.M.

Xestia ditrapezium (Denis & Schiffermüller, 1775): 1 spec., Zboina, Lepşa, Vrancea, 10.VII.2009, leg. C.M.

Xestia c-nigrum (Linnaeus, 1758): 1 spec., Podu Iloaiei, Iaşi, 28.VI.1998, leg.V.M.; 1 spec., Podu Iloaiei, Iaşi, 30.VI.1975, leg.V.M.; 3 specs., Leţcani, Iaşi, 10.V.1998, leg.V.M.

Subfamily Plusiinae

Abrostola triplasia (Linnaeus, 1758): 4 specs., Leţcani, Iaşi, 10.V.1998, leg.V.M.; 1 spec., Podu Iloaiei, Iaşi, 11.VII.1977, leg.V.M.

Autographa gamma (Linnaeus, 1758): 3 specs., Podu Iloaiei, Iaşi, 07.VII.1980, leg.V.M.; 1 spec., Podu Iloaiei, Iaşi, 12.VII.1980, leg.V.M.; 3 specs., Podu Iloaiei, Iaşi, 08.VII.1980, leg.V.M.

Autographa jota (Linnaeus, 1758): 1 spec., Zboina, Lepşa, Vrancea, 10.VII.2009, leg. C.M.

Euchalcia variabilis (Piller, 1783): 1 spec., Breazu, Iaşi, 09.VIII.1978, leg.V.M. **Protection status:** Near threatened (Rákosy *et al.* 2003).

Plusia putnami (Grote, 1873): 1 spec., Podu Iloaiei, Iaşi, 30.VI.1975, leg.V.M. **Protection status:** Endangered (Rákosy *et al.* 2003).

Subfamily Oncocnemidinae

Calophasia opalina (Esper, 1793): 1 spec., Gârboavele Forest, Galaţi, 1-17.VI.2012, leg. C.M. **Protection status:** Vulnerable (Rákosy *et al.* 2003).

Family Notodontidae

Subfamily Heterocampinae

Stauropus fagi (Linnaeus, 1758): 1 spec., Zboina, Lepşa, Vrancea, 10.VII.2009, leg. C.M.

Subfamily Notodontinae

Notodonta ziczac (Linnaeus, 1758): 1 spec., Leţcani, Iaşi, 10.V.1998, leg.V.M.

Pterostoma palpina (Clerck, 1759): 1 spec., Leţcani, Iaşi, 10.V.1998, leg.V.M.; 1 spec., Breazu, Iaşi, 20.VIII.1978, leg.V.M.; 1 spec., Podu Iloaiei, Iaşi, 20.VII.1978, leg.V.M.

Conclusions

In this paper we investigated the data of 307 specimens of moths belonging to 111 species from 11 families. Superfamily Noctuoidea is represented by 5 families with 71 species and Superfamily Geometroidea by one family with 24 species.

In M. Voicu acquisition we identified one rare species of moth, *Plusia putnami* (Grote, 1873), previously recorded from Muntenia and Crişana. Regarding the protection status, 4 species are endangered and 7 species are vulnerable.

Acknowledgements

I want to thank the reviewers for their constructive comments which improved the quality of this paper.

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COLOBOPSIS TRUNCATA (SPINOLA, 1808) (HYMENOPTERA: FORMICIDAE) IN ROMANIA, WITH THE FIRST RECORD FROM DOBROGEA

Ioan TĂUŞAN*

Abstract. *Despite recent faunistical aditions to the knowledge of the Romanian ant fauna, the number is still considered low. Altoghether 113 ant species are known to occur in Romania. Further faunistical investigations may increase the knowledge on the current species number and improve the data on their distribution. Herein we report the first record of Colobopsis truncata (Spinola, 1808) from Dobrogea.*
Key words: *ants, faunistics, Măcin Mountains.*

Rezumat. *Numărul speciilor de furnici din România este în continuare considerat redus, desi recent au fost intreprinse numeroase investigaţii faunistice. Până în prezent, se cunosc 113 specii de furnici. Studii similare pot duce la o creştere a numărului de specii şi ar putea contribui la cunoaşterea mai bună a distribuţiei acestora. În prezenta lucrare este semnalată pentru prima oară în Dobrogea specia Colobopsis truncata (Spinola, 1808).*
Cuvinte cheie: *furnici, faunistică, Munţii Măcin.*

Introduction

In the last decade, in Romania, intense myrmecological studies were undertaken (Markó *et al.* 2006; Ionescu-Hirsch *et al.* 2009; Markó *et al.* 2009; Czekes *et al.* 2012; Tăuşan, Rădac 2014; Tăuşan, Pintilioaie 2016; Tăuşan, Lapeva-Gjonova 2017). The current checklist contains 113 ant species. Despite recent efforts the number is consider rather low, due to neighbouring countries which are charactered by a higher number of species: Hungary – 125 species (Csősz *et al.* 2011), Bulgaria – 163 species (Lapeva-Gjonova *et al.* 2010), and Ukraine – 134 (Czechowski *et al.* 2012). Moreover, regions such Moldova, Banat and Dobrogea are poorly known or understudied in terms of species composition.

More than half of the known ant species from Romania occur in Dobrogea (Markó *et al.* 2006; Markó *et al.* 2009; Moscaliuc 2009; Czekes *et al.* 2012, Tăuşan 2016). The list comprises more than 60 ant species and the number could easily increase if faunistical investigations continue in the area.

In the frame of this context we investigated different habitats in Northern and Southern Dobrogea from 2012 until present.

Among the ant genera, *Camponotus* is represented in Romania by at least 12 species: *C. herculeanus* (Linnaeus, 1758), *C. ligniperda* (Latreille, 1802), *C. vagus* (Scopoli, 1763), *C. atricolor* (Nylander, 1849), *C. dalmaticus* (Nylander, 1849), *C. fallax* (Nylander, 1856), *C. lateralis* (Olivier, 1791), *C. piceus* (Leach, 1825), *C. tergestinus* Müller, 1921, *C. aethiops* (Latreille, 1798) (Markó *et al.* 2009) and *C. samius* (Tăuşan, Lapeva-Gjonova 2017).

More recently, Ward (2015) elevated the formerly subgenus *Colobopsis* to a separated genus. Thus, *C. truncata*, (Spinola, 1808) occurs also in Romania.

Except for several species (*Camponotus ligniperda, C. herculeanus, C. vagus, C. piceus* and *C. aethiops*) distribution data on *Camponotus sp* are scarce (Markó *et al.* 2009). Herein we report the first record of *Colobopsis truncata* from Dobrogea.

Material

Workers were collected from Consulul Hill (45.029949, E 28.506002, 300 m a.s.l. 300 m a.s.l.) (Măcin Mountains) and from Niculiţelului Hills (45.129876°, 28.406622°, 140 m a.s.l.). The habitat in both cases is characterized by light decidous forests (Fig. 1 and Fig 2).

Identification

According to Ionescu-Hirsch (2009) *C. truncata* "is a small dimorphic species with a phragmotic "soldier". The major worker has a cylindrical,

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abruptly truncate head. The minor worker has a rounded head and can be recognized by the straight frontal carina, antennal insertion close to the middle of the frontal carina, propodeum dorsum distinctly concave in lateral view, and by the petiole scale with acute summit in lateral view and indented dorsum in front view" (Fig. 3).

Habitat preferences and distribution

Colobopsis truncata is a Mediterranean species distributed mostly in southern and central Europe and in the southern part of Eastern Europe, as well as occurring east as far as Kopet-Dag Mts, and south as far as Maghreb, Algeria (Rigato, Toni, 2011; Czechowski *et al.* 2012). It is a thermophilous and arboricolous species preferring open habitats, orchards and light forests, mainly oak forests (Marko *et al.* 2009; Czechowski *et al.* 2012). It nests in dead parts of living trees, mainly in dry thin branches (Czechowski *et al.* 2012). Based on our finding, *C. truncate* is now known also from Dobrogrea. Most likely the species is more common as once tought, despite scarce available data (Fig. 4).

Acknowledgements

Special thanks to Liviu Aurel Moscaliuc and Ionuţ Ştefan Iorgu for their help in the field. I am also grateful to AntWeb team (www.antweb.org) for their huge work and personally to Erin Prado for photos of *Colobopsis truncata* used in our work. Finally, I would like to thank Sergiu Török for his useful advice on the first version of the manuscript. Part of the research was possible with the financial support of the Sectoral Operational Programme for Human Resources Development 2007-2013, cofinanced by the European Social Fund, under the project number POSDRU/107/1.5/S/76841 with the title „Modern Doctoral Studies: Internationalization and Interdisciplinarity".

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Fig. 1 *Colobopsis truncata* habitat in Niculițelului Hills

Fig. 2 *Colobopsis truncata* habitat in Consul Hill (photo: Ionuț Ștefan Iorgu)

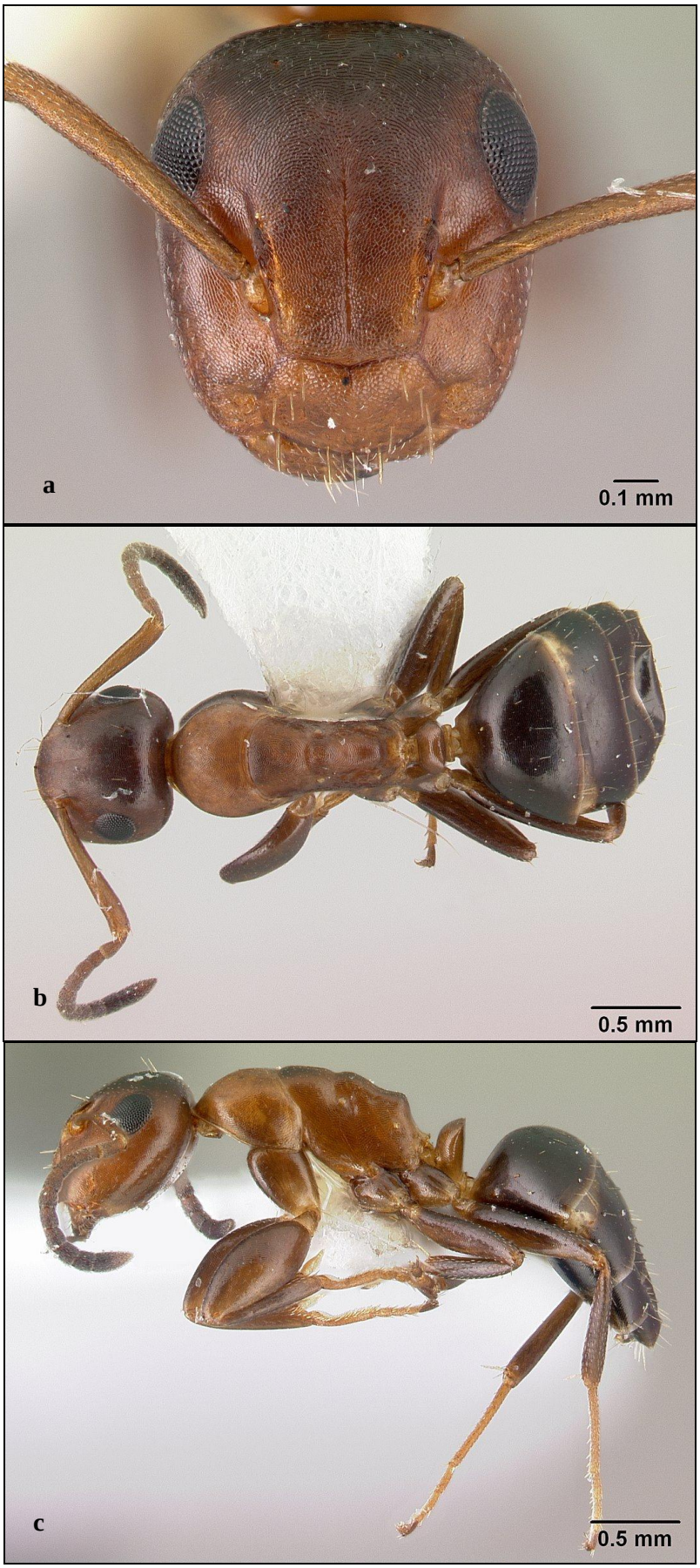

Fig. 3. *Colobopsis truncata* worker from www.AntWeb.org, (CASENT0080857): **1**. head in full face view; **b**. dorsal view; **c**. lateral view (photos: Erin Prado)

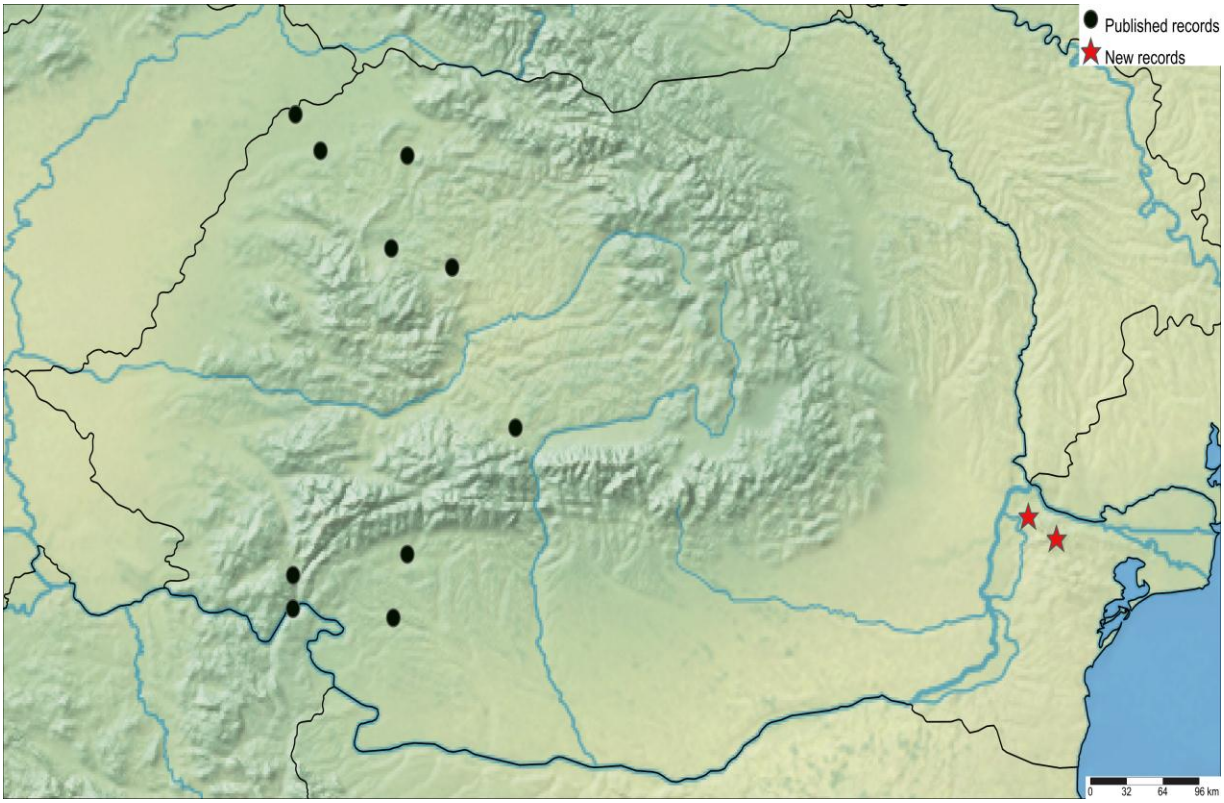

Fig. 4. Known distribution map of *Colobopsis truncate* in Romania (black circles – published records; red stars – new records)

CONSIDERATIONS ON THE ROE DEER TROPHIES (*CAPREOLUS CAPREOLUS* LINNAEUS, 1758) IN THE AUGUST VON SPIESS COLLECTION

Aurelian BORDEI*

Abstract. *In this paper, we focused on the roe deer trophies found in the "August von Spiess" collection belonging to the Hunting Museum in Sibiu. We identified 261 pieces, out of which more than half came from the Cindrel Mountains area. Most specimens were hunted before the First World War, a period in which Spiess did not hold any important managing position. The trophies which received medals are the proof that this country had a hunting fund of an exceptional quality.*
Key words: *roe deer, Spiess, distribution, medals.*

Rezumat. *În studiul de față ne-am îndreptat atenția asupra trofeelor de căprior din colecția August von Spiess a Muzeului de Arme și Trofee de Vânătoare din Sibiu. Au fost identificate 261 de piese din care, mai mult de jumătate, provin din zona munților Cindrel. Cei mai muți indivizi au fost capturați înainte de primul război mondial, perioadă în care Spiess nu a avut nici o funcție importantă de conducere. Trofeele medaliate sunt mărturii ale unui fond cinegetic românesc de o calitate excepțională.*
Cuvinte cheie: *căprior, Spiess, distribuție, medalii.*

Introduction

Hunting, one of the oldest activities known to men, has a positive influence in his evolution. Even though in the beginning, the first men, limited their activity to gathering plants and meat from the remains of animals that have been previously slain by predators; as time passed by, animals were being hunted for their meat used as food and for their skin and fur used as cloth (Cotta et al. 2008; Șelaru 2012). Therefore, the evolution from a vegetarian eating habit to a feeding habit based on animal proteins, does not require a permanent feeding, allowed men to dedicate their time to different other activities such as socializing and communication (Sîrbu, Benedek 2017).

Evidences regarding hunting were found in the north-east part of Oltenia, namely Bugilești, Dolj County (Nania 1977). Archeological diggings showed that groups of hunters that used heavy spears focused their activity on hunting cave bears from Baia de Fier, Gorj County, and wild horses in Ohaba-Ponor, Hunedoara County (idem).

As time passes by hunting is no longer the main activity but it still presents great interest thanks to the benefits it brings, such as meat, clothing items, etc. (Negruțiu 1983).

We can find references on the game species and on the hunt activity in the writing of different travelers that came with different goals in this country (Holban *et al.*1968; Nania 1977).

The domestication of animals and the development of agriculture has not had a great impact on the practice of hunting. Being used to this austere life style, some human beings continue to practice hunting, mainly driven by the urge to feel superior to their peers, and also to show courage, strength, and skillfulness in the fight with wild animals (Șelaru 2012).

Even though today we assume that work replaced hunting, it did not eliminate it completely (Morris 1991).

Mentions of the roe deer (*Capreolus capreolus* Linnaeus, 1758) in Transylvania can be found in the works of Georg Reicherstorffer in 1550. (Geacu 2011; Nania 1977).

In 1888 the naturalist Eduard Albert Bielz, a member of *Transylvanian Society of Natural Sciences*, (*Siebenbürgischer Verein für Naturwissenschaften zu Hermannstadt)* mentioned in his study *Vertebrates from Transylvania*

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according to their current state (Wirbeltiere Siebenbürgens nach ihrem jetzigen Bestande") 75 species of mammals, including the roe deer observed in the area of Cindrel and Retezat Mountains (Bielz 1888).

The roe deer is a middle sized ruminant mammal (Almăşan 1972; Comşia 1961; Murariu 2004). The growth and size of the antlers are directly dependent on numerous physiological processes, and also on its habitat (Kiss 2003; Şelaru 2012).

Originally the "August von Spiess" Hunting Museum developed around the Hunting Collection of the *Transylvania Society of Natural Science* (*Siebenbürgischer Verein für Naturwissenschaften zu Hermannstadt)* (Doltu 1998). Nowadays the most important collection, not only thanks to its size, but the one that has the highest diversity within this museum, is the one that belonged to colonel August Roland von Spiess, the Keeper of the Royal Hunting under the King Ferdinand I of Romania.

In today's Romanian hunting magazines, we do not find enough information about this naturalist and hunter. His diverse activities as a naturalist are less known by the public which recognizes him only as a great hunter (Alaci 2014; Ciobanu, Sandu 2010). His wish to transform his house in a museum represents the main reason why Sibiu has one of the first hunting museums in Romania.

Through this study we tried to highlight Spiess' lifelong interest in the hunting of roe deer and also to create an overview on the distribution in space and time of this species in Romania during his life.

Materials and methods

The August von Spiess collection is made up of 1058 pieces, which include not only trophies but also bows, arrows, weapons, gun powder holders, traps and many others. What sets this collection apart from other hunting collections are the exotic trophies which he gathered during two safaris in Africa in 1936 and 1938 (Spiess 1942).

Of the 1058 objects in the collection only 261 represent roe deer trophies (Tab. 1; Fig. 1). On the back of the plaques on which the antlers are mounted we can find tags written in German by Spiess, tags that offer us information about the weather, the hunting party, the type of weapons used and other. After analyzing the data from the inventory books and after studying different maps from old tourist guides we were able to identify the collecting sites.

Due to the lack of certain information, such as the date and place of capture we analyzed only those that possess all the data needed (Tab. 1).

Results and discussions

The roe deer trophies were collected between 1890 and 1941 especially in the areas of Cindrel, Făgăraş, Gurghiu, and Retezat Mountains and also from the area of different cities or localities such as: Timişoara, Dumbrăviţa, Gurahonţ, Râu de Mori, Anina, Prundu Bârgăului, Gurghiu and Poiana Iţcani (Fig. 2).

Of the 261 pieces that were analyzed, more than half (142 individuals) were hunted in the area of Cindrel Mountains, of all the areas this being the closest to the Spiess's home. It is possible that in the area of Gurghiu, Făgăraş and Retezat Mountains the colonel focused on capturing more valuable or hard to get trophies, such as red deer (*Cervus elaphus* Linnaeus, 1758) and chamoix (*Rupicapra rupicapra* Linnaeus, 1758), which may have led to a smaller number of roe deer trophies hunted in these areas (Fig. 3).

Between 1890 and 1915 Spiess collected the largest number of roe deer (161 individuals); the most prolific years were 1897, 1910 and 1914. Of course, at each hunting party there is the risk you come back empty handed, and this thing happened to Spiess, as well, in 1895 (Fig. 4).

Spiess's day to day activities, such as being the Keeper of the Royal Hunting, the ornithological study carried out in Insula Şerpilor, the two safaris in South-east Africa in 1936 and 1938 drew his attention away from the roe deer. Therefore between 1916 and 1941 he captured only 80 individuals (Fig. 5). The largest number of roe deer hunted during this period was 14, in 1918. He did not collect any in 1916, between 1923 and 1926, and between 1938 and 1940.

By comparing the two periods we can conclude that between 1890 and 1915 he collected the largest number of roe deer (161), perhaps because it was a period in which Spiess did not hold any important managing position, which could explain why he allocated so much time to hunting this species.

Among the 261 pieces studied we found three trophies collected from Cindrel Mountain range (Dealul Ursului, Măgura and Păltiniș) which received medals at the Berlin International Hunting Exhibition in 1937. The first two trophies were awarded silver medals and the third one received two bronze medals.

The trophies also have a historic value, and if some of them already received awards during international hunting shows, we believe that, in this collection, there are more trophies that could receive medals (Doltu 1998).

In the collection of roe deer trophies, we identified some that present different anomalies due to injuries of the legs, testicles, or that present damages of the antlers that appeared during growth (Almășan, Popescu 1964; Cotta *et al*. 2008).

Conclusions

The largest number of roe deer was collected from the Cindrel Mountain area between 1890 and 1915. This was the closest region to Spiess's house compared to the other regions where he used to hunt.

Three trophies collected by Spiess were awarded four medals (2 silver and 2 bronze) at the Berlin International Hunting Exhibition in 1937 which proves the high quality of game from the Cindrel Mountain area.

August von Spiess showed a particular interest in selective hunting by collecting trophies with malformations for which we were not able to find any data in the inventory books regarding the date and place of hunting (Botezat 1931). These trophies show different malformations, such as having more braches than normal or unequal braches. These pieces are exhibited in the second room of the Hunting Museum (Fig. 6).

The dates and places of capture offer us an overview of the roe deer zoogeographical distribution area, the large number of hunted individuals help us conclude that there was a high abundance of roe deer, due to the favorable conditions of hunting funds or areas in that period (Almăşan *et al*. 1973; Geacu 2011; Murariu *et al*. 2009; Spiess 2005).

First mentioned in the 16th century as a native species, after 1800 the roe deer population from Romania's territory suffered many numerical fluctuations due to excessive hunting and poaching (Geacu 2011).

Today this species is protected under the laws 462/2001, of protected natural areas, preserving natural habitats, wild flora and fauna, and 407/2006 of hunters and hunting fund protection.

Each trophy in the collection of this hunter and naturalist carries a story that can be found in his writings published recently (Mija 2015; Spiess 2015).

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***https://www.google.ro/maps/

LIST OF ILLUSTRATIONS

LISTA ILUSTRAŢIILOR

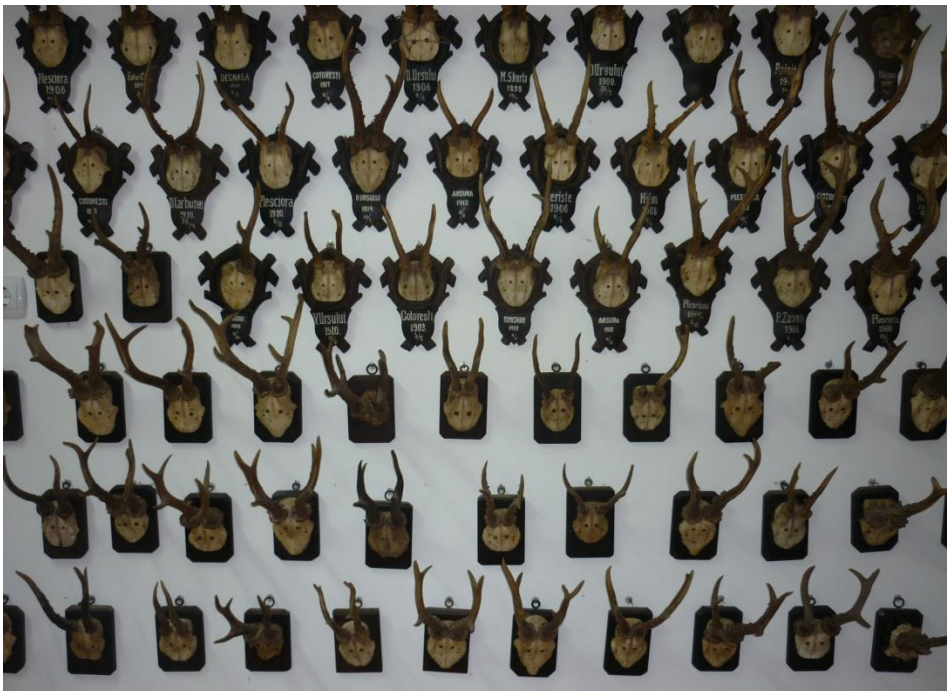

Fig. 1. Roe deer trophies from Spiess Collection

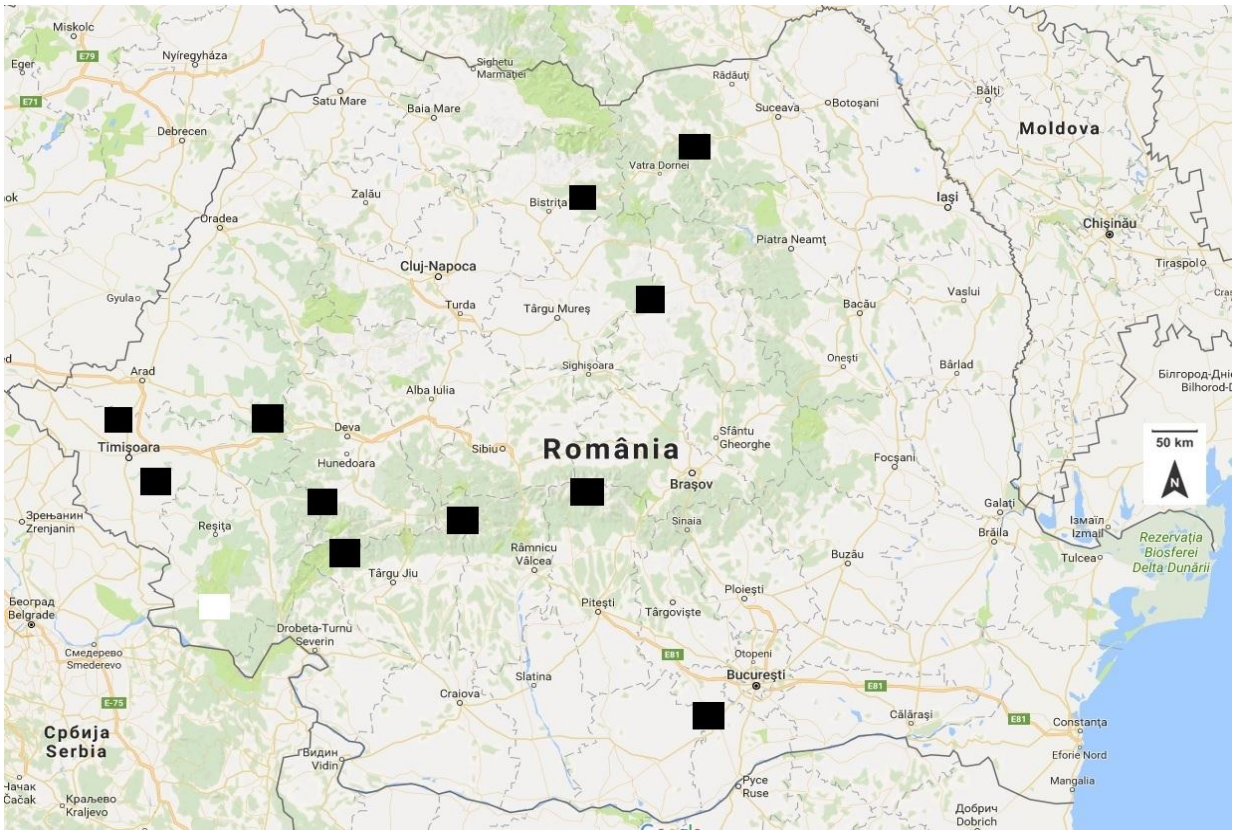

Fig. 2. The collecting sites from Romania of roe deer in Spiess Collection
(modified after www.google.ro/maps)

