CARLINE BOOKLETS NO. 12

THE MAGIC KARST

PROTECTION OF THE NATURAL AND CULTURAL HERITAGE
IN THE BÜKK NATIONAL PARK

AN OVERALL MAP OF THE BÜKK NATIONAL PARK

Headquarters of the Bükk National Park Directorate

Nyugati Kapu Educational and Visitors' Centre

- Driveway
- Industrial road
- Railway
- Forest
- Meadow, pasture-land, plough-land
- Boundary of the Bükk National Park
- Strictly protected area
- Forest preservation core area
- Lake
- Cave
- Beehive rock
- Paleolithic motte
- Medieval castle site
- Castle, castle ruins
- Ruins of monastery
- Relics of industrial history
- Country house, museum
- Chapel
- Nature trail
- Belvedere

On the front cover: The Tar-kő in autumn colours (Photo by Cs. B.)
On the back cover: The Nagy-mező (Photo by Cs. B.)

The most characteristic and uniform section of the Bükk Mountains with island-like elevation from their environs is the karst platform of the Bükk Plateau, with an average altitude of 800 m above sea level, covered by mountain meadows and beech groves. The plateau's gently undulating surface is diversified by crags, doline field karst furrows, valleys with a series of sinkhole dolines and sinkholes, whereas at its lower parts, potholes and caves are found. To the northern margin of the plateau, narrow gorges with steep walls resembling high mountains with cool and humid climate were cut whereas its southern verges are made up by sunlit ranges of limestones composed of consecutive immense tower rocks. Beneath the white crags of the 'rocks' of the Bükk Mountains well visible from the Town of Eger, a lower terrain, i.e. the ranges of the Southern Bükk Mountains divided by long valleys are found. The mountains are encompassed collar-like by the piedmont of the Bükkalja built up primarily of Tertiary rhyolite tuff in the south while by the piedmont of the Bükkhát composed of marine sediments of similar age in the north.

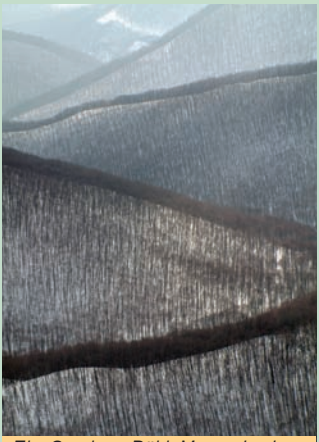
The peculiar and unique plant associations and habitats, the many rare and valuable plant and animal species, evidences of past cultures, the numberless creations of humankind shaping the landscape are all components of the wonder of the Bükk Mountains as well as the individual geologic-geomorphologic physiognomy.

According to the OTvH (Nature Conservancy of Hungary) Decree No. 18/1976 (28th December 1976), the first national park in Hungary with mountainous areas included was established on 1st January 1977, with the basic task of preservation of the abundant living world, specific geological and geomorphologic formations as well as the peculiar cultural historical values of the Bükk Mountains, unique in Hungary.

The Tárkányi Basin with 'The Range of Rocks' in the background (Photo by Cs. B

The area of the national park has been extended three times since its establishment. In 1984, the south-western peak of the Bél-kő with its abandoned quarry – approximately 39.8 hectares, of which 13.4 hectares are strictly protected – was subjoined to the national park. In 1996, within the framework of a larger extension, the national park was accreted by the 3019.8 hectares of the south-eastern Bükk between Kisgyőr and Bükkszentkereszt. Following a smaller extension of 6.5 hectares in 2004, the territory of the Bükk National Park at present is 41 840.7 hectares (as in 2010).

Forest school students at the Kő-köz nature trail (Photo by Cs. B.)



The Southern Bükk Mountains in wintertime (Photo by Cs. B.)

The key section of the Lökvölgyi Formation (Photo by Cs. B.)

Trilobite found in Upper Permian rocks around Nagyvisnyó (Photo by Á. D.)

Radiolarite in the Bánya Hill section (Photo by Cs. B.)

NATURAL HERITAGE

An outline of geology and physical geography

The Bükk Mountains are mainly built up of marine sedimentary rocks formed in between the Carboniferous period of the Paleozoic (330–310 million years ago) and the end of the Jurassic of the Mesozoic Era (170–150 million years ago). The quasi-continuous series of sediments deposited during these 140 to 180 million years is composed of limestone, and clay (clay-shale), radiolarite, dolomite and sandstone later compressed to slates. The specific character of the Bükk Mountains is determined by Triassic white and light-grey limestones: these terrains bear the rich karst landforms that are so characteristic for the mountains.

In the Triassic and Jurassic periods, the undisturbed limestone formation was interrupted by submarine volcanic activity associated with significant crustal movements. Piles of the pillow-lava composed of basalt related to the opening of a deep-sea trench as well as igneous rocks intruded into the sediments (gabbro, ore-peridotite) can be observed on the surface around Szarvaskő.

The folded – overturned folded-imbricated – overthrusted (overthrust folded) structure of the Bükk Mountains was developed during the Cretaceous period that is represented only by conglomerates exposed in the Nekézseny district (however, this formation was settled on the formation building up the Uppony Hills and does not contain gravels of the Bükk Mountains). Some geologists claim that the Paleozoic-Mezozoic formations building up the mountains

The folded rock mass of Odvas-kő is elevated from the side of the Csondró Valley (Photo by Cs. B.)

can be classified into two stratigraphic units whereas by others, a third one, namely the so-called Szarvaskő System of Thrust Sheets is also distinguished.

Thus, by the Cainozoic, the Bükk Mountains with its rather complex structure were 'born' and elevated by orogenic movements and have become mainland. The region with diverse surface composed of synclines, anticlines, reversed and thrusted imbricates and folds – was planished to a tropical peneplain until the Late Eocene. During the Cainozoic, the area of the mountains sank and elevated manifold. These vertical crustal movements went along with the progression and regression of the sea resulting in the formation of clay, sand, sandstone and gravel strata whose vast majority has been eroded.

For example, Mid-Miocene marine sediments are directly deposited on the Triassic-Jurassic rocks of the Bükk Mountains.

The boundary of the Mid-Miocene sea progressing many times is marked by the remnants of abrasion platforms, today at the height of 300–500 m. By this time, volcanic activity of rhyolithic and dacitic in character took place in three stages until the Late Miocene as a result of which the whole mountains were covered by great masses of loose and agglomerated rhyolite-rhyodacite tuffs, tuffits play an important role in the structure of Bükkalja Region.

Karstification and the development of the recent water regime of the Bükk Mountains already started in the Late Miocene with the sea having finally regressed from the continuously elevating mountains with its occasional returns covering the marginal areas only. One can, mostly on the surface of the Bükk Plateau and the Kis (Small) Plateau as well as in the limestone regions of the northern and southern Bükk Mountains, One can observe abundant groups of karst formations mostly on the surface.

The Bükk Plateau and its southern foreground built up of primarily Triassic and Jurassic rocks. A view from the Őr-kő (Photo by Cs. B.)

The western side of the Ablakos-kő Valley. Weathered limestone layers (Photo by P. P.)

The most wide-spread rock of the Bükkalja region is rhyolite tuff of volcanic origin (Photo by Cs. B.)

The Anna Cave arched by travertine (Photo by Cs. E.)

Karrenfeld at the Tar-kő (Photo by Cs. B.)

Doline at Létrás (Photo by Cs. B.)

The mouth of the Szeleta pothole (Photo by G. K.)

The karst

Any geomorphologic formations found at terrains built up of karstic rocks (principally of limestone) shaped by dissolution, are called karst landforms. Thus, karstification is associated with well-soluble solid-structured rocks and inevitably requires the presence of water. The process of karstification takes place underground in fissured, cavernous rocks, although, as a result of karstic dissolution as well as the destructive (karst corrosion, dissolution, erosion), transportation (corrosion – shaping, cutting – action) and building actions of the water, both surface and underground landforms are developed. An assemblage of karst surface landforms (karrens, dolines, uvalas, poljes, sinkholes etc.) and subsurface karst landforms (caves) is the karst.

Of the karst waters discharged in springs, at the waterfalls of streams, with the decrease of pressure and surface tension of the water, carbon-dioxide volatilizes due to which most of their limestone content will fall out. The formation of travertine (sinter) is also generated by mosses and other plants taking up most of the carbon dioxide required to their assimilation from the water settled on the echelons of the stream bed. Such series of waterfalls formed on travertine echelons is the Fátyol waterfalls in the Szalajka Valley.

The Bükk Mountains' area most abundant in karst landforms is the Nagy (Great) Plateau formed in the Triassic period and composed of white and light grey coloured limestone (Bükk Plateau Limestone Formation), however rocks liable to karstification can also be found in the Small Plateau as well as in the Northern and Southern Bükk.

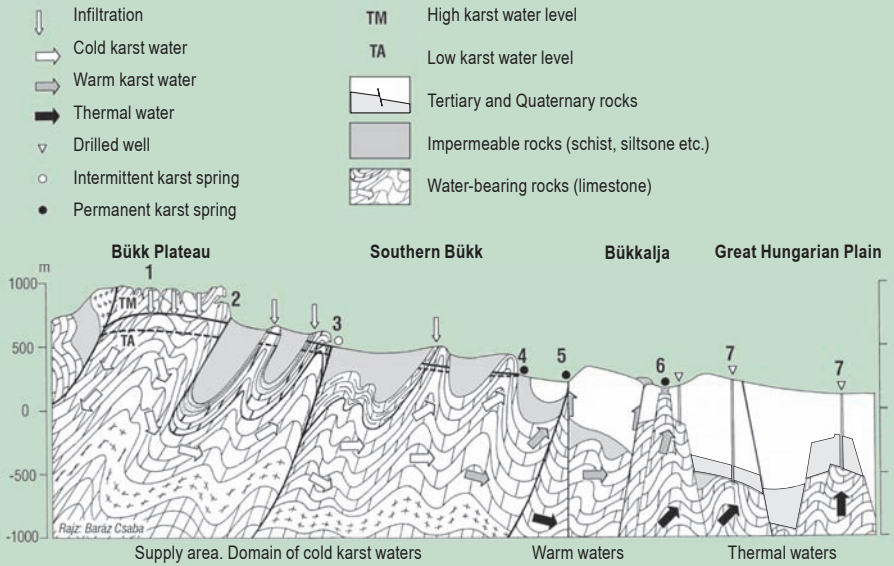
The intermittent spring cave of the Imó-kő (Photo by Cs. B.)

Cold and thermal karst waters – a karst hydrodinamic outline of the Bükk Mountains and its southern foregrounds

Some of the 600 to 850 mm of rainfall experienced annually in the area of the Central Bükk (High Bükk, Bükk Plateau) composed of limestone infiltrates the bedrock. The limestone's system of crevices and hollows (i.e. system of joints) is, during major rainfalls or following thaw, filled up by water. At such times, the surface of karst water becomes cambered beneath the Bükk Plateau resulting in water flowing from there to lower cold karst springs. The water regime of karst springs operated by karst waters emerged at the rim of karstifying rocks can be permanent and intermittent. Intermittent karst springs found at the southern foreground of the High Bükk Mountains, i.e. the Lower Vörös-kő, the Upper Vörös-kő, the Imó-kő and the Fekete-len karst springs, become active only as a result of the significant elevation of the karst water.

Another part of the karst water travels a long way: it flows into the deeply subsided karst system overlaid by basin sediments from where emerges again as warm or hot karst water. At the southern feet of the mountains, at the Bükkalja region, a number of thermal karst springs are found: such are at Eger, Kács and Miskolctapolca. In addition to these natural emergences of water, karstic thermal water was explored by deep-hole drilling at many locations (Bogács, Demjén, Egerszalók and Mezőkövesd) among which some are utilised for the therapeutic purposes or as spas.

The Bükk as karstic mountains and the carbonate rock overlaid by subsided, mainly impermeable rocks at their foregrounds form an integrated karst-hydrodynamic system. The supply area for this abundant treasure of karst water is the surface carbonate rocks of the mountains where water supply, the absorption of rainwater takes place. The second unit is the transition zone: here, the mixing of cold karst water flowing from the mountains poor in mineral salts and warm or hot waters rich in mineral salts flowing from depths beneath basin sediments is enacted. This is also the level where the medicinal springs of Eger were formed. Here, warm karst water emerges as ascending springs through clastic sedimentary rocks from buried horsts elevated along fault planes, bordered by impermeable layers and composed of carbonate rocks. The third unit of the karst hydrodynamical system is the domain of karstic thermal waters. Water moving in the deeply subsided buried carbonate rocks, along the fracture systems, due to the high temperature dominant in the depths are warmed up with their dissolved salt content increased. Hot karst waters significant and valuable from the point of view of medicine are formed here (Eger, Miskolctapolca).



An idealized karst hydrodinamic system of the Bükk Mountains and their southern foregrounds (edited and drawn by Csaba Baráz) 1 – The summit of karst water level 600 m above sea level; 2 – Inactive spring cave; 3 – Intermittent karst springs risen in the Southern Bükk Mountains (Vörös-kői Upper, Vörös-kői Lower, Imó-kői and Fekete-leni springs); 4 – Permanent karst springs (e.g. Szikla Spring); 5-6 – Warm springs (springs at Eger, Kács and Miskolctapolca); 7 – Thermal spring wells (Andornaktálya, Demjén, Mezőkövesd)

Caves in figures

More than one fourth of the all registered caves in Hungary (4050) can be found in the Bükk Mountains from where more than 1100 caves are known. Of the country's 145 strictly protected caves, more then one third (52) as well as one third of the caves with a length exceeding 200 m and with a depth of more than 50 are also found here. Six of the country's deepest caves are also in the Bükk Mountains. However two third of these caves do not reach the length of 10 m with only 58 hollows exceeding the length of 100 m and 22 that of 500 m. Altogether, there are 8 caves and cave systems longer than 1 km. The aggregate length of passages in the known caves of the mountains is approximately 57 km. The longest and deepest cave of mountains, being also the deepest cave of the country, is the strictly protected Cave of István-lápa with a depth of 254 m and with a length of 6700 m. Also, the strictly protected Kőrös Cave with the highest entrance above sea level (932 m) in the country is in the Bükk Mountains

The Diabáz Cave (Photo by Cs. E.)

Geoheritage conservation, cave management

According to the Act on Nature Conservation, protection of the geological values serves landscape preservation, the conservation of the abiotic and non-renewable natural resources as well as that of the life conditions of the living world.

Many of the natural and man-made exposures (mines, quarries, excavations etc.) included in the network of geological key sections of Hungary designated by the Hungarian Stratigraphical Committee.

Restoration and clearing of the nearly 50 key sections of the Bükk Mountains, along with placing interpretive panels require continuous work. At locations being the most abundant in geoheritage sites, geological nature trails have been established (Szarvaskő, the Bél-kő at Bélapátfalva etc.). Scientific surveying and cadastering of the geoheritage sites have also been started.

Within the frame of the cadastering of springs, the aim is not only to trace the presence of springs but also to complete a detailed survey that extends to the environs of the spring, and includes the determination of the endangering factors and the necessary conservation measures. This is extremely important in the case of springs where valuable wetlands (bogs) or vulnerable travertine concretions were formed.

