

# 9th International Geological Conference of Ph.D. Students and Young Scientists

## 9. medzinárodná geologická konferencia doktorandov a mladých vedeckých pracovníkov

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The 9th International Geological Conference of Ph.D. students and young scientists took place in 3.–6. April 2008, being organized by the AGH University of Science and Technology in Cracow, Geological Club of the Faculty of Natural Sciences of the Comenius University in Bratislava and Faculty BERG of the Technical University in Košice. The meeting was taken under auspices colleagues from the AGH-UST in Cracow and they disposed of conference in hotel Diablak in Zawoja near Żywiec.

Significant interest related to this conference was demonstrated by the high amount of participants (over 100 this years) from universities and institutes in Czech Republic, Poland, Russia, and Slovakia. Almost 80 presentations were given by students and young scientists from various geological specializations during 2 days session. Last day traditionally belonged to the field trip.

Organizers greatly appreciate active participation of all participants and are looking forwards to meet them again during the 10th anniversary of the Conference in Herłany 2009. Special thanks of organizers belong to scientific board of the conference and preferably to Prof. Jacek Matyszkiewicz from AGH-UST in Cracow, Prof. Dušan Plašienka from Faculty of Natural Sciences Comenius University in Bratislava and Prof. Ing. Tibor Sasvári, from BERG Technical University in Košice.

Organizátorom 9. medzinárodnej geologickej konferencie doktorandov a mladých vedeckých pracovníkov, ktorá sa uskutočnila 3.–6. apríla 2008, bola univerzita AGH-UST v Krakove, Geologický klub Prírodovedeckej fakulty v Bratislave a Fakulta BERG Technickej univerzity v Košiciach. Zabezpečiť bezproblémový priebeh konferencie v hoteli Diablak v obci Zawoja pri meste Żywiec v Poľsku bolo v roku 2008 úlohou spoluorganizátorov z krakovskej univerzity AGH-UST.

Rastúci záujem o medzinárodné konferencie doktorandov potvrdil aj vysoký počet účastníkov z univerzít a vedeckých inštitúcií z Českej republiky, Poľska, Ruska a Slovenska (v roku 2008 vyše 100). Prvé dva konferenčné dni bolo 80 prezentácií študentov a mladých vedeckých pracovníkov z rozličných geovedných špecializácií. V záverečný deň tejto akcie sa už tradične konala terénna exkurzia.

Organizátori konferencie vysoko oceňujú veľký záujem o ňu, aktívnu účasť všetkých účastníkov a tešia sa na opätovné stretnutie na 10., výročnom ročníku konferencie, ktorá bude v roku 2009 v Herlanoch. Popri poďakovaní vedeckej rade konferencie organizátori vyjadrujú svoju vďačnosť „zastrešujúcim“ osobnostiam tohto odborného podujatia. Bol to prof. Jacek Matyszkiewicz z univerzity AGH-UST v Krakove, prof. Dušan Plašienka z Prírodovedeckej fakulty Komenského univerzity v Bratislave a prof. Ing. Tibor Sasvári, CSc., z fakulty BERG Technickej univerzity v Košiciach.

### J. ADAMCOVÁ<sup>1, 2</sup>, I. KOLAŘÍKOVÁ<sup>2</sup> and R. PŘIKRYL<sup>2</sup>: Alteration processes in bentonite barrier within Mock-Up-CZ experiment

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One of the most important geotechnical barriers in high level waste repository is bentonite buffer and one of the key issues is predicting its behaviour under miscellaneous conditions. Their properties are studied in natural analogues as well as in laboratory experiments.

The Mock-Up-CZ experiment performed by the Centre of Experimental Geotechnics (CTU, Czech Republic) simulated

vertical placement of a container with radioactive waste. The model consisted of heating canister surrounded by an engineered barrier of bentonite blocks (bentonite-based material), which were enclosed in a cylindrical steel cover and saturated with synthetic granitic water. The buffer material used in the experiment was a mixture of 85 % of ground non-activated Ca/Mg bentonite, 10 % of siliceous sand and 5 % of graphite. The bentonite comes from the Rokle bentonite mine operated in the Czech Republic. The experiment lasted for a period of 3 years and 9 months.

We investigated alteration mineralogical processes in the bentonite material, being necessary for understanding how newly formed phases could influence buffer properties under the conditions of underground repository.

In the bentonite envelope of the container newly formed gypsum with illitic aureole was observed and the clay buffer material was affected by several mineralogical alterations – illitization and beidelitization. However, the percentage of transformations was very low (< 2 %). Newly formed illite therefore had no effect on physico-chemical properties (e.g. cation exchange capacity) of bulk bentonite buffer material (Vinšová et al., 2008; Appl. Clay Sci., in press).