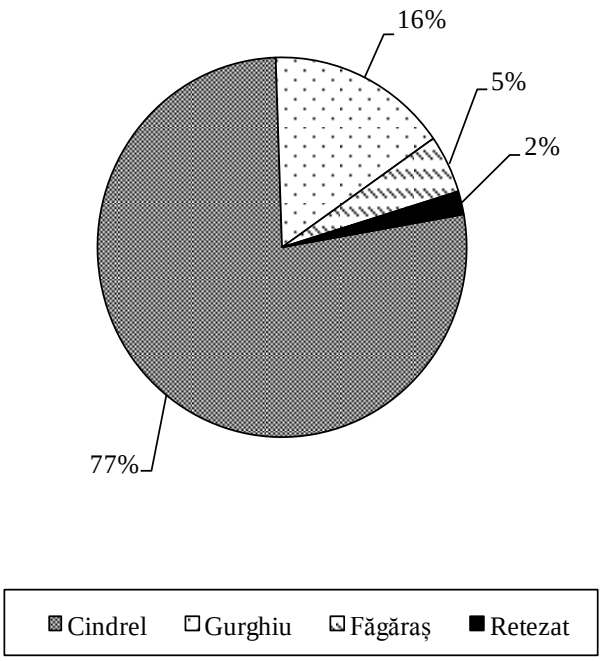

Fig. 3. The zoogeographic distribution of roe deer, found in the Spiess Collection, after the main collecting sites

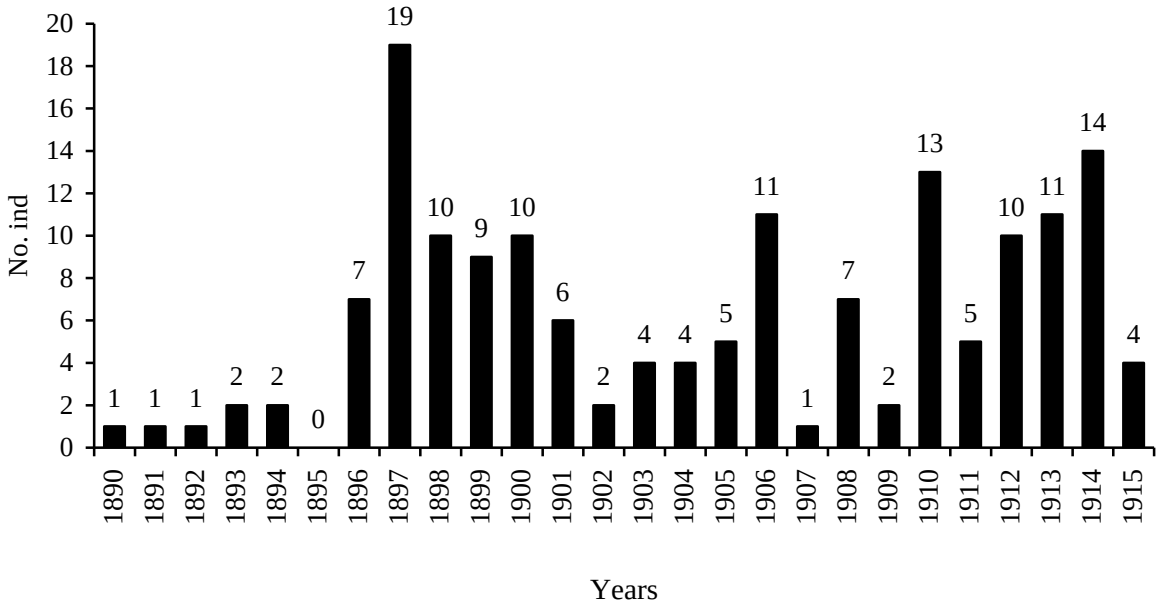

Fig. 4. Number of individuals collected between 1890 and 1915

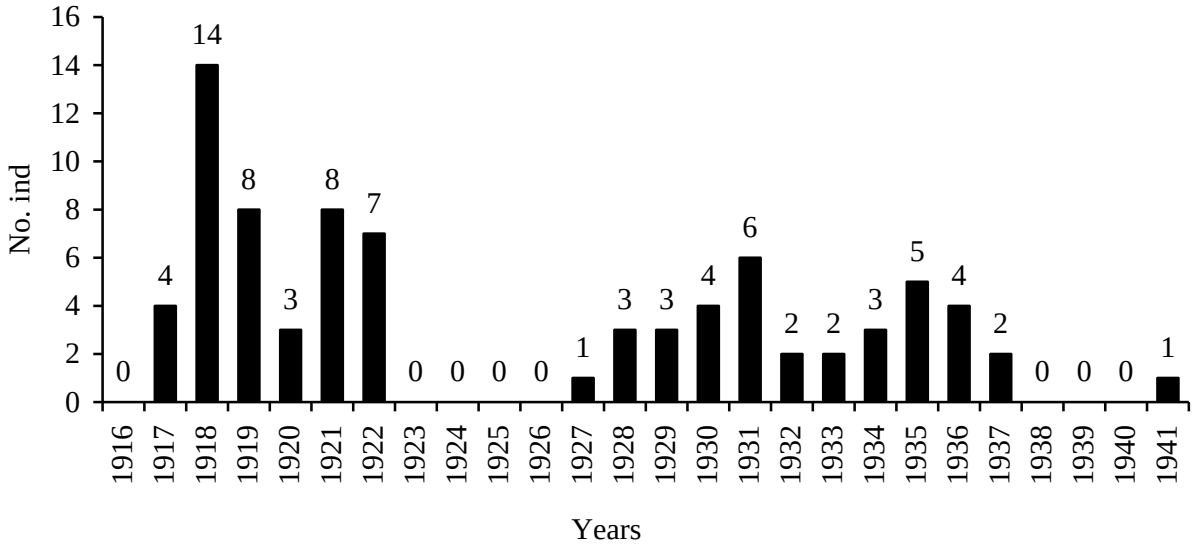

Fig. 5. Number of individuals collected between 1916 and 1941

Fig. 6. Malformed roe deer trophies from the Spiess Collection displayed in the permanent exhibition of the Hunting Museum in Sibiu

Fig. 7. Roe deer trophy which was awarded the silver medal at the 1937 International Hunting Exhibition in Berlin

Tab. 1. Roe deer trophies list identified in the Spiess collection

Nr. crt.	Species	Date and collecting site	Observations
1	*Capreolus capreolus*	9.7.1898 - Dealul Ursului, Cindrel Mtns,Sibiu	Silver medal awarded
2	*Capreolus capreolus*	27.4.1897 - Măgura, Cindrel Mtns, Sibiu	Silver medal awarded
3	*Capreolus capreolus*	30.4.1910 - Păltiniș, Cindrel Mtns, Sibiu	Bronze medals awarded
4	*Capreolus capreolus*	23.4.1919 - Poplaca, Sibiu	
5	*Capreolus capreolus*		Without date and collecting site Trophy with anomalies
6	*Capreolus capreolus*	1917 – Vișlea, Brașov	
7	*Capreolus capreolus*	6.5.1910 - Vf. Surdu, Cindrel Mtns, Sibiu	
8	*Capreolus capreolus*	2.8.1930 – Gurghiu Mtns, Mureș	
9	*Capreolus capreolus*	1.10.1918 - Găujoara, Cindrel Mtns, Sibiu	
10	*Capreolus capreolus*	17.7.1910 - Plescioara, Cindrel Mtns, Sibiu	
11	*Capreolus capreolus*	2.5.1910 - Oncești, Cindrel Mtns, Sibiu	
12	*Capreolus capreolus*	29.5.1915 - Przystalovice	Unidentified collecting site
13	*Capreolus capreolus*	12.5.1910 – Grosul, Cindrel Mtns, Sibiu	
14	*Capreolus capreolus*	10.7.1928 - Poieni	Unidentified collecting site
15	*Capreolus capreolus*	4.5.1906 - Zeristje	Unidentified collecting site
16	*Capreolus capreolus*	22.9.1937 - Gurghiu Mtns, Mureș	
17	*Capreolus capreolus*	7.8.1934 - Prundu Bârgăului, Bistrița Năsăud	
18	*Capreolus capreolus*	2.5.1893 - Păltiniș, Cindrel Mtns, Sibiu	
19	*Capreolus capreolus*	27.4.1899 - Foltea, Cindrel Mtns, Sibiu	
20	*Capreolus capreolus*	9.8.1932 - Gurghiu Mtns, Mureș	

21	*Capreolus capreolus*	1930 - Gurghiu Mtns, Mureş	
22	*Capreolus capreolus*	4.6.1899 - Dealul Ursului, Cindrel Mtns Sibiu	
23	*Capreolus capreolus*	1897 - Măgura, Sibiu	
24	*Capreolus capreolus*	1918 - Găujoara, Cindrel Mtns, Sibiu	
25	*Capreolus capreolus*	8.5.1910 – Cioraschlag	Unidentified collecting site
26	*Capreolus capreolus*	24.5.1914 - Cotoreşti, Cindrel Mtns, Sibiu	
27	*Capreolus capreolus*	15.8.1901 - Arsura, Cindrel Mtns, Sibiu	
28	*Capreolus capreolus*	29.7.1910 - Plescioara, Cindrel Mtns, Sibiu	
29	*Capreolus capreolus*	23.9.1935 - Gurghiu Mtns, Mureş	
30	*Capreolus capreolus*	7.8.1931 - Gurghiu Mtns, Mureş	
31	*Capreolus capreolus*	20.10.1918 - Maslak Remete	Unidentified collecting site
32	*Capreolus capreolus*	24.5.1907 – Poiniţa, Sibiu	
33	*Capreolus capreolus*	20.8.1919 - Cotoreşti, Cindrel Mtns, Sibiu	
34	*Capreolus capreolus*	21.7.1912 - Plescioara, Cindrel Mtns, Sibiu	
35	*Capreolus capreolus*	23.4.1919 - Poplaca, Sibiu	
36	*Capreolus capreolus*	5.5.1906 - Piscu Zăvoiu, Cindrel Mtns, Sibiu	
37	*Capreolus capreolus*	6.8.1898 - Plescioara, Cindrel Mtns, Sibiu	
38	*Capreolus capreolus*	27.4.1912 - Poplaca, Sibiu	
39	*Capreolus capreolus*	28.7.1930 - Gurghiu Mtns, Mureş	
40	*Capreolus capreolus*	8.8.1935 - Gurghiu Mtns, Mureş	
41	*Capreolus capreolus*	18.6.1914 - Dăneasa, Cindrel Mtns, Sibiu	
42	*Capreolus capreolus*	4.9.1899 - Cheile Cibinului, Cindrel Mtns,Sibiu	
43	*Capreolus capreolus*	29.7.1896 - Valea Ursului, Cindrel Mtns, Sibiu	
44	*Capreolus capreolus*	26.4.1894 - Măgura, Cindrel Mtns, Sibiu	
45	*Capreolus capreolus*	28.8.1899 - Arsura, Cindrel Mtns, Sibiu	
46	*Capreolus capreolus*	19.11.1910 - Valea Rea, Făgăraş Mtns, Argeş	
47	*Capreolus capreolus*	22.4.1900 - Arsura, Cindrel Mtns, Sibiu	
48	*Capreolus capreolus*	25.7.1896 - Plescioara, Cindrel Mtns, Sibiu	
49	*Capreolus capreolus*	3.9.1899 - Cheile Cibinului, Cindrel Mtns, Sibiu	
50	*Capreolus capreolus*	14.7.1900 - Plescioara, Cindrel Mtns, Sibiu	
51	*Capreolus capreolus*	5.11.1904- Piscul Vulturului, Cindrel Mtns, Sibiu	
52	*Capreolus capreolus*	13.9.1918 - Dumbrăviţa, Timiş	
53	*Capreolus capreolus*	13.7.1902 - V.Alunelului	Unidentified collecting site
54	*Capreolus capreolus*	23.4.1897 - Măgura, Cindrel Mtns, Sibiu	
55	*Capreolus capreolus*	14.7.1906 - Plescioara, Cindrel Mtns, Sibiu	
56	*Capreolus capreolus*	1.5.1899 - Măgura, Cindrel Mtns, Sibiu	
57	*Capreolus capreolus*	6.8.1904 - Valea Ursului, Cindrel Mtns, Sibiu	
58	*Capreolus capreolus*	6.8.1900 - Arsura, Cindrel Mtns, Sibiu	
59	*Capreolus capreolus*	26.7.1929 – Gurghiu Mtns, Mureş	
60	*Capreolus capreolus*	26.9.1905 - Beşineu, Cindrel Mtns, Sibiu	
61	*Capreolus capreolus*	3.8.1897 - Cuca Peştilor, Cindrel Mtns, Sibiu	
62	*Capreolus capreolus*	19.7.1899 - Pucşoi	Unidentified collecting site
63	*Capreolus capreolus*		Without date and collecting site
64	*Capreolus capreolus*	9.8.1903 - Gurahonţ, Arad	
65	*Capreolus capreolus*	12.6.1911 - Valea Ursului, Cindrel Mtns, Sibiu	
66	*Capreolus capreolus*	8.8.1935 - Gurghiu Mtns, Mureş	
67	*Capreolus capreolus*	19.7.1914 - Cotoreşti, Cindrel Mtns, Sibiu	
68	*Capreolus capreolus*	22.7.1914 - Dealul Ursului, Cindrel Mtns, Sibiu	
69	*Capreolus capreolus*	19.9.1918 - Anina, Caraş Severin	

70	*Capreolus capreolus*	9.6.1906 - Dealul Ursului, Cindrel Mtns, Sibiu	
71	*Capreolus capreolus*	29.4.1896 - Poieniza	Unidentified collecting site
72	*Capreolus capreolus*	30.6.1911 - Plescioara, Cindrel Mtns, Sibiu	
73	*Capreolus capreolus*	16.6.1913 - Arsura, Cindrel Mtns, Sibiu	
74	*Capreolus capreolus*	3.8.1933 - Dealul Ursului, Cindrel Mtns, Sibiu	
75	*Capreolus capreolus*	25.7.1900 - Pucşoi	Unidentified collecting site
76	*Capreolus capreolus*	25.7.1900 - Pucşoi	Unidentified collecting site
77	*Capreolus capreolus*	29.3.1918 - Dial Plopi	Unidentified collecting site
78	*Capreolus capreolus*	22.7.1914 - Cotoreşti, Cindrel Mtns, Sibiu	
79	*Capreolus capreolus*	9.6.1912 - Arsura, Cindrel Mtns, Sibiu	
80	*Capreolus capreolus*	15.6.1918 - Cotoreşti, Cindrel Mtns, Sibiu	
81	*Capreolus capreolus*	10.5.1910 - Crăciuneasa, Cindrel Mtns, Sibiu	
82	*Capreolus capreolus*	8.4.1914 - Poplaca, Sibiu	
83	*Capreolus capreolus*	7.7.1914 - Dăneasa, Cindrel Mtns, Sibiu	
84	*Capreolus capreolus*	5.7.1913 - Dealul Ursului, Cindrel Mtns, Sibiu	
85	*Capreolus capreolus*	9.7.1911 - Dealul Ursului, Cindrel Mtns, Sibiu	
86	*Capreolus capreolus*	29.4.1914 -Dăneasa, Cindrel Mtns, Sibiu	
87	*Capreolus capreolus*	28.4.1905 – Cindrel Mtns, Sibiu	
88	*Capreolus capreolus*	3.5.1914 - Gradina	Unidentified collecting site
89	*Capreolus capreolus*	24.7.1920 - Vf. Onceşti, Cindrel Mtns, Sibiu	
90	*Capreolus capreolus*	29.7.1919 - Păltiniş, Cindrel Mtns, Sibiu	
91	*Capreolus capreolus*	15.7.1912 - Valea Ursului, Cindrel Mtns, Sibiu	
92	*Capreolus capreolus*	24.7.1912 - Valea Ursului, Cindrel Mtns, Sibiu	
93	*Capreolus capreolus*	22.9.1932 - Gurghiu Mtns, Mureş	
94	*Capreolus capreolus*	8.5.1900 - Vf. Niculeşti, Cindrel Mtns, Sibiu	
95	*Capreolus capreolus*	23.7.1913 - Dăneasa, Cindrel Mtns, Sibiu	
96	*Capreolus capreolus*	16.5.1901 - Arsura, Cindrel Mtns, Sibiu	
97	*Capreolus capreolus*	16.6.1913 - Arsura, Cindrel Mtns, Sibiu	
98	*Capreolus capreolus*	19.9.1929 – Gurghiu Mtns, Mureş	
99	*Capreolus capreolus*	6.8.1921 - Maslak Vivolia	Unidentified collecting site
100	*Capreolus capreolus*	6.8.1921 - Maslak	Unidentified collecting site
101	*Capreolus capreolus*	15.9.1917 - Cotoreşti, Cindrel Mtns, Sibiu	
102	*Capreolus capreolus*	21.9.1917 - Dăneasa, Cindrel Mtns, Sibiu	
103	*Capreolus capreolus*	23.5.1917 – Mencsil	Unidentified collecting site
104	*Capreolus capreolus*	7.6.1914 - Dealul Ursului, Cindrel Mtns, Sibiu	
105	*Capreolus capreolus*	28.5.1915 - Przystalovice, Polonia	
106	*Capreolus capreolus*	29.5.1918 - Dealul Plopi	Unidentified collecting site
107	*Capreolus capreolus*	11.6.1915 - Sokolniki-Suche, Polonia	
108	*Capreolus capreolus*	8.5.1920 - Grădina Onceşti, Cindrel Mtns, Sibiu	
109	*Capreolus capreolus*	2.4.1914 - Saksonek	Unidentified collecting site
110	*Capreolus capreolus*	2.6.1901 - Orlat, Sibiu	
111	*Capreolus capreolus*	26.4.1915 - Radona	Unidentified collecting site
112	*Capreolus capreolus*	11.5.1915 - Radonia	Unidentified collecting

			site
113	*Capreolus capreolus*	21.4.1897 - Crăciuneasa, Cindrel Mtns, Sibiu	
114	*Capreolus capreolus*	7.8.1921- Maslak Vivovlia	Unidentified collecting site
115	*Capreolus capreolus*	12.6.1918 - Păltiniş, Cindrel Mtns, Sibiu	
116	*Capreolus capreolus*	3.7.1906 - Valea Rea, Făgăraş Mtns, Argeş	
117	*Capreolus capreolus*	17.7.1890 - Plescioara, Cindrel Mtns, Sibiu	
118	*Capreolus capreolus*	26.10.1908 - Valea Ursului, Cindrel Mtns, Sibiu	
119	*Capreolus capreolus*	23.4.1898 - Orlat, Sibiu	
120	*Capreolus capreolus*	22.4.1897 - Măgura, Cindrel Mtns, Sibiu	
121	*Capreolus capreolus*	26.7.1929 – Gurghiu Mtns, Mureş	
122	*Capreolus capreolus*	16.6.1931 - Poeni, Teleorman	
123	*Capreolus capreolus*	25.8.1927 – Gurghiu Mtns, Mureş	
124	*Capreolus capreolus*	22.9.1894 - Măgura, Cindrel Mtns, Sibiu	
125	*Capreolus capreolus*	5.5.1910 - Crăciuneasa, Cindrel Mtns, Sibiu	
126	*Capreolus capreolus*	28.9.1908 - Poinitea	Unidentified collecting site
127	*Capreolus capreolus*	24.9.1906 - Par Moga	Unidentified collecting site
128	*Capreolus capreolus*	16.6.1913 - Arsura, Cindrel Mtns, Sibiu	
129	*Capreolus capreolus*	26.7.1909 - Dealul Ursului, Cindrel Mtns, Sibiu	
130	*Capreolus capreolus*	9.5.1910 – Cioraschlag	Unidentified collecting site
131	*Capreolus capreolus*	26.6.1910 - Valea Ursului, Cindrel Mtns, Sibiu	
132	*Capreolus capreolus*	28.5.1905 - Valea Rea, Făgăraş Mtns, Argeş	
133	*Capreolus capreolus*	7.7.1897 - Cuca Peştilor, Cindrel Mtns, Sibiu	
134	*Capreolus capreolus*	26.4.1913 - Gura Râului, Sibiu	
135	*Capreolus capreolus*	15.5.1901 - Plescioara, Cindrel Mtns, Sibiu	
136	*Capreolus capreolus*	15.9.1900 -Cheile Cibinului, Cindrel Mtns, Sibiu	
137	*Capreolus capreolus*	15.5.1903 - Valea Rea, Făgăraş Mtns, Argeş	
138	*Capreolus capreolus*	3.6.1899 - Plescioara, Cindrel Mtns, Sibiu	
139	*Capreolus capreolus*	23.4.1908 - Poplaca, Sibiu	
140	*Capreolus capreolus*	26.6.1905 - Plescioara, Cindrel Mtns, Sibiu	
141	*Capreolus capreolus*	16.7.1905 - Valea Ursului, Cindrel Mtns, Sibiu	
142	*Capreolus capreolus*		Without date and collecting site
143	*Capreolus capreolus*	19.10 1988 - Ruzad	Unidentified collecting site
144	*Capreolus capreolus*	20.4.1898 - Piscu Zăvoiu, Cindrel Mtns, Sibiu	
145	*Capreolus capreolus*	21.4.1897 - Crăciuneasa, Cindrel Mtns, Sibiu	
146	*Capreolus capreolus*	21.5.1900 -Vf. Vălari, Cindrel Mtns, Sibiu	
147	*Capreolus capreolus*	20.8.1911 - Valea Ursului, Cindrel Mtns, Sibiu	
148	*Capreolus capreolus*	18.4.1896 - Crăciuneasa, Cindrel Mtns, Sibiu	
149	*Capreolus capreolus*	4.8.1910 - Alunelu	Unidentified collecting site
150	*Capreolus capreolus*	2.10.1912 - Cânaia, Cindrel Mtns, Sibiu	
151	*Capreolus capreolus*	12.9.1921 - Păltiniş, Cindrel Mtns, Sibiu	
152	*Capreolus capreolus*	13.6.1921 - Păltiniş, Cindrel Mtns, Sibiu	
153	*Capreolus capreolus*	2.8.1930 - Gurghiu Mtns, Mureş	
154	*Capreolus capreolus*	18.4.1892 - Vf. Onceşti, Cindrel Mtns, Sibiu	
155	*Capreolus capreolus*	1.5.1893 - Păltiniş, Cindrel Mtns, Sibiu	
156	*Capreolus capreolus*	1.4.1912 - Valea Ursului, Cindrel Mtns, Sibiu	
157	*Capreolus capreolus*	20.10.1912 - Dealul Ursului, Cindrel Mtns, Sibiu	
158	*Capreolus capreolus*	23.7.1912 - Plescioara, Cindrel Mtns, Sibiu	

159	*Capreolus capreolus*	2.9.1899 - Cheile Cibinului, Cindrel Mtns, Sibiu	
160	*Capreolus capreolus*	5.5.1906 - Piscu Zăvoiu, Cindrel Mtns, Sibiu	
161	*Capreolus capreolus*	31.7.1910 - Valea Ursului, Cindrel Mtns, Sibiu	
162	*Capreolus capreolus*	22.7.1904 - Valea Ursului, Cindrel Mtns, Sibiu	
163	*Capreolus capreolus*	14.6.1908 - Zeriste Mare	Unidentified collecting site
164	*Capreolus capreolus*	2.8.1933 - Gurghiu Mtns, Mureş	
165	*Capreolus capreolus*	5.5.1900 - Cheile Cibinului, Cindrel Mtns, Sibiu	
166	*Capreolus capreolus*	24.4.1906 - Bătrâna Mică, Cindrel Mtns, Sibiu	
167	*Capreolus capreolus*	28.10.1902 - Plescioara, Cindrel Mtns, Sibiu	
168	*Capreolus capreolus*	3.7.1903 - Valea Ursului, Cindrel Mtns, Sibiu	
169	*Capreolus capreolus*	19.9.1899 - Cheile Cibinului,Cindrel Mtns, Sibiu	
170	*Capreolus capreolus*	9.7.1905 - Poiselu	Unidentified collecting site
171	*Capreolus capreolus*	2.10.1919 - Alpenvosensteig	Unidentified collecting site
172	*Capreolus capreolus*	6.8.1910 -Plescioara, Cindrel Mtns, Sibiu	
173	*Capreolus capreolus*	30.4.1897 - Vf. Foltea, Cindrel Mtns, Sibiu	
174	*Capreolus capreolus*	27.4.1896 - Dealul Plopi	Unidentified collecting site
175	*Capreolus capreolus*	2.8.1897 - C. Barbu	Unidentified collecting site
176	*Capreolus capreolus*	28.6.1931 - Săcuieni	Unidentified collecting site
177	*Capreolus capreolus*	27.7.1928 - Gurghiu Mtns, Mureş	
178	*Capreolus capreolus*	3.8.1898 - Cheile Cibinului, Cindrel Mtns, Sibiu	
179	*Capreolus capreolus*	22.8.1897 - Lăița, Făgăraș Mtns, Argeș	
180	*Capreolus capreolus*	4.8.1921 - Bulci, Arad	
181	*Capreolus capreolus*	19.9.1931 - Gurghiu Mtns, Mureş	
182	*Capreolus capreolus*	3.8.1941 - Guşterița, Sibiu	
183	*Capreolus capreolus*	13.10.1891 - Vf. Scara, m-ţii Făgăraş, Argeş	
184	*Capreolus capreolus*	8.8.1936 - Gurghiu Mtns, Mureş	
185	*Capreolus capreolus*	Poaina Iţcani, Suceava	Without collecting date
186	*Capreolus capreolus*	26.4.1898 - M. Skurta	Unidentified collecting site
187	*Capreolus capreolus*	27.4.1898 - Piscu Zăvoiu, Cindrel Mtns, Sibiu	
188	*Capreolus capreolus*	3.1897 - Pucşoi	Unidentified collecting site
189	*Capreolus capreolus*	27.4.1896 - Păltiniș, Cindrel Mtns, Sibiu	
190	*Capreolus capreolus*	3.8.1934 – Gurghiu Mtns, Mureş	
191	*Capreolus capreolus*	8.8.1935 - Gurghiu Mtns, Mureş	
192	*Capreolus capreolus*	30.7.1897 - Măgura, Cindrel Mtns, Sibiu	
193	*Capreolus capreolus*	23.9.1936 – Gurghiu Mtns, Mureş	
194	*Capreolus capreolus*	9.8.1922 - Retezat Mtns, Hunedoara	
195	*Capreolus capreolus*	12.4.1913 - Dealul Ursului, Cindrel Mtns, Sibiu	
196	*Capreolus capreolus*		Without date and collecting site
197	*Capreolus capreolus*	15.8.1898 - Senune	Unidentified collecting site
198	*Capreolus capreolus*	16.12.1906 - Valea Rea, Făgăraș Mtns, Argeș	
199	*Capreolus capreolus*	1.5.1897 - Senune	Unidentified collecting site
200	*Capreolus capreolus*	27.4.1897 - Măgura, Cindrel Mtns, Sibiu	
201	*Capreolus capreolus*	26.4.1915	Without collecting site

202	*Capreolus capreolus*	29.6.1904	Without collecting site
203	*Capreolus capreolus*	24.4.1897 - Măgura, Cindrel Mtns, Sibiu	
204	*Capreolus capreolus*	9.7.1936 - Rîul de Mori, Hunedoara	
205	*Capreolus capreolus*	30.7.1914 - Dealul Ursului, Cindrel Mtns, Sibiu	
206	*Capreolus capreolus*	6.8.1922 - Retezat Mtns, Hunedoara	
207	*Capreolus capreolus*	18.7.1936 - Prundul Bârgăului, Bistriţa Năsăud	
208	*Capreolus capreolus*	27.7.1913 - Valea Ursului, Cindrel Mtns, Sibiu	
209	*Capreolus capreolus*	4.7.1906 - Valea Ursului, Cindrel Mtns, Sibiu	
210	*Capreolus capreolus*	23.5.1914 - Cotoreşti, Cindrel Mtns, Sibiu	
211	*Capreolus capreolus*	8.6.1918 - Dăneasa, Cindrel Mtns, Sibiu	
212	*Capreolus capreolus*	26.7.1928 - Gurghiu Mtns, Mureş	
213	*Capreolus capreolus*	11.9.1911 -Plescioara, Cindrel Mtns, Sibiu	
214	*Capreolus capreolus*	6.9.1918 - Timişoara, Timiş	
215	*Capreolus capreolus*	29.4.1913 - Cânaia, Cindrel Mtns, Sibiu	
216	*Capreolus capreolus*	23.4.1919 - Poplaca, Sibiu	
217	*Capreolus capreolus*	8.4.1914 - Poplaca, Sibiu	
218	*Capreolus capreolus*	4.5.1921 - Vf. Crăciuneasa, Cindrel Mtns, Sibiu	
219	*Capreolus capreolus*	3.8.1934 - Gurghiu Mtns, Mureş	
220	*Capreolus capreolus*	24.6.1922 - Gura Zlata, Retezat Mtns, Hunedoara	
221	*Capreolus capreolus*	24.9.1936 – Gurghiu Mtns, Mureş	
222	*Capreolus capreolus*	1.15.1908 - Selistje	Unidentified collecting site
223	*Capreolus capreolus*	31.8.1935 - Poiana Iţcani, Suceava	
224	*Capreolus capreolus*		Without date and collecting site Trophy with anomalies
225	*Capreolus capreolus*	20.7.1913 - Arsura, Cindrel Mtns, Sibiu	
226	*Capreolus capreolus*	22.7.1913 - Dăneasa, Cindrel Mtns, Sibiu	
227	*Capreolus capreolus*	24.6.1922 - Gura Zlata, Retezat Mtns, Hunedoara	
228	*Capreolus capreolus*	12.8.1898 - Tomnatic, Cindrel Mtns, Sibiu	
229	*Capreolus capreolus*		Without date and collecting site
230	*Capreolus capreolus*	25.4.1922 - Gurghiu Mtns, Mureş	
231	*Capreolus capreolus*	2.8.1934 - Gurghiu Mtns, Mureş	
232	*Capreolus capreolus*	2.8.1934 - Gurghiu Mtns, Mureş	
233	*Capreolus capreolus*	12.6.1921 - Dăneasa, Cindrel Mtns, Sibiu	
234	*Capreolus capreolus*	9.5.1906 - Zeristje Mare	Unidentified collecting site
235	*Capreolus capreolus*		Without date and collecting site
236	*Capreolus capreolus*		Without date and collecting site
237	*Capreolus capreolus*	3.9.1919 - Viştişoara, Făgăraş Mtns, Braşov	
238	*Capreolus capreolus*	29.4.1908 - Hilon	Unidentified collecting site
239	*Capreolus capreolus*		Without date and collecting site
240	*Capreolus capreolus*		Without date and collecting site
241	*Capreolus capreolus*		Without date and collecting site
242	*Capreolus capreolus*		Without date and collecting site
243	*Capreolus capreolus*	1.6.1901 - Orlat, Sibiu	