A special attention is given to the protection of caves in the Act on Nature Conservation: all known caves in Hungary, regardless of the protection of the surface area, have been under protection for nature conservation ('ex lege' protection). In addition to nature conservation management, trustee's tasks are also undertaken for these caves by the Bükk National Park Directorate. Precise surveying and cadastering of the caves have been taking place for years, as a result of which a scientifically authentic record system will be established.

Of the geomorphologic values, special attention is paid to the protection of beehive-rocks at Bükkalja. Tuff cliffs with hollow carvings and their environment are regularly cleaned of the aggressive acacia, and at some locations, in introduction on these formations are given by nature trails.

The sinkhole cave of Pénz-patak (Photo by Cs. E.)

Flora

The uniquely abundant living-world of the Bükk Mountains is determined by climatic features and the rather diversified topography. In Hungary, it was the Bükk Mountains where the most regular mountain vegetation zones have been evolved. At the southern rim of the mountains, climazonal forest of the forest steppe zone, i.e. dry loess steppe oak woods can be found. At the average height of 250–400 m above sea level, sessile oak woods predominate of which common herbaceous plant species are wood-meadow grass (Poa nemoralis), wood melick (Melica uniflora) and soft-leaved sedge (Carex montana). At the height of 400–600 m above sea-level, in valleys with a more humid climate as well as at the northern hillsides, oak-hornbeam forests with rich herbaceous level at spring are present. Yellow woodland anemone (Anemone ranunculoides), Isopyrum thalictroides, hollowroot (Corydalis cava), bird-in-a-bush (Corydalis solida) and goldilocks buttercup (Ranunculus auricomus), as well as some orchid species, as for example lesser butterfly orchid (Platanthera bifolia) and bird's-nest orchid (Neottia nidus-avis) flourish at that time. Regions of the mountains above 600 m above sea level are covered by mid-mountain or sub-mountain beech forest stocks, whereas above 700 m mountain beech woods are predominant. This association characterised by the dominance of beech, however, may also be combined with sycamore (Acer pseudoplatanus) and Norway maple (Acer platanoides), Wych elm (Ulmus glabra) and common ash (Fraxinus excelsior) is a green semi-humid mountain forest with closed canopy and fast growth, with insignificant shrub level and bulbous-tubercular herbaceous plants blooming prior to frondescence.

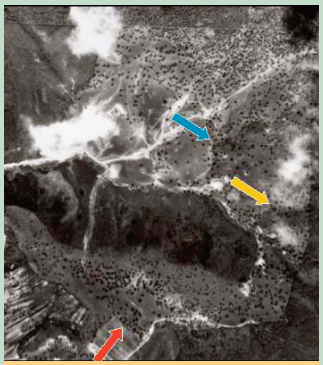
In the steep and narrow valleys, in rocky mountain ridges, on karren-dolina surfaces and areas with extreme climate, extrazonal associations

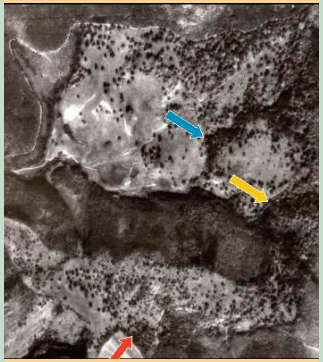
The 'Virgin Forest' (Photo by T. Sz.)

Carlina acaulis (Photo by J. S.)

Karst shrub forest on the Nagy-Eged (Photo by Cs. B.)

Gorge valley (Photo by Cs. B.)





Cserépfalu – Hidegkút-laposa. With the traditional grazing and mast disappearing, the wooded pasture-lands composed of sessile oak and Turkey oak woods several hundred years old were witnessed becoming weedy, shrubby and afforested. Two stages of this process are documented by aerial photos taken in 1956 (above) and 1996 (below).

Hungarian grey cattle (Photo by Z. I.)

Management of grasslands

From the point of view of nature conservation management, the most relevant and vulnerable habitats are the grasslands that have and extent of more than 1000 hectares in the Bükk National Park. From the point of view of coenology, a wide range of grasslands belong here, providing habitat for different biocoenoses with characteristic species compositions. Grasslands within the area of the national park, from the point of view of nature conservation, can be classified into two main categories:

– The first one includes grasslands that do not require active nature conservation treatment intervention. These are the so-called edaphic grasslands ('indigenous grasslands'), such as, for example, rock grasslands, sinkhole meadows and steppe meadows.
– The other main group inculdes grasslands, whose sustenance demands active nature conservation intervention: meadow hayfields, piedmont pasture-lands, wooded pasture-lands, orchards with a reared base and semi-dry grasslands at former vineyards.

Mountain meadows of grazing origin used to be sustained by regular reaping. The winter fodder demand of the animal stock in the central area of the mountains (Répáshuta, Bükkszentkereszt) and in the villages at the foothill areas was satisfied by the rich mountain hayfields. Along with the collapse of pasturing and the decrease of the animal-stock in the past decades, reaping that sustained meadows also discontinued. As a result of this, the turf structure and species composition of the meadows becomes transformed and, finally, they become afforested. The animal stock of the villages was pastured and mast on foothill pasture-lands and wooded pasture-lands, also of grazing origin. With the traditional animal husbandry disappearing, such foothill pasture-lands will also become weedy, shrubby and afforested.

Maintaining habitats of nature conservation interest and their coenoses, the Bükk National Park Directorate organises the restoration of meadows into their previous state (meadow reconstruction) and their preservation in the most favourable conditions (meadow preservation by reaping) from the point of view of nature conservation, with the needs of the protected species living here taken into consideration. To guarantee that management activities take place in an appropriate way, the traditional, previously characteristic methods of farming which sustained the grasslands and, on the other hand, the range of natural values to be protected need to be studied. A management method by which grasslands can be preserved, together with their values of nature conservation, landscape-scenery and farming history, can be developed with respect to these two considerations.

Meadow and bog reconstruction works (Photo by Z. I.)

have been formed. The edaphic association of deep valleys with cool and humid climate is the ravine forest whose abundant herbaceous level's Ice-Age relict species are for example Alpine clematis (Clematis alpina), Alpine rockcress (Arabis alpina) and yellow wood violet (Viola biflora), but perennial honesty (Lunaria rediviva), Anthriscus nitidus, Hart's-tongue (Phyllitis scolopendrium) and Aconitum moldavicum are also common. On the rocky limestone hillsides with southern exposure, ash lime rock forests, with Hesperis vrabelyiana, Carex brevicollis and barren strawberry (Waldsteinia geoides) in its sward are the memento of the warming period following the Ice Age at 9000-7500 B.C. Sub-Pannonic mixed whitebeam-lime relict forests present on the steepest rocky hillsides are rich in sub-alpine relict species.

On the warm slopes of the south-eastern Bükk Mountains with thin soil, association complexes composed of fair shrub forests, thermophile oak forests and steppe meadow patches can be found. Of the treeless vegetation types, typical stocks of the limestone-dolomite rock grasslands or siliceous grasslands formed on volcanic rocks should be mentioned as found for example on the so-called 'Range of stones' (between the Bél-kő and Három-kő). Species-rich mountain meadows in the mountain region that used to be utilised as hayfields have been evolved by deforestation. On the Nagy-mező and Zsidó (Jewish) Meadow interspersed by dolinas, several rare plant species can be found (see page 26).

Forest reserves in the Bükk Mountains

As codified by Article No. 3. § 29 of Act No. LIII of 1996 on nature conservation, 'forest reserves are forest areas promoting the prevention of natural or quasi-natural forest bio-coenoses, the unlimited predominance of natural processes as well as the research of such processes as pronounced by the minister… by law.' Forest reserves of the Bükk National Park (in total: 2336.1 hectares) as well as their core areas (in total: 560.6 hectares) were designated within Hungary by the Decree No. 3/2000. (24 March) by the Ministry of the Environment.

1. Hór Valley Forest Reserve (area: 439.1 ha, core area: 61.1 ha): Uniquely diversified and species rich area.
2. Kecskés-galya Forest Reserve (area: 211.6 ha, core area: 87 ha): Quasi-natural, old stocks of species rich thermophile oak-forests characteristic of the southern Bükk Mountains.
3. Vár (Castle) Hill Forest Reserve (area: 338.9 ha, core area: 94.1 ha): A complex of old and uniquely structured mid-mountain oak-wood stocks with significant biodiversity.
4. Őserdő (Virgin Forest) Forest Reserve (area: 375.3 ha, core area: 59.3 ha): Despite its name, it is not a ' virgin forest', however, it has been untouched for approximately 150 years (the age of the oldest trees exceeds 200 years). It is a mountain beech forest, with diversified wood stock-structure and growing stages. This beech forest is,

Hesperis vrabelyiana (Photo by J. S.)

Yellow woodland anemone (Anemone ranunculoides) (Photo by Cs. B.)

Paradise plant (Daphne mezereum) (Photo by J. S.)

Pine forests

Planted pine forests are also part of the Bükk Plateau's scenery. Intensive plantation of pine began at the Plateau in the first half of the 19th century taking place at clearances to some extent but mainly by reconstruction of the stock, replacing beech-woods. As concluded by the working plan of the Diósgyőr crown manor in 1815–1818, sites of the 2nd cutting line at the woods of Újhuta were suitable for planting Larch and Spruce. The famous 'Swedish pine forest' was grown from the cores of fir trees purchased in Sweden in 1887. Adjacent to this are the spruce woods of Jávorkút planted in 1876. The range of species in the so-called 'Native pine forest' with an area of 8 hectares is much wider compared to the previous one as it is mixed forest (with 78% being spruce and beech 22%). The age of forest composed of pine typically with age groups for end-use was estimated to be 140 years. The 130-year-old standing of spruces exceeding the height and exceeding the height of 40 m today is, due to the climatic conditions unfavourable for spruce, increasingly worsening. Dry trees fall and the light intruding at the 'soul' replacing them will provide good conditions to the growing of young beech trees as well as to the natural rejuvenation of the forest.

The 'Native pine forest' of Jávorkút (Photo by Cs. B.)

The mountain beech forest of the Őserdő (Virgin Forest) Forest Reserve (Photo by Cs. B.)

at present, at a state of collapse, i.e. most of the old trees have been decayed through natural processes (e.g. due to the major windstorms in 2004 and 2005). A new generation is growing at the so-called leaks, i.e. uncanopied areas in the place of fallen trees

5. Leány Valley Forest Reserve (area: 376.9 ha, core area: 56.9 ha): Extremely valuable and diverse relict-conservation area in the Bükk Mountains with an outstanding natural value. It must not be disturbed even by research. A special relict species, the yellow wood violet (Viola biflora) lives in its gorge.
6. Pap-hárs – Kecskevár Forest Reserve (area: 191.5 ha, core area: 57.8 ha): A complex of various mid-mountain oak forest associations.
7. Csókás Valley Forest Reserve (area: 402.8 ha, core area: 144.4 ha): White oak and sessile oak forest associations, in which, at some locations, a significant tree species dynamics can be observed.

Flora of the Bükk Mountains

The abundant flora of the Bükk Mountains contains more than 1300 plant species, of which 16 are only endemic here in Hungary. Most of these rare species can be observed at one habitats even int he Bükk Mountains. As these species are rather remarkable, they all should be listed: Alpine rockcress (Arabis alpina), Armeria elongata, Asplenium lepidum, Calamintha thymifolia, Diphasium alpinum-issleri, Dragon's head (Dracocephalum ruyschiana), Slender Cottongrass (Eriophorum gracile), Hesperis vrabelyiana, Hieracium bupleuroides ssp. tatrae, Lathyrus transsylvanicus, Tufted loosestrife (Lysimachia thyrsiflora), Rock currant (Ribes petraeum), Sesleria hungarica, Sorbus austriaca ssp. hazslinszkyana, marsh valeriana (Valeriana simplicifolia) and Yellow wood violet (Viola biflora).

Plant species can be classified both based on their distribution and occurrences. Based on these, one can mention endemic plants that are known as independent species of areas with various extent as for example Hesperis vrabelyiana and Sesleria hungarica. The specific endemic plants of the Carpathian Basin occur in the Bükk Mountains mostly at the mountain rims or in the xerotherm associations of warm southern hillsides, as for example Awnless brome (Bromus inermis), Carduus collinus, Pannonian knapweed (Centaurea sadleriana), Pasture hawksbeard (Crepis pannonica), Dianthus pontederae, Smelly wallflower (Erysimum odoratum), Ferula sadleriana, Onosma arenaria and Thlaspi jankae.

The following group is composed of species of the ranges of the Carpathians including Aconitum moldavicum, Centaurea mollis, Cerastium tomentosum, Cytisus ciliatus, Dianthus plumarius ssp. Praecox, Fewflower draba (Draba lasiocarpa), Lathyrus transsylvanicus, Minuartia frutescens, Annual meadow-grass (Poa annua), Small scabious (Scabiosa columbaria), Sesleria heufleriana and Sorbus austriaca ssp. Hazslinszkyana. They live at higher terrains or northerly slopes of the Bükk Mountains.

The development of the mountains' vegetation was influenced by various climatic periods, among them primarily the fluctuation of Atlantic-more humid and arid-continental stages of 10 000 years following the latest glaciation. In this stage, certain plant species predominated at large areas while others were repulsed to so-called refuges. Plant species standing out the fluctuations of climate changes at such refuges are relicts (relict species).

Pre-Pleistocene relicts of the Bükk Mountains are Calamintha thymifolia, Common smoketree (Cotinus coggygria) (that is likely to have been distributed during the interglacials) and Ferula sadleriana.

Pleistocene and dealpine-borel (subalpine vegetation) relicts are Variegated monkshood (Aconitum variegatum L. subsp. gracile), Victory onon (Allium victorialis), Anthriscus nitida, Alpine rockcress (Arabis alpina), Green spleenwort (Asplenium viride), Broadleaf grapefern (Botrychium multifidum), Calamagrostis varia, Wide-leaved bellflower (Campanula latifolia), Centaurea mollis, Yellow thistle (Cirsium erisithales), Alpine clematis (Clematis alpina), Glyceria nemoralis, Hieracium bupleuroides, Mossy sandwort (Moehringia muscosa L.), Butterbur broomrape (Orobanche flava Mart.), Bagifana, Roundheaded Rampion (Phyteuma orbiculare), Polystichum spp., Alpine currant (Ribes alpinum), Alpine rose (Rosa pendulina), Stone bramble (Rubus saxatilis), Wedgeleaf saxifrage (Saxifraga adscendens) and White mountain saxifrage (Saxifraga paniculata), Lycium, Senecio rivularis, Blue sesleria (Sesleria varia), Common yew (Taxus baccata), Telekia speciosa, Valeriana tripteris and Valeriana simplicifolia, Arctic Yellow violet (Viola biflora) and Rusty woodsia (Woodsia ilvensis).

Relicts of the cool continental climatic period are Bupleurum longifolium, Carex brevicollis, Cimicifuga racemosa, Dracocephalum ruyschiana, Thalictrum foetidum and Waldsteinia geoides.

Maiden pink (Dianthus deltoides) (Photo by S. J.)

Yellow wood violet (Viola biflora) (Photo by S. J.)

Telekia speciosa (Photo by Cs. B.)

Lady's slipper (Cypripedium calceolus L.) (Photo by Cs. B.)

Bothrychium multifidum (Photo by S. J.)

Cottage pink (Dianthus plumarius L. ssp. praecox (Photo by S. J.)