**M. BAZARNIK<sup>1</sup>, M. ZIMOWSKA<sup>2</sup>, K. BAHRAINOWSKI<sup>1</sup> and E. SERWICKA<sup>2</sup>: Synthetic kanemite as base of mesoporous catalysts of FSM type**

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FSM-16 – highly ordered silica mesoporous materials with hexagonal arrangement of uniform pores (2 to 5 nm) offer new opportunities in the field of adsorption, catalysis and separation of macromolecules. FSM-16 could be prepared from the synthetic mineral – kanemite ( $\text{NaHSi}_2\text{O}_5 \cdot 3\text{H}_2\text{O}$ ). It contains single layers of  $\text{SiO}_4$  tetrahedra. Sodium ions, hydroxyl groups, and molecules of water appear in the interlayer space. Sodium ions in the interlayer space have ion-exchange ability and can be exchanged for the surfactant cations (hexadecyltrimethylammonium-HDTMA) to give a layered organic-inorganic complex. Subsequent calcination at 550 °C removes the organic component and FSM-16 structure is formed.

We have attempted to incorporate aluminium in siliceous framework of the mesoporous materials to generate catalytical sites. Aluminium was introduced by direct synthesis at the stage of kanemite preparation, or by the post-synthesis treatment by impregnation of purely siliceous FSM-16. The method of alumination and the amount of aluminium influences the acidity, hydrophobic/hydrophilic features and the catalytical properties. The largest number of acidity sites is characteristic for post-synthesis aluminated samples of FSM. The amount of acidity sites increases with increasing amount of incorporated aluminium. The same samples indicate the highest hydrophilic feature. They are performed as the best catalyst in reaction of ethanol to ethylene conversion occurring on acidity sites. Total (i.e. 100 %) conversion of ethanol proceeds on this catalyst at temperature 350 °C by 98 % efficiency of ethylene.

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**J. BAZARNIK<sup>1</sup> and B. BUDZYŃ<sup>2</sup>: Th-U-total Pb chronology of detrital monazite from the Lublin Formation (the Lublin Coal Basin, Eastern Poland): Preliminary results**

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Detrital monazite grains from sandstones and mudstones from the Lublin Formation (Westphalian B) were investigated. The sedimentation of these Carboniferous rocks was at the western margin of the East-European Platform.

Chemical compositions of monazite were obtained using the Cameca SX-100 electron microprobe in the State Geological Institute of Dionýz Štur in Bratislava. The following analytical conditions were used: 15 kV accelerating voltage, 130 nA beam current, and a focused beam on polished thin sections coated with carbon. The calculation of monazite ages used method by Konečný et al. (2004) by means of Montel et al. (1996) equation and the Damon computer program (Konečný, personal communication).

Analysed monazite grains have rounded shapes, small size (< 20 µm), and do not reflect zonation in the high contrast BSE imaging. The analytical results provided two age ranges: the first one from 300 to 380 Ma, and the second one from 500 to 580 Ma.

The results falling into the range of 500–580 Ma suggest that detrital material was possibly supplied from the East European Platform (e.g. Winchester et al., 2002). The Variscan monazite age are unexpected. The provenance of such grains remains a matter of discussion that might consider crystalline rocks from the European Variscides as a possible source (cf. Matte, 1986).

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**P. BOŻECKI and G. RZEPA: Trace elements in ferruginous acid-mine drainage sediments from the Muskau Arch area (Western Poland)**

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Łęknica is located within the Muskau Arch – a large glaciectonic structure extending from Klein Kolzig (Barndenburg) to Tuplice (Poland). In this area Neogene lignite deposits were extensively exploited. Abandoned excavations are filled with acidic waters originating from oxidation of pyrite-containing lignite. They are highly mineralized and contain large amounts of dissolved iron and sulphate. As a consequence of ferrous iron oxidation (most probably microbial) and hydrolysis, reddish-brown and orange ochreous sediments precipitate from ponds, stream and spring waters of this area. The main mineral constituents of the precipitates are iron hydroxysulphates (schwertmannite and jarosite), oxyhydroxides (goethite) as well as gypsum. In some cases the presence of ferrihydrite is also apparent.

In this work preliminary results of chemical analyses of the precipitates are presented. They are characterized by rather low concentrations of trace elements. Relatively more abundant are Zn (up to ca. 400 ppm, av. 62.5 ppm), Cu (up to 85 ppm, av. 36 ppm) and Pb (up to 50 ppm, av. 21 ppm).

Other trace element levels rarely exceed dozen or so ppm and their average concentrations are: Cd – 2.4 ppm, Co – 9.5 ppm, Cr – 9.3 ppm, Mn – 17.5 ppm, and Ni – 8.3 ppm. Results of this preliminary study indicate that ferruginous precipitates from the Łęknica region are typical for the acid-mine drainage environments in their mineral composition. The trace elements concentrations, however, are distinctly lower than found in similar areas. It is probably due to rather simple composition of the weathering sulphides.