244	*Capreolus capreolus*		Without date and collecting site Trophy with anomalies
245	*Capreolus capreolus*	31.7.1922 – Timişoara, Timiş	
246	*Capreolus capreolus*	28.7.1922 - Bules	Unidentified collecting site
247	*Capreolus capreolus*	25.4.1908 – Orlater Poinita	Unidentified collecting site
248	*Capreolus capreolus*	17.8.1918 – Timişoara, Timiş	
249	*Capreolus capreolus*	3.8.1933 - Dealul Ursului, Cindrel Mtns, Sibiu	
250	*Capreolus capreolus*	28.6.1934 - Dealul Ursului, Cindrel Mtns, Sibiu	
251	*Capreolus capreolus*	17.7.1897 - Dealul Ursului, Cindrel Mtns, Sibiu	
252	*Capreolus capreolus*	27.8.1899 - Dealul Ursului, Cindrel Mtns, Sibiu	
253	*Capreolus capreolus*	28.7.1910-Dealul Cărbunarului, Cindrel Mtns,Sibiu	
254	*Capreolus capreolus*	30.4.1897 - Vf. Foltea, Cindrel Mtns, Sibiu	
255	*Capreolus capreolus*	7.8.1931 - Gurghiu Mtns, Mureş	
256	*Capreolus capreolus*	Bules	Without collecting date Unidentified collecting site
257	*Capreolus capreolus*	14.7.1897-Dealul Cărbunarului Cindrel Mtns, Sibiu	
258	*Capreolus capreolus*	20.4.1898 - Piscu Zăvoiu, Cindrel Mtns, Sibiu	
259	*Capreolus capreolus*	2.5.1912 - Dăneasa, Cindrel Mtns, Sibiu	
260	*Capreolus capreolus*	5.7.1903 - Cotorești, Cindrel Mtns, Sibiu	
261	*Capreolus capreolus*	26.7.1909 - Dealul Ursului, Cindrel Mtns, Sibiu	

GEOMORPHOLOGICAL FEATURES OF THE SOUTHERN PART OF ŞUREANU MOUNTAINS (SOUTHERN CARPATHIANS) – A COMPREHENSIVE REVIEW OF RESEARCHES

Marioara COSTEA*

Abstract. *This paper presents some geomorphological features of the Şureanu Mountains, more precisely the southern part, based on specialist literature interpretation, on field observations and on map analysis. All researchers consider that the present geomorphological characteristics of Şureanu Mountains are the result of a long and complex evolution during Proterozoic – Quaternary period, in which the geological conditions and the climate were the most important morphogenetic factors. The key features revealed by this study are: the structural homogeneity and petrographic heterogeneity, the radial configuration of summits and valleys, the continuous evolution proved by erosion surfaces, the presence of glaciar and cryo-nival landforms and the karst morphology.*
Keywords: *Orography, leveling surface, glaciar and pariglacial landforms, karst, Şureanu Mountains, Southern Carpathians.*

Rezumat. *Caracteristici geomorfologice în partea sudică a Munţilor Şureanu (Carpaţii Meridionali) – o prezentare cuprinzătoare a cercetărilor. Această lucrare prezintă unele dintre caracteristicile geomorfologice ale Munților Șureanu, partea sudică, pe baza interpretării literaturii de specialitate, pe baza observațiilor de teren şi a analizei hărţilor. Toți cercetatorii consideră că actualele caracteristici geomorfologice ale Munților Șureanu sunt rezultatul unei evoluții îndelungate şi complexe din Proterozoic şi până în Cuaternar, în care condițiile geologice și climatul au fost cei mai importanți factori morfogenetici. Principalele caracteristici relevate de acest studiu sunt: omogenitatea structurală și eterogenitatea petrografică, configurația radiară-divergentă a culmilor şi văilor, evoluția continuă dovedită prin succesiunea suprafețelor de nivelare, prezența formelor de relief glaciar, periglaciar și crio-nival și morfologia carstică.*
Cuvinte cheie: *Orografie, suprafeţe de nivelare, relief glaciar şi periglaciar, carst, Munţii Şureanu, Carpaţii Meridionali.*

Introduction

Şureanu Mountains are one of the largest units that are part of the Parâng mountain group, in its turn subunit of the Southern Carpathians (fig.1). They are situated in the north-western part of the mountain group between Sebeş Valley to the east, Orăştie depressionary corridor to the west - northwest, Haţegului depression to the southwest and Jiul de Est Valley and Parâng Mountains to the south. They occupy an area of 1585 km^2 and have a triangular shape with the hypotenuse oriented towards Orăştie Corridor and with the triangle tip in Tărtărău pass (1678 m), at the contact with the Parâng and Lotrului Mountains.

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Maximum altitude is reached in Vârful lui Pătru peak (2130m) in the south-eastern part of the mountainous unit. The historic city of Sebeş and Sebeş valley vicinity and the accessibility in this unit on the old way which follows this trans-Carpathian valley made these mountains to be known in the past as "Sebeş Mountains". Subsequently, their name was given by one of the most representative peaks (Şureanu Peak, 2059 m).

The geomorphological research on Şureanu Mountains can be grouped into several stages. A first stage is represented by the period between the late nineteenth century - the first half of the twentieth century, in which the geomorphologic observations were subsidiary of geology and paleontology, in research conducted by Stur (1860), Hauer and Stache (1862), Inkey (1884, 1892). Information on relief can be found in older geological studies, that go beyond the

geographical limit of these mountains, and which serve as arguments to reconstruct the paleo-geographic evolution of the Romanian territory, the formation and evolution of the Carpathians or the Transylvanian Depression. Geological research focused mainly on crystalline schists extension in Parâng Group and on overthrust issues (age, hypotheses, Getic Nappe composition) (Inkey 1884; Murgoci 1905, 1912). Also, special attention was given to paleo-climates and glaciers role in modeling the relief (Lehman, 1885; Mrazec, 1898).

One of the most comprehensive and important physical geography works on this area entitled *"Recherches sur l'evolution morphologique des Alpes des Transylvanie"* belongs to the French geographer Emm. de Martonne, which in 1907 published the results of his research on the Southern Carpathians. Details concerning relief morphology, evolution of the hydrographic network, extension and characteristics of glacial landforms, detailed treatment and for the first time in geographical literature of forming and development of the three Carpathians leveling surfaces, are only few arguments which made this work to be considered for many geographers a "bible" of geomorphologic studies on the Carpathians.

The second relevant period to the study of these mountains was between the years 1950 – 1989, when intensified studies of geology (Pavelescu, 1958a, b; Ilie, 1978;), physical geography (Mihăilescu 1963; Trufaş, 1971; Velcea, Savu, 1982; Oancea, Velcea - coord., 1987), geomorphologic studies on relief units and synthesis works were performed. All these studies, by extrapolation and similarity analysis, made possible the generalization and interpretation of the genesis and evolution of landforms and geomorphologic processes.

In the field of geomorphology, starting with the 60s, the studies on neighboring or nearby Carpathian units, that were true models in the relief analysis, were ampilified (Niculescu, 1965; Iancu, 1970; Grumăzescu, 1975). The study of leveled surfaces and erosion levels (Posea, 1969; Posea et al. 1974), of relict landforms (Trufaş, 1962; Mihăilescu, 1963) and current modeling processes for both the interest area and other mountain units with which evolutionary correlation links may be established, were the concerns of Romanian geographers whose works have remained as reference papers in the geographical bibliography.

The third relevant period in the research of this mountain unit is the period after 1990 to the present, when, in physical geography and geomorphology modern methods were applied. The analysis and characterization of landforms were made using the statistical methods and GIS analysis, chemical analysis and spore-pollen methods in identifying the age of landforms. In this respect, a doctoral thesis on Retezat mountains geomorphology stands out (Urdea, 2000) as well as a study on the Cindrel Mountains landscape (Buza, 2000) which make an important contribution to elucidating issues related to altimetric succession of landforms and especially relating to glacier modeling in the Southern Carpathians (Urdea, 2000). During this period Şureanu Mountains were studied also as an independent unit in terms of geomorphology (Drăguţ, 2003; Giuşcă, 2006), as part of large river basins (Costea, 2006; Manea et al, 2011) or as relief subunit in regional studies of geomorphology (Posea, 2002) and Physical Geography (Ielenicz, Pătru, 2005).

Research methodology

The main documentary sources used in the preparation of this material were bibliographical sources (books, scholarly articles) and cartographic sources (topographical maps, geological map, geomorphological maps). The field observations and mapping of the relief formed the basis of geomorphological analysis and interpretation of the landforms genesis and evolution. The geological analysis was based on geology map scale of 1: 200 000, Orăştie sheet, elaborated by the Geological Institute of Romania. To achieve geomorphological maps, topographic maps and field observations were used. For detailed analysis on significant areas particular geomorphological maps quotations from literature were used.

Results and Discusions

The dominant note of the geomorphological landscape of Şureanu Mountains is given by the massiveness, the presence of orographic nodes with high altitudes, the diverging radial disposal of ridges, by good representation and altimetric sequence of levelling surfaces etc., features derived from the ensemble of geological (lithological, structural, tectonics) and modeling conditions which had acted from geological past until nowadays.

The southern part of Şureanu Mountains includes the highest mountain area of this unit and presents

characters that define the distinct geographical individuality, especially the geomorphologic one, of these mountains. In this regard, the key features are shown in the following.

Structural homogeneity and petrographic heterogeneity

From the structural point of view, Şureanu Mountains are part of the Getic Nappe (Murgoci, 1905; 1912; Savu et al., 1968; Berza et al. 1994 b; Mutihac, 1990) and consist of meso-metamorphic crystalline schists which occupy the most part of these mountains (the central and southern parts) and epimetamorphic crystalline schists which occupy the northern part of the mountain massif. To these, sedimentary deposits from depressionary neighboring basins, which belong to the crystalline-Mesozoic zone of Southern Carpathians, are added.

The southern half of Şureanu Mountains consists mainly of metamorphic rocks of the Sebeş - Lotru series, generated by regional metamorphism pre-Variscan cycles (prebaikalian - Upper Proterozoic) (Pavelescu, 1958 a, b; Codarcea et al., 1961; Mutihac, 1990; Medaris et al., 2003). Micaschists with granate, cyanite and staurolite, with intercalations of amphibolites, paragneiss, quartzitic and feldspathic gneisses with manganese and iron silicates are dominating (Geological map 1: 200 000, Savu et al., 1968). These are very hard rocks that have resisted to erosion and conditioned the development of the highest altitudes in the southeastern part of the Şureanu Mountains and deepening (incrustation) of the Sebeş, Cugir, Strei, Jiul de Est valleys. The migmatic (partial melting in pre-existing rocks) phenomena caused the formation, on SV-NE direction, of bands and lenses of very harsh injection gneiss, granitic gneiss, pegmatite and migmatites resulted from metablastesis (certain minerals grow to larger sizes than others) and metatexis process (which form discrete, mostly light-coloured body in a migmatite) (Blatt, Tracy, 1996). They are spread mainly in the origin area of Cugir, Strei and Jiul de Est river basins, around the peaks of Şureanu, Vârful lui Pătru, Cujerele, Titianu (1721 m), Jigoru Mare (1499 m). The high hardness of rocks and more complicated tectonic of south-eastern sector led to twisting of watercourses and to strong deepening of Sebeş, Strei and Jiul de Est rivers tributaries in their middle and lower sectors.

The pre-Variscan cycles, in which the crystalline schists of the Sebeş-Lotru series were formed, were accompanied by smaller scale magmatism. Precambrian magmatism gave rise to typical ultrabasic rocks (peridotite, dunite, gramatite etc.) and to serpentinite, insular arranged in the Sebes - Lotru series mass. These form magmatic bodies that have developed on SW-NE direction in the upper basins of Strei, Cugir, Pian and Sebeş rivers (Pavelescu, 1967). Permian and Mesozoic magmatism is represented by veins of rhyolites brought to the surface in eastern part of these mountains in the Sebeş gorge, downstream the confluence with Nedeiu river and on the Canciu summit and also in the western part, near Luncani.

The sedimentary rocks complete the petrographic diversity, being well represented in the south - southwest of Şureanu Mountains, where they form the sedimentary layer of the Getic crystalline (Stilla, 1981; Mutihac, 1990) (fig.2). This sedimentary coverture was deposited starting from Permian, but this term was removed by erosion, keeping, as small patches in the south-west of the Şureanu Mountains, near Cioclovina. Mesozoic sedimentary is well represented, especially in the contact area of Şureanu Mountains with Haţeg and Petroşani depressions. Jurassic and Cretaceous deposits are distinguished, in which, the paleoclimatic conditions of the upper Jurassic - lower Cretaceous favored accumulation of bauxites (Drăghindă, 1963; Pavelescu, 1965). Jurassic deposits are dominant, composed from sandstones and conglomerates and quartz sandstones with intercalations of clay. Also, massive limestone, oolitic limestones, microconglomerates and sandstones, occupy almost entirely the south-southwestern versant of Şureanu Mountains, to the west of Strei river in the Cioclovina - Ohaba Ponor - Livadia, to the east of Strei River as a massive in the Răchiţelei – Peretu summit and as a narrow strip along the Bolii Cave - Taia alignment and occur to the north of Grădiştea de Munte in the Grădiştea basin.

Cretaceous deposits are transgressive disposed across the Jurassic and even over crystalline. They occur well developed to the north of Strei River in the Purcăreţu (870m) - Crucii Peak (1031 m) - Măgura (804 m) - Ponor - Livadia de Coastă area and have an insular spread between Băniţa and Peştera. Cretaceous deposits were formed in different sedimentary cycles and consist of: microconglomerates, sandstones, marls quartz sandstones and clays (Pop et al., 1990; Pop, 1990; Grigorescu, Melinte, 2001; Ion et al., 2004; Berza, 2004).

Getic Nappe and its sedimentary blanket suffered reactivation of old faults, activation of new faults, epirogenetic movements and secondary character plicative movements (Săndulescu, 1984; Mutihac, 1990; Pop, 1990; Posea, 2002). These tectonic movements caused, in the southern part of the Şureanu Mountains, the formation of a system of folds (anticlines Prigoana - Smida, Tărtărău - Măneţani, Fetiţa - Oaşa Mare in the southeast and synclines Taia - Jiu, Crivadia - Băniţa, Fizeşti and Strei - Galaţi in the southwest) and faults (fault at the Jiul de Est source area, Taia fault, and the fault of the mountain unit southern limit on the Răscoala - Bolii Cave - Băniţa alignment and faults system from the limestone area of Federi - Livadia).

This led to the reorganization and paleogeographic evolution of the hydrographic network towards the current configuration (Trufaş, 1971). This accounts for the longitudinal corridor of Jiul de Est river and the transverse sector of Sebeş river, where these rivers were established even before the overthrust and persisted on these trails due to their erosion power. Sebeş, Jiul de Est, Strei and Grădiştea rivers tributaries were forced to permanently adapt their courses to post-tectonic changes (post-overthrust), at general base level oscillations (Transylvanian Basin and Getic Basin) or to local levels oscillations and to contact between crystalline and sedimentary layer. Evidence of these adaptations are frequent changes of courses direction (Strei, Sibişel, Cugir, Prigoana etc.), their deepening relative to the summits and forming of the gorges or keys with high slopes and relief energy (Costea, 2006).

The existence of orographic nodes and radial divergent arrangement of summits and valleys

Vârful lui Pătru (2130 m) is the representative orographic node from that detaches the main summits towards N, NW and V:

- from south to north – Vârfu lui Pătru – Şureanu (2059 m) – Canciu (1766,4 m) – Vf. Căptanului (1617,7 m) – Tomnătăcelu (1375 m) – Muncelu (1371,6 m) (fig. 2);

- from southeast to northwest – Sălanele Peak (1709 m) – Smida Mare Peak (1773,8 m) - Vârful lui Pătru – Şureanu Peak (2059 m) – Comărnicel (1894 m) – Godeanu (1636 m) – Brusturelu (1279 m), with a branch to Cugir on Bătrâna (1792 m) – Lupşea (1487 m) – Bătrâna (1129 m) alignment;

- from east to west – Vârful lui Pătru (2130 m) – Şureanu Peak (2059 m) – Comărnicel (1894 m) – Rudei Peak (1281 m) – Chicera Izvorului (1174m) – Crucii Peak (1031 m).

The ridge oriented from south to north has a horizontal sinuosity coefficient of 1.34 and has a deviation towards the right between Vârful lui Pătru and Muncelu peaks. This deviation may be due, on the one hand, to different hardness of magmatic and metamorphic rocks which are in contact in this sector: micaschists and paragneiss with pegmatite (Savu et al., 1968). On the other hand, orientation towards east of this summits might have been due to Cugir river (which had a lower local level than the Sebeş river) and regressive erosion made by its tributaries which extended the upper basin eastward in order to accumulate the necessary flow for deepening into the pegmatite bar from Cujerele (Costea, 2006). Vertical sinuosity coefficient of the summits (terrain sinuosity) of 1.18 indicates a petrographic homogeneity; the longitudinal profile shows a slight altimetric decrease in the same direction and highlights the sequence of altitudinal levels: ± 2000 m, ±1600 m, ± 1400 m, 1000 - 1200 m. Bigger differences (over 500 m) along the summits appearing between Vârful lui Pătru Peak and the saddle at the Prigoana source area and also at the Stâna Prisăcii area; these confirm the hydrographic network reorganization caused by the lowered base level of the Transylvanian Depression.

The ridge between Vârful lui Pătru Peak - Sălanele – Tărtărău is almost linear (horizontal sinuosity coefficient of 1.02). As in the north, the altitudinal level of 1650 - 1800 m has a maximum extension, the transition from the upper surface leveling to the medium leveling surface is abrupt (abrupt approx. 500 m) as a result of the fault vicinity (with a direction from northwest to southeast) which delimits the upper basin of Jiul de Est river.

The ridge deployed from east to west between Vârful lui Pătru Peak and Crucii Peak (1031 m) has a horizontal sinuosity coefficient of 1.3, with the maximum inflections between Şureanu and Bătrâna. Outlining and completion of this interfluve was the result of the combination of tectonic and climatic factors developed in geological time. Vertical movement of the early Neogene generated local sedimentary basins (Haţeg and Petroşani to south and Transylvanian Basin to north) which, through their different levels influenced the erosion intensity in the area above sea level.

In the Pannonian and subsequently, during the Pliocene, the uplifting movements and lowered and nearest base level of Haţeg and Petroşani basins, compared to Mureş corridor which was farthest, generated a strong regressive erosion in the origin area of Strei and Auşel rivers, intense denudation of the raised area accompanied by accumulation in the lower areas of the south (polygenic gravels, coarse sands, clays) (Trufaş, 1971; Grumăzescu, 1975). Moreover, the modeling of summits from Şureanu Mountains continues even today depending on the different bases of erosion, which today are represented by the Mureş corridor to the north and the Jiu river course in the Petroşani Depression to the south.

All river basins that drain the Şureanu Mountains have their origin in the southern half of the mountain unit: Sebeş and Cugir river basins occupy the northern slopes, Orăştia with Grădiştea and Sibişel are developed on western slopes, Strei and Jiul de Est on southern slopes. The horizontal configuration of valleys network indicates a dendrite structure, mostly due to the presence on large areas of metamorphic rocks which belong to the Getic Nappe. As a whole, there is a relatively symmetrical development of these river basins in their upper sectors, but their first order tributaries (Gravelius hierarchy) have asymmetric basins (Sălane, Prigoana, Miraş in the Sebeş basin, Râul Mic, Gliva - Orăştie river basin).

This dendritic structure of hydrographical network is complicated by tectonic factor by adapting to the Nappe structure, plicative post-overthrust structures and local tectonic accidents. In this regard, sectors with rectangular structure marked by right angle confluences stand out, main courses suddenly turn and change their flow direction which obliges their tributaries to a perpendicular connection (Costea, 2006). Usually, these rectangular segments of valleys correspond to the sectors with high relief energy (300-500 m/km^2) and in longitudinal profiles valleys have big slope ruptures (± 1160m on Prigoana valley, 1100-1200 m on Cugir valley; 1000-1100 m on Strei and on the Jiul de Est valleys).

Unlike crystalline schists area where the hydrographical network is well organized, on the Mesozoic calcareous sedimentary in the region of Ohaba-Ponor – Cioclovina Cave this is poorly organized and has many blind valleys, antithetical steps and catchments to underground, which complicate the spatial configuration of hydrographic network and raises watershed supply and drainage issues. An example in this regard is the supply area of Văratec, Luncani and Ohaba (Şipot) river basins. Here it raises the issues of underground paleo-courses organized on the galleries of Cioclovina Cave (Häuselmann et al., 2010) that fuelled from the underground the Luncani river basin with the waters drained towards underground from neighbor river basins, Văratec to south and Şipot to east.

Also, at the entrance into limestone plate the Strei river tributaries are trapped underground, crossing the limestone mass through underground courses and resurface after 6-7 km. (Giuşcă, 2006). Capture to deep is made on the faults alignments by sinkholes or even by infiltration on diaclases. Another example is Şipot Valley in the middle sector, where the existence of a fault over a length of 3 km in limestone mass makes the course to be conducted to the underground. On the surface, it keeps on this sector a dry valley with a typical fluvial shape (Giuşcă, 2006).

The presence of polycyclic relief - proof of continuous evolution

Polycyclic relief in the Şureanu Mountains is the result of continuous development started with the Cretaceous, after laramic orogenesis, until now. This development must be integrated into the whole chain of the Carpathians and is marked by the succession of elevation phases (intense tectonic activity) followed by leveling phase (low tectonic activity and active action of external agents modeling as morphogenetic systems) (Posea, 2002; Ielenicz, Pătru, 2005).

Throughout time a series of research on polycyclic relief were developed in this mountain unit or in Parang group, which aimed to identify surfaces and levels of erosion, dating and correlating of these with piedmont forms (de Martonne, 1907; Trufaş, 1971; Mihăilescu, 1963; Posea 1969; Iancu, 1970; Posea, 2002) and current modeling and antropogenic impact (Costea, 2006; Manea et al., 2011).

In the southern part of the Şureanu Mountains, all three polycyclic complexes identified in the Carpathians are very well represented; they are generically known as Borăscu (upper polycyclic complex), Râu-Şes (medium polycyclic complex) and Gornoviţa (inferior polycyclic complex) (Table 1, fig. 2, fig. 3, fig. 4).

Conservation of Quaternary glaciations' traces and spread of cryo-nival and periglacial forms

The main interfluve located in the upper Carpathian level was modeled by glaciers in Quaternary Pleistocene. Glacial and fossil periglacial modeling have generated detailed landforms, which complement the geomorphological framework of Şureanu Mountains at the Borăscu surface level. Phases of rigorous climate occurred in this mountain unit as in the rest of the Southern Carpathians by transforming nival cover in ice according to a number of local factors (elevation, topographic surface configuration, general northern exhibition, hardness of rocks, limit of perennial snow) and general factors (general circulation of the atmosphere, lowering temperatures, neotectonic movements) (Velcea, 1961; Urdea, 2000, 2004).

In other mountain units of Parang Group (Parâng Mountains, Latoriţei and Lotrului Mountains) Quaternary glaciation reached its maximum development, the glaciers setting up in the catchment area of some pre-existing valleys, where they formed complex cirques glaciar and representative glacial valleys. Unlike these, in the Şureanu Mountains glaciers had a reduced extension generating less spectacular forms. Pleistocene glaciers were installed in small excavations of Borăscu platform on the Cârpa - Şureanu alignment, where they shaped small and simple cirques, Pyrenean type (suspended) like: Şureanu, Cârpa, Parva, Gropşoara and Auşel cirques (fig. 1, fig. 5). These are better developed on the slopes with eastern-northeastern exhibition - at the origin of Cugir (Şureanu, Cârpa) (fig. 5, fig. 6, fig. 7) compared to the others with northwest exhibition (Pârva) or southern orientation (Auşel).

Although the size of these cirques carved in the upper platform or in the edge of it are relatively reduced compared to Iezerul Mare and Iezerul Mic below the Cindrel Peak (Cindrel Mountains), or other cirques from Parâng Mountains, however, therein can be identified glacial and periglacial relief microforms quite well represented. Glacier cirques are simple, slightly elongated, with debris partly fixed and moraine waves hardly visible beneath the juniper shrubs. Cârpa and Şureanu cirques are more developed. Between the two cirques there are some differences both in terms of size, shape, configuration of transverse and longitudinal profiles and many forms of detail. But these are not obvious. Against the background of general northern exhibition, there are two cirques glaciers oriented to west - southwest - east - northeast, less differentiated in terms of altitude.

The longitudinal profile of Şureanu cirque has slope ruptures, reduced in size, which correlates with those of the transverse profile (fig. 6), indicating a development of cirque glacier on stage. Transversal profile indicates the symmetry of cirques, and correlation of slope ruptures on the two slopes indicates deepening phases. The U-shape is slightly flared at the top of the profiles which give the appearance of a complex modeling (fluvial-glacier), but the wide opening of the profile can be attributed to moderate slopes and to cirque position on the Borăscu surface (very weakly inclined). Glacial thresholds occur between 1780 - 1720 m, that can be connected with frontal moraines, which are found at altitudes of about 1550 m (Urdea, Drăguţ, 2002-2003).

The glacier forms from Şureanu Mountains have been studied in the past by Lehmann (1885), Emm. de Martonne (1907), Niculescu (1969), Trufaş (1962) and identified as forms carved during a less intense glacier phases. Most of studies indicate for the Southern Carpathians the existence of Riss and Würm glacier phases (Niculescu, 1965,1969; Niculescu et al., 1983; Posea et al., 1974; Velcea, 1973; Urdea, 2000). For the Şureanu and Cindrel Mountains (glacial landscape has the same characteristics as in Şureanu) Niculescu (1969) showed that glaciation was installed later than in the rest of Parâng group or in other mountains from the rest of Southern Carpathians, namely Würm stage, when the limit of perennial snow in the analyzed area would have been on approx. ± 1800 m, hypothesis sustained also by Posea (1981).

The recent research conducted by Urdea, Drăguţ (2002 - 2003), Urdea (2004) and Urdea, Reuther (2009) bring novelties regarding the manifestation of Quaternary glaciation during the last glacial maximum in Şureanu Mountains and beyond their limits. The reconstitution of surface occupied by glaciers in the Şureanu Mountains, based on glacier morphology identified through field observations and its representation by mapping (fig. 7), led to appreciation of glaciers spatial development as reduced (6.5 km^2, which represents 0.41% of the surface of Şureanu Mountain unit) compared to the Parang Mountains (129 km^2 or 11.7% of their surface) or the Retezat Mountains (121.5 km^2 or 26.8% of their surface) (Urdea, Reuther, 2009).

Morphological peculiarities of the Şureanu Mountains and their geographical location in the

group of Parâng and in the Southern Carpathians are the main factors that led to reduced extension of glaciers in this mountain unit. The field observations and literature reveals some distinct features in this regard, namely:

- cirques development is reduced to the limit of Borăscu surface; rounded peaks and Carpathian peneplain flatness favoured the drifting of snow and not its accumulation (Evans, 1977, 2005; Urdea, Reuther, 2009);

- cirques development was dictated by the asymmetry of the mountain unit and by the development of main summits on two directions: E - W and SE-NW;

- asymmetry of mountain unit was pronounced by climatic asymmetry on the two large scale slopes, leading to greater development of glaciers and glacier forms on the northern side of the mountain unit (Evans, 1977, 2005);

- significant development of Quaternary glacier, respectively of glacial relief, on sheltered slopes (E-NE) towards the direction of prevailing winds, favorable for the accumulation of snow and ice formation, compared to the slopes exposed to the wind (Urdea, Reuther, 2009); in Pleistocene, the prevailing wind direction was from the West - North West (Urdea, 2004; Urdea, Reuther, 2009).

Fossil periglacial and current cryo-nival morphology are well represented. Figure 7 shows the presence of detail landforms. Current climate conditions from the superior mountain level with large thermal amplitudes and sudden and repeated oscillations of average temperature above and below 0 °C cause frost and thaw of rocks and disaggregation, with the formation of debris. These are new attack plans for gelivation and gelifraction, a couple of mechanical processes efficiently acting especially during the seasons changing. Also, the snow is an important morphogenetic agent that by accumulation of volume (weight) and thermal processes (melting – refreezing) is able to create a characteristic nival micro-relief: nival niches, avalanches corridors, gullies and ravines pluvio-nivale, nival micro-depressions etc. The snow acts mainly on soil layer and on eluvium and colluvial deposits through mechanical and chemical processes.