Species protection programs for strictly protected plants in the Bükk National Park

In the area of the Bükk National Park, many species protection programs, initiated in order to salvage stocks, rehabilitate the habitats or increase the number of individuals of vulnerable and endangered plant species, have been taking place.

Lady's slipper (Cypripedium calceolus L.) is a strictly protected orchid with the largest flowers in Hungary. Regarding its habitat, it is primarily a forest species, often linked to special forest associations and being extremely susceptible to succession changes at its habitat. It tolerates neither excessive sunlight nor deep shadow. By today only about 20 of its occurrences are known in Hungary. Due to the low number of individuals of the populations it is extremely vulnerable and is presently endangered.

This plant with extremely complicated mechanism of reproduction had been cadastered followed by intervening actions: fencing and guarding of endangered habitats, confining disadvantageous succession processes and invasive extraneous tree species, in the case of populations with a low number of individuals, carrying out artificial pollination and preparations for artificial reproduction. In order to control the impacts of interventions, continuous monitoring surveys are conducted.

Bothrychium multifidum (GMEL.) RUPR. is extremely endangered in nearly the whole of its distribution area. It is the only known population in Hungary can be found in the Bükk Mountains, whose number of individuals fluctuates between 25 and 300. This fern species, primarily linked to mountain mat-grass swards and sometimes to acidophilous oak forests, belongs to the group of one of the oldest heath species.

From the point of view of the species' sustenance in Hungary, the greatest problem occurs to be that mat-grass swards in the last two decades have undergone a significant decrease caused by a lack of the traditional use of meadows as well as by climatic reasons. In order to conserve this species, meadow management tasks are taken up by the Bükk National Park Directorate.

The most important task is the fastest possible reconstruction of this habitat of very small extent, vigorously becoming scrubby and forested and the sustenance of the optimal turf structure.

Cottage pink (Dianthus plumarius L. ssp. praecox (KIT. EX SCHULT.) DOMIN) is present at three locations in Hungary: at the Esztramos at the margins of the Bódva Valley, and at two sites in the Bükk Mountains of which the Bél-kő is better known. The stock at the Bél-kő was devastated by limestone quarrying for decades, and its long-term sustenance seemed to be warranted only at the protected south-western pike of the hill. This species, also regarded as a Pleistocene relict species, can be found exclusively at open limestone rock grasslands that are greatly threatened by the grazing and treading of the extraneous moufflon, over-populous in the Bükk Mountains.

At present, the species' monitoring is being carried out, with attention paid to changes in its distribution and the number of individuals within the population. Following the closing-up of the limestone quarry at the Bél-kő in 2003, the area was given into the trustee of the Bükk National Park Directorate, thus no further decay in the plant's habitat has taken place and, even we have been experiencing, due to the natural succession of the open limestone surfaces, a rather rapid increase in the number of individuals.

Fauna

The Bükk Mountains – that, from zoo-geographical point of view, belongs to the Eumatricum fauna region of the Matricum fauna district – is a collecting place of the most varied fauna elements. Whereas in the habitat types with cold and wet climate (e.g. gorges) of the mountains boreal, boreal-alpine, mountain and Carpathian fauna elements have predominance, on the rock ruptures ranging on the southern 'façade' of the plateau (on the range of the 'rocks of the Bükk') as well as in the dry and warm habitats of the southern Bükk, sub-Mediterranean, Illyrian and continental elements predominate. Endemic species living only in the Bükk Mountains, as for example Duvalius Gebhardti or sub-endemic butterfly species such as Enterphria cyanata or mountain argus (Aricia artaxerxes) are very valuable. As a result of the various impacts on the fauna, the diverse geomorphologic features and the multi-coloured vegetation, a species-rich fauna has been evolved, as an estimated minimum number of ca. 22 000 animal species are present in the Bükk Mountains.

In the extended zonal beech forests lives, along with several other insects, the sub-alpine rosalia longicorn (Rosalia alpina). Characteristic species of the avifauna of beech forests are wood warbler (Phylloscopus sibilatrix), collared flycatcher (Ficedula albicollis), black woodpecker (Dryocopus martius), stock pigeon (Columba oenas), whereas in the older, seminatural forests is white-backed woodpecker (Dendrocopos leucotos).

Many rare species can be found in the gorges at the northern part of the mountains. Of the snails, a typical east-Carpathian endemic species is the Bielzia coerulans or Vertigo substriata being a glacial relict. Further typical ravine forest species are: mountain green-

Bush cricket (Saga pedo) (Photo by T. Sz.)

The living world of waters

The characteristic animals of the living world of karst springs are snail species preferring cold and clear water: Bithynella austriaca and Sadleriana pannonica. In the warm springs at the southern rim of the mountains lives a Mezosoic relict species, the Theodoxus praevostianus. Members of the fish fauna of some major watercourses to be mentioned are the brown trout (Salmo trutta m. fario) and Barbus meridionalis petényi Heckel, being a Pannonian endemism. In the still-waters lives the Alpine newt (Triturus alpestris) preservation of which is supported by the reconstruction of former wetlands and an indoor reproduction program.

Moufflons (Photo by R. J.)

Lipica stud at the Nagy-mező (Photo by Cs. B.)

The Lipica horses

The breeding stock of the stud at Csipkéskút now being part of the image of the Bükk Plateau's western part was started to be propagated by the Archduke Karl von Habsburg in 1580 in a tiny village of Lipizza near Triest at the foot of the Karst Mountains. The state stud consisting of Andalusia horses bred here set out a long journey at many occasions from 1797, finally arriving to Hungary, or more precisely to Mezőhegyes in 1804. In 1874, the stud was put out to Fogaras than to Bábolna in 1912. As the Lipica horses prefer mountain conditions, the entire breeding stock was re-settled in the Bükk Mountains between 1950 and 1961. The stable for stud-horses and mares is in Szilvásvárad where birth is given to colts that, after separation, are raised at the Bükk Plateau, Csipkéskút and the Nagy-mező until the age of 3.

Greater mouse-eared bat (Myotis myotis) (Photo by P. E.)

veined white butterfly (Pieris bryoniae) of the butterflies while among the bird species, Red-breasted Flycatcher (Ficedula parva).

Rare butterflies of the dolina meadows in the Bükk Plateau are mountain argus (Aricia artaxerxes), Maculinea xerophila and Noctuidae. Dolina meadows are loud because of a Psophus stridulus. Among the beetles, four rare protected Carabus species are worth mentioning, i.e. Carabus glabratus, garden carabus (Carabus hortensis), Carabus scheidleri and the previously mentioned cave-dweller Duvalius Gebhardti. In the shrub forests, thermophile oak-forests and dry turf associations of the mountains, as for example on the 'galya hills (treeless, grassy hills)' located in the south-eastern Bükk Mountains, thermophile fauna elements are present, such as Rileyana fovea, a Buprestidae species called Anthaxia hungarica or predatory bush cricket (Saga pedo) with a sub-Mediterranean distribution. Rock-grasslands,

Large banded grasshopper (Arcyptera fusca) (Photo by Z. V.)

slope steppe meadow-patches are the habitat of the sub-endemic snake-eyed skink (Ablepharus kitaibelii). The most significant ornithological value of the karst shrub forests is rock bunting (Emberiza cia).

The majority of the bat population in Hungary can be found in the caves of the Bükk Mountains. Rarities of the bat fauna of the mountains are Savi's pipistrelle (Pipistrellus savii), a Brandt's bat (Myotis brandti), a whiskered bat (Myotis mystacinus), long-eared bat (Barbastella barbastellus), Bechstein's bat (Myotis bechsteini) and greater noctule (Nyctalus lasiopterus) now thought to be extinct. Schreiber's bat (Miniopterus schreibersi) and Mediterranean horseshoe bat (Rhinolophus euryale) extremely endangered in Europe propagate only in caves. Among the birds of prey, peregrine falcon (Falco peregrinus) re-appearing on the rocks of the mountains must be mentioned as well as Saker falcon (Falco cherrug), Hungary's treasured ornithological rarity. Protection programs and monitoring-type research carried out in the area of the Bükk National Park also made a great contribution to the distribution of this latter one. In recent years, most of the nesting flocks of the species have moved to its original habitats, i.e. to plainlands.

Protection of birds of prey

Demands for the active protection of birds of prey were apparent at the time of the establishment of the Bükk National Park. It had been known before that the area of the Bükk Mountains is abundant in strictly protected birds of prey (e.g. saker falcon, imperial eagle, lesser spotted eagle, booted eagle, short-toed eagle, honey buzzard), however limited information was available on the volume of their stocks, vulnerability and nesting sites.

First, mapping of nests began, resulting in, until now, the cadastering and annual supervision of more than 1500 stick-nests in the Bükk Mountains. Following the basic cadastering of the rarest species' flocks, exploration of the endangering factors took place, aiming at prevention against them. It became apparent that, in addition to providing a so-called areal protection, elaboration and application of active conservation programs in accordance with the special demands of given species are also required.

During the 1980s, the flock of saker falcon (Falco cherrug) was the most endangered as only 30–40 pairs nested in the country. At that time, guarding of the threatened nests began and such actions proved to be extremely successful as from the guarded nests, 100 youngs flied out within one and a half decade, establishing the later saker flock of the plainlands at the foregrounds of the mountains.

Another ornithological rarity is the imperial eagle (Aquila heliaca). Compared to the 5-6 pairs at the beginning, today more than 50 pairs of this compelling bird of prey breed in our operation area. Approximately 20% of the pairs breed in secure artificial nests year by year.

A protected rarity of our mountainous forests is the lesser spotted eagle (Aquila pomarina). In addition to the cadastering of its flock, a protection program for the younger nestling which nearly almost dies was experimented and first applied in the country in our operation area. The smaller nest-mate ('Abel') can not be brought up because of the aggressive behaviour of the bigger young that hatched earlier ('Cain'). The intervention requires an almost up-to-date knowledge of the time of hatching as a few hours' delay would result in the smaller young being found dead by nature conservationists.

Imperial eagle (Aquila heliaca) (Photo by T. Sz.)

Constructing an artificial nest (Photo by T. Sz.)

Saker falcon (Falco cherrug) (Photo by T. Sz.)

Active protection of the birds of prey is not an undangerous task (Photo by T. Sz.)

The Suba-lyuk Cave (Photo by Cs. B.)

Flint stone instruments of the Mousteri culture

Neanderthal horde (after Zdenek Burian)

MAN IN THE BÜKK

Primitive cultures in the Bükk Mountains – the Stone Age

At the end of the Pleistocene, from ca. 130 thousand years ago, many caves of the Bükk Mountains provided shelter to people living in this area. From the Suba-lyuk Cave situated in the forepart of the Hór Valley in the southern Bükk, stone instruments of the Paleolithic Mousteri culture were explored and from the layer deposited 71 to 61 thousand years ago, the famous findings of the Neanderthal man became well-known. The most famous are the palaeo-archaeological findings of the Szeleta Cave. Based on the more than 700 stone instruments of chalcedony, quartz porphyry and obsidian as well as the characteristic bayleaf-shaped spearheads, a substantive Palaeolithic culture (Szeleta culture) was described by experts. From the Istállós-kő Cave above the Village of Szilvásvárad, bone and stone instruments (spearheads, arrow-heads and one of the most valuable findings of the Hungarian palaeoarchaeology, i.e. a flute made of the bone of a young cave-bear) made by the folks of

The Szeleta Cave is the most famous site of palaeo-archaeological findings in Hungary (Photo by B. B.)

the Aurignaci culture living here from 44 thousand years ago for about 20 thousand years were discovered.

During the excavations in 1906, first in the Kecske-lyuk cave and Büdös-pest cave of the Forrás Valley while later in the Szeleta Cave of Hámor, typical Neolithic pottery findings were discovered that were defined by Lajos Bella as a separate culture. Folks of the Bükk civilisation (6th to 5th millennia B.C.) lived in timbered houses, traces of such settlements were discovered at the higher ranges of the mountains as well as in the valleys of minor streams and major rivers. One of the special features of the culture is that caves were used both as residential and burial places (e.g. Kő-lyuk Cave No.2 or Jenő Hillebrand Cave).

Fortified settlements – the Bronz Age

The first classic era of the Palaeolithic 'castles' was the Early and Middle Bronze Ages. People of the Hatvani culture of the Early Bronze Age (2000–1750 B.C.) and the Füzesabonyi culture of the Middle Bronze Age (1750–1350 B.C.) settled down mostly at the marginal hills of the Bükk and Mátra mountains. Their characteristic fortress type was the small castle (0.02–0.08 ha) next to the larger 'open ground'. The protected area mostly surrounded only by trenches might belong to the upper class and likely to serve their segregation from their own people as well as defence against nearby folks and hostile tribes of other cultures.

The second great era of the Palaeolithic fortified settlements started in the Late Bronze Age. Settlements of the Kyjatice culture (from the 12th to the 8th-7th century B.C, i.e. until the intrusion by 'pre-Scythians') surrounded by ramparts, trenches and steep hillsides are extensive and rather impressive in appearance; they are present in the inner areas of our mountains at relatively high hilltops: Bükkszentlászló – Nagysánc, Miskolctapolca – Vár (Castle) Hill, Bükkaranyos – Földvár, Cserépfalu – Mész-tető, Sály – Latorvár-tető, Felsőtárkány – Vár (Castle) Hill.

The rampart of Kelemen széke (Kelemen's seat) from the Bronz Age (Photo by Cs. B.)

Fortresses, monasteries – the Middle Ages

In the area of the Bükk Mountains, remnants of towers, walls and ramparts of 16 fortresses from the Middle Ages can be found. The girdle of walls of the wide-footed rampart castle of Sály (the Fortress of Örsur as also mentioned by Anonymus) and the Vár (Castle) Hill of Felsőtárkány represents only the beginnings just as the most well-known fortress of the mountains, i.e. the Castle of Diósgyőr remained in the most well-conditioned.

On the ethels of the Örsur kin, at the hill above the medieval settlement of Váralja, one can find the tower of the Váralja branch, i.e. the Latorvár whereas on the castle hill of Kács (Tibolddaróc),

Beehive-rocks

One of the most unique types of the natural rock formations carved by mankind is the so-called 'beehive-rocks' occurring in the greatest numbers in the Bükkalja Region. These rocks with niches were called beehive-rocks by the inhabitants of Szomolya, whereas they are called blank-windowed stones at around Eger, and churn-stones, Ördögtorony (Devil's tower), Nagy-Bábaszék (Great midwife's chair), Nyerges (Saddler), Hegyes-kő (Sharp rock), Kecske-kő (Goat rock), Ablakos-kő (Windowed rock), Királyszéke (King's chair), Kősárkány (Rock dragon) at other places. A number of theories have been created in connection with the function and age of the niches as well as the features of the carvers and users of the niches (population, ethnic, group). According to one of them, the beehive-rocks used to be tombs, and urns with the deceased's ashes were placed to the niches. Another theory designated these false windows as fetish staddles and sacrifice, claiming that these mementos are of the Conquest of Hungary in age. Another apprehension has become popular to the public, according to which the niches of the beehive-rocks are mementos of the Medieval forest rock apiculture, and this kind of apiculture was introduced by either the Kabars joining the Hungarians during the time of the Conquest of Hungary or by a small ethnic group escaped here from the Balkan Peninsula (Agrians).
In the Bükkalja Region, altogether 72 beehive-rocks from 38 localities are known, and 473 niches were recorded on the rock formations.