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**M. BRČEK and Z. KOMPANÍKOVÁ: Temperature as a factor of degradation in rock mass**

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This report is specialized for the study of heat flow process and thermo-physical properties in the rock mass. The thermo-mechanical rock behaviour have an important influence on the loosening of the rock mass. The temperature fluctuation makes thermal stresses in the rock mass, which activate different thermal expansion of mineral grains. Basic dates for the review effect of temperature to mechanical behaviour of the rock mass are natural field of the temperature and the thermo-physical properties of the rocks, like coefficient of thermal and temperature conductivity, specific heat and coefficient of linear temperature expansion. This information is necessary for the study of space flow, time flow and the scale of thermal deformation. The temperature expansion and thermal deformation of rocks are not standard tests, so this report presents the equipment – thermodilatometer measuring these parameters. The range of temperature changes for the test samples as well as detection of wet are important factors, having influence on the thermo-mechanical behaviour of rock or rock mass. The report is devoted to ineligible consequences of thermo-mechanical process, which is caused by temperature changes, like factors, which influence it. The research is orientated on the most thermic attacking layer of rock mass, where the main generating volume change, the temperature deformation and the other processes of rock mass disintegration occur.

**J. BUČOVÁ, V. MIKUŠ and P. GAŽI: Deformation structure analysis of the western part of the Pieniny Klippen Belt (Western Carpathians)**

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The oldest widely recorded deformation stage in studied area of the Pieniny Klippen Belt (PKB) was the macroscopic folding with SW–NE trending fold axes, generated by NW–SE compression. The continuing NW–SE compression and relative counterclockwise rotation of the Central Western

Carpathian block resulted in foundation of a dextral transpression zone along the western sector of the PKB in the Upper Oligocene – Lower Miocene. Rotation of the  $\sigma_1$  axis of the regional paleostress field to the N–S direction during the Lower to Middle Miocene is ascribed to a rigid counterclockwise rotation of the entire ALCAPA block during the Lower Miocene by some 80° at a stable orientation of the  $\sigma_1$  axis. N–S compression is expressed mainly by W–E trending reverse faults, both N-vergent (Vršatec area) and S-vergent (Zázrivá). The last, probably Upper Miocene tectonic event is characterized by NE–SW orientation of the  $\sigma_1$  axis and perpendicularly oriented extension. Older faults were reactivated and new conjugate strike-slips and normal faults originated in a sinistral transtension zone, particularly in the Púchov sector of the PKB and the N–S trending dextral Zázrivá fault zone truncates the PKB in the eastern part of the investigated area.

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**A. CIUREJ and M. DWORNIK: Image analysis of Oligocene finely laminated limestones from the Polish Outer Carpathians**

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We applied methods of computer image analysis to investigate the vertical succession of light and dark laminae in two coccolith limestone horizons: Tylawa Limestone (TL) and Jasło Limestone (JL), both marker horizons in the Oligocene in the Carpathians. We attempted to detect periodicity in the series of laminae.

We used macrophotographs of polished sections of the laminated limestones. TL samples were collected in closely spaced outcrops in the Dukla and Silesian unit in the eastern part of the Polish Carpathians. JL samples from G. Haczewski's collection were collected from widely spaced locations in the Silesian unit in the eastern part of the Polish Carpathians.

Computer analysis was done using MATLAB 7.1. Boundaries were picked for each sample. Then vertical profiles of brightness were counted and averaged. Fourier lowpass filtering was used to determine brightness long-period changes.

In both, the TL and JL image analysis the short and long period changes were revealed in the mean brightness level. The short-period changes are related to the alternation of the dark and light lamina, most likely annual. The origin of the long-period changes has not been yet determined.

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**A. ČERNÁNSKÝ: New finds of lizards (Reptilia, Sauria) from the Lower Miocene of Central Europe**

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The disarticulated remains of Lower Miocene lizards are described from Czech localities – Dolnice near Cheb and Merkur-North. This is the first record of the family *Gekkonidae* detected in Czech Republic. The first taxon is identical with the material of the species *Euleptes gallica* from the Miocene locality Monttaigu. It brings a new information about distribution of this species, which was known just in France. The second taxon is described as gen. et sp. indet., because their lower jaws have unique features. It could be a new taxon. The work brings also the first record of the rare family *Amphisbaenidae* from the locality Merkur – the species *Omoioptychops gracilis*. This paper also deals with the family *Lacertidae*, which is very conservative. The exact determination of fragments is shortly impossible. The material has typical marks for the genus *Lacerta* and therefore the remains are described as *Lacerta* sp. There is the well-preserved huge frontal of adult individual from Dolnice, which was created by grow of the left and right bone together. On the other hand, there is the left frontal bone from juvenile individual in the material and it gives a conception about ontogeny of the frontal of this genus in the Lower Miocene. The big similarity to *Lacertidae* has the family *Cordilyidae*. The species *Cordylus bohemicus* is described from the locality Merkur. These finds testify to conjunction of the African and European lizards in Lower Miocene.