Karst morphology

The presence of Mesozoic sedimentary rocks in the west – southwestern part of the Sureanu Mountains introduces a variety in the geomorphologic landscape of this mountain unit. The association between carstificable (soluble) rocks (limestone, calcareous conglomerates, sandstone with calcareous cement, etc.) and water from rain or running water has created in this region varied spectacular karst landforms, both on the surface (karren, limestone pavements, vertical shafts, poljes, gorges, sinkholes etc.) and underground (cave galeries and cavernes like: Cioclovina Cave, Ponorici Cave, Bolii Cave, Şura Mare Cave, Tecuri Cave etc. with a great variety of speleothems). Some areas are representative to the west of Strei: Ponorici plateau (Ponorici and Fundătura Ponor poljes) (Ilie, 1978; Oancea, Velcea, 1987) and Ohaba Ponor plateau. Within these plateaus of different sizes can be found sinkholes, doline valleys, blind and dry valleys and atitetical steps (fig. 8). Representative is also Băniţa area with gorges of Băniţa, Crivadia and Petrosu Valley.

The morphographical and morphometric peculiarities influence the evolution of karst through their involvement in the organization of drainage (Ilie, 1970; Denizman, 2003). Fragmentation density is one of the most relevant morphometric indicators that conditioned karst forms density in this region. In the Ohaba Ponor plateau, for example, the fragmentation density varies from 1.5 km / km^2 to over 4.75 km / km^2, about 44% of the plateau being characterized by high values of this indicator, of over 2.5 km/km^2. Also, between Costeşti Valley and Valea Roşie high values of fragmentation density are found (from 2.5 to 3.5 km / km^2 and more than 3.5 km / km^2), values which overlap to the karst area of Jupâneasa and Jigureasa valleys (Giuşcă, 2006). The slope is, also, a very important morphometric indicator that has a significant influence on karstification through water flow at surface or infiltration in the limestone mass. Average slopes vary from 0 - 6^o on the plateaus and in the karstic depressions to 6 - 12^o in the versants domain. In the contact steep sectors and in the gorges and the average slopes can exceed 12 - 24^o. In the case of Ohaba Ponor plateau average slopes below 6^o have a share of 17% of the plateau surface, average slopes between 6^o and 12^o occupy about half the area (52%) and average slopes over 12^o meet on 31% of the plateau surface (Giuşcă, 2006).

These two morphometric parameters indicate that exokarstic modeling prevails, due to the large share of high fragmentation density values and of the slight and moderate slopes. Typology and dominance of karst modeling (exo-karst and endo-

karst) can be evidenced also by the indicator of frequency of surface karst landforms and depth karst landforms and by the ratio between the weights of these types of forms. In this regard, Giuşcă (2006) estimates that this report reveals karstification stage toward which a karstic area tends, and for Ohaba Ponor plateau this report indicates the predominance of exokarst modeling, whereas 56% of karst forms can be assigned to surface karst (p.157).

Conclusions

Forming and evolution of the southern part of Şureanu Mountains must be analyzed in the Parâng Group and Southern Carpathian evolution context. Tectonic conditions and Getic Nappe homogeneity led to development of a massif relief with slow summits. In the climate conditions of Paleogene (tropical), Miocene (subtropical) and Pliocene (warm temperate) a succession of three complex levelling surfaces was modelled. The climate change from Quaternary (Pleistocene) has generated the glaciar and periglacial morphogenetic system that has modelled the specific landforms. The current modelling processes are cryo-nivale, gravitational and pluvial denudation. The presence of calcareous rocks generates an active karstic modelling in the south-western part.

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LIST OF ILLUSTRATIONS

LISTA ILUSTRAŢIILOR

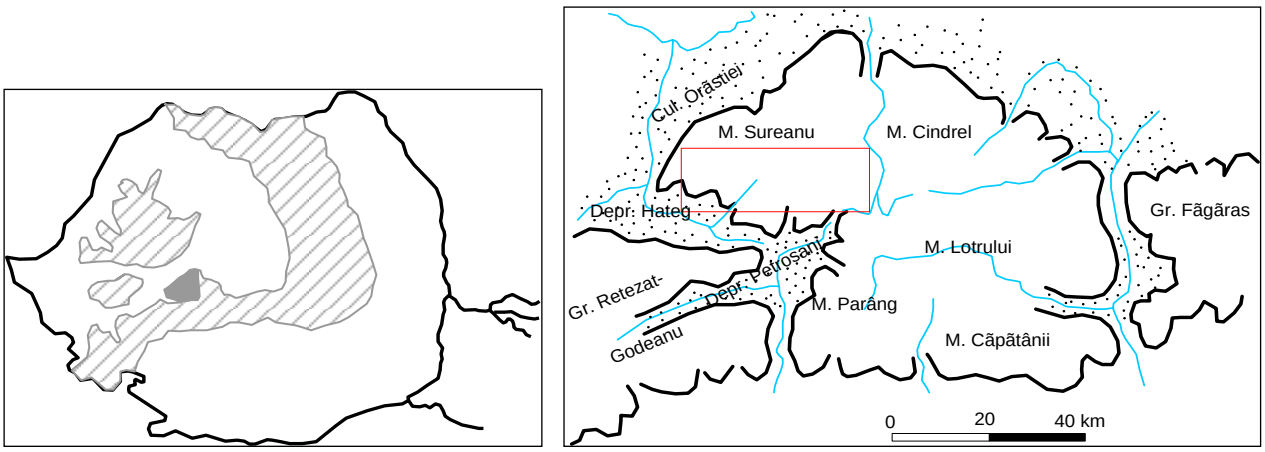

Fig. 1 Geographical position of Şureanu Mountains in the Carpathians and in the Parâng Group.

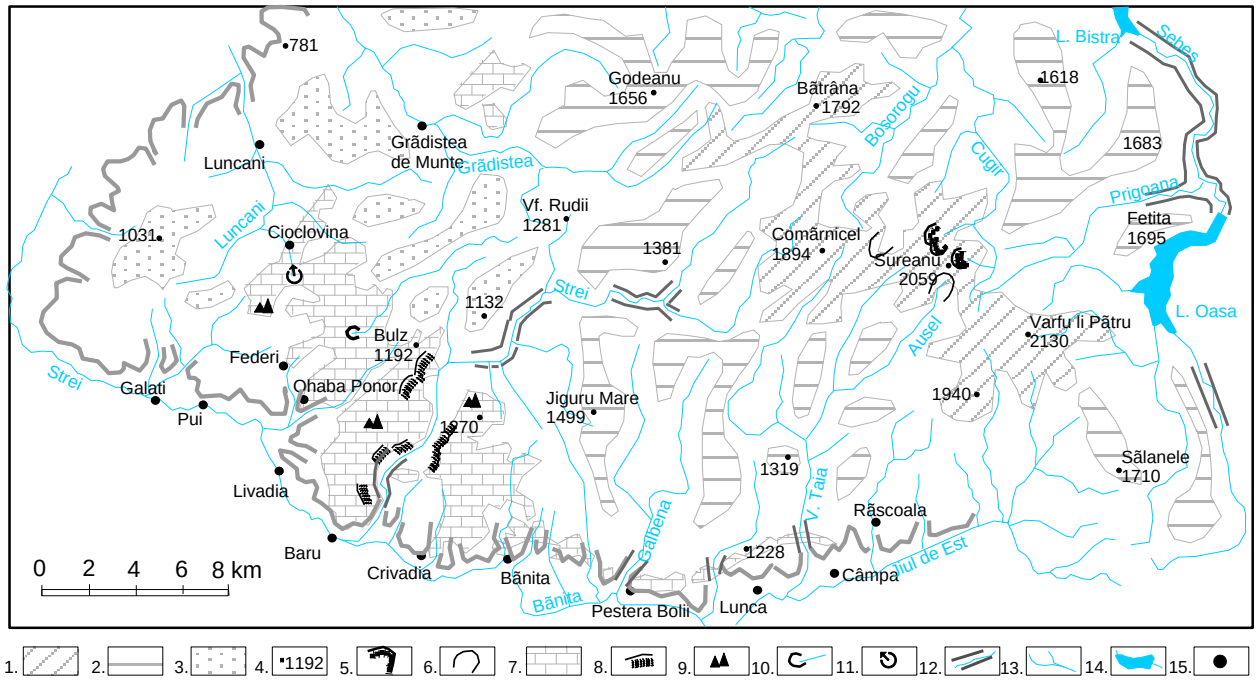

Fig. 2 Geomorphological map of southern part of Şureanu Mountains

1. Borăscu erosion surface; 2. Râu Şes erosion surface; 3. Gornoviţa erosion surface; 4. Peak, quota; 5. Glacial cirque; 6. Glacio-nival cirque; 7. Karstic relief; 8. Calcareous steep slope; 9. Rocks; 10. Shinkhole; 11. Karstic spring; 12. Gorges; 13. Hydrographical network; 14. Lake; 20. Settlements.

Fig. 3 Borăscu surface in the Şureanu Mountains and Cârpa Peak

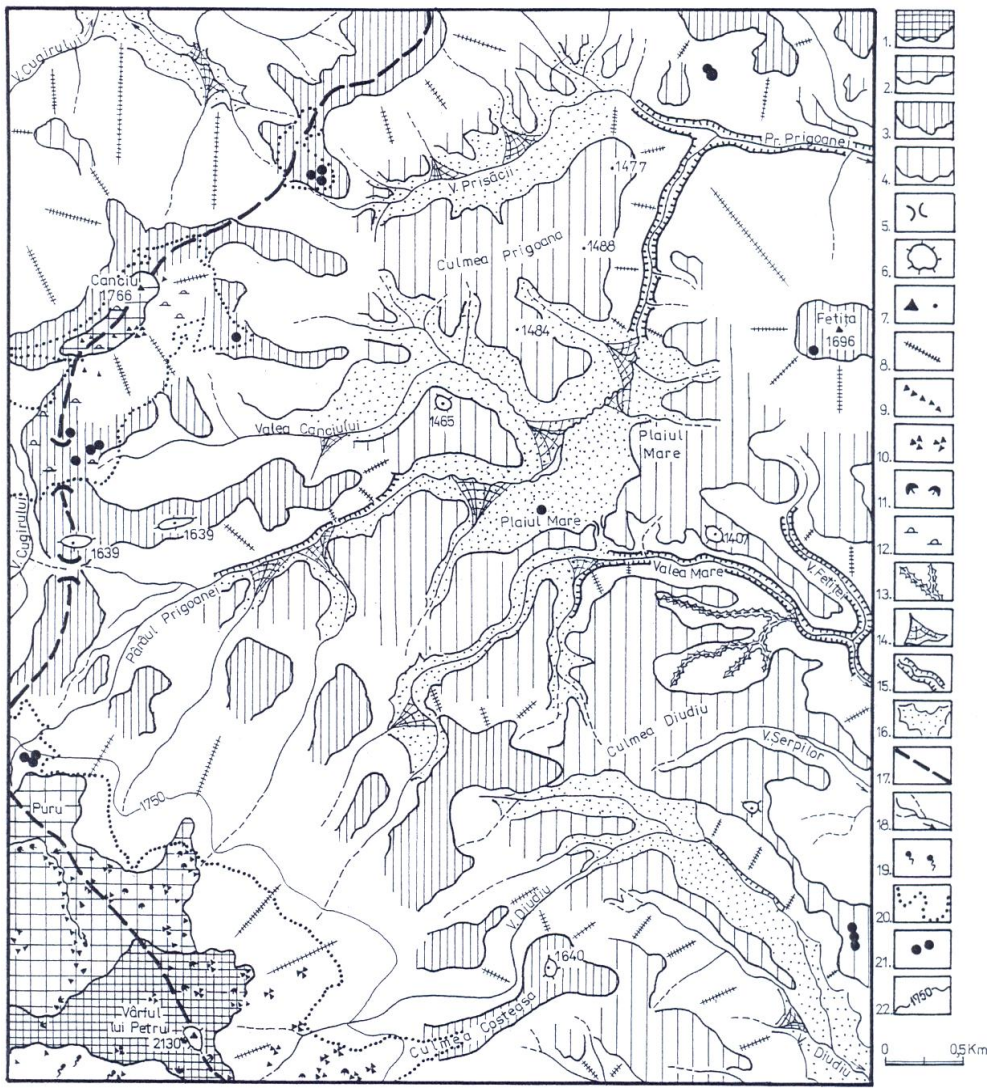

Fig. 4 Geomorphologic details in the south-eastern part of Şureanu Mountains

1. Upper level of Borăscu erosion surface; 2. Inferior level of Borăscu surface; 3. Râu Şes I – upper level; 4. Râu Şes II – inferior level; 5. Saddle; 6. Erosion outliers; 7. Peaks; 8. Inclined slopes > 20°; 9. Rock rivers; 10. Erratic blocks; 11. Sliding blocks; 12. Periglacial hummocks; Marghile; 13. Torrents; 14. Alluvial fans; 15. Gorges; 16. Small depressionary basins; 17. Watershed between Sebeş and Cugir river basins; 18. Hydrographical network; 19. Springs; 20. Upper timberline; 21. Sheepfolds; 22. Level curves. (Source: Costea, 2006)

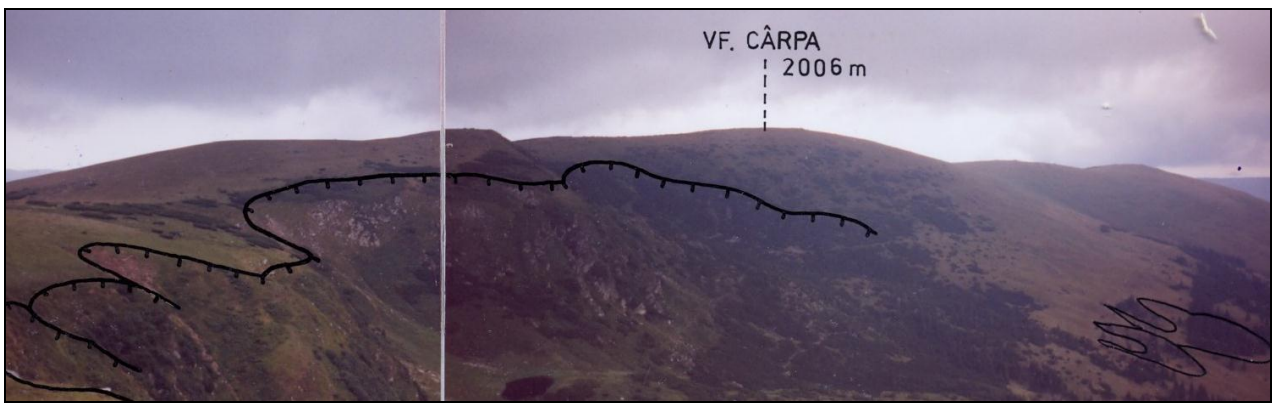

Fig. 5 Cârpa glacial cirque (Şureanu Mountains)

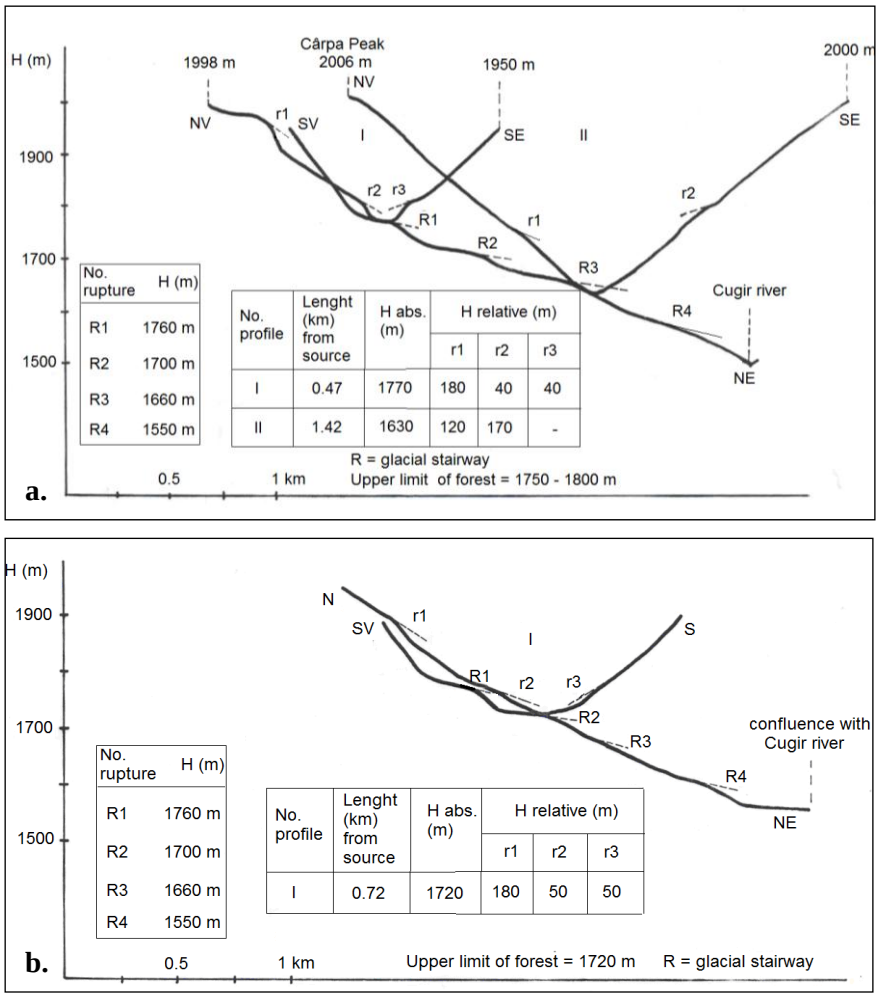

Fig. 6 Mixed profile in the Cârpa (a) and Şureanu (b) glacial cirque

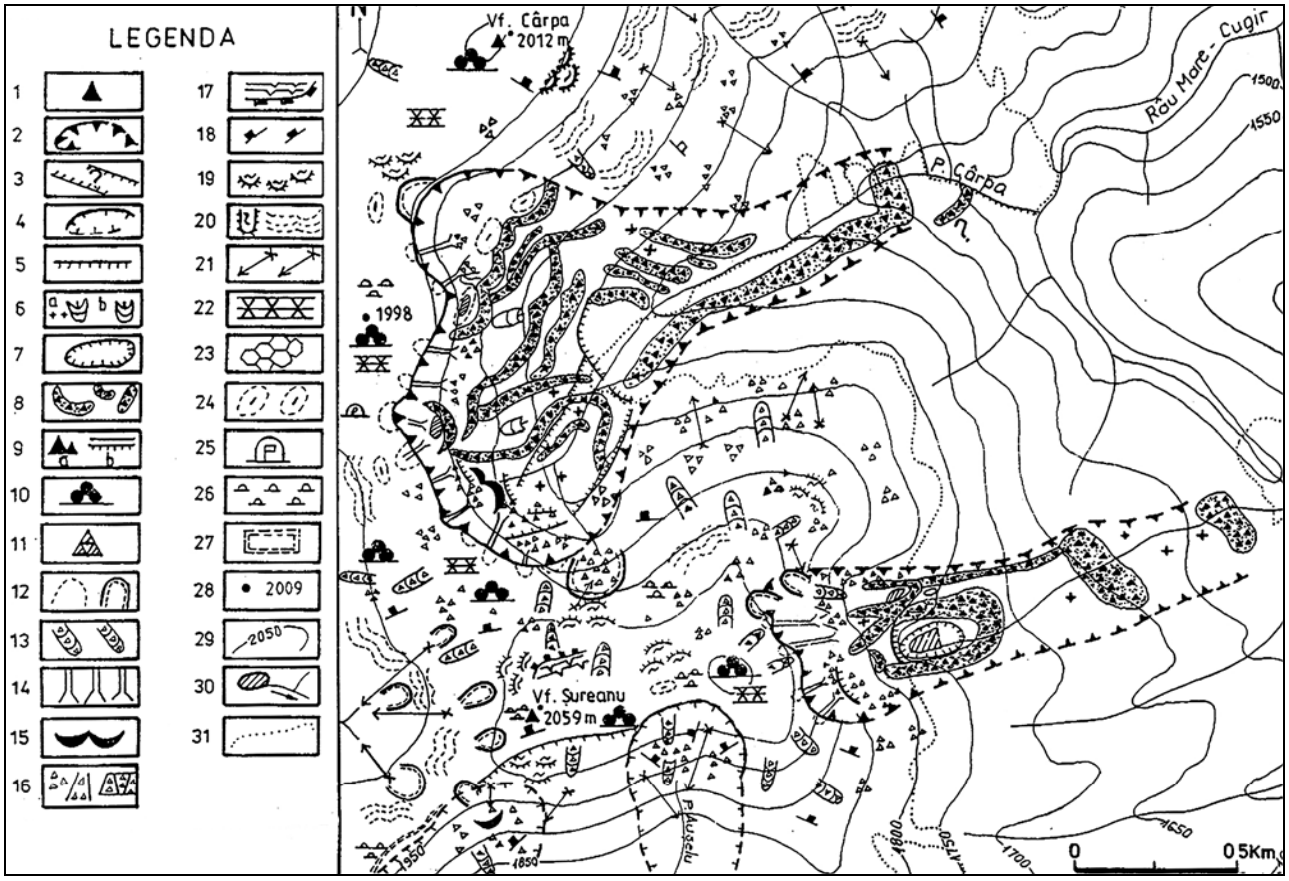

Fig. 7 Geomorphological map of Şureanu-Cârpa area (Şureanu Mountains)

1. Peak; 2.Glacial cirque and valley; 3. Possible glacial valley; 4. Glacionival cirque; 5. Glacial rock bar; 6. Erratics (a) and roche moutonnées; 7. Overdeepening depression; 8. Moraines; 9. Rocks (a) and cryergic-lithological scarps (b); 10. Tor; 11. Periglacial tamp; 12. Nival semifunnel (a) and niche (b); 13. Rock rivers; 14. Avalanche paths; 15. Protalus ramparts; 16 Talus cones and scree slopes; 17. Cryoplanation terraces; 18. Ploughing blocks; 19. Solifluxion terracettes; 20. Solifluxion ondulations; 21. Nivo-fluvial gullys; 22. Periglacial pavements; 23. Patterned grounds; 24. Nival microdepressions; 25. Fossil palsen; 26. Periglacial hummocks; 27. Roman camp; 28. Elevation; 29. Level curves; 30. Rivers and lakes; 31. Upper timberline. (Source: Urdea, Drăguţ, 2002-2003).

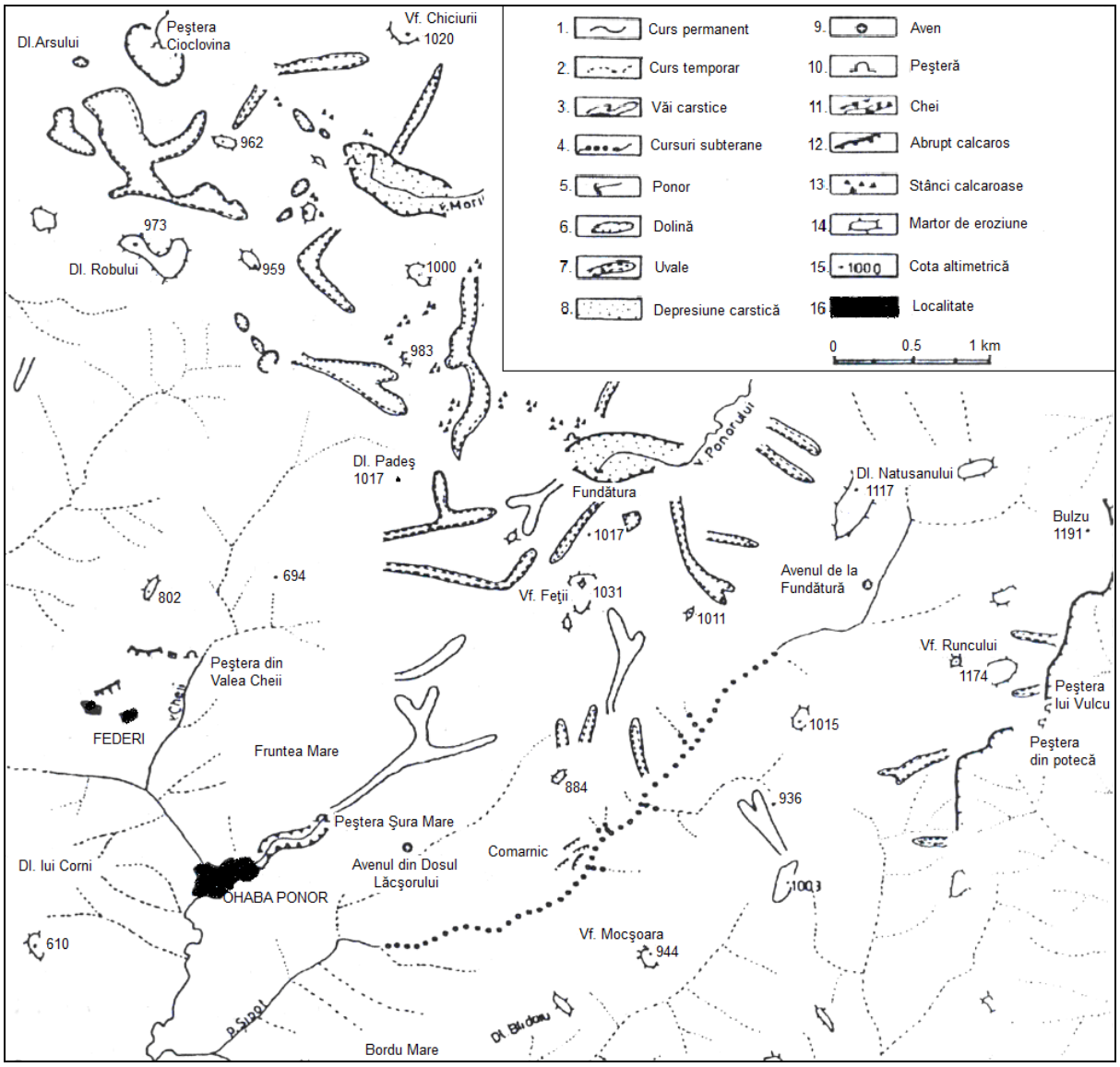

Fig. 8 Ohaba Ponor karst area – geomorphological map

1. Permanent water courses; 2. Temporary water courses; 3. Karstic valley; 4. Underground drainage; 5. Swallow-hole (Shinkhole); 6. Doline; 7. Uvala; 8. Poljes; 9. Vertical shafts (Aven); 10. Cave; 11. Gorges; 12. Calcareous steep slope; 13. Limestone rocks; 14. Erosion outlier; 15. Quota; 16. Settlement; (Source: Giuşcă, 2006).

Table 1 Leveling surfaces from Şureanu Mountains

Period/ Epoch/ Age	Studies	Location	Characteristics
Superior sculptural complex Borăscu (Carpathian pediplain – Posea, 2002)			
Paleogene (Danian – Eocene);	Emm. de Martonne, 1907; Velcea, Savu, 1982; Iancu, 1970; Mihăilescu, 1963; Posea et al., 1974; Posea, 2002; Drăguţ, 2003; Costea, 2006.	In the southern – southeastern half of Şureanu Mountains in the Sălane (1709 m) – Vârful lui Pătru (2130 m) – Şureanu Peak (2059 m) – Comărnicel (1894 m) – Bătrâna (1792 m) summit. As a large plateau with outliers.	- local name: Auşel (Trufaş, 1971); - 2 levels: Borăscu I (2000 – 2200 m) Borăscu II (1800 – 1900 m) - glacier and periglacial in Pleistocene; - current modeling through cryo-nival and gravitational processes;
Medium sculptural complex Râu - Şes			
Inferior Miocene	Emm. de Martonne, 1907; Velcea, Savu, 1982; Iancu, 1970; Mihăilescu, 1963; Posea et al., 1974; Posea, 2002; Drăguţ, 2003; Costea, 2006.	- Highlighted at the summit level in the central – southern part of the mountains, in the source area of Strei and Grădişte rivers: Rafainu (1446 m) - Godeanu (1656 m) – Vf. Rudei (1281 m) – Chicera Izvorului (1174 m), Titianu (1721 m) – Jigoru Mare (1499 m) – Răchiţele (1270 m) – Peretu (1254 m); The summits are prolong, slightly undulating and inclined to N, W and S and have large plateaus known under the toponim „lands" („plaiuri"): Plaiul Haţeganului (1500 m), Plaiul Comanului (1617 m), Plaiul lui Godeanu (1656 m); - Present also in the valleys in the form of origin small depressions – Oaşa pe Sebeş şi Sălane, Plaiul Mare pe Prigoana, Diudiu.	- local name: Păltinei (Mihăilescu, 1970); - 2 levels: Râu-Şes I (± 1600 m) (Păltinei level – Costea, 2006); Râu-Şes II (1350 – 1450 m) with local name Oaşa – Plaiul Mare or the level of suspended depressions (Costea, 2006) that gradually descends to the altitudes of 1200 – 1250 m. - current modeling through cryo-nival modeling system, fluvio-torrential modeling processes, fluvial modeling system and lacustrine processes in the dam lake vicinity;
Inferior sculptural complex Gornoviţa (Carpathian border surface – Posea, 1969; 2002)			
Pliocene	Emm. de Martonne, 1907; Velcea, Savu, 1982; Iancu, 1970; Mihăilescu, 1963; Poesea et al., 1974; Posea, 2002; Drăguţ, 2003; Costea, 2006.	Insular spreading in the west – southwestern part of the Şureanu Mountains in area of: Crucii Peak (1031 m); Cioclovina – Ponorici; Luncani – Grădiştea de Munte; Between Grădişte and Strei rivers the complex is modeled into Jurassic and Cretaceous deposits, forming a karstoplaine (suspended karst plateau compared to surrounding depressions) with various exo- and endokarstic landforms.	- local name: Luncani Platform (Conea, Kandel, 1950;); - 2 levels: Superior level Pontian (960 – 1100 m); Inferior level Dacian-Romanian ±800 m modeled through abrasion and pedimentation. - current modeling is made by gravitational processes, fluvio-torrential processes and elementary and complex processes specific to the karst.