The Beehive rock named Király-széke (King's seat) at Szomolya (Photo by Cs. B.)

The Castle of Diósgyőr

The castle's history is revealed by many data in diplomas, former descriptions, mentioned in the literature and depictions. After Anonymus, historians presumed in unison the conquering Hungarians had to find an established castle at this location. This was also justified by excavations exposing the traces of a wooden structure put together from posts and timber beneath the oldest castle wall. The motte owned by the Bors Dynasty could stand as long as the Tatar Invasion after which castle walls were constructed of stone. The first stone fortress is derived to Ban Ernye of the Ákos Dynasty who, due to his crossing of King Charles Robert of Anjou, lost it in 1316 along with his proprieties. The heyday of the castle was estimated to be during the reign of King Louis the Great by whom it was developed into a four towered, Gothic castle and was visited many times during his long reign (1342–1382). Following the king's death, the Castle of Diósgyőr remained the endowment and provincial residence of queens as long as the defeat at Mohács.

The Castle of Diósgyőr (Photo by Cs. B.)

the fortress of the Daróc branch is seen. Such early, small-sized feudal castles built in the 12th century basically consist of one single tower surrounded by an ensemble of ramparts and trenches. The Odorvár at Cserépfalu, the castle of Kecske-kő at Kisgyőr, the castle of Éles-kő and Gerennavár at Szilvásvárad as well a the Castle of Dédes at Dédestapolcsány are inevitably among our stone castles built following the Tatar invasion: built to serve passive defence at locations hard to access, at heights unattackable found remote from settlements.

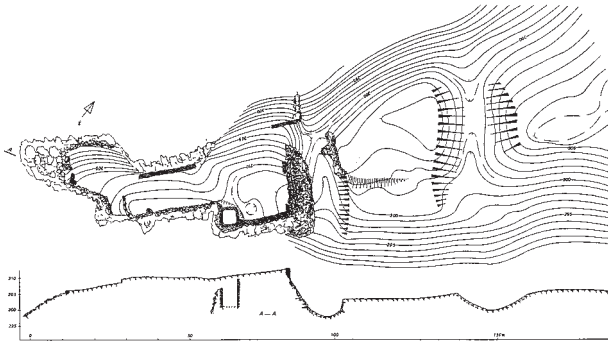
According to the unwritten traditions, at the cragged peak of Gerennavár, a hunting seat was built to King Louis the Great.

During the Middle Ages, several monastic orders settled down in the Bükk Mountains. The Benedictines had their monastery in Görömbölytapolca and Kács. The Cistercian abbey at Háromkút (Bélapátfalva) was founded by the Bishop of Eger Kilit II. The monastery church beneath the Bél-kő still stands today and is one of the most beautiful Romanesque architectural monuments in Hungary. The Carthusians had their monastery in the Barát Valley, north-east from Felsőtárkány. The only monastic order founded by Hungarians, i.e. the Paulines settled down at three locations in the depths of the Bükk Mountains covered by native forests: at the outskirts of Dédes (Szentlélek), in Diósgyőr and Felnémet (Almár). The Pauline monastery at Szentlélek is the only sacral monument of the Middle Ages in the area of the Bükk Plateau.

Ancient roads

As early as in the medieval times, two relevant roads crossed the Bükk Plateau in a north to south direction. The so-called Royal Road starting from Eger, led to the Bükk Plateau from the

Ruins of the Pauline monastery at Szentlélek (Photo by Cs. B.)



The ground plan of the Castle of Szarvaskő (after Gyula Nováki)

Tárkányi Basin through the Egeres and Vörös-kő Valley, on the ridge of Kecskor near the Toldi Gate. As by the oral traditions, the Royal Road led to Gerennavár, the Hunting seat of King Louis the Great. The other most noticeable road of the Bükk Mountains is the Turkish Road still well-traceable today. At the Tiba-kút, it bent to the Bikk-bérc then from Várkút beneath the Vár Hill, it led, through Csipkéskút, Táskás-gerinc and Narrow Bükk to Kőkapu. From there, by the Bánya Hill, crossing the saddle of Kis-Kő-hát, through the Nagy-mező, it led to Bánkút, followed by downhill at the Ördögoldal through the immense Bronze aged ramparts of Verepce near Vásárhely-parlag to the Castle of Dédes.

Forest management and industry – the Modern Age

The picture on the proprietorship and use of the forests in the Bükk Mountains is rather multi-coloured. For example, by Paragraph No. 1 of 1514 the approximately 100,000 acre manor of Diósgyőr was declared to be one of the crown goods that was pignorated and lodged by our kings at many occasions. It was definitively redempted in 1755 from its last beneficiary, i.e. the Chapter of Eger by the Chamber of Szepes by which a forest propriety of approximately 50,000 acres has become government possession ere now. The Bishopric of Eger was designated by King Stephen I around 1000 as well as ensured the protection of patrimony thus that of forests. Of this patrimony, the Cistercian abbey at Bélháromkút founded in the 13th century and the Benedictine abbey of Tapolca had a share. For example, the Bishopric of Eger owned forests with an extent of 13,401 acres at the outskirts of Felsőtárkány and Felnémet from the 19th century however the Arch-chapter of Eger continued to have significant forest tenures. Owners of the manors of the castles of Dédes, Éles-kő and Cserép destroyed during the era of Turkish occupation were also varied frequently.

The Kuruc Bishop

The rock castle of the bishops of Eger already stood at the Vár-bérc above Szarvaskő as early as the 13th century. In 1596, following the fall of Eger and the Battle of Mezőkeresztes, the Turkish military stationed inside its walls. The castle gained importance once again during the time of the Rákóczi War of Independence: István Telekessy kuruc bishop siding with Sovereign Rákóczi was expatriated to the Castle of Szarvaskő in 1710 when the Castle of Eger was captured by imperial general Pálffy.

The Castle of Dédes

Dédeskő was traded, by the neifs of Dédes in 1247 to the Zagreb provost File and his brothers of the Miskolc dynasty who passed it on the Ban Ernye, son of Endrew of the Ákos Dynasty. As the son of Ban Ernye called István as well as his grandchildren sided Máté Csák in 1316, the castle was besieged and occupied by the battalion of King Charles Robert of Anjou. Following this, his own men were appointed as castellans. The fortress was besieged in 1567 by the Pasha Hassan of Timisoara when the tower was blown up onto the Turkish by the escaping defenders.

A view of Kisvár and Dédesvár (Castle of Dédes) (Photo by Cs. B.)

Forest Proprieties, Manors

The Manor of Dédes, by royal gift became a property of Serényi Family whereas the Forest propriety of Szilvás that of Keglevich Family. The Forest of Cserépfalu belonged during the 18th century, by marriages, praefectio and royal gifts to the Forgách, Dessewffy, Esterházy and Koháry families then from 1817 became the property of Ferdinand, Prince of Coburg-Saxon-Gotha through a marriage. This fidei-commissum under the name Coburg Propriety founded at the end of the 19th century had a forest of 6,153 acres. The 8500 hectares forest manor including the western part of the Bükk Plateau was purchased by Karl Wessely in 1901 who in 1904 was qualified for exploiting the coal resources around the Village of Egercsehi, in 1907 established the Eger–Putnok Local Railway Corporation then in 1910 built up the Cement Works of Bélapátfala. Wessely, in 1913 sold his forests to Margrave Alfonz Pallavicini who started the intensive works of exploration of the Bükk Plateau's parts west of Bánkút, the construction of roads and railways and the exploitation of forests. As a result of the Law on Land Reform in 1945, these church and private-owned forests also became state-owned.

Former foresters in the Bükk Mountains (archive)

The use of forests in the Middle Ages was not restrained. The ceasing of free use of forests could be first referred by the Werbőczy laws: neifs were forbidden to cut woods and could receive building and firewood as demanded in accordance to the wood allowance law to peasants to which they were obliged to serve. Furthermore, forest owners took a tenth from mast pigs as well as payments had to be made for grazing, lime- and coal-burning.

The beginnings of regular forest management are estimated to the mid-18th century when fundamental changes took place in the approach of the management of chamber as the industrial development based on the use of wood has gained increasing importance. As a result of the increasing demand for wood, an inspection of forests owned by the chamber and the regulation of logging were ordained. It was then when the entire manor of Diósgyőr was cadastered based on previous decrees of the chamber, terriers of 1767 and the forest regulations of 1769 by Maria Theresia. According to Paragraph No. 31 of 1879, the working plans of government forests were renewed as well as the first working plans for church-owned forests and entails were compiled that also regulated the sustenance of forests. A rotation of 100 years for government forests was proposed by the forest stewardship of Tótsóvár, a rotation of 60-80 years for church forests by the pubic foundation forest stewardship whereas the working plan for the Coburg manor was prepared by its own domanial forest stewardship.

Accordingly, the forests of Bükk Mountains were dominated by peace and quiet until the 18th century, with the mountains' interiors wandered mainly by hunters, woodcutters, herds, calciners and those picking forest products. The utilisation of the region's minerals and forests for industrial purposes began in the early 1700s. The wood demand of glass-works (the first domanial glass-work started to operate in the forest propriety of the Diósgyőr crown manor between 1712 and 1720, Répáshuta – 1766, Gyertyán Valley – 1834), iron-smelters and tilting mills as well as the paper mill at the Szinva Valley (1782) could only be fulfilled by this immense mass of forests.

The renaissance of the region's iron industry started in the second half of the 18th century. In this regard, Henrik Fazola merited full credits for discovering the regions of the Bükk and Mátra Mountains between 1768 and 1769 at his own expenses. In 1769, he discovered iron ore of good quality at the outskirts of Uppony and based on the raw material exploited in the Péter Mine opened, between September 1771 and late 1772, he built the blast furnace of Ómassa as well as tilting mills No. 1 and 2 at Hámor where in the same year, iron-melting was started.

As a consequence of the reviving forest management at the turning of the 19th and 20th centuries, narrow-gauge railways were established in the Bükk Mountains that are today used for tourism purposes.

A mountain beech-woods section (Photo by Cs. B.)

The Beginnings of Nature Conservation in the Bükk Mountains

The role of forests in social welfare was recognised by the forest treasury as early as the late 19th century: after 1892, 475 acres of park forests around the villa yards of Lillafüred containing walking and tourist trails were designated that was, following the construction of Hotel Palota have been finished, extended to 841.3 cadastral acres. In 1922, the working plans for the 11.3-acre, 150-year-old oak-woods at Mocsolyás, the 7.1-acre, 130-year-old beech-woods at Lillafüred and the 20.8 cadastral acre area spruce-woods of Jávorkút were complied as for natural vestiges and these areas, along with the 42.2 cadastral acre old beech-woods of the Pallavicini Propriety at Szilvásvárad were designated as nature conservation areas in 1942. Basically, the core of the Bükk National Park consisted of the spruce forest at Jávorkút planted in ('Native Pine forest') and the 'Swedish Pine Woods' planted in 1887 as well as the so-called 'Native forest' found at the southern Virágos-sár hillside above the Sima-kő.

Hotel Palota in Lillafüred (Photo by Cs. B.)

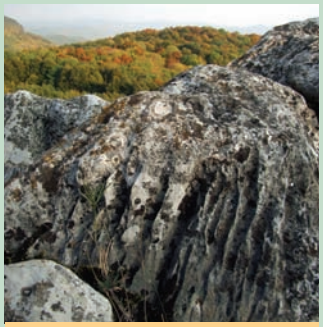
Iron Smelters

At Szilvásvárad, an iron tilting-mill was established by Count Adam followed by the setting-up of a smelter based on the iron ore of the Mária Mine at Bélapátfalva discovered between 1801 and 1803 and the St Anna Mine in the Gilitka Valley. This iron smelter operated until 1848 whereas the tilting mill until the early 1870s.
The selected site of the Great Smelter of Ómassa, however, did not proved to be successful: the smelter was built too close to the stream and production was hindered by water-logged soil conditions.
Although, the re-location of the smelter was proposed as early as in 1777, it was accomplished only in 1813 when the original smelter in Újmassa still seen today as an industrial monument was constructed.
The factory proved to be viable, until 1868 exclusively charcoal was used for smelting. Following this, the firm then being owned by the Hungarian State was re-located to Diósgyőr becoming, due to the orders by the state, one of the largest heavy-industrial plant giants of the country in the 19–20th centuries.

Old smelter in the Garadna Valley (Photo by Cs. B.)

The karst water balance of the autogenous karst is not linked to the waters of the surrounding non-karstic terrain but only to the precipitation: in such case, water flows from the karst toward lower non-karstic areas.

The main feature of derivative karst is that watercourses received from the non-karstic environs also influence the hydrography and karst landforms of the limestone mass.



Dissolved ripples in the limestone (Photo by Cs. B.)

Network of depressions at the Nagy-mező (Photo by Cs. B.)

LANDSCAPES, LANDSCAPE SECTIONS

The 'Table of Giants' – the Bükk Plateau

Most of the Bükk Plateau (the Nagy Plateau and the Kis Plateau) is exhumed open autogenous and exhumed open mixed derivative karsts whose most characteristic landforms are valleys antecedent to limestone and deep-beheaded by a series of sinkhole dolines. Crags and knaps elevated between shallow and arid valleys ('lápa') resultant from the thinning and ripping of overburden layers bear karrens, decayed sinkhole dolines ('overhanging dolines'), potholes or ruinous spring caves. Blind valleys with subterranean stream ending in karst rim sinkholes are peculiar landform elements of open mixed derivative karsts.

The crags and knaps of the Nagy Plateau originated from an Early-Mid-Eocene peneplain further planated transmuted during the Late Oligocene-Early Miocene and began to be exhumed from below the Mid-Late-Miocene overburden during the Late Sarmatian. Their arrangement was determined by the valley system of the mountains' Late Sarmatian-Early Pannonian surface water regime. These internal and rim crags are, at present, elevated as open autogenous karst-islands from the partly covered, partly exhumed derivative karst of the Plateau. On the surface of such crags (Küllő Hill, Istállós-kő, Tar-kő, Cserepes-kő, Pes-kő, Fekete-sár-bérc, Kőris Hill, Örvény-kő) karrens are formed. The less frequent near-knap potholes are the mountains' oldest karst formations, presumedly remnants of

A vast doline at the side of the Köves ridge (Photo by Cs. B.)

sinkhole caves being Late Pliocene or older in age lost their supply areas and horns as e.g. the Kálmán-rét, Kis-Kőhát, Lyukas-gerinc and Mélysár-bérc pothole.

Solitary dolines at the sides of crags, found at near-knap locations and independent from the valley's series of sinkhole dolines, are likely to be the successors of Late Pliocene sinkholes and indicate the level of deep-beheading of the then surface water regime. The largest near-knap 'overhanging dolines' are found at the Korcsmáros Meadow, Kis-Vöröskő-bérc, Kis-Kő-gerinc, Zsérci-Nagy-dél, Hosszú-bérc, Nagy-Kőris and Nagy-Hárs. Among them, the most spectacular is the Tányéros-teber in the proximity of the Istállós-kő.

At the slopes of crags, in addition to the near-knap dolines, caves are also opened as for example the two-entranced Fekete-sári passage being a remnant of aven barely 10 m in length or the Kőrös Cave having the entrance at the highest elevation in Hungary (932 m above sea level) that is among of the mountains older spring cave generation: it could be formed during the Villanyian stage of the Late Pleistocene.