**D. ČUNDERLÍKOVÁ and J. SCHLÖGL: Ammonite biostratigraphy of Tunesica formation from Butkov locality, Manín Unit**

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Lower Jurassic sediments of Trlenska and Tunesica, Brt-ska limestone formations were documented from the Butkov locality. The sections through these formations can be found on the 15<sup>th</sup> floor of the Butkov quarry. Crinoidal limestones rich in sandy admixture and sponge-crinoidal limestones, with thin intercalations of marly shales are dominant for the lithology of these formations. Marly shales representing the thicker and condensed layers, are rich on fossil macrofauna with mostly ammonite fauna. Two independent fossiliferous layers were observed on the locality. In the studied assemblage, from the first layer, following two biozones were recognized: Bifrons and Variabilis of Middle Toarcian age. The condensed layer was formed by massive numbers of ammonite shells with oolitic matrix and common hardgrounds. Stratigraphic range of the second layer is according to the occurrence of ammonite genus *Podagrosites* sp. the end of Middle Toarcian to Upper Toarcian.

The fossil material consisted mainly from the fossil casts and prints covered with a fine glauconite cover. Ammonite genera *Phylloceras* SUESS, *Calliphylloceras* SPATH, *Lytoceras* SUESS, *Dactylioceras* HYATT, *Harpoceras* WAAGEN,

*Hildoceras* HYATT, *Frechiella* PRINZ, *Haugia* BUCKMAN and *Podagrosites* GUER were identified. The most dominant taxon was represented by the genera *Hildoceras* encompassing 61 % of the total assemblage. Beside the ammonite fauna, nautilids, bivalves (2 taxa) and gastropodes (3 taxa) were collected. The microfossil content of the observed sediments yielded common shark teeth (*Sphenodus*? sp.), textulariid and lagenid foraminifers. Uniquely a small tooth fragment of probably a sea reptile was found.

The ammonite assemblages of Tunesica Formation belong to the Bifrons, Variabilis and Thouarsense zone of Middle and Upper Toarcian.

**D. DIRNEROVÁ, J. JANOČKO and M. PREKOPOVÁ: Application of sequence stratigraphy to deep-marine sediments: Case study from Dukla Unit**

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Sequence stratigraphy is a useful tool in many scientific studies concerned with identification and classification of depositional environment. Nowadays, the sequence-stratigraphic analysis applies three basic types of data: seismic, gamma ray logs or sedimentary profiles, but the best source of data is the combination of them.

The study area is situated close to water dam Starina in Eastern Slovakia. Our data are in the form of sedimentary profiles and they represent sediments of Cisna, Submenilite and Menilite Formation belonging to Dukla Unit of Outer Western Carpathians. We designated the depositional environment as deep-marine. From structural elements we have identified deep-marine slope, slumps at the base of slope, turbidity lobes and interlobe space on the basin plane.

Sequence stratigraphy is based on relationships between deposits and relative sea-level changes. In the case of deep-marine environment, differences in sediment caused by oscillation of sea-level are not as distinctive as that in shallow-marine, but the sea-level oscillation has influence in this environment too. Decrease in sea-level can temporarily cause a transformation of deep-marine environment to the conditions of shallow-marine environment. In reverse, increase in sea-level can be distinguished by sediments typical for basin plane. In our study we attempt to apply sequence stratigraphy for identification of depositional environments and connect the character of sediments with oscillation of sea-level.

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**A. DUSZA-DOBEK: Environmental geochemical mapping of selected parks in Warsaw (Poland)**

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Detailed, multi-media geochemical mapping has been conducted in Łazienki Park, Ujazdowski Park, Morskie Oko Park and Agrykola Park (center of Warsaw). All parks are playing an important recreational function. Łazienki Park is also one of the oldest nature-historical complexes in the city. Parks localized in a city center are on the strength of multiply anthropogenic pollution (gases and ashes from transport, industrial plants and power plants).

Mapping in the parks area was focussed on topsoils collected from 0.0–0.3 m; subsoils taken from 0.8–1.0 m; sediments from ponds and canals; and surface water. The soils were collected at a sampling density of 100 x 100 m.