Source: Synthesis from literature

FROM MINERAL TO HOMEOPATIC REMEDY – CELEBRATING 240 YEARS SINCE SAMUEL HAHNEMANN (1755 – 1843) CAME TO SIBIU AS "MEDICINE CANDIDATE AND LIBRARIAN OF HIS EXCELLENCY BARON BRUKENTHAL" BETWEEN 1777 AND 1779

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Ladislau ROSENBERG**

Abstract. *In 2017 we celebrate 200 years since the Brukenthal Museum was opened to the general public and commemorate 240 years since the visit of Christian Hahnemann, the father of Homeopathy, to Sibiu, between 1777 and 1779. The paper presents a short biography of Hahnemann, especially the events that led him to Sibiu, focusing on the period spent here and the role of Baron Samuel von Brukenthal in his future development as a doctor. The Museum of Pharmacy History in Sibiu (department of the Brukenthal National Museum) organized in 2017 a temporary exhibition dedicated to these two historical personalities entitled From Mineral to Homeopathic Remedy, displaying minerals from the Baron Brukenthal Mineral Collection (The Natural History Museum in Sibiu) and Homeopathic remedies obtained from the same minerals, still used today.*
Key words: *Brukenthal, Hahnemann, Homeopathy, mineral, Pharmacy History Museum*

Rezumat. *În 2017 sărbătorim 200 de ani de la inaugurarea Muzeului Național Brukenthal către publicul general și comemorăm 240 de ani de la vizita lui Christian Hahnemann, părintele Homeopatiei, la Sibiu, între 1777 și 1779. Lucrarea debutează cu o scurtă biografie a lui Hahnemann, punctând acele evenimente din viața sa care au contribuit la vizita acestuia în Sibiu și mai ales rolul pe care Baronul Samuel von Brukenthal l-a avut în dezvoltarea viitoarei sale cariere ca medic. Muzeul de Istorie a Farmaciei din Sibiu (compartiment al Muzeului Național Brukenthal) a organizat în 2017 expoziția temporară De la mineral la remediu homeopat, expoziție dedicată celor două mari personalități istorice. În cadrul expoziției au fost etalate minerale din Colecția Mineralogică a Baronului Brukenthal (Muzeul de Istorie Naturală din Sibiu) și remedii homeopate obținute din surse minerale, utilizate și astăzi.*
Cuvinte cheie: *Brukenthal, Hahnemann, Homeopatie, mineral, Muzeul de Istoria Farmaciei*

Introduction

Samuel Hahnemann on his way to Hermannstadt (today Sibiu, Romania)

Christian Friedrich Samuel Hahnemann was born on 10 April 1755 (at midnight, according to one of his daughters, and he was registered in the town's church *Frauenkirche* registry only the next day 11 April 1755 in the morning) in Meissen, Saxony, near Dresden. His father Christian Gottfried Hahnemann (1720 – 1784) was a painter and designer of porcelain, for which the town of Meissen was famous. Samuel Hahnemann's mother was Johanna Christiane Spiess (1727 – 1790) daughter of a regimental quartermaster from Koetzschnebroda, near Radebeul. She was the second wife of Christian Gottfried Hahnemann.

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Hahnemann's father was deeply interested in his son's education, being a strong believer in Jean-Jacques Rousseau's pedagogical ideas. The educational principle that Hahnemann's father handed down to his son, following Rousseau, was "never *be a passive listener or learner*" (Jütte 2005, 9). Schooling was not yet compulsory in Saxony and students had to pay a tax which Hahnemann's father could not afford. As a result, Samuel was home schooled, learning from his parents to read and write. Hahnemann did not receive formal education until he was twelve, registering as a student at the Meissen town school. Unfortunately, Samuel was often unable to attend classes as his father could not pay the monthly tax. The incredible intellect of Samuel was noticed by his teacher Johan August Müller, who cleared Hahnemann from school fees. J. A. Müller taught classical languages and German composition and was also a believer in

Rousseau's teaching methods. Following his teacher, who was for Samuel like a parent, he became proficient in a number of languages. Müller encouraged him, gave him private lessons and even let him teach other students, for example the foundation of Greek language. His teacher favored Samuel's interpretation on ancient writers, even if they were different from his one. Since that young age Hahnemann earned a living by translating books from other languages in to German.

After finishing the primary school at fifteen, his father sent Samuel to a merchant in Leipzig to learn an occupation. But Samuel, returned in secret to Meissen and with the help of his teacher Müller he enlisted in November 1770 at the renowned private secondary school of "St. Afra" in Meissen. Müller helped him gain a bursary, so he would not pay the annual fees. Also, he enrolled Samuel as his "famulus" meaning assistant so he would not pay board and lodging. Samuel lived thus with his teacher.

At this private school, all the teachers had only high praises for Samuel, as he was a gifted and avid learner. He finished secondary school in 1775.

The next step in his education was the medical faculty at Leipzig University. His father was able to give him 20 Thalers for this purpose (not enough), but found his son a benefactor. Doctor Carl Wilhelm Poerner, town physician and an eminent chemist, commissioner of the Royal Saxon Porcelain Factory (where his father worked), made sure that Samuel Hahnemann did not pay the tuition fees at the University. As a student, he earned money by teaching German and French to a Greek wealthy student and by translating medical texts from English to German. At the university, he only attended courses which he found deemed to be useful to him.

In 1777, after two years at Leipzig University, he considered transferring to another university as here there was no clinical training on patients. Despite his poor financial situation (Hahnemann asserts in his autobiography that he was cheated out of a considerable sum of money in Leipzig) he moved to Vienna. At the University, here he found the perfect teacher Joseph Baron von Quarin (1733 – 1814), private physician of Empress Maria Theresa (1717 – 1780) and medical director of the Hospital of the *Merciful Brothers* in Vienna. Quarin saw immediately the potential in Samuel Hahnemann and soon he became a regular student on his hospital wards and even took him on home visits to private patients (only privilege students went on private visits).

Jütte (2005, 12) states that there is no evidence of Hahnemann registering at the Vienna University as there is no evidence in the university archive.

After nine months in Vienna Hahnemann was close to starvation (Haehl 1973, 22). The Baron Quarin wanted to help Hahnemann and introduced him to the Baron Samuel von Brukenthal (1721-1803), doctor Quarin was a member of Brukenthal's entourage in Vienna. The Baron Samuel von Brukenthal was the only representative of the Transylvanian Protestant Saxon community who acceded to a high public office in the Austrian Empire under the Empress Maria Theresia. On 18th January 1754, he was appointed as *Gubernialsekretäre* or Secretary of the Govern, in 1762 he became Chancellor of the Transylvanian Province, in 1765 he was Head of the Aulic Chancellery, and in 1774 Brukenthal held the position of Intermarry Governor of the Principality of Transylvania. When Hahnemann met Baron Brukenthal he was officially the Governor of the Great Principality of Transylvania since July 30, 1777 (Cozma, Vlaicu 2006, 21).

Baron Brukenthal, after meeting with Hahnemann and at the recommendations of Baron Quarin, acted at once according to his motto: "*I will remain true to my nationality and my faith*" (Haehl 1973) and accepted to help the 22 years old Saxon and Protestant student in need. Samuel Hahnemann would become the Baron's private physician and librarian, following the renowned example of Gerard van Swieten (1700 – 1772), the Dutch-Austrian physician who was in 1745 the personal physician of the Empress Maria Theresa and librarian of the Imperial Library.

Samuel Hahnemann in Sibiu

Hahnemann arrived in Sibiu on 3 October 1777 (Autexier, 1998, 71). Sibiu was known then as Hermannstadt, Cibinium, Nagy Szeben or as Villa Hermanni. The city could not be compared to other European capitals of that time but locally, Sibiu was the capital of the Grand Principality of Transylvania.

In 1776 the fortified city counted 1228 inhabited houses (Cozma, Vlaicu 2006, 2).

There was no medical university in Sibiu at Hahnemann's arrival but the practice of medicine had a long tradition in Sibiu, as the first hospital

in Romania was inaugurated here in 1292. The first documented pharmacy in Sibiu was opened in 1494 and was the town's pharmacy (it is also the first pharmacy in Romania). In 1777 Sibiu counted one military apothecary and three private apothecaries: *Zum Schwarzen Adler Apotheke* (*At the Black Eagle*, head apothecary Ahlefeld Michael), *Zum Schwarzen Bären Apotheke* (*At the Black Bear*, head apothecary Schäffer) and *Zum Krone Apotheke* (*At the Crown*, head apothecary Johann Gottlieb Schuster) (Roth, 1970, 321 – 336).

Hahnemann was accommodated in Baron Brukenthal's home, outside of the city walls. It was located in front of the Cisnădia Gate or Heltauertor (demolished in 1836) and it was called "The Garden House", because it had a beautiful ornamental garden, with alleys decorated with statues, an exotic plants greenhouse, with oranges and lemons. "The Garden House" was built in a moderate, rather modest Baroque style, similar to that of many Austrian country houses. Interiors were decorated with a mixed assemblage of traditional and imported decorative elements, which from time to time were subject to interdiction as luxury. A "Polizeiordnung" from 1752 forbade certain pieces of furniture, the great mirrors with golden frames, portraits and "neu mode-Schilderein" (Ordeanu, 2001). Inside "The Garden House" Brukenthal arranged since 1774 his library, his coin collection cabinet and a small art collection.

On October 16, 1777, Hahnemann was admitted as a first-degree member of the Freemasons' Lodge in Sibiu, "*St. Andreas zu den drei Seeblattern*" (*St. Andrew's Lodge to the Three Lotus Leaves* active between 1767 and 1790), with the title "*Medicine candidate and Librarian of His Excellency Baron Brukenthal*".

The ceremony was held at the first floor of the town's inn the *Römischer Kaiser* located then on Heltauer Street, today Nicolae Bălcescu Street number 6 (Fig. 1). The building where the lodge meetings took place was demolished in 1891 and the hotel was rebuilt across the street.

The lodge had at its inauguration in 1767 nine founding members. This lodge was permissive and did not take into consideration religion or nationality. The statues of the lodge, inspired by the Age of Enlightenment, stated that it was an educational institution for "the humaneness of men" (Jütte, 2015, 12). The lodge was the perfect setting for intellectual elite to meet, many of them having scientific concerns, especially in the field of history and science. A year before, Hahnemann's arrival the lodge, in 1776 the lodge enrolled a large number of new members; the acceptance conditions were not strict as in other lodges. Also, members could advance to higher positions in a short period of time after joining. According to Teleianu (2014) and Sălăgean (2010; 2010, 215) at its pick the lodge consisted of 276 Masons from which 147 Catholics, 73 Evangelical Lutherans, 8 Orthodox members, and 2 Unitarian members.

Known members in 1777, when Hahnemann joined, were: Simon Friedrich von Bausznern (1741 – 1827) founding member of the lodge and senator in Hermannstadt; Baron Karl von Brukenthal (1753 – 1807) the brother of Baron Samuel von Brukenthal, town archivist and court secretary; Philipp Collignon from Belgium, owner of the *Römischer Kaiser* Inn; Prince Alexander Mourousis (1750 – 1816), who became later Prince of Moldavia and Wallachia; Martin Hochmeister (1740 – 1789), pressman, founder of the first public library in Sibiu and of the first German theater in Transylvania; Franz – Joseph Müller von Reichenstein (1740 – 1825), the discoverer of the chemical element "tellurium" in 1782; Daniel Gräfer chair richter in Sibiu; Johann Aurelius Müller director of the Evangelic Gymnasium in Sibiu and later administrator of the Evangelic Church in Sibiu; Johann Filtsch (1753 – 1836) town priest, teacher and writer; Joseph Theseo (1717 -) Obristwachtmeister in Sibiu (the officer who, like the sergeant at the company, had to regulate the economic and garrison conditions of a regiment); Christoph Ludwig Seipp (1747 – 1793) member of various traveling theater groups, since 1774 in Hermannstadt, was also a writer, and later theater director in Bratislava (Hungary) and Vienna; Johann Nepomuk Claudius Cristani von Rall (1729 – 1796) Austrian field marshal from the famous family Cristani von Rall, who contributed to the settlement of the Landlers in Transylvania between 1734 – 1737, in 1790 became general commander ad interim of the Imperial Army in Transylvania, based in Sibiu; the town physician Michael Neustädter (1736 – 1806) and town apothecaries (Fischer, 2007, 52; Hochmeister, 1873; Jütte, 2005, 20; Lux, 1997, 40).

The lodge in Sibiu had close connections with similar lodges in Vienna, Leipzig, Erlangen, Tübingen and Braunschweig.

There are authors who consider that Hahnemann was not interested in freemasonry, as he did not advance to a higher position inside the lodge, in comparison to other members who joined the group at the same time as him (Lux, 1997, 41). But there are sufficient elements that demonstrate the opposite.

Firstly, the *Friedrich-Alexander-Universität* from Erlangen today called the *Friedrich-Alexander University Erlangen-Nürnberg*, where he obtained his doctor diploma, was founded in 1743 and the professors teaching here were members of the Erlangen freemason's lodge *The Three Cedars of Lebanon* opened in October 1757. Between the members were nobility, university professors and students. The Erlangen University was closely identified with the lodge (Fouse, 2005, 43 – 44).

Secondly, the lodge in Sibiu had close relations to the lodge in Erlangen. Two members from the lodge in Sibiu were alumni of the Erlangen University: Michael Neustädter, town physician, founding member of the Sibiu lodge, obtained his doctor diploma at this university in 1762, after presenting his thesis under the guidance of Professor Heinricher Friedrich Delius. Delius would be Hahnemann's professor also; Johann Filtsch, priest and writer in Sibiu, member of the local lodge, studied between 1775 and 1777 at the Erlangen University. Hahnemann, as a member of the Sibiu lodge, "brother" to Neustädter and Filtsch, probably beneficiated from the connections between these alumni and their alma matter.

Thirdly, during his career Hahnemann was helped by various members of German lodges. In 1817, Hahnemann joined the Loge "Minerva to the Three Palms" in Leipzig and remained an active member until his departure. This may have enabled him to make contact with his physician colleague and *Freimaurer* brother Dr. Billig in Altenburg, who probably gave Hahnemann authorization in 1821 as a physician in Köthen, in the duchy of Anhalt-Köthen, ruled by prince Herzog Friedrich Ferdinand von Anhalt-Köthen. The Prince was an honorary member of the Lodge "Zur Säule" in Breslau. Hahnemann was also supported by another school physician Prof. Christoph Wilhelm Hufeland (1762-1836), a famous physician, author of medical books, and editor of a trade journal in which Hahnemann was allowed to publish several times. Hufeland was a member of the Göttingen Loge "Augusta zu die drei Flammen". The writer and publisher Rudolf Zacharias Becker (1752-1822), publisher of the widely read "Allgemeine Reichsanzeiger" promoted Hahnemann's research by numerous publications in his paper. Becker was a leading member of the "Zum Kompass" lodge in Gotha (http://www.mitweltonline.de/custom/s_hahnemann.htm (Accessed March, 2017)).

Last but not least, in some letters written by Hahnemann after 1820 he referred to himself as "Br." (Brother), as Masonic members identified each other (Haehl, 1973; Jütte, 2005, 13). Some researchers found evidence of Masonic terminology in the *Organon der Heilkunst* or the *Organon of Rational Medicine* published in 1880, in phrases such as: "service at the altar of truth", "thrice blessed", "fellow brothers" (Jütte, 2005, 13).

Hahnemann spent most of his time in Sibiu fulfilling his librarian tasks. He shared his tasks with Johann Michael Soterius senior (1742 – 1794) (Fig. 2), both with the assignment to catalog the Baron's book collection. Soterius was since 1771 Gubernialkonzipist in Sibiu, and was given the 'von Sachsenheim' title in 1792 for services to the country by Emperor Leopold II.

As the Baron's librarian, Hahnemann had the opportunity of reading antique and that period literature on medicine, botany, chemistry, mineralogy and farmacology. The Brukenthal Library gave Hahnemann unlimited access to study resources (Discord, Pliny, Mathioli, Fuchs, Hippocrates, Galen, Mirabeau, Diderot, Lessing etc.).

The Brukenthal Library held the work of renowned medical professors of that time: Friedrich Hoffmann (1660 – 1742) professor of medicine and natural philosophy at University of Halle; the renowned Herman Boerhaave (1668 – 1738) from the University of Leiden, called"the Dutch Hippocrates", regarded as the founder of clinical teaching and of the modern academic hospital and is sometimes referred to as "the father of physiology"; from the Medical University in Vienna, Anton de Haen (1704 – 1776) head of the University medical clinic, associate to Gerard van Swieten (1700 – 1772), mentioned previously.

Also, Transylvanian medicine students' dissertations were stored in the Brukenthal library.

The volume by Johannes Pharamond Rhumelius (1597–1661), a German alchemist and physician, notable for his works on alchemical medicine, can be found in the Brukenthal collection. In his paper *Medicina Spagyrica Tripartita* (Tripartite alchemist medicine), published in Frankfurt in

1648, Rhumelius mentioned, in various paragraphs the therapeutic principle of *similia similibus curantur*, stipulated by Hippocrates, the father of medicine.

Hahnemann translated from French to German Paul-Henri Thiry, Baron d'Holbach (1723 – 1789) controversial work *The System of Nature or, the Laws of the Moral and Physical World* (*Système de la Nature ou Des Loix du Monde Physique et du Monde Moral*) (published in 1770), the most comprehensive description of materialism and atheism in the entire history of philosophy (Durant, 1965, 710). Hahnemann wrote to an unnamed publisher at a later point in time and two weeks after settling in Erlangen he searched for a publisher with the intention of selling or printing the translated version of the book (Jütte, 2005, 20). We can assume that he wanted to earn some money as this book was highly controversial and would be of interest to publishing houses, because of its content.

Currently, Brukenthal National Museum Library stores the catalog from that period, completed in 1780, comprising around 5,000 book titles. Soterius, mostly, wrote the catalogue entries, probably because "he was extremely diligent" (http://www.soteriusvonsachsenheim.com/johann-michael-the-elder-sv/4573948016 (accessed March, 2017)) and often worked at the Hermannstadt archive, having thus experience with cataloging and archiving.

But there are some by Hahnemann. We consider that Hahnemann's aptitudes as a translator were put to use at the library. Hahnemann and Soterius complemented each other, one was a perfect archivist and the other was a polyglot.

Also, Hahnemann was in charged with translating the Latin inscriptions from the Roman Empire coins included in the Baron's new numismatic collection. This was not an activity that helped him.

In Sibiu, Hahnemann's inclination towards foreign languages was also satisfied as here during that period he encountered locals speaking predominantly Romanian, but also German, Magyar and a variety of Slavonian idioms (Haehl 1973). Hahnemann informs us that he found time "to learn a few more languages that I needed and to study a number of secondary sciences" (Jütte, 2005, 19).

Lux (1997, 39) mentions that Hahnemann could have visited in Sibiu the *Hermannstätter Kapellen – Bibliothek*, founded in 1592. Here Hahnemann could have read the work of Paracelsus, Andreas Vesalius, and Georg Ernst Stahl, not included in the Brukenthal library.

Haehl (1973) considered that Hahnemann, as the young medical candidate, was afforded opportunities to practice medicine in the town or extend his views and knowledge regarding his profession by practical means or by observation. He might have accompanied and observed his Masonic brother doctor Neustädter, during his rounds. Lux (1997, 24) mentioned that Hahnemann could not officially prescribe remedies to the baron as he was still a student but during 1777 and 1779 there are no medical prescriptions found in the Brukenthal archive.

Before leaving, Samuel Hahnemann left a manuscript, where he praises Baron Brukenthal, to which the Baron made himself some additions.

After one year and nine months of preparation and "the kindness of the Governor of Transylvania who had provided him with the financial means" (Haehl 1973, 24) Hahnemann returned to Germany to finish his studies at Erlangen University, for reasons mentioned before, mainly for the Masonic connections between the Sibiu lodge and the one there.

On 11 April 1779, at the age of 24, Samuel Hahnemann registered at the University as *promovendus* or *doctoral candidate* (Lang, 2014, 2). He graduated MD on 10 August 1779, after the doctoral *viva tentamen* (preliminary examination), *examen rigorosum* (final oral examination in a wider field) and *disputation* (scientific debate of the doctoral thesis) (Lang, 2014, 3). Some researchers write in Hehnmann's biographical notes that he graduated with honors. According to Lang (2014, 3) Hahnemann was awarded the grade rite (satisfactory), the lowest possible. His written thesis *Conspectus adfectuum spasmodicorum aetiologicus et therapeuticus* or *Aetiological and therapeutical consideration on spasmodic afflictions* was according to Hahnemann "a laconic and aphoristic sketch" and he must have prepared it during his stay in Sibiu (Lang, 2014, 3). Lang (2014) explains his opinion, and we subscribe to it, as Hahnemann graduated after only 10 months upon arriving at the University. During that period dissertation theses, were authored by the tutor, not the student, as students paid for these services. Considering his dissertation subject and content and the small grade received we can conclude that he did not

spend much time consulting a tutor from the University on the subject.

The years that followed, since Hahnemann left Sibiu and obtained his doctor diploma have been studied and documented by numerous historians worldwide.

Materials and methods

The Pharmacy Museum from Sibiu is part of Brukenthal National Museum since the beginning of its collection in 1950. The outset of this museum was triggered by the Act number 352 of April 2, 1949, that initiated the nationalization of pharmacies in Romania. The pharmacies were divided into two categories: those that were turned over to the state and continued to operate and those that were closed. Nationalized pharmacies inventory contained numerous valuable artifacts, considering their age and technical – scientific importance, marking the development and evolution of this noble profession in Romania.

As a result, in 1949, the Ministry of Health released a decree stipulating that all history of pharmacy vestiges found in the possession of the nationalized pharmacies should be sent to the Brukenthal National Museum in Sibiu. Since 1950, over 70 pharmacies, pharmaceutical offices and medical institutions from 32 municipalities across the country responded to the decree. The Brukenthal History of Pharmacy Collection was thus established. It was held under storage for over 20 years until the completion of the inventory and exhibition area. After the inauguration, the museum's collection has diversified and increased, now including 6642 pieces, structured into the following general categories: furniture and accessories; pharmaceutical containers (bottles, jars); laboratory instruments, specific machinery and equipment; medical instruments and accessories; books, documents; Homeopathic inventory (bottles and kits). The origin of these remedies, utensils, containers, books and historical documents are famous European centers such as Vienna, Dresden, Leipzig, Berlin, Stuttgart, Budapest, London, Paris, from where they were purchased by pharmacists who practiced in Romania. The museum's collection includes thus world heritage. The museum was opened to the public in 1972.

The Brukenthal National Museum was not accidentally chosen as custodian to these historical objects. Brukenthal is the first museum officially opened in Romania, in 1817. In 2017 we celebrate 200 years since its inauguration.

The decisive factor was the location of this museum, meaning the city of Sibiu. From all the cities in Transylvania, Sibiu has the richest tradition in the development of health institutions, starting back with the 13th century. The council of Sibiu or as it was called then Villa Hermani or Cybinium, founded in 1292 a community hospital, entrusted to the *Frateribus Cruciferis Sancti Spiritus Order*. The hospital was dedicated to the care of the poor and sick. This is the first hospital in Romania. About the religious order administrating the hospital, Pope Urbanus the 4th (1195 – 1264) wrote, in 1262, that they paid particular attention to the preparation of remedies.

The first documented pharmacy in Romania was opened in 1494 in Sibiu, referred to as the "town pharmacy" (Stadapotheke), later on became the private pharmacy *At the Black Eagle* (*Zum Schwarze Adler Apotheke*) until 1949.

At the end of the 19th century, in Sibiu were opened six public pharmacies and a military pharmacy, highlighting yet again the rich tradition of the town towards this practice.

Also Homeopathy has a long tradition in Sibiu and played a vital role in the spread of this alternative doctrine in Romania. In 1914 Eugen Wittmeyer (1883 – 1958) leased together with his brother-in-law doctor pharmacist Johann Binder the famous Sibiu pharmacy *At the Black Eagle*. Wittmeyer opened the first homeopathic section in Sibiu in 1915. The *Black Eagle Pharmacy*, the oldest pharmacy in Romania (1494), became the first pharmacy to sell homeopathic remedies in Sibiu. In 1919 Wittmeyer bought the *Angle Apothecary* (*Engel Apotheke*) and in 1924 he moved his entire homeopathic section to this pharmacy and dedicated to the doctrine two rooms specially decorated and equipped. Wittmeyer also specialized for one year at the Robert Bosch Homeopathic Hospital in Stuttgart. Because of the high demand, the homeopathic section was enlarged with remedies brought from Germany, Austria, becoming one of the best known providers for all pharmacies in Romania (Maior, 2014, 489). In 1949, when the Angel Pharmacy was nationalized, 2915 objects that belonged to the homeopathic section were donated to the Brukenthal Museum Pharmacy Collection in 20 October 1950 (Fig. 3).

The collection comprises 2910 bottles (empty or still holding the remedy) and 5 portable homeopathic remedies set. Analyzing the origin of

these remedies Ban (2003, 270) listed the collection as following: of vegetal origin 1463 remedies, of animal origin 196, of chemical origin 1188 and 63 biotherapeutic remedies. The name of the Angel Pharmacy is marked on the majority of the labels, but there are many remedies acquired from renowned homeopathic laboratories in Leipzig, Stuttgart, Dresden, Budapest and London. The historical and documentary value of this collection is undisputed.

In 2017, we celebrate 200 years since the inauguration of the Brukenthal Museum and 240 years since Hahnemann visited our city and became for two years the baron's protégé and official librarian. To pay a tribute to these personalities and their life work we decided to exhibit, temporarily, in the Pharmacy Museum general exhibition, natural history specimens from the Baron Brukenthal Mineral Collection and homeopathic remedies of mineral origin from the *Angel Pharmacy* Collection.

The Samuel von Brukenthal petrographic and mineralogy comprises 3622 samples, the majority from the Metaliferi Mountains (the Carpathian Mountain Range, a division of the Apuseni Mountains, Romania). The collection was initiated in 1780 and continued until the Baron's death (Ciuntu, 1998, 37).

Homeopathic remedies originated from mineral sources, found in the Pharmacy Museum collection from Sibiu (Fig. 4), have been studied extensively by the former curator of the collection pharmacist Ban (2001, 2003a, 2003b, 2007).

The process of preparing homeopathic remedies using minerals follows the original method described by Hahnemann. The mineral is grinded into powder until it is water soluble. The powder after being triturated, as mentioned above, is dissolved in a liquid mix containing pure alcohol and distilled water in different ratio, depending on the substance that we want to obtain. The mixture is left to stand and shaken occasionally from two to four weeks. At the end of this time, the mixture is strained using a special tincture press. The liquid obtained is known as the "mother tincture" or "tincture". From the "mother tincture", a single drop is added to 99 drops of alcohol and/or water while shaken vigorously. The process is repeated many times over because the more dilutions substance undergoes, the higher the potency will be. For the final product, a few drops of the remedy are added to lactose (milk sugar) forming the round tablets. The tablets are then placed in an airtight container.

Results and discussions

Acidum arsenicosum synonym *Arsenicum album* was published Hahnemann's Materia Medica Pura for the first time in 1821, and it was used mainly to treat the mucous membranes of the digestive and respiratory tracts. *Arsenicum album* is extracted from the mineral arsenopyrite (an iron arsenic sulfide FeAsS).

Acidum hydrofluoricum synonym *Hydrofluoric acid* or *Fluroic Ac*. Is prepared by distilling the mineral fluorite (CaF_2) with sulfuric acid to create hydrogen fluoride gas, which is then dissolved in water to produce hydrofluoric acid. The remedy is used for teeth and gums, nail conditions and even alopecia.

Acidum phosphoricum synonym *Phosphoric Acid* or *Glacial phosphoric acid* proved by Hahnemann in *Materia Medica Pura* to be used for profound exhaustion. Produced by grinding apatite ($Ca_5(PO_4)_3(F,Cl,OH)$) into a powder and then mixing it with sulfuric acid.

Aluminum oxydatum synonym *Alumina* or *Pure Clay* is obtained from the mineral bauxite. In Matria Medica Pura, Hahnemann prescribes Alumina for sluggish states and dementia.

Argentum nitricum synonym *Silver nitrate*, *Hellstone*, *Devil's stone*, *Lunar caustic* is used for digestive disorders, irritable bowel syndrome, nervouse disorders after been described for the first time by Hahnemann and then intensively researched by the homeopathic doctor J. O. Müller from Vienna in 1845. It is obtained from the mineral acanthite a form of silver sulfide (Ag_2S).

Aurum metallicum synonym *Gold* (Au), proved as homeopathic remedy by Hahnemann in 1818 for depression, angina, reproductive system problems and bone pain.

Cuprum metallicum synonym *Copper* (Cu) obtained from deposits in rocks worldwide. It is toxic in nature and chronic copper poisoning symptoms gave Hahnemann in 1834, the remedies utility for coughs, colic, diarrhea and difficulty in assimilating food.

Ferrum metallicum synonym *Iron* (Fe) obtained from powdered iron. The powder is extracted from the mineral hematite (Fe_2O_3). It is prescribed as homeopathic remedy for anemia caused by blood loss, and to absorb iron more efficiently.

Graphites synonym *Blacklead*, *Plumbago* is obtained from the mineral graphite ©. Hahnemann published this remedy in 1821 prescribing it for skin complains and anxiety.

Hydrargyrum metallicum synonym *Mercurius solubilis Hahnemanni*, *Mercury*, *Quicksilver* was published by Hahnemann in Materia Medica Pura as a remedy for ulcers, glandular problems. The mercury is extracted as a liquid from cinnabar (HgS) a volcanic rock. The liquid mercury is dissolved in nitric acid resulting a gray powder used to obtain the remedy.