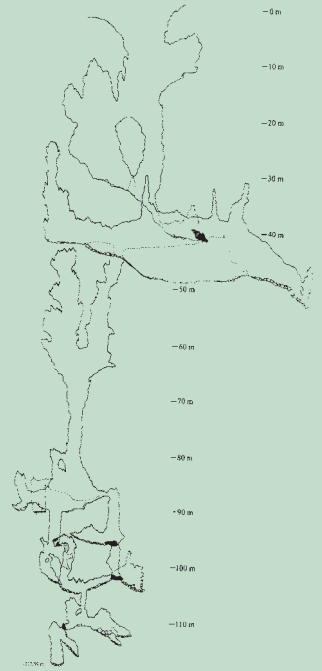
Valleys with sinkhole dolines found between crags and knaps were antecedented to the limestone terrain by the river regime of the plateau's covered karst. The shape of dolines – and, in many cases their functioning, too – refers to their sinkhole origin or sinkhole character: their intersection is aven-shaped, their relative depth (2–25 m) to their diameter (5–200 m) is significant. The longest valley with a series of dolines of the western half of the Nagy Plateau is the Káposztás-kert-lápa. Another good example can be seen along the Jávorkút nature trail, south west to the 'primeval pine forest' in the area between Nagy-Kőris and Kis-Csipkés.

The karst valley of the Nagy-mező from the Kis-kő ridge (Photo by G. K.)

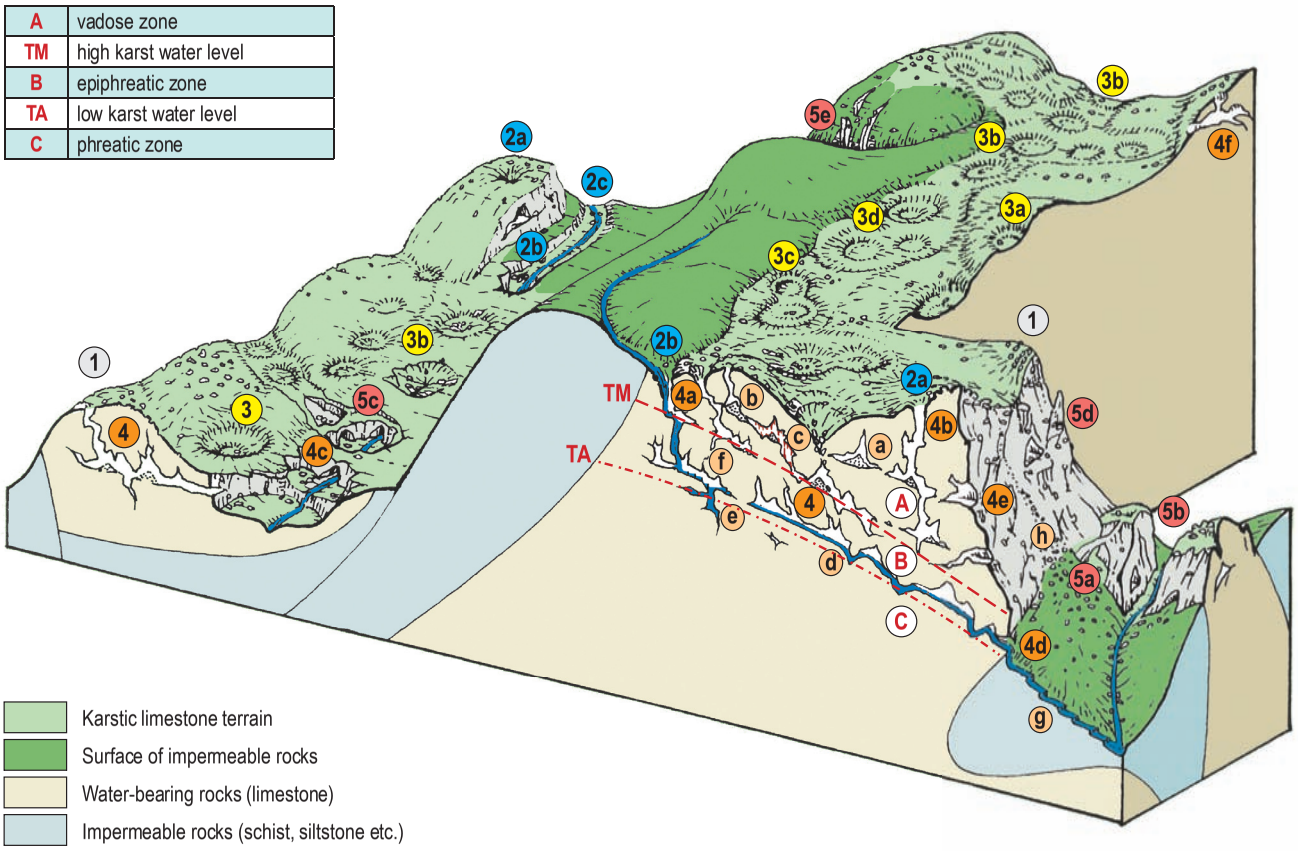
The Zsidó Meadow (Photo by Cs. B.)

The Oldest Pit Cave

The pothole of Kis-Kőhát, judged by its internal landforms, could function as a sinkhole thousand centuries ago. Based on depth, it is ranked as the 7th deepest pit cave in the Bükk Mountains and 17th in Hungary (-114 m). Its quasi-vertical opening, in a depth of 35–40 m expands to an immense hall abundant in dropstones.



The Kis-kőhát pothole (Hungarian National Cave Registry)



An overview block diagram on the karst landforms of the Bükk Moutains (edited and drawn by Csaba Baráz)

A – vadose zone: descending karst water zone, **B** – epiphreatic zone: periodically contains water, **C** – phreatic zone: potholes are permanently filled out by karst water, **TA** – low karst water level, **TM** – high karst water level.

Surface karst landforms

1 –karren, 'ördögszántás' ('Devil's plough-land'),

2 – sinkhole, 2a – near-knap doline pothole (→ 4b), **2b** – sinkhole with (active) sinkhole cave, **2c**– blind valley (underground brook tailing off in sinkhole),

3 – doline, **3a** – single (near-knap, 'overhanging') doline, **3b** – series of sinkhole dolines, **3c** – uvala – twinned doline, **3d** – polje.

Subsurface karst landforms

4 – cave, **4a** – sinkhole cave (functioning), **4b** – pothole (crippled, inactive sinkhole cave), **4c** – through cave with underground brook,

4d – spring cave (functioning), **4e** – elevated decaying spring cave, **4f** – near-knap crippled spring cave.

Surface, karst denudation landforms

5a – ruin cave (rock gate, 'through cave'), **5b** – limestone gorge (rock tunnel, 'rock passage', 'iron gate' formed by the rupture of the cave),

5c – karst escarpment ('escarpment doline'), **5d** – inter-vent tower,

5e – Hogback: limestone layer exposed by denudation accordant to rock quality.

Cave and surface small landforms

a – caved hall with chimney, **b** – ruptured vent with slum scarps, **c** – hall with dropstones, **d** – siphon, **e** – internal sinkhole passage,

f – travertine basins, **g** – travertine (travertine dams, travertine accumulation), **h** – debris cone, debris slope.

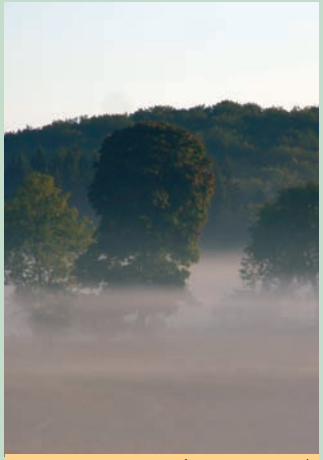
Karrenfeld formed on basset at the top of the Őr-kő (Photo by Cs. B.)

Sinkholes in the karst valley of the Nagy-mező (Photo by Cs. B.)

The Cave of István-lápa (Photo by Cs. E.)

Variegated monkshood (Aconitum variegatum L. subsp. gracile) (Photo by J. S.)

Rime-covered mountain meadow (Photo by Cs. B.)



Trees in radiation fog (Photo by Cs. B.)

Mountain meadows and 'fog ponds' in the Nagy-mező

Herbaceous associations characteristic in the karst areas of the mountains are rock grasslands, doline meadows, steppe meadows or the mountain meadows of the Bükk Plateau, formed as a result of deforestation, regular mowing and grazing. The valuable range of species of the meadows at the plateau consists of plants with various spots of stocks and former forest associations (i.e. a mountain beech-woods, rock forests, brush). This as well as the diverse soil and micro-climatic conditions is the reason for the diversity of the range of species of mountain meadows found on doline surface.

Here mat-grass swards (with the eponym mat-grass), mesophile hay-meadows (whose characteristic plants are Red fescue (Festuca rubra), Upright borme (Bromus erectus) and Tall oat-grass (Arrhenatherum elatius)) as well as, at area with southern exposure steppe meadows can be found. On the surface densely jointed by dolines, a specific microclimate is formed providing habitat for this assemblage of diverse plant associations. Some of the plant species living here are as follows: Common moonwort (Botrychium lunaria), Dane's blood (Campanula glomerata), Carlina acaulis, Dactylorhiza sambucina, Paradise plant (Daphne mezereum), Maiden pink (Dianthus deltoides), Gentianaceae, Gladiolus imbricatus, Fragrant orchid (Gymnadenia conopsea), Hypericum maculatum, Siberian Iris (Iris sibirica), Orange Lily (Lilium bulbiferum), Southern adders-tongue (Ophioglossum vulgatum), Early Purple orchid (Orchis mascula), Traunsteinera globosa, and the cool continental relict Dragon's head (Dracocephalum ruyschiana) living only here in Hungary. A unique association of deep sinkholes with extremely cool and humid microclimate resembling high mountains is tall-herb Aconitum whose eponymous species is Variegated monkshood (Aconitum variegatum L. subsp. gracile).

The basin of the Nagy-mező and, especially the dolines and assemblages of dolines at their bottoms are pitfalls for weighty near-surface air cooled down by irradiation at clear no-wind nights where even during the summer months, frost can occur. Cold 'air ponds' formed in summer and early autumn are rapidly discontinuing dawn phenomena of the dolines of karst valleys with unique microclimate.

Dragon's head (Dracocephalum ruyschiana) (Photo by Cs. B.)

As dolines accumulated by permeable slope detritus are mainly widened by solution, adjacent dolines often merged into double or triple, sometimes even into foursome twin dolines, uvalas.

The Nagy-mező, Zsidó Meadow, the mouth of the Kis-sár Valley and the eastern part of Létrás are significantly different from the valleys with a series of dolines: the sinkhole dolines and uvalas of their wide valleys make up a dense system of depression (karst valleys, poljes). The largest surface karst landform of the Bükk Mountains is the polje (karst valley) of the Nagy-mező: it is an extensive basin deepened into karstifying rock whose bed is jointed by dolines, twin dolines (uvalas) and sinkholes. The dense network of dolines of the Nagy-mező was formed by the former, mostly intermittent watercourses of valleys running from knaps.

The Fekete-sár – Zsidó Meadow area is a somewhat smaller polje (karst valley) compared to the Nagy-mező. The largest doline of the entire mountains, i.e. the Mohos Doline is deepened into the south-western end of the group of dolines.

A significant proportion of the Plateau's sinkhole caves and potholes, as for example, Hungary's deepest cave, the Cave of István-lápa or most of the caves of Borókás-teber, are opened at the bottom of valleys with a series of dolines, twin dolines and karst valleys.

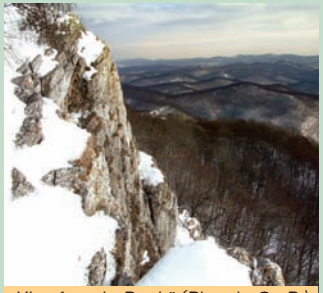
At the Bükk Plateau, non-karstic rocks are present only in minor spots, in narrow strips, springing short watercourses with low discharge terminate as reaching the limestone terrain in sinkholes, making up so-called blind valleys. At the Nagy Plateau, the countercurrent of Bánkút and the sinkhole of Csipkés-kút are worth mentioning. More relevant countercurrents and adherent sinkhole caves (the sinkholes of Létrás, Jávorkút and Bolhás) are located at the eastern part of the plateau.

Cold air ponds at the Nagy-mező (Photo by Cs. B.)

'The Range of Rocks'

The 'rocks', i.e. the vertical, even overbending limestone-walled fringe crags of the Bükk Plateau spectacularly indicate the boundary between the Nagy Plateau and the South-western Bükk Mountains. Its most well-known members are the Bél-kő, Őr-kő, Cserepes-kő, Pes-kő, Tar-kő and Három-kő jointly making up the 'Range of Rocks'.

The southern rim of the Nagy Plateau is, as thought in general, a fault in the junction of limestone and schist. According to some researchers, a reverse fault with a strike of East-West direction can also be proved here. This is, however, contradicted by the saw-tooth character of the southern rim as well as the continuation of the plateau's successive layers in the southern foregrounds. It is more likely that the series of cliffs was formed by denudation in accordance to the geological structure. In the contact zone of rocks with different quality (limestone and schist), in strips cropping out as bassets, rock-gaps and along layers, denudation processes accelerated, solution, weathering and frost shattering became more intense due to which continuous downfall of steep limestone cliffs is experienced. As the physical or chemical weathering of slates is more rapid compared to limestone therefore, they underwent further downfalls after losing their underpinning forming this range of vast cliffs.

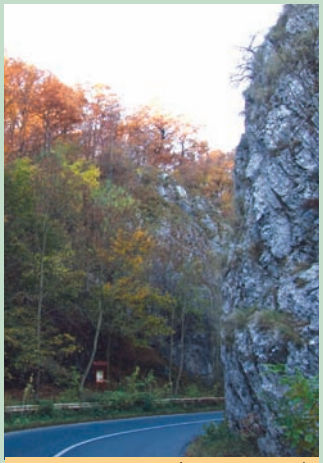


View from the Pes-kő (Photo by Cs. B.)

Limestone Gorges

Derivation of limestone gorges from limestone adits is especially possible where the surface watercourse is antecedent to a terrain containing belts of karstic and non-karstic rocks. From the limestone surfaces, the watercourse is forced to cave passages with brook whose arch will collapse in time. This way of gorge formation could be frequent in the Bükk Mountains during the Pleistocene: in addition to the Hámori Gorge of the Szinva Stream, among others, the Kő-köz at Felsőtárkány, the gorge of the Mész Valley and the Tatár Trench at Bükkszentlászló were also formed through the collapse of caves.

Ruined cave in the Vaskapu, Lök Valley (Photo by Cs. B.)



Gorge of the Kő-köz (Photo by Cs. B.)

The Garadna Valley and the Kis Plateau

The most remarkable valley of the Bükk Plateau is that of the Garadna Stream. It is determined not by a fault but the axis and sliver boundary of one of the mountain's longest anticlines. The immense size, the 150 to 225 m depth of the Garadna Valley is resultant from the softer, i.e. more easily decaying, schist and sandstone complex located between the series of limestones of the Kis Plateau and Nagy Plateau.