Concentration of Al, As, Ba, Ca, Cd, Co, Cr, Cu, Fe, Hg, K, Mg, Mn, Na, Ni, P, Pb, S, Sr, Ti and Zn was determined in topsoil, subsoil and sediments following aqua regia digestion. In addition, organic carbon and grain size distribution were determined in topsoil samples; PAHs, PCBs, chloroorganic pesticide were determined in sediments; pH was measured in topsoils, subsoils, and surface water; and conductivity was determined in surface water. Analysed constituents of surface water included Ag, Al, As, B, Ba, Ca, Cd, Cl, Co, Cu, DOC, Fe, K, Li, Mg, Mn, Mo, N, Na, Ni, P, Pb, Rb, Sb, SiO<sub>2</sub>, SO<sub>4</sub>, Sr, Ti, Tl, U and Zn.

This data set will be used for preparing data bases, statistical analyses, geochemical maps, environmental valorization and interpretation of the research (geochemistry characteristic of soils, surface water and sediments in presented Warsaw parks).

**A. FIGUŁA, A. KLESZCZEWSKA, M. MANECKI and T. BAJDA: Application of modern glass fertilizers for *in situ* immobilization of Pb pollution in acidic soils**

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Recently introduced, modern synthetic glass fertilizer VitroFosMaK, releases Ca, Mg, K and phosphates slowly to the soil without the risk of eutrophization. It can also raise pH of acidic soils. Phosphate ions released to lead-contaminated soils can immobilize Pb *in situ* through the formation of pyromorphite Pb<sub>5</sub>(PO<sub>4</sub>)<sub>3</sub>Cl. Therefore, this modern agriculture glass appears to be suitable for reclamation of soil contaminated with heavy metals.

This study was targetted to experimental characterization of processes and products of reaction between VitroFosMaK and solutions containing Pb ions. These experiments serve as a model for the reaction between soil solution and fertilizer in lead contaminated site. One gram of the fertilizer reacted with 250 mL of solution containing Pb and Cl ions. The pH was kept constant at 3.5 during the experiment. The results were compared with the experiments where pH was not adjusted.

As a result of reaction the concentration of ionic Pb was lowered significantly – below the detection limit for initial 50 mg Pb/L. Precipitation of crystalline pyromorphite was apparent. In control experiment, where pH was not adjusted,

final pH reached 10.9 and precipitation of pyromorphite was accompanied with the formation of laurionite PbOHCl (result of partial hydrolysis of Pb). The experiment at pH = 3.5 simulates the conditions in contaminated soil better.

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**W. FRANUS<sup>1</sup>, P. KALOTKA<sup>2</sup> and M. WDOVIN<sup>3</sup>: Synthesis of zeolitic materials from fly ash: Laboratory and technological tests**

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The aim of this study was the receiving of zeolite with Na-X structure, using hydrothermal reactions of soda lye with class fly ash. A number of chemical reactions on these substrates in variable conditions of NaOH concentration, time and temperature were conducted.

As a result, the most optimal was receiving this zeolite by hydrothermal reaction at following conditions: 20 g of fly ash, 0.5 L of 3 M NaOH water solution, temperature 80 °C, and time 24 h. Reaction conducted in this way, allowed to receive zeolitic material with Na-X content from 60 to 80 %.

These investigations suggested undertaking of chemical reaction application test from laboratory scale to semi industrial scale. To this end, a reactive container from PP material with volume of 130 liters was designed. It was also equipped with system of heaters responsible for monitoring temperature and level of reagents. In such prepared medium, tests of Na-X zeolitic material synthesis was successful, however, its quantitative content decreased twice. Therefore, it is necessary to mix the substrates.

Semi-technical scale tests showed the necessity of the whole synthesis process automation, composed of respective technological systems: filling the container of fly ash and soda lye water solution; vacation of a container; washing the zeolitic material (in order to separation of NaOH excess); granulation and drying of zeolitic material. Such technology will allow to receive the high class of zeolitic material which can find an application in industry, chemical and environmental engineering.

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**I. GAŁECZKA<sup>1, 2</sup>, M. MANECKI<sup>1</sup> and J. MAJKA<sup>3</sup>: The reactions between copper minerals and rain water on slag heap in Ľubietová**

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The slag heap located in Lubietová, Slovakia, is a result of 19th century mining of gold, iron and copper. Primary copper minerals (chalcopyrite, tetrahedrite), and secondary copper minerals (malachite, azurite, libethenite, reichenbachite and covellite) were identified in the deposit.

In the bottom of a spring and a small stream coming out from the tailing, green earthy precipitates are apparent. Samples of water taken down the stream show that the concentrations of major components, Ca, Mg, Na and K are relatively low, equal to 5.83, 6.83, 2.73, and 1.96 mg/L, respectively. The major anions are  $\text{SO}_4$  (33.12 mg/L) and  $\text{HCO}_3$  (28.07 mg/L). However, the concentration of Cu is higher than in typical springs and equals to 2.0 mg/L.