Natrium chloratum synonym *N. muriaticum*, *Rock salt*, *Sodium chloride* obtained from halite (NaCl) crystal. Hahnemann described the remedy for colds, headaches, skin conditions, and mouth and throat conditions.

Plumbum metallicum synonym *Lead* (Pb) described as homeopathic remedy by Hering, Hartlaub, Trinks, and Menning, and published in Allen's *Encyclopedia of Pure Materia Medica* (1874–1879). Lead is extracted from the mineral galena (PbS).

Silicea Terra synonym *Acidum silicicum*, *Silicea*, *Flint*, *Quartz*, *Rock Crystal* extracted from silica minerals (SiO_2 agate, amethyst, chalcedony, flint, quartz) especially from flint. The remedy described by Hahnemann in 1828 was used for skin, nail and teeth conditions.

Stibium sulphuratum nigrum synonym *Antimonium crud*., *Antimony black sulfide of antimony* is found naturally in the mineral stibnite or antimony (Sb_2S_3). Hahnemann and Caspari proved the efficiency of the homeopathic remedy in 1828 for digestive disorders and skin problems.

Tellurium Metallicum synonym *Tellurium* (Fig. 5), *Tellur*, *Metal Tellurium* was introduced as a homeopathic remedy by Hering in 1850. The trituration is prepared from the mineral tellurium (Te) for conjunctivitis, otitis and muscular tonic.

Zincum metallicum synonym *Zinc sulfide* is refined from sphalerite ((Zn, Fe) S). Hahnemann used the remedy for nervous exhaustion, urogenital problems and headaches.

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LIST OF ILUSTRATIONS

Fig. 1. The old *Roman Emperor Inn* (Hermannstadt, Sibiu) before it was demolished. The place where Samuel Hahnemann became member of the *St. Andrew's Lodge to the Three Lotus Leaves* on 16 October 1777 and, probably, attended the lodge meetings (Source www.sibiu.patrimoniu.ro, accessed February 2017).

Fig. 2. Johann Michael Soterius von Sachsenheim (the Elder) (1742 – 1794) portrait by unknown artist, Brukenthal National Museum, Sibiu

Fig. 3. The official report number 604 from 23 October 1950 through which the homeopathic inventory from *The Angel Pharmacy* (Sibiu) became part of the Brukenthal Museum Collection (Source: the archive of the Pharmacy Museum in Sibiu, department of the Brukenthal National Museum).

Fig.4. Pharmacy History Museum in Sibiu (Brukenthal National Museum) Homeopathy section (Photo credit: Gabriela Cuzepan – Bebeșelea).

Fig. 5. *Tellurium* (inventory number Fh 2646) from the Pharmacy Museum Collection (Foto credit: Gabriela Cuzepan – Bebeșelea).

LISTA ILUSTRAȚIILOR

Fig. 1. Vechiul han *La Împăratul Romanilor* (Sibiu) înainte să fie demolat. Locul unde Samuel Hahnemann a devenit membrul lojei masonice *Sfântului Andrei la cele trei frunze de lotus* în data de 16 octombrie 1777 și unde, posibil, a participat la întâlnirile membrilor (Sursa www.sibiu.patrimoniu.ro, accesat februarie 2017).

Fig. 2. Johann Michael Soterius von Sachsenheim (cel bătrân) (1742 – 1794), portret artist necunoscut, Muzeul Naional Brukenthal din Sibiu.

Fig. 3. Procesul-verbal numărul 604 din 23 octombrie 1950, prin care inventarul homeopatic al Farmaciei *La Înger* (Sibiu) a intrat în gestiunea Muzeului Brukenthal (Sursa: arhiva Muzeului de Istoria Farmaciei din Sibiu).

Fig.4. Muzeul de Istoria Farmaciei din Sibiu – sectorul dedicat Homeopatiei (Foto credit: Gabriela Cuzepan – Bebeșelea).

Fig. 5. *Tellurium* (numărul de inventar Fh 2646) din colecția Muzeului de Istoria Farmaciei din Sibiu (Foto credit: Gabriela Cuzepan – Bebeșelea).

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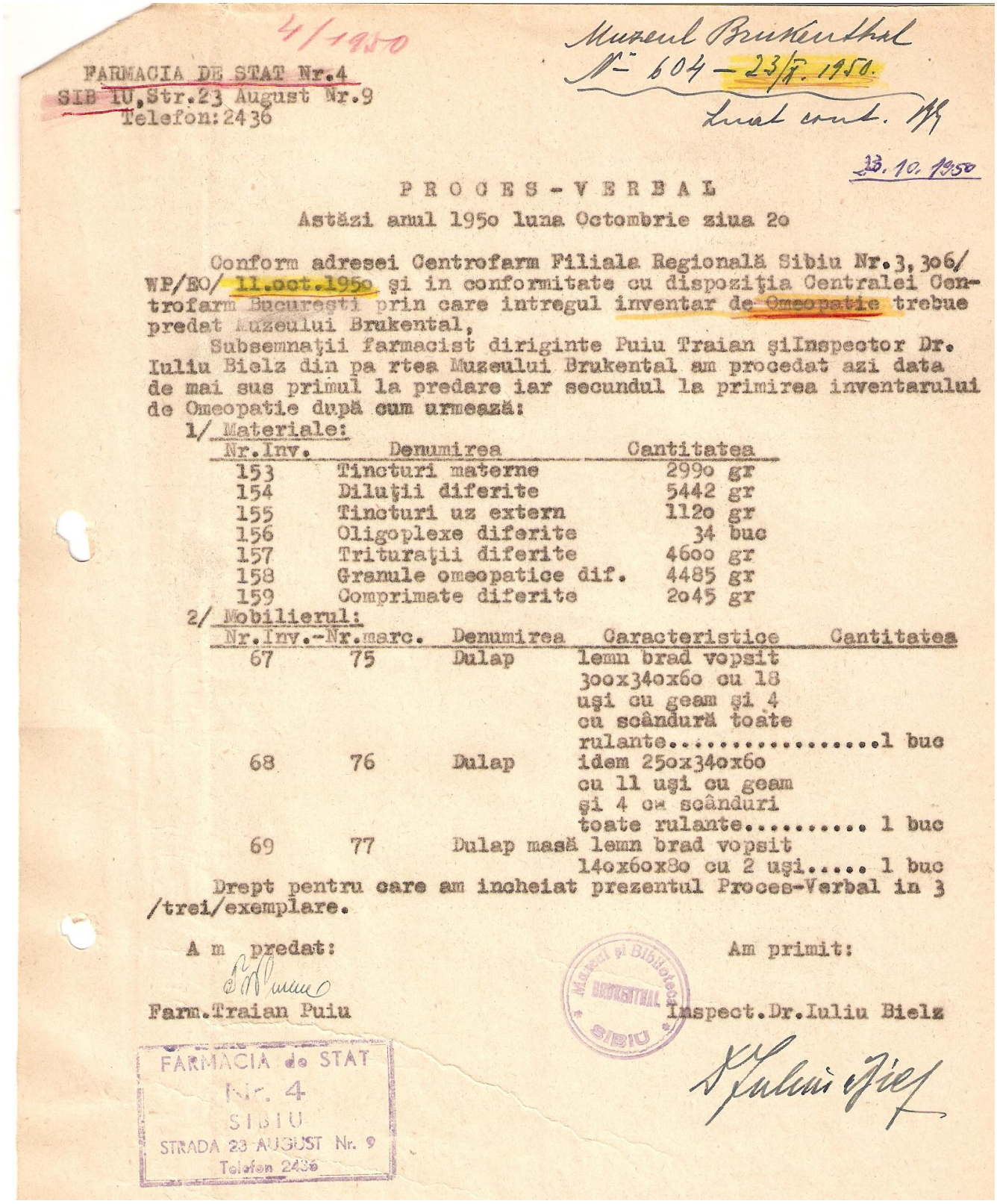

4/1950

FARMACIA DE STAT Nr.4
SIB IU, Str.23 August Nr.9
Telefon: 2436

Muzeul Brukenthal
Nr. 604 – 23/X. 1950.
Luat cont. 1/4

23. 10. 1950

P R O C E S - V E R B A L

Astăzi anul 1950 luna Octombrie ziua 20

Conform adresei Centrofarm Filiala Regională Sibiu Nr.3,306/ WP/EO/ 11.oct.1950 şi in conformitate cu dispoziţia Centralei Centrofarm Bucureşti prin care intregul inventar de Omeopatie trebue predat Muzeului Brukental,

Subsemnaţii farmacist diriginte Puiu Traian şiInspector Dr. Iuliu Bielz din pa rtea Muzeului Brukental am procedat azi data de mai sus primul la predare iar secundul la primirea inventarului de Omeopatie după cum urmează:

1/ Materiale:

Nr.Inv.	Denumirea	Cantitatea
153	Tincturi materne	2990 gr
154	Diluţii diferite	5442 gr
155	Tincturi uz extern	1120 gr
156	Oligoplexe diferite	34 buc
157	Trituraţii diferite	4600 gr
158	Granule omeopatice dif.	4485 gr
159	Comprimate diferite	2045 gr

2/ Mobilierul:

Nr.Inv.	Nr.marc.	Denumirea	Caracteristice	Cantitatea
67	75	Dulap	lemn brad vopsit 300x340x60 cu 18 uşi cu geam şi 4 cu scândură toate rulante.....	1 buc
68	76	Dulap	idem 250x340x60 cu 11 uşi cu geam şi 4 cu scânduri toate rulante.....	1 buc
69	77	Dulap masă	lemn brad vopsit 140x60x80 cu 2 uşi.....	1 buc

Drept pentru care am incheiat prezentul Proces-Verbal in 3 /trei/exemplare.

A m predat:
Farm.Traian Puiu

Am primit:
Inspect.Dr.Iuliu Bielz

Muzeul şi Biblioteca BRUKENTHAL SIBIU

FARMACIA de STAT
Nr. 4
SIBIU
STRADA 23 AUGUST Nr. 9
Telefon 2436

Fig. 3. The official report number 604 from 23 October 1950 through which the homeopathic inventory from *The Angel Pharmacy* (Sibiu) became part of the Brukenthal Museum Collection (Source the archive of the Pharmacy Museum in Sibiu, department of the Brukenthal National Museum).

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THE NATIONAL BRUKENTHAL MUSEUM BICENTENNIAL. THE MINERAL COLLECTION OF BARON SAMUEL VON BRUKENTHAL

Rodica CIOBANU*
Nicolae TRIF*, **
Raluca STOICA*

Abstract. *Samuel von Brukenthal's mineral collection drew the attention of his contemporaries ever since the moment of its creation and more so when it became accessible to the Baron's close friends. This paper presents aspects related to factors of building the collection and its historical and scientific importance.* The ownership of the collection changed over the years. *According to Brukenthal's will, after the death of the last male offspring of the family – Hermann von Brukenthal – in 1872, the collections automatically entered in the possession of the Evangelical Church. Initially united with the other collections, the mineral collection was handed over by the then management of the Brukenthal Museum – while retaining ownership rights – to the "Transylvanian Society for Natural Sciences", for its museum, therefore moved to the Museum of Natural History. In 1948, in accordance with Decree 176 of August 3, 1948 regarding the state taking over the estate of the church, congregations, communities or individuals, the patrimony of the Brukenthal Museum passed under the administration of the Ministry of Arts and Information. Thus, the Baron's minerals collection arrived in 1957 again to the mother institution, but only in its records, as its physical location was in the Museum's storage. Presently, the collection is in the process of being resituated (Decision no. 614 of November 21, 2005), together with the Brukenthal Museum's entire patrimony, to the Evangelical Church, the rightful owner of the patrimony of the Brukenthal foundation, enriched over time by three barons. The mineralogical collection of Baron Brukenthal is at the Museum of Natural History in Sibiu and presently has 3.622 samples.*
Keywords*: Romania, Sibiu, museum, mineral collection, Brukenthal*

Rezumat. *Colecţia de minerale a lui Samuel von Brukenthal a atras atenţia contemporanilor încă din momentul constituirii dar mai ales când a devenit vizitabilă pentru apropiaţii baronului. În această lucrare prezentăm aspecte legate de conjunctura constituirii colecţiei şi importanţa ei istorică şi ştiinţifică. Apartenenţa colecţiei a cunoscut modificări de-a lungul timpului. Conform testamentului baronului Samuel von Brukenthal, după decesul ultimului vlăstar masculin al familiei - Hermann von Brukenthal - în 1872, colecţiile au intrat automat în posesia Bisericii Evanghelice. Originar unită cu celelalte colecţii, colecţia de minerale a fost predată în anul 1923, de către conducerea de atunci a Muzeului Brukenthal – cu menţinerea dreptului de proprietate – „Societăţii Ardelene de Ştiinţele Naturii", pentru muzeul acesteia, fiind mutată la Muzeul de Istorie Naturală. În 1948, în conformitate cu Decretul 176 din 3 august 1948 privind trecerea în proprietatea statului a bunurilor bisericilor, congregaţiilor, comunităţilor sau particularilor, patrimoniul Muzeului Brukenthal a trecut în administraţia Ministerului Artelor şi Informaţiilor. În acest fel şi colecţia de minerale a baronului a ajuns, în 1957 din nou la instituţia „mamă", scriptic, dar faptic a rămas în depozitele Muzeului. În prezent colecţia se află în proces de retrocedare (Decizia nr. 614 din 21 noiembrie 2005), alături de întreg patrimoniul Muzeului Brukenthal către Biserica Evanghelică, proprietara de drept a patrimoniului fundaţiei Brukenthal, îmbogăţită de-a lungul timpului de trei baroni. Colecţia mineralogică a baronului Brukenthal, aflată la Muzeul de Istorie Naturală din Sibiu, numără, in prezent, 3.622 eşantioane.*
Cuvinte cheie*: România, Sibiu, muzeu, colecţie de minerale, Brukenthal.*

Introduction

Samuel von Brukenthal's mineral collection drew the attention of his contemporaries ever since the moment of its creation and more so when it became accessible to the Baron's close friends.

This paper presents aspects related to factors of building the collection and its historical and scientific importance.

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The premises for building the collection

We can only guess what drew Brukenthal to mineralogy. It seems that, other than the obvious passion of collecting, as well as the universal inclination toward natural sciences, specific to the spirit of the 18th century, there were two main aspects that laid the basis for starting this collection: on the one hand, his profound understanding of everything beautiful and grand, a mentality which naturally could not disregard the mineral kingdom, with its splendour of colours and forms, nor the grandeur of the formation process of minerals; on the other hand, his professional situation, which offered Brukenthal the possibility of having a more profound vision and direct access to information from this field. Thus, the collector's two incentives, namely the systematic-scientific and the economic one, determined the main characteristics of the collection.

After having studied in Halle, Jena and Vienna, Brukenthal returned to Sibiu and held various positions in the administration of Transylvania. As an imperial official, he also dealt with issues related to state finances, and took into account the priceless source of income which Transylvania's mineral resources represented for the Viennese Court and the private entrepreneurs alike. As President of the Chancery Court, he mentions in a report on the economic situation of the Grand Principality of Transylvania the increase in the price of salt and the noble metals which could be extracted from the mines of Transylvania, which could thus constitute new sources of income (Göllner, 1977, p.15). In 1764, in order to further stimulate the mining activity, Brukenthal brings forward the idea of creating a University in Transylvania. Although he does not consider a natural sciences department, he does suggest establishing a department of "economy and state revenues", which would address also the mines – rich sources of revenue for the imperial treasury (Göllner, 1977, p.15).

After his return from Vienna, Brukenthal had shares in the mines from Săcărâmb, Zlatna, Topliţa, Boiţa and Bucium. Today, the areas where most of the minerals were collected from are located in the golden quadrilateral of Transylvania. The documents in his archive reveal that the acquisition of the shares was not so much about profit, but rather about encouraging the leverage of Transylvanian wealth. Thus, in 1775, Brukenthal had eight shares at the gallery of Barbara Zlatna and in 1781 - eight shares at the St. Clement gallery of Săcărâmb. In 1782, he bought eight shares at Topliţa Bucium, Boiţa (Schuller, 1969, p.285; State Archives, CD_{1-51}, p.156). As governor and shareholder in mining, Brukenthal had access to valuable mineral samples (Ittu, 2008).

There was also another side to this interest – setting up the collection, mentioned by his biographer, Georg Adolf Schuller. Between 1770 and 1780, in Sweden, Linné revolutionized the systematic organization of the vegetal world and encouraged the scientific research in natural sciences. Linné's research influenced his countrymen Kronstedt, Bergmann and Wallerius, who applied the new ideas in the research of minerals. Their works arrived in Vienna and from here all the way to Transylvania. On the other hand, the growing interest in mineral resources has led to the emergence of a new trend: setting up mineral collections. At the Viennese Court, Emperor Francis I was a zealous collector. He was the founder of the "cabinets of curiosities", within which various collections were built. At the Court there was also a "cabinet of natural sciences", and such cabinets were present in the noble houses throughout Austro-Hungary and the entire Western Europe. It seems that these Viennese collections set a strong example and thus influenced Brukenthal's activity as collector. (Schuller, 1969, p. 283, 284). At the Halle University, the true school of the future enlightened scholars, Brukenthal came to understand the importance of personal example, of political pragmatism, of philosophical openness and of the custom of setting up an artistic and literary environment for oneself.

Brukenthal also started to collect and to boost the research of nature because Transylvania, which despite its visible natural wealth, was not systematically, scientifically or competently studied. According to notes of his wife, Sofia, when they were younger, the Baron and his wife had more alchemistic preoccupations rather than scientific. But all these did not change his naturalistic ideas acquired during his years at Halle, as well as through his membership to the Masonic lodges which mostly included the progressive intellectuals of the time. It is worth mentioning the fact that at Halle he had as colleague M. J. Agnethler (1719-1752) who edited the works of Linné, who revolutionized the naturalistic systematization.

In a paper on fossils from Transylvania, Fichtel (1780), gubernatorial counselor of Transylvania, expressed his view on the situation of natural sciences in Transylvania:

"…Only Transylvania – where nature proved to be after all more generous than in other countries – with all its rarities, lies hidden in the dark. The distant location of this country and the lack of communication channels make foreign guests visit us only rarely, and this is one of the reasons for our obscurity; to this I have to add a second reason: the lack of local amateurs for natural sciences. Transylvania is certainly not lacking great statesmen, politicians, savants, legal experts, theologians and other scholars; only the natural sciences – with all its local wealth of subjects worthy of attention and conspicuous subjects – have not yet received the proper attention, - so that we cannot find any notes of any kind, and the few that exist, we owe in great part to the activities of foreign naturalists." (Binder, 1956)

His struggle to improve the exploitation of the land riches for the benefit of the state budget and the encouragement the Viennese collections would provide, gave a scientific direction to his preoccupation for minerals. This aspect was supported as well by the complexity of the mineralogical books collection from the Baron's library. Samuel von Brukenthal appreciated not only the arts and literature, but he also had an extensive knowledge and concern for the natural sciences, especially for minerals.

Brukenthal added to his minerals collection a book collection. He worked on this project for approximately a decade and a half, with so much success, that the Danish mineralogical and geognost savant Jens Esmark, said about Brukenthal's collection, in his work *Short description of the mineralogical journey through Hungary, Transylvania and Banat*, undertaken in 1794, that he found in it "the most complete series of gold samples from Transylvania which he had ever seen…".

The honorary member title he was granted in 1798 by the "Mineralogical Society of Jena" (Jenaische mineralogische Sozietät) comes as recognition of his endeavours for mineralogical sciences and of his role as its protector. In the letter which accompanied the diploma, the Association Director, refers to him as a "connoisseur and protector of the mineralogical sciences". (Göllner, 1977, p.15)

Building the collection

The ownership of the collection changed over the years. According to Brukenthal's will, after the death of the last male offspring of the family – Hermann von Brukenthal – in 1872, the collections automatically entered in the possession of the Evangelical Church. (Ittu, 2007) Initially united with the other collections, the mineral collection was handed over by the then management of the Brukenthal Museum – while retaining ownership rights – to the "Transylvanian Society for Natural Sciences", for its museum, therefore moved to the Museum of Natural History.

In 1948, in accordance with Decree 176 of August 3, 1948 regarding the state taking over the estate of the church, congregations, communities or individuals, the patrimony of the Brukenthal Museum passed under the administration of the Ministry of Arts and Information (Ittu, 2008). Thus, the Baron's minerals collection arrived in 1957 again to the mother institution, but only in its records, as its physical location was in the Museum's storage. Presently, the collection is in the process of being resituated (Decision no. 614 of November 21, 2005), together with the Brukenthal Museum's entire patrimony, to the Evangelical Church, the rightful owner of the patrimony of the Brukenthal foundation, enriched over time by three barons. The mineralogical collection of Baron Brukenthal is at the Museum of Natural History in Sibiu and presently has 3.622 samples.

It is difficult to estimate exactly when Brukenthal started his collection. We can deduce from Fichtel's notes from a paper from 1780, on geological research in Transylvania (p. 9), that in 1778 Brukenthal did not yet have a collection of his own. Schuller (1969, p. 12) quotes Fichtel, who mentioned about Brukenthal's praiseworthy intention of creating a mineral collection: "this learned leader of the country is now considering a natural collection related to the library. What an excellent prospect for the future and for the great geniuses, who miss only the opportunity and the inspiring examples." (Schuller 1969, p.12) Therefore we can assume that Brukenthal started building his collection in 1780.

We can conclude that the collection, which he continued to improve until the last years of his life, was completed after the mid 1790's, and a new stage in the evolution of the Brukenthal mineral collection was about to begin: the classification. In conclusion, the greatest part of the collection was created between 1778 and 1787. In 1777, there already existed a mineralogy cabinet, and in 1789 he set up a reading room which also included courses on natural sciences. A few acquisitions were done shortly before his

death, namely between 1799 and 1800, when he bought golden samples. Nevertheless, we can estimate that around 1795 his mineral collection was already completed.

The mineral collection of Baron Samuel von Brukenthal had 2018 specimens, most of them of Transylvanian origin, during the period when Carl Eder was custodian. The collection was enriched over the years, but the most important acquisition was the collection of over 1.500 specimens, from the inheritance of the treasury counsellor Johann Michael von Rosenfeld (1775-1837). Even though the contents of the latter collection cannot compare, as far as the number and size of the specimens go, with the old collection, its acquisition still remarkably increased the value of the Brukenthal collection. The Rosenfeld collection (State Archives Sibiu, Brukenthal fond, CD_{1-51}, nr.131). The catalogue of the Rosenfeld collection was signed by Neugeboren on June 15, 1838, included beautiful specimens which connoisseurs paid special attention to when visiting the Brukenthal collection. It was considered great luck for the research of minerals that this collection was joined with that of the Baron, as the combination of the two contained mineralogical representations of all deposits from Transylvania (Neugeboren, 1866, p. 382).

An analysis of the collections of minerals and fossils present in Transylvania in the 18th century, made by Neugeboren (1866) highlighted the wealth of the geological collections from the province and from Sibiu, especially after the Baron's death, which also proves his influence. Even before 1778 there existed a collection belonging to a doctor from Sibiu, which included art objects, minerals, and "petrified beings". Among the valuable Transylvanian collections, which did not rise to the level of Brukenthal's collection, but show the spirit of that time, are: the Fridwalsky collection, Baußner, Fichtel (it is possible that a big part of the specimens became part of the Brukenthal collection), Carl Eder, Lerchenfeld, Henné, Flitsch, Sigerus (donated to the Transilvanian Society for natural Science Sibiu / Siebenbürgischer Verein für Naturwissenschaften zu Hermannstadt), Johann Binder (part of it integrated in the Ackner collection and in the Evangelical Gymnasium in Sibiu), Mätz (donated to the colleagues in Sighişoara and in Mediaş), Litschko, Ziegler, Ignatz Reinholdt etc. In total, over 30 collections (Neugeboren, 1866, p.374-400).

The custodians of the collection

In order to make best use and preserve these cultural treasures, he had beside him connoisseurs in the field, themselves being well-known collectors of the time, as: Johann Fichtel, Johann Michael von Rosenfeld, Carl Eder etc. Brukenthal being overloaded with his multiple professional occupations, had the luck to have had the right people for the proper care of his multiple cultural treasures.

Among them is also Josef Karl Eder (1760-1810), director of the Normal School in Sibiu. At the same time, he manifested a great predilection for mineralogy, which he concerned himself about with so much eagerness and success, that he was named by the famous „Grand Ducal Mineralogical Society" in Jena as „agent for Transylvania". J. Carl Eder was also an assiduous and appreciated collector. The renowned Danish geologist of that time, Jens Esmark, who visited Transylvania in 1794, recounted in the description of his travels here that his stop in Sibiu gave him the opportunity to visit Eder's Mineral Cabinet.

Eder was the one, who – besides taking care of his own mineral collection, mentioned and praised by Fichtel and Esmark (notable mineralogists of the time) – was the first one to systematically arrange Brukenthal's mineral collection and create a catalogue, making him the first custodian of this collection. He compiled the first catalogueue of the mineral collection (Verzeichnis Siebenbürgischer Mineralien, die sich in dem Cabinette des Freiherrn von Brukenthal befinden, 353 p.) which nowadays resides in the Brukenthal Library. Carl Eder highlights in the catalogue that „so much pure gold" had not been found in any European country as had been in Transylvania until then, and the collection of Baron Samuel von Brukenthal reflects that. The catalogue is especially hisorically valuable and is interesting for its notes on the position, moment of collection of samples, their research state and exploitation attempts. (Trausch, 1868, p.270; Schuller, 1969, p.286) The catalogue manuscript is not signed or dated, but information on p. 145 „...in October of this year, 1796..." indicates the year when the catalogue was started. Regarding the author, the examination of the writing led biographers of Brukenthal, such as Trausch, to indicate Carl Eder as author. The catalogue was not finished in that year. Eder divided the entire collection in 4 classes:

1. soil and stones;
2. salts;
3. flammable substances;

4.metals, and each class in order – classification which resembles the systematic of the living world.

About a quarter of a century after Eder's death, Brukenthal's collection came under the care of another custodian, who was as zealous as he was cultivated, namely the evangelical priest Johann Ludwig Neugeboren (1806-1887), later nestor of the Transylvanian palenthology, who – besides his activity as lector at the Evangelical Gymnasium, afterwards as preacher at the hospital, and at the evangelical department in Sibiu – at the same time, in the period 1836-1862, served as librarian and custodian of the Brukenthal Museum.

Neugeboren's work on the Transylvanian mineral and fossil collections, published in 1866, proves that the author knew most of the Transylvanian minerals collectors and their collections from the 18th and 19th century. This knowledge offered him the possibility of comparing Brukenthal's collection with those contemporary to his and following it. Neugeboren considers that only one collection rises to its level regarding the gold, copper, silver and nagyagit, namely that of Karl Knöpfer. (Neugeboren, 1866, p.391). As custodian, Neugeboren arranged the Baron's collection and compiled the second catalogue of the collection. The manuscript-catalogue, in three volumes, presently resides at the Brukenthal Library and has the title *Brukenthalisches Hausarchiv, Verzeichnis der Mineraliensammlung.* The catalogue was in progress, with blank spaces to be filled in late. The paper used for the catalogue are reused herbarium sheets where the filigree manufacturing technique and the traces left by dry plants can be seen. Neugeboren did his apprenticeship by studying this collection.

The catalogue was written based on the important work of 1843 *Mineralogy Manual* of Carl Hartmann, which in turn is based of the system of the renowned mineralogist and crystallographer Christian Samuel Weiß (1780-1856). Taking into account the various increases and decreases that have taken place since then, the Brukenthal Collection retains its particular historical-cultural character and nowadays is still arranged according to the old system of those times. The collection currently includes:

I. Oxide minerals – 718 specimens
II. Saline minerals – 775 specimens
III. Saline ores – 167 specimens
IV. Oxidized ores – 304 specimens
V. Native metals – 526 specimens
VI. Sulphide metals – 1.129 specimens
VII. Flammables – 3 specimens

After the Transylvanian Society for Natural Sciences in Sibiu took over the collection, Rudolf Binder became custodian of the collection. Binder himself, who was a member of the Society, was a renowned mineral collector, and he took care of the Brukenthal collection until it was nationalized. In 1948, according to law no. 638/1946, the gold samples of the Transylvanian Society for Natural Sciences were evaluated by an expert from the National Bank of Romania. A year later the goods of cultural societies were nationalized, and these in turn abolished. The person who participated in the evaluation from the Society's side was Rudolf Binder, the custodian of the mineralogical collections.

The description of the collection

When creating his mineral collection, the aesthetic point of view (as well as value or rarity) undoubtedly prevailed for Brukenthal; a quick look at the content of this collection proves this. Although a certain systematic balance was pursued regarding the content of the collection, it can be clearly seen, that in Brukenthal's collection there is somewhat of a numerical disproportion between groups, namely the mineral species which seem insignificant, species that do not offer anything special to the layman's eyes, and the groups which are more appealing to the eyes through their beautiful colours or forms, fact which makes plausible the assumption that there was an intentional favouring towards the „beautiful" minerals – favouring which is besides easy to understand and often absolutely justified. This is, however, a fact found in most collections of minerals that do not serve scientific purposes or do not pursue special purposes, which does not diminish the great value of the present collection. It should also be taken into account that at Brukenthal's time, the number of exactly known and described minerals was much lower than today (at the beginning of the last century about 260 species were known and quoted, compared to 5.300 known today) – this especially because for some of the mineral groups, due to the lack of research means and methods of the time, the difficulties encountered in an exact determination were great, if not insurmountable.

For this reason, the general attention was directed – except in the case of precious stones, which are, indeed, usually easily recognized, but rare – towards „stones, soils and salts", necessary for economic needs (for example: construction

stones, raw materials for glass and ceramics manufacture, kitchen salt, coal etc.), and especially towards minerals, respectively metals extracted from them, which are precisely – along with the accompanying minerals in the gangue, often wonderfully crystallized and richly coloured – the greatest value of the mines in Transylvania. In fact, the groups mentioned – minerals and gangue minerals – clearly prevail in Brukenthal's collection.