These Late Carboniferous and Permian non-karstic rocks as well as the Mid-Late Triassic diabase and porphyrite belts ensure the cutting of the valley's many spring branches (Vadász, Száraz and Farkas-nyak valleys) and most relevant side-valley, i.e. the Hetemér–Három-kút Valley to the interiors of the plateau. The cutting of this latter pair of valleys resulted in the formation of the wreck caves at Köpüs-kő, Köpüs-kő-alja, Három-kút, Magas-kő and Magas-kő-alja.

The most remarkable right-side branch of the Garadna Valley is that of the Szinva Stream. The Szinva Stream having cut through the waterfalls echelon of the gorge section beneath the Fehér-kő, formed an immense separation of travertine at Lillafüred that includes one of Europe's most significant system of hollows found in travertine, namely the Anna Cave.

From these travertine accumulations, the stream reaches the valley as waterfalls through two large echelons. At the northern front of the travertine hill, the country's highest cascade, the Alsó waterfalls with a height of 20 m was formed.

After the mouth of the Garadna Stream, the Szinva reaches a schist area, whose extension made the settlement of Felsőhámor possible, than cuts through a narrow limestone belt in the Hámori Gorge presumedly formed by cave disruption. It is here where the spring mouth of the Szeleta Cave elevates to a height of 108 m related to the stream level. At the left side of the gorge's lower end, one can find the two-entranced passage of the Szinva Gorge Cave whereas at its right side, the spring corridor of the Ottó Herman Cave with a double mouth is located above which the bell-mouthed eddy mill of the Puskaporosi Shelter Cave yawns. The valley extension of the schist terrain below the gorge gives place to Alsóhámor.

View from the Magos-kő to the Garadna Valley (Photo by Cs. B.)

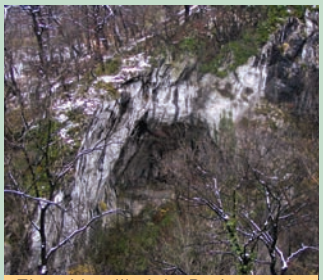
Beneath the settlement, the valley again grows narrow, at the Molnár-bérc crossing a flint stone-dolomite limestone terrain.

The 'younger sister' of the Nagy Plateau, the Kis Plateau with a height of 350 to 750 m above sea level is also a partly covered derivative karst formed on an originally opened, later buried, mixed derivative. Its eastern section is covered by a detritus sheet some meters in thickness, with short, permanent rills and intermittent watercourses at its surface. Here, excellent research can be carried out on the process of exhumation, the regression of the place of watercourses deep-beheading as well as the characteristic landforms of valleys deep-beheaded by a series of sinkhole dolines antecedent to limestone. Moreover, the particular landforms of opened mixed derivative karsts, subterranean brook blind valleys ending in karst rim sinkholes can also be found here: countercurrents of Örvény-kő and Kaszás Meadow.

The only real collapse sink of the Bükk Mountains, the Udvar-kő was formed at the junction of two valleys with a series of dolines. The cauldron of the Felső Spring could originally be a vast collapse sink. Its waters arrived from the main valley of the Sólyom-kút – Csókás Meadow – Soros-teber – Andó-bikk area and the Kaszás Meadow countercurrent.

The Fehér-kő elevated above the Szinva Valley (Photo by Cs. B.)

The Szinva waterfalls (Photo by Cs. B.)



The eddy mill of the Puskaporosi Shelter Cave in the Hámori Gorge (Photo by Cs. B.)

Sesleria hungarica (Photo by J. S.)

The untouched Bél-kő (Engraving from the 19th century)

The quarried hilltop of the Bél-kő (Photo by Cs. B.)

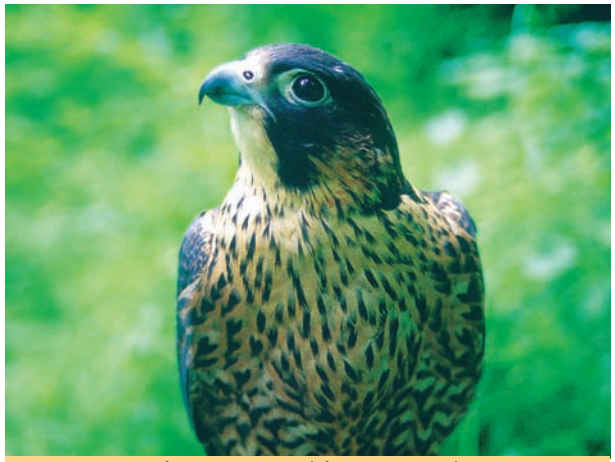
Thalictrum foetidum (Photo by J. S.)

The Bél-kő

This hill that despite its outstanding natural and cultural heritage has become a victim of our industrial era and is the memento of a world called modern and civilised. The cement factory at Bélapátfalva, for nearly a century, had intensively exploited its limestone mass, not sparing its unique flora and fauna and specific habitats.

The Bél-kő elongated from the Bükk Plateau like a peninsula has a diverse flora. Alpine and sub-Alpine species, as for example *Alpine rockcress (Arabis alpina)*, *Alpine clematis (Clematis alpina)*, *Dianthus praecox*, *Valeriana tripteris*, *White Mountain Saxifrage (Saxifraga paniculata)* can be found in Sesleria hungarica rock grasslands formed at the northern wall, in Carpahian limestone rock grasslands, as well as mixed whitebeam-lime rock forests reflecting Carpathian influences. Also, xerotherm continental sub-Mediterranean plant species as for example *Common smoketree (Cotinus coggygria)*, *Limodorum abortivum*, *Asyneuma canescens*, *Squarrose knapweed (Centaurea triumfettii)*, *Onosma visianii* living at limestone rock grasslands, slope steppe meadows, Mahaleb cherry thickets and xerotherm oak-woods at southerly crags exposed to intensive solar radiation can also be observed.

A rock fauna similar to that of the Bél-kő is found in the mountains of the Balkan Peninsula as the closest. The most typical butterfly of old beech-woods at the northern slopes of the Bél-kő is *Tau Emperor (Aglia tau)*, a typical daytime butterfly of spiraea scrub is *Hungarian glider (Neptis rivularis)*. One can find *Large blue butterfly (Maculinea alcon) in the warm rock grasslands* and edges of white oak-woods of the



Peregrine falcon (Falco peregrinus) (Photo by T. Sz.)

View of the Bél-kő and the abbey in the 1920s (Archive)

southern hillside, whereas at turfs covered by detrital *Crassulaceae* lives the *Pseudophiolites vicrama*.

Among the amphibian, the large *Common frog (Rana temporaria)*, the smaller *Agile frog (Rana dalmatina)*, the lazy Common toad *(Bufo bufo)* and the yellow-black patterned *Fire salamander (Salamandra salamandra) are present at shadowed, humid habitats*. Reptilians are primarily represented by *Common wall wizard (Podarcis muralis)* hiding in the fissures of limestone rocks and *Aesculapian snake (Elaphe longissima) living in xerotherm forests with abundant* scrubs. The avifauna of the ridge surrounded by forests is also extremely rich.

Terraces formed by quarrying at the north-western hillside of the Bél-kő (Photo by Cs. B.)

A Scar in the Landscape

The Bél-kő was excluded from the Bükk National Park established on 1st January 1977. However, its south-western crag was withdrawn from mining in 1984 and was attached to the national park: of its area of 39.8 hectares, 23.4 hectares were classified as strictly protected. The adjacent mountain ridge, however, continued to be diminished. The cement works causing the scar of the Bél-kő, closed by today was established in 1908 by Karl Wessely Austrian large producer. The firm started its operation for nearly a century in 1910. According to calculations, of the Bél-kő, during this period of time, 19,475,000 tonnes of limestone was excavated, i.e. more than 7 million m^3 is lacking…

Mountain green-veined white butterfly (Pieris bryoniae) (Zoltán Ilonczai)

Broad-leaved helleborine (Epipactis helleborine) (Photo by J. S.)

'Devil's Ribs' 'Window Rocks'

Strata formerly vertical during the orogenesis crop out in gorge valleys running down from the rims of the Bükk Plateau. Such tilted strata of limestones became uncovered from their weathered environment (schist, sandstone), and as layers, limestone ribs and rock towers perpendicular to the direction of the valley resist forces destructing rocks. The most beautiful examples can be observed in the Leány and Ablakos-kő valleys. The most spectacular representative of perforated layers, i.e. the 'window rocks' is the Ablakos-kő being the eponym of the valley.

The Ablakos-kő (Photo by Cs. B.)

Series of layers in the Leány Valley (Photo by Cs. B.)

Gorge Valleys, Limestone Cliffs – The Northern Bükk

The Northern Bükk Mountains is a micro-landscape with a top height of 300–600 meters built up of Late Carboniferous complexes of schist and sandstone, Permian variegated slate, sandstone and limestone layers as well as Early-Mid-Triassic limestone and dolomite tracks interspersed by limestone intercalations. The micro-landscape's character is determined by on the one hand, crags of Late Carboniferous-Early Triassic limestone lentils dissected from the clastic-sedimentary surrounding rock (Éles-kő, Dédesvár, Kisvár, Cakó-kő, Odvas-kő, Buzgó-kő etc.) and, on the other, by long, deep valleys and the inter-valley ridges dividing such valleys. The majority of gorge valleys originate from the northern side of the Bükk Plateau or deepen to the rim of the plateau as Szalajka-Horotna Valley, Leány Valley, Ablakos-kő Valley, Bán Valley, Csondró Valley etc.

Geomorphologic features of the valleys and the ridges (inter-valley ridges) reflect the lithologic settings: limestone lentils and layers bedded into slates and sandstones compose sharp cliffs and hogbacks disjointing valley sides. Several occurrences of travertine are known in the Northern Bükk. Among them, the sinter banks of the stepped Fátoly Waterfalls in the Szalajka Valley is the most well-known, however, the travertine echelons of the Harica Springs and the lacustrine limestone cone of Dobrica-kút ash cone should also be mentioned.

In the gorge valleys deepening into the northern rim of the Nagy Plateau (e.g. Ablakos-kő Valley) especially beautiful remnants of the Carpathian rock beech woods can be traced. The floral vegetation abundant in species is composed of elements, today, under protection, as the *European Columbine (Aquilegia vulgaris)*, *Centaurea mollis* and

View from the Nyír-kő: the valley of the Barócz Stream and the rocks of Dédes (Photo by Cs. B.)

Gorge valley at the northern rim of the Plateau: the Leány Valley (Photo by Cs. B.)

Alpine rockcress (Arabis alpina) (Photo by Cs. B.)

Cirsium erisithales distributed in the Carpathians. Ravine forests found in the steep valleys cut during the Pleistocene and antecedented to limestone (Ablakos-kő Valley, Leány Valley, Jegető Valley, Mészkő-lápa, Kukucsó-lápa) are classified as relict forests. On the cliffs, rock vegetation abundant in Pleistocene relicts lives. Unique rock plant species are *Alpine clematis (Clematis alpina)*, *Valeriana tripteris*, *Hollyfern (Polystichum lonchitis)* and *Brightgreen spleenwort (Asplenium viride)*. Microclimatic features of the cold valley floor are indicated by glacial relicts as *Anthriscus nitida*, *Alpine rockcress (Arabis alpina) and Arctic yellow violet (Viola biflora)*. The eponym fern of the association's Latin name, i.e. Phyllitidi-Aceretum, is the overblown *Hart's-tongue fern* (Phyllitis scolopendrium).

Fire salamander (Salamandra salamandra) (Photo by Cs. B.)

View of the Leány and Nagy valleys (Photo by Cs. B.)

The eponym rocks of the Ablakos-kő Valley (Photo by T. Sz.)

Pillow Lava

The globoid rock surface of the Keselyű-bérc and Vár-bérc indicate peculiar conditions for formation. The volcanic rock with such shape is referred to by geologists as pillow lava. The surface of the glowing basalt lava effused under deep-sea circumstance on the oceanic basement with a rather high temperature when contacts with sea water would suddenly cool down by which a crust is formed on the surface of lava flow. This solid cover as a kind of pipe would carry on the glowing melt rock. The intersection of consolidated lava 'snakes', as referred by the name, resembles a pile of pillows. The glowing melt rock can not always break through the overlying not yet consolidated clayey sediment but got stuck. As a result of the slower cooling, coarse-crystal gabbro or dolerite was formed. The volcanic-igneous range of the rifting oceanic basement (Szarvaskő Basalt Formation, Tardos Gabbro Formation) can be traced from Szarvaskő to the Bél-kő.

Pillow lavas on the Keselyű-bérc (Photo by Cs. B.)

Oceanic wrecked basement – The Southwestern Bükk

Landforms of the Southwestern Bükk built up of Jurassic schist and flinty slate as well as igneous rocks (gabbro and diabase) monochromic with deep-sea sediments resemble to non-karstic mountains, especially due to the fact that Late Triassic-Jurassic limestones only crop out here in an island-like way. Valleys usually cross terrains composed of more resistant rocks as well where they shrink into gorges or passes. The limestone pinnacles of Imó-kő, Fekete-len and Esztáz-kő make up the cores of anticlines whereas the surrounding schist makes up synclines. Among others, Gorge of Esztáz-kő (in the Gyetra Valley), the Gorge of Mész Valley, or the section of the Lök Valley called Vaskapu and the Kő-köz at Tárkány are rock arches formed in such limestone spots. The latest one is a good example of valley formation by cave collapse. Also the Diabase Range of Szarvaskő (Gorge of Szarvaskő) is also cut by the Eger Stream by an epigenetic valley.

On the volcanic rock, attractive mosaics of rock fissure grasslands, siliceous grasslands, steppe meadows, continental steppe scrubs and xerotherm oak forests alternate. Character species of the rock fissure grasslands are Forked spleenwort *(Asplenium septentrionale)* and *Woodsia observable in the fissures of volcanic blocks highly enlaced by mosses lichen*. Typical species of the siliceous grasslands are the Carpathian endemic Minuartia frutescens, *Jovibarba hirta*, White stonecrop (Sedum album) and Goldmoss stonecrop (Sedum acre), *Allium flavum*, *Lactuca perennis*, in the more unopened steppe-meadow-like stock, *Pulsatilla grandis*, *Common rock-rose (Helianthemum ovatum)*, *Inula hirta*, *Anthericum ramosum*, *White mullein (Verbascum lychnitis)*, *Hungarian Iris (Iris variegata)*, *Dianthus pontederae can be observed*. Characteristic

A winter view of Szarvaskő and the Vár Hill (Photo by Cs. B.)

The gorge of the Eger Stream cut between the Keselyű- and Vár-bérc (Photo by G. K.)

species of the area's rock scrubs are *Spiraea media*, *Cotoneaster integerrimus* and *Mahaleb cherry (Prunus Mahaleb)*. Arboreal vegetation here is represented by xerotherm oak-woods adjacent to shrubberies and with an abundant scrub and sward and with many continental xerotherm species. On the northern hillside of the Keselyű-bérc, in Sesleria heufleriana grassland one can trace Wedgeleaf saxifrage (Saxifraga adscendens) and White mountain saxifrage (Saxifraga paniculata).

The area's fauna complies with that of the surrounding regions. The avifauna of the habitats disjointed by open grasslands and rock scrubs is rather rich, with one of its typical nesting bird being *Rock bunting (Emberiza cia)*.