The purpose of this study is the identification of reactions between rain water percolating through the mine tailings and copper minerals that lead to increased concentration of Cu in water. The preliminary results (SEM/EDS, XRD) indicate that the green coating on the rocks in the bottom of stream is organic (algae). Optical microscopy reveals that the transformation of chalcopyrite is a main source of copper in secondary minerals. This explains the presence of sulphates as well. However, laboratory experiments simulating the reaction of percolating water with rocks on the slag heap show higher concentration of sulphates and lower concentration of Cu than observed in the field. The reactions are also simulated with hydrochemical model PHREEQCI.

#### **M. GÓRNA: Valorization of the outcrops of teschenite rocks from geotourist aspect (Polish Western Carpathians)**

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This paper is a part of dissertation dealing with volcanism in the Western Carpathians from geotourist point of view. It is an introduction for further research.

The occurrence of magmatic rocks of Lower Cretaceous age called "teschenite rocks" is limited to the Outer Western Carpathians. In Poland, they can be found between Cieszyn and Bielsko-Biała only in the Cieszyn Subunit, which is the lower part of Silesian nappe. They form intrusions of various thicknesses, within the Cieszyn Limestones and the Upper and Lower Cieszyn Shales. The term "teschenite rocks" includes a wide range of petrological types with variable textures and structures (teschenites, picrites, monchiquites, diabases, syenites). The teschenite rocks can be observed in the abandoned quarries and in the natural exposures, especially in streams. The outcrops in Cieszyn, Puńców, Rudów, Grodziec, Żywiec and Świętoszówka were selected to carry out the valorization. At assessment, following criteria were taken into account: condition of outcrop, educational value, location, extent of conservation and sights in surroundings. The outcrops in Cieszyn and Rudów were

recognized as the most valuable and should be available for tourists and promoted as geotourist sites.

#### **B. ZYCH-HABEL, A. KĘDZIERSKA and M. MICHALIK: Phosphate accessory minerals in the granitoids from Strzeblów (Strzegom-Sobótka massif)**

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Granitoids from Strzeblów constitute a part of Strzegom-Sobótka massif, situated in the Fore Sudetic block. Rocks from Strzeblów quarry were subjected to intense alteration processes (albitization, episyenitization, chloritization and also kaolinization). Chemical composition of accessory minerals from sixteen samples of granitoids was determined using SEM-EDS method.

Phosphates (apatite, monazite, xenotime, and cheralite) dominate among accessory minerals in the studied rocks. Based on chemical composition, several types of accessory minerals can be distinguished. Two types of apatite are observed in all samples. One type is characterized by the low REE content and the second one by very high Th (up to 10 wt.%) and REE content. Monazite usually occurs as tin plates within altered biotite. This form of monazite contains relatively high content of REE (mainly Ce and Nd), U and Th. Sometimes monazite can be found in the form of relatively small individual crystals. Xenotime usually contains relatively high amount of Gd, Dy, Ho ( $\text{Gd}_2\text{O}_3$  to 7 wt.%;  $\text{Dy}_2\text{O}_3$  to 7.9 wt.%; and  $\text{Ho}_2\text{O}_3$  to 6.9 wt.%). Xenotime often contains cheralite inclusions. Besides P, Th and La cheralite contains relatively high amount of Nd (to 11 wt.%  $\text{Nd}_2\text{O}_3$ ).

Chemical composition of accessory minerals varies within broad range. It is probably connected with influences of alkali-rich fluids, which caused albitization. Variable degree of albitization suggests different intensity of fluid-rock interaction.

#### **S. HANIGOVSKÁ: Geological structure of fluvial sediments of Torysa and Hornád rivers, southern part of Košická kotlina depression**

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This work describes Quaternary geological setting of fluvial sediments of Hornád and Torysa rivers in southern part of Košice basin. The research is focused on lithofacial evolution and stratigraphy of these sediments during Quaternary. It analyses the depth and space relations between the components of this fluvial system, and also describes geological and geomorphological characteristics of the river's terraces in valleys of Hornád and Torysa rivers. From morphological point of view the Košice basin is divided into area of fluvial plain and smoothly shaped basin downs. From geological point of view this area belongs to East-Slovakian Neogene basin. Its subsoil

represents Paleogene sediments, Mesozoic rocks of Čierna hora, Paleozoic rocks of the Spiš-Gemer Ore Mts. The youngest sediments of Košice basin are Quaternary sediments divided into several genetic types. Most common are fluvial ones deposited into terrace accumulations and on river beds. This work intends to make a space model of the fluvial system elements, thickness of fluvial sediments and its position in the studied area with the PETREL software. The main use of results can be in the fluvial exploitation of the gravel from fluvial plain of Hornád river.

#### **A. HAVLÍN<sup>1, 2</sup>: Landslide hazard assessment along the main road E 50 in Chřiby highlands**

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The main road E 50 passing Chřiby highland, presents an important connection line between Czech Republic and Slovakia. Negative factors – like frequently alternating flysch layers (clays and sandstones of Magura Unit of Flysch Belt of Western Carpathians), main infiltration and drainage area of groundwater, slope predisposition – give rise to landslides and slope instabilities across the highland and impend the main road.