Around 1774, Fichtel remarked, while referring to the mineralogical collections in Transylvania, that most collectors of the time, although initially animated by the desire to collect autochthonous minerals, would give in to the scientific impulse, enriching their collections with specimens from abroad. This makes the collection of Baron Samuel von Brukenthal all the more different, since only 50 specimens are from outside of Transylvania (from Austria, Hungary, Bohemia, Sweden).

While studying the collection, one must keep in mind the realities of those times, namely that: the number of mineral species was ten times smaller than today, the research methods were barely taking shape, and the mineral collections were not primarily scientific.

After a simple reading of the inventory and after a brief research of the collection, it is clear that the aesthetic criteria were what mainly guided the collector, thus the first two groups represent almost half of the collection specimens. Although the aesthetic had priority, the economic is what enlivened it.

1. The „oxide minerals" class is represented numerically and aesthetically by the quartz group (428 quartz samples). The specimens are remarkable due to the size of the crystals (between 3 and 10 cm), the variety of colours – ranging from the one from Săcărâmb, Cavnic, Baia de Arieş, perfectly transparent, to the pale violet amethyst from Roşia Montană, to the dark violet Porcura amethyst (Barbara mine). Also included in this class, beside the quartz varities, chalcedony, opal and silicates, feldspars, as well as rocks such as: pechstein, pone and clay. (Figs.1, 2)

2. The „saline minerals" class is represented by: carbonates (calcite, aragonite, dolomite), sulphates (gypsum, barite), phosphates (apatite), fluorides (fluorite), chlorides (halites), as well as: limestone, oolite, pisolite, and marl. (Figs.3, 4, 5, 6, 7)

The carbonates are numerically well represented, 296 samples, but not so much in regard to the variety of species. The calcium in the „saline minerals" group dominates through the variety of crystallographic forms (obtuse rhomboids, scalenoedri, etc.) as well as through the diversity of colours (milky white, cream, pink, etc.). Most of the samples are from Faţa Băii, Boiţa, Săcărâmb, Cavnic, Rodna and others.

The sulphates, also included in the „saline minerals" group, are represented mainly by baryte (140 specimens) and gypsum (78 specimens). The samples from Roşia Montană, Boiţa, Baia de Arieş, Cavnic, Rodna stand out through the size of the twinned tubular-prismatic crystals, the variety of colours – from transparent to white-bluish.

3. The „saline metals" class includes: carbonates (siderite, auzirite, malachite, ceruzite), sulphates (alunite), phosphates (pyromorphite), arsenides (erythrin), molybdate (wulfenite) and oxides (hematite). The azurite and the malachite, more modest in number, 96 specimens, are impressive through the colour and size of elongated prismatic crystals (sample from Băiţa, Ghelar, Moldova Nouă). (Figs. 8, 9, 10)

4. The „oxide ores" class includes oxides magnetite, hematite, limonite, ilmenite, cassiterite, pyrolluzite, rutile, wad, cuprite, tenorite. (Figs.11, 12)

The class of carbonates, much poorer in species than that of the silicates, but which accompanies ores as gangue (commercially valueless mineral), is much better represented in the collection than, for example, silicates (267), because they present beautiful colours. Only the calcite genus, characterized by an extraordinary abundance of forms, is represented in the collection by 296 specimens, and the azure, with its beautiful blue colour and the green malachite by 96 specimens, and the rhodocrosite with its pink shades by 109 specimens.

The rhodocrosite samples from Săcărâmb, Baia de Arieş, Cavnic etc. stand out through the diversity of the twins and the colouring of the crystals.

5. The „native metals" class contains metals such as gold, which contributed to the fame of the collection. This class, according to the classification made by the second custodian, as we have already mentioned, also includes: silver, tellurium, bismuth, copper and arsenic. (Figs. 13, 14)

The attention of the renowned geologists of the time was directed to the gold samples, as well as

on the newly discovered mineral tellurium and its compounds.

The Danish researcher Jens Esmark, while travelling through Transylvania and visiting Sibiu in 1794, remarked among the minerals collection that of Baron Samuel von Brukenthal, especially the „pure gold suite", considering it the most complete suite of gold samples he had ever seen. Among these, two very interesting samples stood out: one „with golden cubic crystals" and another one with „crystals in two double pyramids with eight sides". Carl Eder's catalogue, Jens Esmark's travel notes and those of other foreign travellers made the gold, silver samples, and gold and silver tellurides known throughout Europe. The collection includes 438 gold specimens and 271 silver-gold tellurides (petzite, sylvanite, krennerite and nagyagit). (Fig. 15, 16, 17) The samples were collected from gold deposits at Săcărâmb, Baia de Arieș, Zlatna and mostly from the mines where the Baron had shares (Barbara and St. Clemes mines). (Esmark, 1798; Schuller, 1969, p.287)

Until Klaproth isolated and named (1789) the old „metallum problematicum" – the current tellurium –, the minerals containing this element were known at that time only in Transylvania under the name "Weißgoldherz" (white gold ore). On the one hand, the name expressed the content of gold in the minerals, but on the other hand, the fact that they did not have the colour of gold (golden yellow), but were usually white or grey. Klaproth distinguished among the minerals in Transylvania (Binder, 1958), which were available to him for research, four different minerals, namely:

1. „Gediegen Tellur" (native tellurium), of which he had samples from the "Maria Hülf" (=Holy Virgin, protect us) mine, from the Fața Băii Mountains, near Zlatna.
2. „Schrifterz" (=script ore) [sylvanite] – so named because it has long-prismatic penetration twins resembling script – from the „Franciscus" mine, near Baia de Arieș.
3. "Blättererz" (=leaf-mineral, because its form often resembles a leaf) [nagyagite], from Săcărâmb.
4. „Gelberz" (=yellow ore – besides the silver color, it often has a light-yellow hue like brass) [krennerite] – also from Săcărâmb.

When studying this collection of tellurium ores from Transylvania [the Samuel von Brukenthal Collection], we cannot lose sight – besides the large number of its specimens and, in part, considerable dimensions – of its respectable age, due to which it can be considered as the oldest collection of this kind from South-Eastern Europe. It was already in existence at the time when the first discoveries of these rare minerals were made, in the time of Brukenthal and his contemporary scholars, such as Müller von Reichenstein and Heinrich Klaproth, Johann Ehrenreich von Fichtel, Josef Karl Eder, Andreas Xaver Stütz and other scholars whom we owe the knowledge of these remarkable products of nature, products that are particularly characteristic of Transylvania. Some of the samples in the collection are from 1784, others from the old mines, which in the meantime have become inaccessible; and if the ores found there were marked as very rare 100, or even 150 years ago, they have become in the meantime even rarer, or have even completely disappeared. Knowing these facts does not only prove the great value of this unique collection, but, at the same time, imposes on its custodians – at present or future – the duty of honour to preserve and care for it with faith, conscientiousness, understanding and piety.

Franz Josef Müller von Reichenstein (1740-1825) is unanimously recognized as the discoverer of tellurium – named such by Martin Heinrich Klaproth (1743-1817) [German chemist who discovered zirconium, uranium, cerium] - who in 1798 isolated the new metal, which he named after the latin name of Earth – tellus „Tellur". He reached a successful mining career, first as agronomical engineer in southern Hungary, then as senior supervisor of mines and director of mines in Banat and Tyrol – in 1778, in Transylvania, as treasury counsellor, activating very fruitfully as general inspector and leader of the entire administration of mines, factories and salines in Transylvania until 1802, when he was called to Vienna. Here in Transylvania, in 1782, he saw in that „metallum problematicum" – which was previously thought by some mineralogists and miners to be antimony, and by others (including Müller von Reichenstein) bismuth – a new metall, unknown until then, however, in any case, different from antimony and bismuth. Numerous determinations have been made under different names. The last decisive examination made by the great chemist-mineralogist Jöns Jakob von Berzelius (1779-1848) brought definitive evidence (1832) of the accuracy of Klaproth's analysis, whose „Tellur" remained since then uncontested. „In no other country are there so many ores, whose external appearance looks so strange and whose composition has been so uncertain until now, as in Transylvania... I am referring here only to those ores, which obtained

the name „problematic", since no proper determination could be made; and, because many of them provided gold, they were named minera problematicum, aurum paradoxum. With this name, nobody thought of course about declaring the gold hidden in these ores as problematic or paradoxical, but through this name it was understood that the gold is bound to an unknown substance. The first Transylvanian ore which was named „problematic" was that from the "Maria Hülf" mine, ore whose description and first more detailed analysis is found in „The physical papers of interested friends from Vienna"/ Physikalische Arbeiten der einträchtigen Freunde, Wien", in H. R. Müller von Reichenstein's treaty... The colour of this ore is between pewter-white of the native antimonite and the reddish yellow of the native bismuth..." (Xavier, 1803, Binder, 1958)

6. The „sulphide metals" class includes minerals such as: pyrite, arsenopyrite, cobaltin, smaltite, calcopyrite, bornite, sylvanite, krennerite, nagyagit, tellurium, molybdenite, stephanite, sphalerite, alabandite, tetrahedrite, cinnabar, realgar, orpiment. (Figs. 18, 19, 20, 21, 22, 23)

Among the sulphides aesthetically predominant are the antimony samples (92 specimens) from din Cavnic, Săcărâmb, Baia de Arieș, Topliţa, with long crystals of 8-10 cm.

7. The „flammable" class includes sulfur, lignite and ozocerite. (Figs. 24, 25, 26)

In terms of geographical range, most of the samples are from the territory of Romania, coming from the „Golden Quadrilateral" of the Apuseni Mountains (Săcărâmb, Baia de Arieș, Măgura-Topliţa, Băiţa Crăciuneşti, Fața Băii, Techereu, Roşia Montană etc.), the Trascăului Mountains, the Poiana Ruscă Massif, the metallogenetic area of Baia Mare, the Moldova Nouă-Oravița-Dognecea (Banat) area, the Rodna deposit etc. The samples acquired from abroad are less numerous and belong to occurrences in Hungary, the Czech Republic, Slovakia, Serbia, Austria, Switzerland, Italy, Norway and Rusia.

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The collections of Baron Samuel von Brukenthal were accessible to all visitors and were visited by foreigners passing through Sibiu of the end of the 18th century (Armbruster, 1978, p. 36). We cannot omit that the passion for collecting falls into a trend of the times, but which Brukenthal did not turn into a purpose in itself. (Armbruster, 1978, p. 36)

The chemist Dr. Ferdinand Schur (1799-1878), coming from Königsberg, settled for a long time in Transylvania, where he earned remarkable merits especially regarding Transylvania's botany, and one of the leading founders of the Transylvanian Society of Natural Sciences in Sibiu, writes in a series of articles titled „Indications on the current state of natural sciences in Sibiu", while speaking about the Brukenthal Museum and its founder, the following:

„...Although, as shown, we have several collections of minerals in Sibiu, yet none of them can be compared to the one found in the Brukenthal Museum, both in terms of its riches, as of its beauty and integrity of the specimens, and not only Sibiu, but the whole of Transylvania can be proud of it..." (Verhandlungen, 1849)

Today, the Baron's minerals collection, extended after the founder's death, is of great scientific and historical importance. It is palpable evidence of the preoccupations and knowledge of nature, of the generosity of this precursor of the systematic learning and understanding of the environment as prerequisite for its protection. If Sibiu „becomes at the end of the 18th century the scientific centre of the Transylvanian naturalist movement" (E. Pop.), gaining an international reputation as a cultural-scientific centre, this was primarily due to this patron of sciences and arts which was Samuel von Brukenthal.

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THE BRUKENTHAL PALACE ORIENTAL TAPESTRY APPROACHED FROM A NATURAL HISTORY POINT OF VIEW

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Abstract: *The Brukenthal Palace is the first public museum in Transylvania, Romania, opened during the late 18th century with the aim of being accessible to the public and to educate it. It is a museum that until today preserves and exhibits numerous works of art along with history and natural history collections. After the palace was built, much attention was given to the decoration and to the interior design. In the guest rooms located at the first floor, the Palace still preserves some of the original tapestry. This article analizes the birds depicted on the wallpaper with oriental influences from two of these guest rooms.*
Keywords: *tapestry with oriental influences, the Brukenthal Palace, species diversity, birds, distribution.*

Rezumat: *Palatul Brukenthal este primul muzeu deschis publicului în Transilvania, România, la sfârşitul secolului al XVIII-lea, cu scopul de a fi accesibil publicului și de a-l educa. Muzeul păstrează până în zilele noastre și expune numeroase opere de artă, alături de colecții de istorie și istorie naturală. După construcția palatului, o atenție deosebită a fost acordată pentru decorarea și aranjarea interiorului său. Palatul mai păstrează și azi o parte din tapetul original în camerele de primire a oaspeților situate la primul etaj. Această lucrare analizează reprezentările păsărilor de pe tapetul de hârtie cu influențe orientale din două dintre aceste camere pentru oaspeți.*
Cuvinte cheie: *tapet oriental, Palatul Brukenthal, diversitatea speciilor, păsări, distribuție*.

Introduction

Samuel von Brukenthal (1721-1803) is a leading figure of the eighteenth century in Transylvania. Since his youth he was educated in the cultural context of the French and German Enlightenment, as an intellectual with modern conception and an openness to change (Hrib, 2008). In 1743 he undertook a study trip to Central Europe, which was ment to be the basis of his education as a young nobleman. In the begining he studied and formed himself in Viena, and later on in Halle and Jena (1744) (Fischer, 2007). During his later stay in Vienna, the metropolis of the Habsburg Empire, he occupied different social and political positions. Through them he completed his professional ascension, winning his carreer through his own merits. After Brukenthal investment as Principality Governor of Tranylvania (1777-1787), granted to him by Empress Maria Theresia on July 30, 1777, he brought the Enlightment movement to Sibiu (Fischer, 2007, Mesea 2006).

One year later, the construction of his new residence in Sibiu began. The architecture of his palace followed the model of the contemporary imperial palaces, and was build in late Baroque style. The palace was completed in 1788 (Fischer, 2007). Through this construction, Brukenthal succeded to establish a new type of building, namely the urban palace or the palace built inside the city (Hrib, 2007). His attention, like that of other pasionate amateur collectors in the Baroque period, was focused on books, paintings, objects of art, coins and minerals which he collected and stored in this newly constructed palace. In 1817 the Palace become a public museum open to the community, according to his last will. It stated that his collections will become property of the Evanghelical Curch with the condition to keep it open to the public.

Baron Samuel von Brukenthal was also preoccupied by the decoration of the interiors of his Baroqe palace. He became a good connoisseur of the contemporary tendencies by documenting himself about the palaces of the Imperial House and of Austrian aristocracy during his stay in Vienna, when he occupied various political or social positions (Mesea, 2006; Fleșeru, 2007). This was the reason for introducing the model of

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imperial palaces he learned about in Vienna to Transylvania.

Indeed, from an architectural point of view, the palace cleary follows the design of Austrian imperial palaces. On the first floor, also known as *le bel étage*, the palace has five reception rooms designed for receiving guests and for special events. In addition to the local craftsmen involved in the decoration of the palace, Baron Samuel von Brukenthal brought also craftsmen from Vienna, who made their contribution to the design in accordance with the tendencies of imperial palaces from Western Europe (Fleșeru, 2007). The rooms located on the first floor were decorated during the years 1779 - 1783 and were designed as guest or reception rooms (Dâmboiu, 2007).

In the five reception rooms situated in the front side of the palace, the design was completed with tapestry. Out of these rooms, the central room or the Music Room has tapestry of oriental origin (Fleșeru, 2007), two rooms have silk tapestry of burgundy colour and the two smaller guest rooms have wallpapers with oriental influences. The tapestry used in decorating the reception room revels the Barons concern with the contemporary tendencies. Integrating the Chinoiseries in interior arrangements or decor was flourishing at that time across Europe. As Fleșeru (2007) mentioned, all palaces built in the late eighteenth century have at least one room, if not a whole pavilion with walls covered by tapestry and decorative art objects crafted or inspired by the Far East. This trend implied that the nature was depicted in a stylized manner typical to Chinese landscapes, which was commonly used to give an exotic touch to the European interior (Fleșeru, 2007).

The most famous reception room, the central room or the Music Salon, has tapestry printed on a type of linen called hinds or chintz (Fleșeru, 2007). This is a type of fabric made of cotton, flax or hemp. The print, also known as calico print, has floral and zoomorphic motifs. This type of tapestry originally came from Indian and Chinese workshops in the 17th and 18th Century, and after 1775-1785 from European ateliers which finally managed to dominate the market after 1830 (Fleșeru, 2007). The central room is framed by two salons with burgundy silk tapestry, which in 1960 was replaced with an identical silk tapestry comissioned to the Manufacture of the Fine Arts Fund in Bucharest (Fleșeru, 2007). At the present moment, only one room on the right side of the central room still preserves in a corner the original burgundy silk tapestry.

Both of the two reception rooms with burgundy silk tapestry have smaller reception rooms or cabinets on the sides, the so-called cosy corners. These are decorated with wallpaper tapestry of oriental influence. Dâmboiu (2007) mentions that the one on the left was the personal cabinet of Samuel von Brukenthal and the other one, on the right side, was known as the Japanese Cabinet. The wallpaper tapestry with numerous animals repesentations, out of which the birds representations prevail, is the object of our study that purposes to establish the species represented as well as their meaning.

Aims

The present study focuses on four main research directions: 1. the identification of the bird species depicted on the wallpaper, 2. the identification of symbolic representations, 3. the artistic typology in which the wallpaper was made, in relation to the natural appearance of bird species, 4. the aesthetic integration of the wallpaper in the environment of the Brukenthal Palace.

The data obtained in this research will be used for a temporary exhibition as well as for an exhibition catalogue, both projects being part of the celebration of Brukenthal National Museum's bicentennial in 2017.

Identification Method

Some steps were followed in order to achieve our goals. First of all, we analyzed the wallpaper directly, in order to identify its major organization and the different types of bird forms. This approach gave us the possibility to systematically take pictures of the wallpaper episodes and of the birds images. We examined the pictures, selected the images of birds and edited them in order to identify the species. We used three main works as identification guides: the Illustrated Checklist of the Birds of the World Volume I (Hoyo, Collar 2014), Volume II (Hoyo, Collar 2016) and the OM Field Guide Birds of India, Sri Lanka, Pakistan, Nepal, Bhutan, Bangladesh and the Maldives (Kazmierczak 2000). With the help of these works we had the opportunity to examine all bird species in the world, ensuring thus the best fit between depictions and exact species.

The species identification consists in determining how the reality is reflected by the artists who made the wallpaper, in other words how precisely they rendered the features of the birds using their skills and technique. It might look like a technical analysis, but this process is interesting because it

shows the way by which in a certain historical stage and culture the nature is translated into images. Therefore, it reveals a stage of the human capability to perceive and to express the nature, according to various specific cultural features.

In order to detect the fidelity in the reproduction of natural features, we examined two particular species whose depictions can be clearly assigned, due to their particular appearance. There are as well several kinds of birds depicted on the wallpaper which can be analyzed by comparison. It is also interesting to see how the same species is depicted differently and thus, analyzing the significance of the noted variations, we deduced the tools we need for the identification of other species.

Another finding was to overlap specific patterns and the artistic hybridization and thus to obtain images which required, in order to be determined, a combined methodology, designed from all aspects discussed above. On this basis, we could decide if some characters are decisive in the identification process or if they are relevant only to discriminate general taxonomic groups, such as Genus, Family or Order. Even if sometimes the depictions cannot be attributed to a certain species, they give us the opportunity to investigate and discover the impressive avifauna of Asia, being a virtual journey in this amazing and distant world.
One of the species discussed in order to discover the degree of reproduction fidelity is the Himalayan Monal (*Lophophorus impejanus (Latham, 1790)*). One of the first non-correspondent features is the red face of the birds, which in reality is blue. This feature probably comes from an imprinted pattern, due to the commonality with other pheasant species, whose face is mostly red. The legs are depicted as mostly red, with white claws. Both the colour of the legs and that of the claws are discriminant features in the case of other species, therefore we cannot use them in identifications. In reality, the legs are ashy-yellow, with lighter shades of yellow on tarso-metatarsus and black claws, observed only in one depiction. Birds with painted wings, suggesting females or juvenile, are unreal. Therefore, we can sense in this case an overlap of a pattern motif (red face) over a hybrid image (feet shape like as borrowed from the Tetraoninae group) with imaginary elements (wings colour).
The Mandarin duck is the other species that presents unmistakable features variation in various depictions. Referring to the leg we noticed a variation in colour, in particular of the nails, as well as in the shape of these body parts. It is interesting how even the skin between fingers shows notable variations in the wallpaper depictions. Another feature is the colour of various parts of the body which do not correspond to the reality, in none of the cases.

Other species such as the Silver or the Golden Pheasant are accurately rendered. The Common Pheasant shows a faithful rendering of its general appearance, excepting a slight deviation with respect to some particular details. Therefore, it can be seen as a transitional form regarding fidelity in reproduction of reality.

From the previous examples, we may conclude that certain features, if discerning real species, cannot be taken into account in determining the birds depicted on the wallpaper. In this case an overall feature or the represented bird posture should be assessed, as well as certain defining patterns which are relevant for this attempt, by discriminating other species.

Results

We identified a total of 30 different bird forms. Most of these forms were determined, more or less precisely, but 7 ambiguous ones could be assigned only to an Order and do not reflect any relation with an actual species. Therefore, we opted not to make any taxonomic references about those forms. A number of 10 species are certainly belonging to precise species and 13 forms were assigned only to Genus or to Family, giving vague connections with an actual species.

The identified forms of birds belong to 7 Orders as follows: Galliformes, Anseriformes, Gruiformes, Columbiformes, Coraciiformes, Passeriformes and probably Cuculiformes. The most represented groups are the Phasianidae Family with 5 species and the Pycnonotidae Family with 3 species. The rest of the represented Family groups count only 1 or 2 species.

Green Peafowl – *Pavo muticus* Linnaeus, 1766 (Fig.1.)

From the beginning, we question whether the image on the wallpaper corresponds to the Peacock (*Pavo cristatus*) or to the Green Peafowl (*Pavo muticus*), a rare species and even endangered in some parts of its distribution area. A more careful analysis of the plumage shows some distinctive features that indicate the second species. Among these we can list: the green colour of the head and of the neck, which in the first species are blue. The black colour on the abdomen, which is also blue in the case of the first species,

the presence of the blue part on the wing and the white face, which are distinctive features of the second species. On the other hand, the model of the wing with the alternative white and black stripes, specific to the first species, is not present on the wallpaper depiction, which motivates the choice for *Pavo muticus*. The wallpaper depiction is interesting taking into account the choice to render a choice of more rare species, but in the same time whose area overlaps the territory of China (Hoyo, Collar 2014).

Common Pheasant - *Phasianus colchicus* Linnaeus, 1758 (Fig.2.)

Although the bird's depiction resembles that of the rooster, there are some typical features due to which we assign the image to the common pheasant. Among these we can mention the long slender tail feathers and the white thin collar, as well as the long legs which compensate the lack of some particular body colouration. The facial image may mislead the identification, especially due to the red crest depicted represented as in case of the rooster, but this feature cannot diminish the determinative value of the other characteristics of the common pheasant, which were mentioned above.

This species is of Asian origin, widespread in general across China (Hoyo, Collar 2014). In Europe, it was brought as a decorative species or for hunting interest. Within the European natural habitat, the pheasant is an invasive species, escaped from farms or intentionally introduced for hunting. It should be noted that it is not a native species and sometimes it has even a negative impact on autochthonous species.

Golden Pheasant - *Chrysolophus pictus* (Linnaeus, 1758) (Fig. 3.)

It is one of the most accurately rendered species regarding its natural looking plumage. There are some specific characteristics of this species such as the orange-red chest and belly, the yellow tuft on the head and the neck collar with black border feathers.

The species is widespread in southern China (Hoyo, Collar 2014). Because of its breathtaking beauty it was brought as an ornamental species in Europe, where it was also introduced in nature in England (Svensson 2009). In the Chinese culture, the Golden Pheasant is a symbol of beauty, good fortune and refinement.

Silver pheasant - *Lophura nycthemera* (Linnaeus, 1758) (Fig. 4.)

The Silver pheasant is another species whose image is accurately rendered. It is also one of the species which occupy a central position on the wallpaper. Its plumage is depicted in black and white colour, contrasting with its red face and a black tuft on its head.

The species is widespread in Southeast Asia, including China (Hoyo, Collar 2014). Probably it complements a range of species from the group of the pheasants (family Phasianidae): the Peacock, the Golden pheasant, the Silver pheasant and the Common pheasant in order to suggest a hierarchy of virtues of beauty, as succeeding in the scale of values of the precious metals whose names are given to these birds.

Himalayan Monal - *Lophophorus impejanus* (Latham, 1790) (Fig. 5a. Fig. 5b.)

This depiction has many features that differ from the actual form of the species to which it is assigned. However, the overall shape of the bird depicted on the wallpaper can be assigned to Lophophorus Genus. The ventral black and orange dorsal side and collar are specific. The apparent problem is assigning the image to one of the three species of this Genus. *L. impejanus* was chosen due to its distribution in the region where from the most part of the species was selected to carry out the assembly of birds depicted on the wallpaper. This is the territory covering North East India - Southern China - the Himalayas. In its depictions, the bird has red face and legs and the auricular colour is white. These details are due to the artist's subjective choice and are not determinative. Both male and female are depicted on the wallpaper. The image can also be assigned to *L. sclateri* Jerdon, 1870 (Sclater's Monal) because of the orange color on the wing and the lack of the tuft on the head. The orange collar that flows down on the back of the bird can indicate *L. lhuysii* A. Geoffroy Saint-Hilaire, 1866 (Chinese Monal)
This Monal is the national bird of Nepal. It is a Pheasant species which shows the highest variety of feather colours determined by particular reflections of light.

Mandarin Duck - *Aix galericulata* (Linnaeus, 1758) (Fig.6.)

This is one of the most beautiful duck in the world and also one of the representative species for the East Asian region (Hoyo, Collar 2014). The

distinctive feature of this species is given by the unusual form of its wing feathers, generating two orange sickle shapes on the sides of the body.

It was brought to Europe as an ornamental species. Here it escaped from captivity or was intentionally introduced, especially in England where it survived in the wild. Such escaped individuals can be found throughout Europe, including in Romania, in parks, near rivers or other water areas close to urban areas.
In the Chinese mythology, the mandarin duck is a symbol of fidelity, love and couple affection. It is commonly rendered as a decorative element on various objects of Oriental origin, as in the case of the wallpaper from the Brukenthal salon.

White-breasted waterhen - *Amaurornis phoenicurus* **(**Pennant, 1769)**/ Purple swamphen** - *Porphyrio porphyrio* (Linnaeus, 1758)

Given the shape of the legs, of the beak and a red forehead tuber, this representation is certainly suggesting Rallidae species, a bird Family that includes waterrails and moor hens.

These features equally suggest two Asian species whose images seem to have been hybridized in this depiction. The blue colour on the back suggests the Purple swamphen, but the white ventral side leads us to assign the image to White-breasted waterhen. Besides the adult birds, on the wallpaper one can see the depiction of a juvenile of this species. In most of the cases of this family the juvenile is gray-brown, as illustrated here.
Both species have a wide distribution in Asia (Hoyo, Collar 2014), mostly in the southern half of this continent and some subspecies of Purple swamphen can be found in Africa and even in the southern part of Europe.

Eastern spotted dove - *Spilopelia chinensis* (Scopoli, 1768)

The necklace on the bird's neck stands immediately out in this depiction. This feature is particular to an Asian dove species which belongs to the pigeons group (Columbiformes Order). The necklace in the picture is a common characteristic of most doves, being in most cases represented by a band or sequence of black strips. In this Chinese species, the neck band is wider and integrates feathers with white ending that give a dotted appearance, recalling a jeweled necklace. Another feature which is remarkable both in reality and in the painting, is the pinkish chest. This species is widespread in East Asia including Southeast China (Hoyo, Collar 2014).

Barred cuckoo-dove - *Macropygia unchall* (Wagler, 1827)**/ Asian Koel** - *Eudynamys scolopaceus* (Linnaeus, 1758)

This depiction is interesting because of the difficulty to assign to an exact order of birds and even less to a particular species. However, the painting can suggest one of two species, one belonging to the pigeons Group (Columbiformes Order) and the other to cuckoos group (Cuculiformes Order).

Some suggestive features in the identification process of this species are the elongated silhouette, the characteristic, long tail feathers of different size, as well as the shape and colour of the beak. However, the discriminant feature for the species, as we shall see, is the head plumage.

We can assign this depiction to the Barred cuckoo-dove. The name itself denotes the similarity between the two choices for the image of this little bird. The distribution of this species corresponds to the area wherefrom most of the species represented on the wallpaper were selected. However, the image does not follow completely the real feather pattern. Among the Cuckoos, the depiction may suggest the Asian Koel. Although it is more light-coloured on the ventral part, the feathers on his head form longitudinal stripes rather than transversal ones, as shown on the wallpaper. The pale beak may be an argument for this species. Its distribution overlaps with the area inhabited by most of the species rendered on the wallpaper.

A strange aspect of these depictions is that, looking at the feet, one of it has three toes pointing forwards, which would indicate the first species and the second shows only two toes facing forwards, typical for a Cuckoo. For this reason, the depicted bird remains an enigma, oscillating between the two species.

Common kingfisher - *Alcedo atthis* (Linnaeus, 1758)

Two of the depictions on the wallpaper suggest apparently different species of the Kingfisher group (Alcedinidae Family). The two images differ quite a lot, but probably refer to the same species – the Common Kingfisher, with a very wide distribution (Hoyo, Collar 2014), occurring as well in Romania.

In both cases the beak is completely red, which does not correspond with the actual appearance of the species and can refer to other Genus such as Halcyon and Ceyx, from the same Family of birds.