The 'Galya of Kisgyőr' – The Southeastern Bükk

The Southeastern Bükk Mountains area is a limestone table-land mostly built up of the Répáshutai Limestone Formation whose karst landforms resemble the crags of the Bükk Plateau. On the knaps of the Nagy-bodzás, Bükkös-Mátra and Kőlyuk-galya, a series of overhanging dolines of remarkable size with their diameters often reaching 100 meters are found. The extensive karrens of Ásottfa Knag and Galya-tető formed on bassets also compete with those at the Plateau. The area of the Kisgyőr–Tapolca limestone table-land features valleys with a series of dolines deepened between crags (Galuzsnya-tető, Nagy-Som, the 'Galya of Kisgyőr' etc.) resembling the Nagy Plateau. Typical landforms of 'lápa' (valleys) are twin-dolines (uvalas) formed by the coalescence of adjacent dolines.

Such diverse lithologic setting and the jointed surface made a contribution to the formation of a multi-coloured living world.

Rose daphne (Daphne cneorum) (Photo by J. Suba)

Csák-pilis

"János Suba et al. gave a description on the Southern Bükk Mountains in 1982, from near Felsőtárkány (on Vár Hill–Csák-pilis), on the dolomite bedrock, the Seslerio-Quercetum virgiliianae forest association as well as by András Vojtkó on its variation ranging to the northern hillsides (Seslerio-Quercetum pubescenti-petraeae, Vojtkó 1992). Beneath the scarce wood stock, Sesleria hungarica and, at some locations, Carex humilis predominate, in the turf, great masses of Daphne cneorum and Calamagrostis varia are present. This forest is rich in orchids with Cypripedium calceolus and Gymnadaenia odoratissima. This association, developed in the zone of oak-woods, can be considered as a local vegetation historical precedent of the Seslerio-Fagetum in which beech-wood features do not predominate however, the oak-woods character is much more represented.' (Excerption from Gábor Fekete's work entitled Coenology and geobotanics, from Acta Academiae Paedagogicae Agriensis Vol. 25. Sectio Biologiae. Honorary studies for the 75th Anniversary of dr. János Suba. Eds. András Vojtkó –Sándor Dulai. Eger, 2004)

The Dorongós

The Dorongós, as the greatest karstic depressions of the Nagy Plateau (Nagy-mező, Zsidó Meadow, Létrás), can also be considered as a polje. Its basin jointed by wide, shallow dolines, twin dolines and series of dolines was originally the side valley of the Dorongós Valley, however as a result of the deep-beheading of its intermittent watercourses, it ceased to further develop. At the northern part of the floor of the valley filled up by red clayey detritus, an intermittent sinkhole, the sinkhole cave of Dorongos can be found.

Diverse habitats

In the Southeastern Bükk, one can find several habitats of unique character. Such are karren block of the 'Galya of Kisgyőr' (Kőlyuk-galya – Ásottfa-tető – the range of Galya-tető with the Ruda-, Ivánka-, Elő-galya and Vizsolyi-búb) abundant in karst phenomena, the gorge of the Csókás Valley, the Pap-Hárs – Kecske-vár area (being also a forest reserve) or the meadows of Dorongós, Lófő Opening, Geszti-rakottyás, meadows of the Kék-mező (Village Pasture-land) that are remnants of former hay-fields and pasture-lands.

Young eagle-owl (Bubo bubo) (Photo by Cs. B.)

North from Kisgyőr, on the 'Galya of Kisgyőr' (Ásottfa Knag – Elő-galya), i.e. on the karren-doline mountain range above the vine-yards and orchards, one can find rich and diverse habitats. The vegetation of this limestone terrain is composed of the mosaic of steppe meadow, rock grassland, white oak karst low woods and xerotherm oak-woods. Protected plants as *Dwarf Iris (Iris pumila)*, *Stipeae*, *Sorbus spp.*, *Onosma visianii*, *Italian aster (Aster amellus)*, *Snowdrop anemone (Anemone sylvestris)*, *Jurinae*, *Rose daphne (Daphne cneorum)*, *Orchidaceae*, *Pulsatilla grandis*, Sesleria hungarica, *Doronicum hungaricum*, *Gasplant (Dictamnus albus)*, *Polygala major*, *Echium russicum*, *Linum flavum*, *Spring pheasant's eye (Adonis vernalis)* and *Silaum peucedanoides are common here*.

The fauna of the 'Galya of Kisgyőr' is described by the abundance of xerotherm relict species: in addition to the *Rileyana fovea*, *Anthaxia* and *Saga pedo* with sub-Mediterranean distribution, on the rock grasslands *Praying mantis (Mantis religiosa)* and *Wormwoods (Cucullia absinthii)* live. Protected butterflies of the white oak karst low woods are *Erannis ankeraria*, *Panchrysia deaurata*, *ezerjófű bagolylepke* and *Phalera bucephaloides*. Stag beetle (Lucanus cervus) and *Rhinoceros beetle (Oryctes nasicornis)* or, among the reptilians, *Smooth snake (Coronella austriaca)* are the protected species of rather older oak-woods. The rarest species of the reptilian fauna of the mountains, i.e. the sub-endemic *Snake-eyed skink (Ablepharus kitaibelii) can be observed at* rock grasslands, slope steppe-meadow spots. The most noticeable ornithological value of the karst low woods of the 'Galya of Kisgyőr' is *Rock bunting (Emberiza cia)*. In addition to this, a number of protected and strictly protected bird species nest in this area as for example *Short-toed eagle (Circaetus gallicus)*, *Black woodpecker (Dryocopus martius)* and *Grey-headed woodpecker (Picus canus)*.

The Southeastern Bükk Mountains with the 'Galya of Kisgyőr' in the background (Photo by Cs. B.)

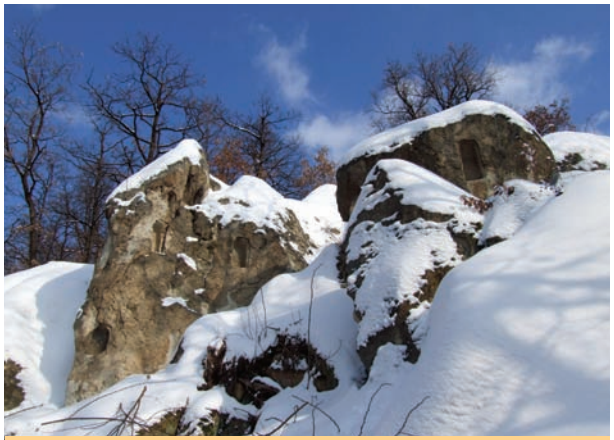
Tuff cliffs, 'Beehive-rocks' – The Bükkalja Region

The lithologic structure of the Bükkalja region with a maximum elevation of 200–400 m above sea level is different from the southern part of the Bükk Mountains built up of mostly limestone and clay-shales making the tectonic border. Here, terrains built up of vast rhyolite and dacite tuff sheets and ignimbrite plateaux alternate, formed 20–10 million years ago as a result of the intensive Miocene volcanic activity.

Streams coming from the Bükk Mountains flow in edged valleys with N-S direction and a wide valley floor. Volcanic sheets and pediments were jointed by tectonic movements, faults in the Tertiary and Quaternary, inducing the series of asymmetric hill-crests and blocks being steeper at their northern side, gently sloping towards the Great Hungarian Plain.

The peculiar natural values of the Bükkalja region are 'beehive-rocks' being also interesting cultural historical mementos as well. The material of the beehive-rocks is mostly rhyolite tuff. The most typical groups of these tuff cones, cliffs can be found in the outskirts of Eger (*Nyerges Hill, Mész-tető, Cakó-tető*), near Szomolya (e.g. *Vén Hill–Kaptár Meadow*) and around Cserépváralja (*Mangó-tető, Nagy- and Kis-kúp, Csordás Valley, Furgál Valley, Kő Valley, Nagy-bába-szék, Köves-lápa*).

A number of legends, assumptions and scientific hypotheses were created regarding the function, carvers and age of the niches of the hive-stones. One group of the legends preserved in the region mentions cremation, fetish staddles and sacrifice places, whereas another rather common myth mentions bee-keeping in connection to the niches.



Beehive rocks at the outskirts of Szomolya (Photo by Cs. B.)

Ignimbrite plateaux, rock towers, balanced rocks

An extreme volcanic feature of the Bükkalja region is the ignimbrite. This stone with significantly harder compared to the loose-structured tuff sheets is lava-like in facies despite the ignimbrite was also formed by explosion, i.e. the dispersion of detritus. Its texture and lava drop appearance indicate a facies mechanism different from that of tuffs, i.e. secondarily consolidated volcanic detritus. The erupted steam volcanic dust loses much of its temperature therefore when dropped down, it can not agglomerate. In case, due to the side-explosion, volcanic detritus will flow on the surface as burning cloud, everything will be embroiled. Tiny slivers of volcanic glass, dust and mineral particles will abruptly billow in the glowing pillow of gases and after deposited, the detrital particles will agglomerate, merge. The wild pass of the Felső (Upper) Gorge at Cserépváralja, one of the Bükk National Park's strictly protected areas, was also indented into an ignimbrite plateau formed from such eddy flow, hot pumice stone.

A balanced rock in the Felső Gorge (Photo by Cs. B.)

A BÜKKI NEMZETI PARK TERMÉSZETI ÉS KULTÚRTÖRTÉNETI ÉRTÉKEI

A BÜKKI NEMZETI PARK

Az *1977*-ben megalakult Bükki Nemzeti Park hazánk sorrendben harmadik nemzeti parkja – ugyanakkor az első, amely hegyvidéki területet foglalt magába. A nemzeti park jelenlegi kiterjedése – az alapítást követő háromszori bővítés után – *41 840.7 hektár*.

FÖLDTANI FELÉPÍTÉS, FELSZÍNFORMÁK

A Bükk hegységet főleg tengeri üledékes kőzetek építik fel, amelyek a földtörténeti óidő karbon időszakától a középidő jura időszakának végéig képződtek. A több mint 150 millió év alatt lerakódott, szinte folyamatos tengeri üledéksort *mészkő*, valamint később palává préselődött *agyag* (*agyagpala*), *radiolarit*, *dolomit* és *homokkő* alkotja. A Bükk karakterét a triász időszaki fehér és világosszürke, helyenként rózsaszín mészkő határozza meg: ezek a térszínek hordozzák a hegységre oly jellemző karsztformakincs zömét.

A triász és jura időszakokban a békés mészkőképződést jelentős kéregmozgásokkal együtt járó tenger alatti tűzhányó-tevékenység szakította meg. A mélytengeri árok kinyílásával kapcsolatos *bazaltból* álló párnaláva-halmazok és az üledékbe nyomult magmás (*gabbró, ércperidotit*) kőzetek Szarvaskő környékén láthatók a felszínen. A kréta időszakban alakult ki a Bükk hegység *gyűrt – átbuktatott redős-pikkelyes – rátolódásos (takaróredős)* szerkezete. A kőzetek változatosságát a miocén kori vulkanizmus során keletkezett laza és összesült *riolit-riodácit tufák, tufitok* fokozzák, amelyek a Bükkalja felépítésében játszanak jelentős szerepet.

A hegység mészkőterületein a karsztjelenségek gazdag együttesével találkozunk, különösen a Nagy-fennsík és a Kis-fennsík felszínén. Míg a *török* feneke széles, lapos, tehát nagy felületen szivárog le a csapadék, addig a *víznyelő* rendszerint egyetlen nyíláson vezeti le a felszíni vizet. A víznyelőkben – mint pl. a *Barátság-kerti-visszafolyóban* vagy a *Pénz-pataki-víznyelőbarlangban* – elnyelődő, a töbrök alján mélybe szivárgó vizek a mészkő belsejében kisebb-nagyobb járat- és barlangrendszereket oldanak, de leginkább – a mélybe szállított szilárd hordalék fizikai koptató hatása révén – vésnek. A magyarországi barlangok negyede – több mint 1000 – található a Bükkben. Ezek közül 49 fokozottan védett, mint például az *István-lápai-barlang*, amely az ország legmélyebb (253 m), egyben a Bükk leghosszabb (6 km) barlangja.

NÖVÉNYVILÁG

A hegység páratlanul gazdag élővilágát az éghajlati sajátosságok, valamint az igen változatos domborzati viszonyok határozzák meg. Hazánkban a Bükk hegységben alakultak ki legszabályosabban a hegyi vegetációs zónák. A Bükk déli peremén az erdőssztyepp zóna klímazonális erdejét, a száraz *löszpusztai tölgyeseket* találjuk. A tengerszint feletti 250–400 m-es átlagos magasságban a *cseres tölgyesek* uralkodnak. 400–600 m tengerszint feletti magasságban, a nedvesebb klímájú völgyekben és az északi oldalakon *gyertyános tölgyesek* találhatók, a tavaszi időszakban gazdag lágyszárú szinttel. A hegység 600 méter feletti területeit *középhegységi (szubmontán) bükkösök* állománya borítja, 700 m felett pedig *montán bükkösök* uralkodnak. A hűvös, párás levegőjű mély völgyek extrazonális társulása a *szurdokerdő*. Dús lágyszárú szintjének jégkorszaki maradványfajai a *havasi iszalag*, a *havasi ikravirág* és a *sárga ibolya*. A délies fekvésű mészkősziklás hegyoldalakon a jégkorszak utáni mogyorókor emlékét idézi a *hársas kőrises sziklaerdő*, gyepszintjében a *Vrabélyi-estikével*, a *mérges sással* és a *Waldstein-pimpóval*. Alhavasi maradványfajokban gazdag a legmeredekebb sziklás oldalakon megtalálható *hársas-berkenyés* reliktumerdő. A Délkeleti-Bükk meleg, sekélytalajú lejtőin szép *bokorerdőkből*, *melegkedvelő tölgyesekből* és *sztyeppprét-foltokból* álló társulás-komplexumok találhatók. A fátlan vegetációtípusok közül jellemzőek a *mészkő-dolomit sziklagyepek*, vulkanikus kőzeteken a *szilikát sziklagyepek*. A montán régió fajgazdag *hegyi rétjei* erdőirtás révén jöttek létre, melyeket egykor kaszálóként hasznosítottak. A töbrökkel tarkított Nagy-mezőn és a Zsidó-réten számos ritka növényfajt találunk. A Bükk hegység flórája körülbelül *1300 növényfajból* áll, melyek közül *18 hazánkban csak innen ismert*. Ilyen például a *havasi ikravirág*, a *magas istác*, a *mirigyes fodorka*, a *szirti pereszlény*, az *északi sárkányfű*, a *tátrai hölgymál*, az *erdélyi lednek*, a *Wiemann-pimpó*, a *magyar nyúlfarkfű*, a *Hazslinszky-berkenye*, a *Teleki-virág*, az *éplevelű macskagyökér* és a *sárga ibolya*.

ÁLLATVILÁG

A különböző faunahatások, a változatos geomorfológiai adottságok és a sokszínű vegetáció következtében fajgazdag állatvilág alakult ki: a Bükkben előforduló állatfajok számát ma minimálisan 22000 körülire becsüljük. Igen értékesek a csak a Bükkben élő endemikus fajok, mint például a *Gebhardt vakfutrinka*, illetve a szubendemikus lepkefajok, mint a *bükki hegyiaraszoló* vagy a *bükki szerecsenboglárka*.