Input data for GIS and statistic methods were obtained from field inventory mapping. Fossil landslides and slope movements were revised and new were described in the maps of 1 : 10 000 scales. Various tools in ArcGIS environment were used for evaluation and producing of parametric maps of slope angle, land use, curvature of the relief, slope length, DEM, runout distance, elements at risk and risk vulnerability.

The investigation result is a landslide hazard map as well as landslide risk scenarios using bivariate statistical analysis.

#### **M. HYŽNÝ: Brachyuran (decapoda) assemblage of Tomášovce Member (Paleogene), Western Carpathians, Slovakia**

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The Tomášovce Member represents the uppermost member of the Borové Formation, a part of the Podtatranská (Subtatric) Group, representing typical transgressive formation dating back to the youngest Priabonian time. The layers of the Tomášovce Member contain a hydrophilous tropical flora (predominantly angiosperm plants), a neritic macrofauna (predominantly bivalves) and benthic foraminifers. The determined faunal assemblages are characteristic of a neritic marine environment (with the addition of a littoral thanatocoenosis) and a prevalence of euryhaline forms.

A rich brachyuran assemblage consisting of about 70 specimens was collected on two localities within the Tomášovce Member in the Hornád basin situated in the Spišská Nová Ves district – the stratotype locality of the Tomášovce Member – the Ďurkovec quarry and the locality Hlinisko.

Crab remains are well preserved; also complete, isolated specimens were found so it is possible to describe the characters of the pereopods and chelipeds as well. Several taxa were determined including two new species, undescribed yet: *Ranina* sp. nov., *Calappilia* sp. nov., *Coeloma* (*Coeloma*) *vigil* A. Milne-Edwards, 1865, and ?*Portunites* sp. Several specimens of *Ranina* sp. nov. preserved in living position were found. At the Ďurkovec quarry locality, there were collected also some trace fossils referred to decapod crustaceans: *Thalassinoides* igen. and *Ophiomorpha* igen. A closer relationship between the trace fossils and crab specimens was not determined until now.

The similarities between the brachyuran faunas of studied localities and transitional layers of the Molare Formation and the Rigoroso Marl in Italy were observed.

#### **B. CHALUPOVÁ: Otoliths from the Sarmatian sediments, borehole TPM-23B (Danube Basin, Slovakia)**

Geological Inst., Slovak Academy of Sciences, Bratislava, Slovakia

Five metres deep borehole TPM-23B was drilled in the Trstín depression of Danube Basin southeast of Smolenice village. It penetrated Quaternary and Neogene pelitic sediments with fossil remnants of various animals (molluscs, foraminifers, ostracods, fish and tubes of worms) and plants (calcareous nannoplankton, green algae, oogons of characeans, palynomorphs, seeds of herbs and wood plants). The Neogene sediments in the borehole are represented by the Vráble Fm. of Sarmatian age – brownish yellow and grey calcareous clays with the layer of carbonized pieces of woods. The borehole samples from depth of 2.6–2.7 m, 2.7–3.0 m, 3.0–3.1 m and 4.0–4.3 m were studied.

The otoliths of *Atherina* aff. *austriaca* Schubert, 1906, *Cepola rubescens* Linnaeus, 1832, *Gobiidarum* sp. 1, *Gobiidarum* sp. 2, *Gobiidarum* sp. and *Gobius* sp. were identified. These are typical shallow fish, which live in brackish water over the sand or stone bottom near the coast.

Based on found fossils, it may be concluded that the fossil-bearing sediments were deposited in shallow (about 50 m) environment near land with subtropical climate.

#### **M. CHUCHRO and M. MANECKI: The Machowskie lake: Quality and development of basin**

Fac. of Geology, Geophysics and Environmental Protection, AGH-Univ. of Science and Technology, Cracow, Poland

The Machów opencast mine is situated in the Carpathian Foredeep region. The land surface area directly used by the mine reached 1560 ha. In 1992 the operation of the mine ceased and since 1994 reclamation procedures were implemented. External waste tip was transformed into meadow-forest area and large water reservoirs were designed for

open pits. The excavations were partly filled with rock material and waste. This was covered with 25 m thick clay insulation and filled with water from nearby Wisła river. Two groundwater aquifers are identified in the area. The interaction between waters is yet unclear but the risk of contamination is apparent.