In one of the representations the bird has orange-brick-red ventral side, corresponding to the real colouration. However, the couple of birds painted on the left wall shows pink underparts which may refer to other species. In this case, it may be an artistical hybridization of the Common Kingfisher with *Halcyon coromanda* (Latham, 1790) – the Ruddy Kingfisher. This second species has a corresponding distribution in the north-east of India, but in its case the pink colouration appears especially on the back side.

The Common Kingfisher shows a blue plume on back, with reflexes that varies to green, depending on light. It is interesting that in the second picture this duality is depicted simultaneously by the colour combination between extreme forms of reflection, blue and green.

Red-billed blue Magpie - *Urocissa erythrorhyncha* (Boddaert, 1783)

This magpie is one of the species with the most accurate representation on the wallpaper. It is very beautifully coloured, unlike other species that belong to the crows group (Corvidae Family). Is related to the European magpie, present in Romania as well, the two-species resembling especially in what concerns the elongated tail, longer in case of the Asian form.

It is a species widespread in northern India, bordering China on the Himalayan chain (Hoyo, Collar 2016). In Chinese culture, this magpie symbolizes good mood and joy.

Common Nightingale - *Luscinia megarhynchos* C. L. Brehm, 1831

Considering this bird's silhouette and posture, it seems that the representation may correspond to the Common nightingale. Another argument is the corresponding occurrence of this species with the region wherefrom most of the species represented on the wallpaper were chosen.

It is an interesting choice to paint this species that complements the visual spectrum of the wallpaper with an acoustic effect, taking into account its well-known and impressive song.
Probably the artists who realized the wallpaper wanted to transpose the acoustic feature in order to complement the vitality of the landscape, given as well by many birds painted in motion.

Himalayan Bulbul - *Pycnonotus leucogenys* (J. E. Gray, 1835) (Fig.7.)

The tuft on top of this bird head is a typical feature of the bulbul group (Pycnonotidae Family). The painting reproduces faithfully the appearance of *Pycnonotus leucogenys* – the Himalayan bulbul. Although the depiction is very close to reality, it lacks the unmistakable yellow patch under the tail of this bird which is a clear and distinctive feature. Therefore, this feature is ignored by the artist and allows us to ignore it in other identifications of bulbul species. That applies to the Yellow-vented Bulbul, in case of which the yellow patch is missing as well.

The name describes the species distribution, including the northern Indian territories as well as Bhutan, Nepal and the neighboring countries overlapped by the Himalayan mountain range (Hoyo, Collar 2016). It is also the national bird of Bahrain.

White-eared Bulbul - *Pycnonotus leucotis* (Gould, 1836)

This depiction corresponds to the White-eared bulbul - *Pycnonotus leucotis*, a relative species of the Himalayan bulbul that was considered in the past subspecies of the same species. On the other hand the image may correspond to a different species from a different group of birds – Laughingthrushes (Famila Leiothrichidae). We can relate the image as well with *Garrulax nuchalis*, which looks similar in patterns with the White-eared bulbul, being larger in size and with warmer brown shade on the back.

It is hard to attribute the image precisely to one species on one hand because we noted that the artist insists on representing Pycnonotidae Family and on the other because the second species show a correspondence in its distribution with the area from which most of the species are represented. This Bulbul has a western distribution, less compatible but better matching in respect of the shape and colour.

Yellow-vented Bulbul - *Pycnonotus goiavier* (Scopoli, 1786)

The silhouette, colouration and especially the head pattern in this painting suggest the depiction of one of the southeastern species of bulbul – *Pycnonotus goiavier*. The light beak colour and the black on the head do not fully correspond to the reality, but applying the method deduced from the analysis of other species' depictions, we can assign the image to this species.

This is one of the only species whose distribution does not overlap with that of the other species of

birds represented in the wallpaper. It is spread throughout the southern part of Asia (Hoyo, Collar 2016), which makes this species an exotic choice for the origin of the wallpaper.

Chestnut-backed Laughingthrush - *Garrulax nuchalis* Godwin-Austen, 1876

Some of the features that led to the identification of the species are the white stain on the face, the shade of brown on the body and the way tail feathers look like. The colour of the wings rather gray and the colour of legs cannot be considered as a determinant feature, but the overall shape would suggest this species. Another argument is the distribution of this bird in the eastern part of the Himalayan chain (Hoyo, Collar 2016).

White-browed Laughingthrush - *Garrulax sannio* Swinhoe, 1867

The silhouette, general brown colour and the white eyebrow are some of the arguments due to which we attribute this image to the species *Garrulax sannio*. However, the shape of the white area on the face (but here black), as well as the blue circle around the eye, correspond to a different species – *Garrulax caerulatus*. In this case it may be a hybridization of forms, but we decided that the image corresponds to *G. sannio*, due to the brown neck and chest. In respect of its occurrence area, the second species is more convenient.

Hill Blue Flycatcher - *Cyornis banyumas* (Horsfield, 1821)

Most likely, on the wallpaper is depicted a species of the genus Cyornis, blue coloured birds (mostly on the back) and of cream colour on the ventral part of the body. The underside is sometimes coloured in shades of brown, orange or pure white.

Given that the bird depicted here has a light coloured chin may mean that we are dealing with *Cyornis banyumas*, whose dorsal colouration resembles the most with the hue of the picture. Another argument for this species is its distribution area, corresponding to Nepal-Bhutan (Hoyo, Collar 2016), wherefrom most of the species were selected for the ensemble fauna rendered on the wallpaper.

Ultramarine Flycatcher - *Ficedula superciliaris* (Jerdon, 1840)

In the identification of this species the combination of contrasting colours (ultramarine blue on the back and white on the belly) has been decisive. Other useful features are two white spots on wing occurring in many other species painted on the wallpaper, but actually real features of this species, formed by the last tertiary wing feathers with white boards. Another argument is its occurrence in the eastern Himalayan region (Hoyo, Collar 2016), most appropriate to the distribution area of the most species rendered on the wallpaper.

Orange-bellied Leafbird - *Chloropsis hardwickii* Jardine & Selby, 1830

The green colour on most of the dorsal area of the body and the blue wings are features that correspond almost too exclusively to this species and in general to the Chloropsis Genus. Another argument is the specific elongated form of the beak and the blue tail.

For confirmation, we point again on the distribution of this species, which is endemic to the region of origin of other species that appear on the wallpaper.

Species from Sylviidae Family

At least two depictions can be attributed to different genuses in Sylviidae Family, comprising species named Parrotbills. The body colour and especially the short and stocky beaks, with the curved tip, are arguments to assign the images to this Genus. To ascertain precisely the species is difficult.

Parrotbills are found in north-eastern India (Hoyo, Collar 2016), the region whose bird fauna seems to have been the inspiration for the artists who realized the wallpaper. One species could be *Suthora nipalensis* (Hodgson, 1837), due to the black eyebrow and size. This feature appears in the picture as a black stripe next to the eye. The second species seems to be *Chleauasicus atrosuperciliaris* Godwin-Austen, 1877 due to its occurrence in the correspondent area.

Slender-billed Oriole - *Oriolus tenuirostris* Blyth, 1846

One of the few medium size bird species, almost entirely yellow coloured. The black eyebrow, a natural feature, is missing in the painting, but most likely a reminiscent of this colouration is transposed on the dewlap, appearing here as black. It is one of the only species of orioles whose wing feathers show some lines which give an almost blue colouration, as painted on this wallpaper. In reality, this shade is more an optical illusion, which however the artist managed to depict.

The species is distributed exclusively in northeastern India and the neighboring countries (Hoyo, Collar 2016), once again its distribution area being a reason for its identification.

Discussions

Species diversity

The wallpaper is not simply a snapshot, a picture which is immediately grasped, but an ambience that invites us to travel through the world. Like a natural landscape, it does not exhaust at first glance, but has consistency, spatiality, volume, in which we are invited to enter, to translate. The oriental landscape reproduced on this wallpaper presents more than 20 different species of birds, which are depicted in addition to many species of plants, butterflies, dragonflies and even reptiles.

Some images of birds can be clearly attributed to certains species, if the paintings reproduce faithfully the reality, impressing by the rich details of plumage. Often, on the wallpaper the image suggests an artistic hybrid, only alluding to a certain species, without precise confirmation. Therefore, the connection between these paintings and some species is uncertain, and could refer to more than a certain taxonomic group. In other cases we cannot accurately identify the species, the painting being largely a fantasy.

As for the images of plants – there are the characteristic oriental species such as bamboo or lotus, magnolia or Japanese rose.

Regarding the images of butterflies - countless species occur that are difficult to determine, but can be attributed to general groups (for example some specimens on the wallpaper could be attributed to the Papilionidae Family).

There are also images of dragonflies - two forms differing by colour, some green and other red.

Finally there is an image with a reptile - a discrete depiction which can be identified just by looking very carefully, probably referring to a gecko species.

Other images of birds

The Brukenthal Palace provides the opportunity to admire zoomorphic images in different contexts: on the murals, on some furniture and on decorative items. Referring to the mural depictions in the salons, we can make some observations. First, we find that they are imaginary productions and to a lesser extent correspondents of real species. Probably the creator of such images had no intention to reproduce reality, but instead was prone to a certain visual symbolism. In this sense, some representations may refer to the Phoenix bird or other mythical birds. In general, it is almost impossible to assign these mural paintings to particular species.

In contrast to the above set of depictions, the wallpaper with oriental motifs wallpaper refers with great fidelity to reality, and the images reproduced there can be attributed to the exact species. For this reason it is possible to reconstitute the correspondent natural landscape.

It is worth to describe this world from the perspective of the real fauna, being otherwise inaccessible due to the distance that separates us from it. Following the species painted on the wallpaper, we have the opportunity to outline a particular Asian fauna and to discover many rare or endemic species of some remote areas of this continent. Besides its aesthetic value, the wallpaper acts, if compared to the mural paintings, as a genuine diorama.

Particularities in representation

Some constant elements can be observed in the depiction of birds which occur in case of many species regardless of their relationship. These models can be considered related to the artistic technique of reproduction of real features. These repeating patterns have no equivalent in reality for the species in question, being only a painting technique artifact and could create difficulties in determining the species rendered on the wallpaper.

However, we agree that the models in question come from the features belonging to a real species the artist was impressed by and then it was projected by him on the increasingly large part of the series of species rendered on the wallpaper.

One of the models discussed above is the pair of white spots on the back formed by the last wing feathers. They occur most frequently in many unrelated species and can cause confusion, mainly in respect to rare birds, which are also difficult to determine in reality. Another repetitive feature is the one represented by the ear, which is often depicted as a wide circular strip, light or even white. Mustaches are modified feathers that appear in some bird species close to the beak.

This feature is quite often figurative being more of a repetitive pattern than a real characteristic. Most usually, the eyes are depicted as having pale iris, yellow and black pupil. In case of figures which obviously can be attributed to the exact species it was found that it is not a reality but a

corresponding repetitive pattern. We can clearly notice this artefact looking at the difference between the Mandarin duck's depiction and its real appearance. Other examples are some of the butterflies, which show the same depiction way of the eye, though the eyes of these insects are shaped differently. Less obvious is the proclivity to depict the wing feathers in blue. This trend can be observed in the transition on forms apparently belonging to the same species, which in reality do not have this colouration.

Artistic hybrids

Analyzing the depictions of many species we found that the images painted on wallpaper are artistic hybrids, blending together features of two or more species. In some cases this hybridization does not alter the identity of a species. At the same time, we point to a different situation that of the aforementioned pure imaginary depictions mentioned in mural paintings. The multicoloured Himalayan Monal female wing or multicoloured wings of some Passeriformes are not pure imaginary forms, but real ones, stylized by projecting and assembling other natural forms. The reason is their depiction by memory, not after nature, and therefore the real features have a relatively lower imprint or stabilization if compared to other more impressive birds, whose characteristics had more impact on the painter. We must therefore make a distinction in this case between the fantastic and the realistic rendering, although in the wallpaper picture there is a certain compound which does not have a counterpart in reality.

In some cases the artistic hybridization occurs between only two species that share equal characteristics. In this case the image cannot be assign to a species, because it is impossible to discriminate specific features. In other cases, there are common characteristics of an entire taxonomic group projected on one particullar species. Still the oscillating image can be primarily assigned to one of them. For this second situation, we can bring the example of the White-browed Laughingthrush (*Garrulax sannio*) who lends, among other characteristics, the blue colour around the eye from a related species, the Grey-sided Laughingthrush (*Garrulax caerulatus*) and the pale iris which is a more frequent feature of the Leiotrichidae Family.

Conclusion

The tapestries of oriental influence in the two smaller guest rooms are almost identical. The only difference noticed by us lies in the manner in which the same species of animals were painted.

Regarding the origin, we can not mention whether the tapestry was handpainted in a Chinese atelier for the external market or if it was manufactured in an European workshop; any evidence for a conclusive answer hasn't been discovered so far, as a stylistical analysis of the composition and of the depiction of landscape elements, plants and animals is still lacking. However, we can asume that it has Oriental influences due to the motifs painted which represent mostly species from the Oriental or more specifically Asian area. The manner they were represented is also typical to the Oriental culture.

The paper tapestry was painted on separate strips, that together form an exotic landscape with numerous Asian species, especially birds, plants and some butterflies. The plants depicted are magnolia, Chinese peony, Japanese roses and plum flowers. Fleșeru (2007) also mentioned theses species in the article dealing with the tapestry from the five reception rooms of the palace. The butterflies are probably depictions of species belonging to the Nymphalidae and the Papilonidae, two of the butterflies faimilies with several representatives in Asia. All these are evidence of Samuel von Brukenthal's concern to integrate the Chinoiseries in an European interior, a trend that had become popular in Europe during the 18th century, due to the trade with the Far Eastern world.

An interesting fact is that the tapestry preserves a blue colour in some places, especially in Baron Samuel von Brukenthal's personal cabinet. The reason for this is probably the original blue-turquoise background colour of tapestry. This can be confirmed by a comparison with the tapestry in the Blue Chinese Salon in the Schönbrunn Palace in Vienna, which was also blue in the beginning. Now, its ground colour is yellow-brown, the same colour as the tapestry in the two smaller guest rooms in the Brukenthal Palace. The fact that some parts of the wallpaper tapestry in the two smaller guest rooms still preserved the blue-turquoise ground colour can be explained by the fact that the wallpaper wasn't constantly exposed to light. These salons were closed to the public for a long period of time and the windows were closed with wooden shutters.

The number of shapes and especially of the species portrayed on such an aesthetically accomplished wallpaper is impressive. This reflects the attention to nature and, on the other

hand, the knowledge and ability of those who made the wallpaper to differentiate so many species. As consequence, 10 depictions have a certain correspondence to real species. Other 15 depictions have a more or less vague connection with an actual species, but are surely belonging to a certain Genus or Family. Some of the birds depicted on the wallpaper cannot be determined exactly, although they make vague references to some extant species. In these cases, the colours are in loud tones and apparently do not have a counterpart in reality. For this reason, we chose to present these images only for aesthetic reasons, without placing them in a taxonomic context.

Regarding the depictions of birds we can observe some nonspecific patterns that are repeated in many cases and also some features that are not realistic such as the colour of the eyes or the legs. An interesting feature is the artistic hybridization between different species.

At first glance, we notice all sort of pheasant species, represented as central figures on certain segments of the wallpaper.

Other strips of the wallpaper render a set of several species placed in connection, as if to achieve a kind of cycle. This is the case of the group: Silver pheasant, Himalayan Monal, Mandarin duck and the Common Kingfisher. These birds seem to stare at each other, creating a field with some centrality that seems to tell a story in itself. The story is probably related to the symbolism of each species, which is less transparent for the onlookers belonging to another culture.

It may be noted that on the wallpaper raptors do not appear and the central represented birds have a primarily vegetarian diet. This can reflect the intention of reproducing a peaceful landscape, in concordance with the guest salon's function. Some species may suggest through their symbol a noble ambiance, while others the feeling of joy, as the jay usually symbolizes. This combination of symbolic elements probably guarantees a good mood that the salons atmosphere should emanate.

Further clarification should be made in connection with other studies about this wallpaper. Domestic birds do not occur on the wallpaper, as mentioned elsewhere. All species are wild birds with the remark that due to their decorative plumage or for hunting interest some of them are kept in breeding farms in a state of half-wildness. On other hand, certain wallpaper strips are repetitive in some aspects, as the entire surface of the wallpaper is not perfectly distinct in its episodes.

The wallpaper's composition was probably meant to reproduce a wild habitat with endemic, rare and most beautiful species, willing to rebuild a heavenly landscape. Therefore, the artist selected species with a strong aesthetic sense to generate decorative beauty. These species are mostly endemic to the eastern Himalayas, where probably the group of craftsmen that have transposed them on wallpaper lived.

As noted before, some species occur on the wallpaper only as male individuals, but sometimes both males and females are depicted, as well as juveniles. If the bird's symbol suggests for example the strength of the couple in love, such as the mandarin duck does, it appears in all depictions as a couple, indicating that the structure of the wallpaper's composition integrates the symbolic aspect as well.

Acknowledgments

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LIST OF ILUSTRATIONS

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LISTA ILUSTRAȚILOR

Fig. 1. Green Peafowl – *Pavo muticus* Linnaeus, 1766

Fig. 2. Common Pheasant - *Phasianus colchicus* Linnaeus, 1758

Fig. 3. Golden Pheasant - *Chrysolophus pictus* (Linnaeus, 1758)

Fig. 4. Silver pheasant - *Lophura nycthemera* (Linnaeus, 1758)

Fig.5a. Himalayan Monal - *Lophophorus impejanus* (Latham, 1790), male

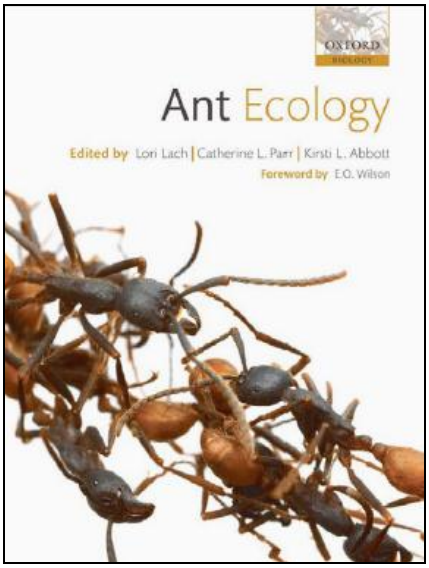
Fig.5b. Himalayan Monal - *Lophophorus impejanus* (Latham, 1790), female

Fig.6. Mandarin Duck - *Aix galericulata* (Linnaeus, 1758), female and male

Fig.7. Himalayan Bulbul - *Pycnonotus leucogenys* (J.E. Gray, 1835)

Lori LACH, Catherine L. PARR & Kirsti L. ABBOTT (Eds.), ***ANT ECOLOGY***

Ioan TĂUȘAN*



Oxford University, New York. 402 pages + xvii pages. ISBN: 978-0-19-959261-6, (Hardback), (acid-free paper); Price: ₤ 84.

Ant Ecology is divided into four parts, followed by a last chapter called Synthesis and Perspectives. The book ends with a glossary and references.

The foreword to the book is written by the famous myrmecologist, Edward O. Wilson, who summarizes the knowledge on ants so far and emphasizes the importance of the book by the fact that "*we understand little of the environmental factors that shaped the social adaptations of these insects, how assemblages of species have evolved as an evolutionary product*".

Each part consists of four chapters. The first part *Global ant diversity and conservation* starts with Philip Ward's chapter, which outlines major aspects regarding the origin, taxonomy, phylogenetics and evolution of ants. In the second chapter, Brian Fishers takes the readers into a comprehensive analysis on the biogeography of ants. The third chapter, written Robert Dunn *et al*. discuss diversity patterns along gradients (latitudinal and elevational). Leeanne Alonso, in chapter four, deals with the status of ant conservation and highlights the hotspots of ant richness and endemism.

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The second part focuses mainly on community dynamics. In chapter five, Catherine Parr and Heloise Gibb highlight the "*competition as the 'hallmark of ant ecology'* and discus the factors modifying the competitive interactions. Ness *et al.* review the mutualism and its dynamics in ants, in chapter six. In the next chapter, Nico Blűthgen and Heike Feldhaar approach aspects regarding the trophic position of ants, food storage, nutrients requirements and the diversity of nest structures. Philpott and colleagues highlight the impact of different disturbances on the ant diversity and function (Chapter eight).

The third part is dedicated to the population ecology. In chapter nine, Peeters and Molet explore the colony life histories, mating biology, dispersal, colony growth and reproduction. The colony structure under various aspects such as habitat structure, genetics, gene flow and others are analyzed in chapter ten by Steiner, Crozier and Schlick-Steiner. In chapter eleven, d'Ettorre and Lenoir outline the kin and nestmate recognition. Dornhaus and Powell explore the issues on foraging and defense strategies in chapter twelve.

The last part of the book deals with the invasive ants. Suarez *et al.* discuss the biogeographic and taxonomic patterns of invasive ants in chapter 13. In the next chapter (Chapter 14), Krushelnycky *et al. give* insights on the invasion processes (local patterns of spread, biotic interactions and abiotic

conditions) and causes of success. In chapter 15, Lach and Hooper-Bùi emphasize the consequences of ant invasions on both invertebrates (ants and other ground-dwelling invertebrate taxa) and vertebrates. In the closing chapter (Chapter 16), Hoffmann and colleagues underline the most recent approaches, protocols and techniques (chemical and non-chemical) in managing invasive ants with case studies (e.g. *Solenopsis invicta*, *Linepithema humile*, *Wasmannia auropunctata* and others).

Each chapter begins with a brief introduction which offers insights about the following chapter. The authors are experts in their research field, therefore the reviews have a great scientific quality.

Due to a vast number of contributors there is a variation of writing styles and therefore comprehensiveness also varies.

Such a vast field of research cannot be fully covered by one book; therefore, *Ant Ecology* has its weaknesses. Most of the data refer to Australia and America (examples from Europe are scarce), suggesting that other parts of the world with high diversity of habitats such as Asia, need research (Paknia 2013).

All in all, I consider this book a crucial step in understanding ant ecology. Moreover, I strongly recommend the book for all those young myrmecologists interested in this field of expertise.

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BRUKENTHAL NATIONAL MUSEUM IN 2016: A CHRONICLE OF NATURAL HISTORY EXHIBITIONS AND EVENTS

Dana Roxana HRIB*

Abstract: *The present study is a synthetic presentation of Brukenthal National Museum's cultural offer in the field of natural history during 2016.*
Keywords: *Brukenthal National Museum, natural history, 2016.*

Rezumat: *Articolul de faţă constituie o prezentare sintetică a ofertei culturale a Muzeului Naţional Brukenthal în domeniul istoriei naturale, pe parcursul anului 2016.*
Cuvinte cheie: *Muzeul Naţional Brukenthal, istorie naturală, 2016.*

1. Temporary exhibitions[1]

a. Exhibitions at the museum locations:

Out of the total of 34 temporary exhibitions opened in 2016 at the Museum's locations, 7 displayed selections of exhibits in various fields of natural history. To be noted in the 2016 exhibition agenda is the diversity of the approached subjects from heritage selections to museum education projects and the history of the Romanian museums:

_*The Dissection of Love* (Museum of Natural History, Multimedia Room, 17.02-31.03): the exhibition aimed at creating a parallel view on the reproductive relationships between animals and the love between people, highlighting the biological substrate of the latter; moreover it emphasized the ambiguous delimitations between sexual instinct and spiritual love, as revealed by hormones associated with love and behavioral characteristics of different animals, casting a new perspective on monogamy, fidelity and passion. Among the items on display there were 12 dissected hearts and a male whale reproductive organ on a heartbeat sound track.

_*Mineralia – Spring Crystals* (Casa Albastră/Blue House, Multimedia Hall, 11 – 13.03): organized in partnership with Mineralia Association, the exhibition was dedicated to unique jewelry made of natural stones, coral or amber. There were also on display less known fine stones as the aventurine, the labradorit, the tourmaline, the aquamarine, fluorine, tanzanite and many others.

_*Mineralia – Summer Edition* (Brukenthal Palace, Temporary Exhibitions Hall, 17 – 19.06): organized in partnership with Mineralia Association, the exhibition brought to Sibiu ornaments and jewelry of the rarest semiprecious minerals as black opal from Australia, ruby in zoisite from Tanzania, muscovite from Russia, brown obsidian from Indochina, tugtupit (a pink stone that can be extracted for only one month per year in Greenland), electric-blue cavansit, apple green crisopraz, Argentinian rhodochrosite and Peruvian chalcedony.

_*Lessons on harmony with nature* (Museum of Natural History, 23.06 – 15.09): the exhibition was part of the educational project "Turn the waste into a resource" and comprised objects made by the pupils in the second grade, Elementary School no. 2 in Sibiu.

_*Plants in the German-Saxon Ethnography* (Museum of Natural History, Multimedia Room, 19.10-20.11): the exhibition was part of the educational project "Plants in the German-Saxon Ethnography" developed by Brukenthal National Museum, the ASTRA National Museum Complex and the "Samuel von Brukenthal" National College. It focused on the flowers and the floral motives and the implied significations related to the life cycle, plant properties and their use in everyday life.

_*Evolution: the illustrated story of the "Grigore Antipa" National Museum of Natural History, 1834-2016* (Brukenthal Palace, Cartography Cabinet, 9.11 – 4.12): part of the project "Private collections and museums in Romania", the exhibition presented in 35 photo-documentary panels the history of "Grigore Antipa" National Museum of Natural History back to the princely decision issued on 3rd of November 1834 stipulating the establishment of a National Museum of Natural History and Antiquities in Bucharest. Further on, the

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[1] The short descriptions of temporary exhibitions are selected from the texts given by the curators for public information.

information related to subjects like the establishment of the collections, of the most important publications, the expeditions organized in different geographic areas worldwide as the Pacific Ocean (Peru-Chile area), the Indian Ocean, the Caribbean Sea and Brazil etc. along the most important collectors who donated their pieces to the museum, the first dioramas in the permanent exhibition, the most important temporary exhibitions and the international congresses organized by the museum.

_*Exotic Insects* (Museum of Natural History, Multimedia Room, 25.11.2016 – 20.03.2017): the exhibition presented several species of beetles and butterflies preserved in the exotic Entomological Collection, some of the exhibited species coming from the Wilhelm Weber collection, a remarkable material put together during 20 years of exchanges with other collectors, personal collecting trips in various countries or by growing butterfly eggs. Weber was known for his patience and thoroughness. In his collection, different species stand out through their shape and color, as a result of his work towards collecting the most attractive and representative specimens from several exotic butterfly families. The exhibition displayed 56 exotic species of beetles and butterflies from South America, North America, Africa, Australia and Asia. It also presented aspects from the life of the species: behavior, morphology and distribution in the world. Among the emphasized species were the Goliath beetles – some of the biggest beetles in the world, Hercules beetle – the longest beetle form the Rhinoceros beetle group, Sabertooth Longhorn beetle and Darwin's beetle – currently considered as vulnerable species, the White Witch moth – the moth with the largest wingspan in the world, Edward's Atlas Moth – the largest Asian moth, the butterfly D'Urville's Birdwing (*Ornithoptera priamus urvillianus*) – endemic species and the *Morpho* genus butterflies, one of them being the Sunset Morpho – the largest butterfly of the genus *Morpho*.

b. Online exhibitions:

_*Evolution: the illustrated story of the "Grigore Antipa" National Museum of Natural History, 1834-2016*
http://www.brukenthalmuseum.ro/index2.php/virtuale/muzee_4_en

2. Natural history events organized and/or hosted by Brukenthal National Museum

_*The International Workshop Alternative Methods to Combat the Biodegradation and to Reduce Pollution in Museums* (Blue House, Multimedia Hall, 4 – 5.02): organized by the Evangelical Parish Sibiu and Brukenthal National Museum in cooperation with "Lucian Blaga" University of Sibiu and the National Museum of Transylvanian History, the workshop reunited three well-known researchers in the field of conservation in museums – Dr. Robert Waller from Canada, Dr. Pascal Querner from Austria and Dr. Morten Ryhl Svendsen from Denmark. The works were attended by 119 participants, representatives of Romanian museums, universities and cultural centers. The event was part of the project "Green Cap: Management, Environment and Art Communication at Brukenthal National Museum, Evangelical Parish and Environment Protection Agency from Sibiu".

_*Earth Hour 2016* (Brukenthal National Museum: all locations, 18.03): as in every year, Brukenthal National Museum joins in the Earth Hour campaign – the biggest voluntary action for the environment in the entire history, involving 2 billion people. A simple gesture like turning off the lights is the first step in saving natural resources and preventing environmental degradation. The Earth Hour 2016 campaign sustained its invitation to partaking for a cleaner, a better preserved and a healthier environment by promoting on this occasion environment friendly means of transportation. At the Museum of Natural History, March 18 marked the debut of a new education project under a title that took after the campaign's slogan: "Give Nature some of your energy". Participants in the project are 1st grade students from Sibiu.

_*The 8th Conference of African Association of Women in Geoscience* (1 – 7.10): Brukenthal National Museum participated in the organizing committee for the 8th Conference of African Association of Women in Geoscience that took place in Sibiu, having as theme: "Building bridges between Earth Scientists worldwide: a way for promoting peace and strengthening integration".

3. Worth mentioning

_*Brukenthal Museum – the first in Romanian to receive EMAS registration!*

Brukenthal National Museum is the first museum in Romania to receive EMAS registration, Environment Management Audit System. The EMAS certifying procedure also comprised the obtaining of ISO 14001:2004 certificate – Environment Management System.

The system implementation involves direct participation of all museum employees to achieve the key performance indicators aimed at: reduced consumption of electricity, natural gas and water, lower waste and higher degree of information and awareness. EMAS certification was part of the "Green Cap" project initiated

by the Evangelical Parish CA in Sibiu together with Brukenthal National Museum and APM Sibiu being financed by DBU Germany and the Ministry of Environment, Water and Forestry.

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