A nagy kiterjedésű zonális bükkösökben él az alhavasi jellegű *havasi cincér*. A bükkösök madárvilágának karakterfajai a *sisegő füzike*, az *örvös légykapó*, a *fekete harkály*, a *kék galamb*, az idősebb, természetközeli erdőkben pedig a *fehérhátú fakopáncs*.

A hegység északi részén lévő szurdokvölgyekben sok ritka fajjal találkozhatunk. A csigák közül jellegzetes kelet-kárpáti endemikus faj a *kék meztelencsiga*, vagy a glaciális reliktum *Vertigo alpestris*, a lepkék közül a *hegyi fehérlepke*. A gerincesek közül jellegzetes szurdokerdei madárfaj a *kis légykapó*.

A Bükk-fennsík töbörrétjeinek ritka lepkéi a *szerecsenboglárka*, a *karszti hangyaboglárka* és a *bagolylepkék*.

A bogarak közül négy ritka, védett futrinkafaj érdemel említést: a *domború futrinka*, az *aranypettyes futrinka*, a *változó futrinka* és a már említett barlanglakó *Gebhardt vakfutrinka*.

A hegység bokorerdeiben, melegkedvelő tölgyeseiben és száraz gyeptársulásaiban – például a Délkeleti-Bükkben található „galyákon" – melegkedvelő faunaelemekkel találkozunk: a *zörgőlepkével*, az *Anthaxia hungarica* nevű díszbogár fajjal, vagy a szubmediterrán elterjedésű *fűrészlábú szöcskével*. Sziklagyepek, lejtőszteppprét-foltok képezik a szubendemikus *pannongyík* élőhelyét. A karsztbokorerdők legjelentősebb madártani értéke a *bajszos sármány*.

A karsztforrások élővilágának jellemző állatai, a hideg és tiszta vizet kedvelő csigafajok: a *Bithynella austriaca* és a *kárpáti forráscsiga*. A hegység déli peremének meleg forrásaiban él egy harmadkori maradványfaj, a *feketecsiga*. A hegység néhány nagyobb vízfolyásának említésre méltó halfajai a *sebes pisztáng* és a *petényi márna*, amely pannóniai endemizmus. Az állóvizekben él az *alpesi gőte*, melynek védelmét az egykori vizes élőhelyeinek rekonstrukciójával, valamint zárttéri szaporítási programmal oldjuk meg.

A bükki barlangokban található a hazai denevérpopuláció jelentős része. A hegység denevérfaunájának ritkaságai az *alpesi denevér*, a *brandt denevér*, a *bajuszos denevér*, a *pisze denevér*, a *nagyfülű denevér* és az *óriás korai denevér*. Csak barlangokban szaporodik az Európában erősen veszélyeztetett *hosszúszárnyú denevér* és a *kereknyergű patkósorrú denevér*.

A ragadozó madarak közül a *parlagi sast*, a hegység szikláin újból megjelenő *vándorsólymot* kell föltétlen megemlíteni.

EMBER A BÜKKBEN

A Bükk történelem előtti korszakának régészeti lelőhelyei a nagy szádájú barlangok. Az őskőkori *Szeleta-kultúra* és a neolit *bükki kultúra* sajátosan bükki régészeti jelenségek. A hegység történelmi múltjának leglátványosabb emlékei a várak. Nemcsak a sziklaszirteken álló, impozáns megjelenésű – jelentős falmaradványokkal rendelkező vagy majdnem ép – *kővárak* (mint például a szarvaskői, a dédesi, a kácsi várak, a Gerennavár, Éles-kő vára) tanúskodnak a történelem viharos évszázadairól, hanem a sáncokkal, árkokkal határolt *„földvárak"* is. Ezek az őskori erődített telepek (pl. Töröksánc a Kelemen székén, felsőtárkányi Vár-hegy, Verepce-bérc) a késő-bronzkori *Kyjatice-kultúra* emlékei. A Bükkalja területén rejtőzködő *kaptárkövek* – olyan sziklavonulatok vagy kúp alakú kőtornyok, amelyek oldalaiba a régmúlt korok emberei fülkéket faragtak – ma még rejtélyes kultúrtörténeti emlékek. A középkort a várak mellett az erdők mélyén megbújó *kolostorromok* idézik, legszebb közülük a Kis-fennsíkon álló szentléleki pálos kolostor. A török hódoltság után következő újkort már az *ipari létesítmények* megjelenése jellemzi: az üveghuták, a vasolvasztó massák, vasverő hámorok, a különféle bányák és manufaktúrák története napjainkig ível.

PRÍRODNÉ A KULTÚRNO HISTORICKÉ HODNOTY NÁRODNÉHO PARKU BÜKK

V roku 1977 vznikol Národný park Bükk, v poradí tretí národný park v Maďarsku a súčasne prvý, ktorý v sebe zahŕňa územie horskej krajiny. Súčasná rozloha národného parku – po trojnásobnom rozšírení po jeho založení – je *41 840,7 hektárov*.

GEOLOGICKÁ STAVBA, POVRCHOVÉ ÚTVARY

Pohorie Bükk tvoria najmä horniny z morských usadenín, ktoré vznikali v dobe od pravekej geologickej doby karbónu po etapu konca strednej doby jury. Takmer súvislé pásmo morských usadenín, usadených v priebehu viac ako 150 miliónov rokov, tvorí *vápenec*, ako aj neskôr na bridlicu zlisovaná *hlina (hlinená bridlica), radiolarit, dolomit a piesko*vec. Charakter Bükku určuje vápenec z doby triasu bielej, bledosivej a miestami ružovej farby: tieto miesta nesú podstatnú časť pre pohorie charakteristického krasového tvarového bohatstva.

V obdobiach triasu a jury pokojnú tvorbu vápenca prerušila podmorská sopečná činnosť, sprevádzaná významnými pohybmi zemského jadra. Magmatické horniny (*gabbró, rudný peridotit*), zatlačené do nahromadenín lávových podušiek a usadenín, pozostávajúcich z *čadiča* vzniknutého otvorením hlbokomorskej rokliny, sú na povrchu viditeľné v okolí Szarvaskő. V období kriedy sa vytvorila *skrčená-prekladaná šupinato-zvrásnená - natlačená (pokrývajúco-zvrásnená) štruktúra* pohoria Bükk. Pestrosť hornín zvyšujú voľné a spečené *riolitné-riodacitné tufy, tufity* vzniknuté počas vulkanizmu miocénnej doby, ktoré v štruktúre predhoria Bükku zohrávajú významnú úlohu.

Na vápencových územiach pohoria sa stretávame s bohatým súborom krasových útvarov, najmä na povrchu planín Bükk-fensík a Kis-fensík. Kým dná *dolín* sú široké, ploché, takto zrážky presakujú na veľkej ploche, na druhej strane *ponory* spravidla povrchovú vodu odvádzajú cez jediný otvor. Vody pohlcované v ponoroch – ako napríklad *v spätnom privádzači Barátság-kerti-visszafolyó* alebo *v ponorovej jaskyni Pénz-pataki-víznyelőbarlang* - a vody hlboko presakujúce v dolinách rozpúšťajú systém väčších či menších chodieb a jaskýň, ale tieto najčastejšie vytesávajú – pôsobením fyzického opotrebovania hlboko zanášaných pevných nánosov. Štvrtina jaskýň v Maďarsku - viac ako 1000 – sa nachádza v Bükku. Z týchto je 49 prísne chránených, ako napríklad jaskyňa *István-lápai-barlang*, ktorá je najhlbšia jaskyňa v Maďarsku (253 m) a súčasne aj najdlhšia (6 km) jaskyňa Bükku.

SVET RASTLÍN

Nevídane bohatý živý svet pohoria určujú klimatické osobitosti, ako aj veľmi premenlivé reliéfne pomery. V Maďarsku sa horské vegetačné zóny vytvorili najpravidelnejšie v pohorí Bükk. Na okraji južného Bükku nachádzame klimazonálny les lesostepnej zóny, *dubiny suchých sprašových púšť*. Vo výškach priemerne 250–400 m

nad morom panujú *dubovo-cerové lesy*. Vo výške 400–600 m nad morom, v dolinách s vlhkejšou klímou a na severných stranách možno nájsť *čemericu voňavú*, v jarných mesiacoch s bohatou úrovňou vo výške mäkkej stopky. Územia pohoria vo výške nad 600 m nad morom pokrývajú stavy *stredohorských* alebo *submontánnych bukovín*, vo výške nad 700 m zase panujú montánne *bukoviny*. Extrazonálnym spoločenstvom chladných, sparných hlbokých dolín je *rokľový les*.

Zostatkové druhy ľadovej doby, jej mäkko-stonkatej úrovne, sú *plamienok alpínsky, arábka alpínska a fialka dvojfarebná*. Obdobie lieskovca po ľadovej dobe na vápencových lesných stráňach južnej polohy pripomína *skalný les lípy a jaseňa štíhleho*, v úrovni trávy *s večernicou Vrabelovou, ostricou krátkoklasou a valdštainkou kuklíkovou*. Na podhorské reliktívne druhy je najbohatší reliktívny *lipovo-brekyňový* les. Na teplých stráňach juhovýchodného Bükku s plytkou pôdou možno nájsť komplexy spoločenstiev, pozostávajúce z pekných *lesokroví, z teplomilných dubín a z ostrovčekov stepných lúk*. Spomedzi typov vegetácií bez stromov sú charakteristické *vápencovo-dolomitné skalné pasienky*, na vulkanických horninách *kremičité skalné pažite*. Na druhy bohaté *horské lúky* montánneho regiónu, ktoré niekedy využívali ako lúky na kosenie, vznikli v dôsledku klčovania lesa. Na poli Nagy-mező, spestrenom dolinami a na lúke Zsidó-rét môžeme nájsť veľký počet zriedkavých rastlín.

Flóra pohoria Bükk pozostáva z asi *1300 druhov rastlín*, z ktorých *18 druhov sú v Maďarsku známe len z tohto miesta*. Takými sú napríklad *arábka alpínska, trávnička predĺžená, cievnatá rastlina Asplenium lepidum, libavka douškolistá, jasnomodrý včelník severný, ostropysk poľný tatranský, hrachor panónsky, večernica Wiemann, Sesleria hungarica, jarabina Hazslinszkého, telekia ozdobná, valeriána lekárska, fialka dvojkvetá*.

SVET ZVIERAT

V dôsledku rôznych vplyvov fauny, premenlivých geomorfologických daností a pestrej vegetácie sa vytvoril na druhy bohatý svet zvierat: počet druhov zvierat vyskytujúcich sa v pohorí Bükk dnes odhadujeme na približne 22 000. Veľmi hodnotné sú len v Bükku žijúce endemické druhy, ako napríklad *fúzač Duvalius gebhardti*, resp. subendemické druhy motýľov, *ako sú Enterphria cyanata a modráčik bocianikový*.

V bukových zonálnych lesoch s veľkou rozlohou žije aj podalpínsky charaktermajúci *fuzáčalpský*. Charakteristickými druhmi sveta vtákov bukových lesov sú *kolibiarik sykavý, muchárik bielokrký, tesár čierny, holub plúžik* a v starších, prírode blízkych lesoch *ďateľ bielochrbtý*.

V rokľových dolinách v severnej časti pohoria sa môžeme stretnúť s mnohými zriedkavými druhmi. Zo slimákov je charakteristický východokarpatský endemický druh *slizniak karpatský* alebo glaciálny relikt *vrkoč horský*, spomedzi motýľov *mlynárik horský*. Zo stavovcov je charakteristickým druhom vtákov *muchárik červenohrdlý*.

Zriedkavými motýľmi lúk s dolinami planiny Bükk sú *ohniváčik tmavohnedý, modráčik Rebelov* a *siatica oziminová*. Z chrobákov si zasluhujú pozornosť štyri zriedkavé chránené druhy: *bystruška rodu Carabus, bystruška záhradná, bystruška menlivá* a už spomínaná jaskynná *Duvalius gebhardti*. V lesokroví pohoria, v teplomilných dubinách a na suchých trávnatých spoločenstvách pohoria – napríklad v juhovýchodnom Bükku možno stretnúť teplomilné prvky fauny: motýľa *Rileyana fovea*, ozdobného chrobáka druhu *krasoň južný*, alebo mediteriálne rozšíreného *koníka pilkovonohého (Saga pedo)*. Skalné pastviny, ostrovčeky svahových stepí predstavujú biotop subendemickej *krátkonôžky štíhlej*. Najvýznamnejšou ornitologickou hodnotou krasových lesokríkov sú *strnádky cia*.

Charakteristickými zvieratami živočíšneho sveta krasových prameňov sú druhy slimákov obľubujúce studenú a čistú vodu: *Bithynella austrica* a *pramienka rakúska*. V teplých prameňoch južného okraja pohoria žije druh pozostatku z treťohôr *slimák čierny*. Z fauny rýb väčších vodných tokov, zasluhujúcich si pozornosť, sú *pstruh* a *mrena škvrnitá*, ktorá je panónsky endemizmus. V stojatých vodách žije *mlok horský*, ktorého ochranu sme vyriešili rekonštrukciou bývalých vodných biotopov, ako aj programom rozmnožovania v uzavretom priestore.

V jaskyniach Bükku sa nachádza podstatná časť domácej populácie netopierov. Zriedkavosťou fauny netopierov pohoria sú *večernica malá, netopier Brandtov, netopier fúzatý, uchaňa čierna a raniak obrovský*. Len v jaskyniach sa rozmnožuje v Európe silne ohrozený *lietavec sťahovavý* a *podkovár južný*.

Z dravcov je potrebné bezpodmienečne spomenúť *orla kráľovského* a na skalách horstva sa znovu objavujúceho *sokola sťahovavého*.

ČLOVEK V BÜKKU

Predhistorické archeologické náleziská Bükku sú jaskyne s veľkými vletovými otvormi. Praveká *Seleta-kultúra* a neolitická *bükkská kultúra* sú charakteristické archeologické útvary Bükku. Najpozoruhodnejšími historickými pamiatkami horstva sú hrady. O búrlivých storočiach dejín svedčia nielen impozantne vyzerajúce *kamenné hrady* (napríklad hrady Szarvaskő, Dédes, Kács, Grenna, Éles-kő), stojace na skalných bralách – s významnými pozostatkami múrov alebo aj s takmer zachovalými múrmi – ale aj *pozemné hradiská* ohradené valmi, priekopami. Tieto praveké opevnené sídla sú pamiatky *Kyjatickej kultúry* neskorej doby bronzovej. *Úľové kamene,* ukrývajúce sa na území predhoria Bükk – pásma skál alebo kamenných veží tvaru kužeľa, do boku ktorých ľudia pradávnych dôb vytesali výklenky – dnes majú ešte stále záhadnú minulosť. Stredovek okrem hradov pripomínajú *zrúcaniny kláštorov,* ukrývajúce sa v hĺbkach lesov, najkrajšia z nich je zrúcanina palošského kláštora v Szentléleku na planine Kis-fennsík. Novovek nasledujúci po tureckej porobe už charakterizuje objavenie sa *priemyselných zariadení*: história sklárskych hút, maší na tavenie železa, hámrov na kovanie železa, rôznych baní siaha až do dnešných dní.

View from the Látó-kövek. The High Tatras are at the horizon (Photo by Cs. B.)

Sunset with the Tar-kő. The Mátra Mountains in the background (Photo by G. K.)

The mass of the Bükk Mountains seen from the Mátra Mountains (Photo by Cs. B.)

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