The overall goal of this investigation is an assessment of present condition of water and bottom sediment in Machów reservoir. The results of analyses will be used for determination of the direction of geochemical evolution processes in the water basin. The collected samples consist of 10 water-sediment pairs. Sampling localities were evenly distributed along the shoreline. Concentrations of major ions (sulphates, nitrates, chlorides, calcium, magnesium, sodium and potassium) as well as selected trace elements were determined using atomic absorption spectroscopy and UV- vis spectrophotometry. A mineralogical composition of the bottom sediment was also determined. The preliminary results and data gathered from Machów opencast mine archives show that water parameters are equal or higher than water class III, except for coli titre – class IV.

*Acknowledgement.* The study was partly supported by Department of Geoinformatics and Applied Computer Science, within framework of the Statutory Research, University of Science and Technology, Cracow.

#### **M. JAMRICHOVÁ and R. AUBRECHT: Microfacies analysis of selected profiles of the Czorsztyn Unit of the Klippen Belt**

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Microfacies analysis of profiles in central Považie (Hrebeň, Štepnická skala II, Žiačik) and in Orava areas ("Erdúdsy Kostol") disclosed facies dissimilarities of Czorsztyn Unit from the classical development defined by Birkenmayer in 1977. In the Hrebeň section, red Krupianka Limestone is missing above the Smolegowa Limestone but grey to pink-red crinoidal limestones occur there. Higher up they pass into micritic crinoidal limestones which contain quantity of brachiopods. A new name – Streženice Limestone of the Kimmeridgian to Lower Tithonian age was proposed for a complex of brown, to brown-red crinoidal (Saccocoma) limestones which were found developed at Štepnická skala II locality. The transitions between particular microfacies are gradual, which is evidenced by transitional "filamentous" – Globuligerina microfacies presence of Globuligerina in the Saccocoma microfacies. Rogoża Coquina at the Žiačik section is typical by absence or just subordinate occurrence of the Globochaete microfacies.

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#### **I. JERZYKOWSKA and M. MICHALIK: Weathering of minerals in podzolic soils in the Tatra Mts.**

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Weathering intensity in four podzolic soil profiles formed on granitoid rocks from the Tatra Mts. was examined. The degree of mineral dissolution, weathering microtextures and the range of weathering intensity in different horizons in soil profiles were established basing on chemical analysis of soil samples, optical microscopy observations and SEM-EDS analysis of soil thin sections.

Fragmentation and dissolution of minerals and precipitation of new crystalline and amorphous phases are the main indications of weathering process in these soils. Rock-forming minerals stability order was established as follows (from the most resistant): quartz, muscovite, K-feldspar, Na-plagioclase, sericitized K-feldspar, biotite and Ca-plagioclase. Coexistence of very strongly decomposed minerals and not weathered minerals in single soil horizon indicates the presence of weathering microenvironments.

#### **B. KAJDAS and M. MICHALIK: Relationship between two types of hydrothermally altered granites at Straconka hill, Jelenia Góra Basin, Poland**

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The excavation at Straconka hill at Miłków village (about 10 km S from Jelenia Góra) is one of the biggest outcrops of grusified granite in Jelenia Góra basin. Three types of hydrothermally altered granites were distinguished. One type of granite seems to be altered in closed system, and the other two types, containing low amount of Ca, were probably altered by the same hydrothermal fluid. Granites characterized by low content of Ca are discussed in this paper.

Processes of albitization of feldspars and chloritization of biotite are wide-spread. Quartz veins are also present. Two groups of samples of granite with low content of Ca can be distinguished. The main difference between both groups is presence (in rocks of group A) and absence (in group B) of K-feldspar. Primary K-feldspars in granites of group B are replaced by pseudomorphs, which are composed of mica, chlorite and albite. Removed K (and probably Ba and Sr) from feldspars of group B granite is incorporated into secondary sericite in granite of group A. Stability of Rb content in these granites shows, that Rb contained in primary K-feldspars seems to be preferentially accumulated in secondary mica-chlorite pseudomorphs after decomposition of feldspar, while Ba and Sr are almost completely removed.

#### **E. KALIŃSKA: Grain-size distribution, rounding and frosting of sandy sediments in the vicinity of Jaktorów and Żyrardów (southern Mazovia Lowland)**

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Southern part of Mazovia Lowland between Jaktorów and Żyrardów (about 30 km on the SW from Warsaw) is developed



as almost flat surface varied by straightforward rivers and build from fine- and medium-grained sands. Thickness of sediments reaches few meters. In the older literature the origin of sediments was explained by fluvial, fluvioglacial and sloping processes and they were designated as "alluvial fans".

Cumulative curves show well developed section of saltation (with many subpopulations), presence of traction part only in few samples from the middle and bottom parts of profiles and absence of suspension section. Inclination of cumulative curves oscillates from 40 to 60°. CT points (between traction and saltation transport) are changeable and fluctuate between 0 and 2 phi (1–0.25 mm). Sediments are characterized by moderate and sometimes poor standard deviation and symmetrical skewness as a rule. Sediments are enriched in medium rounding and frosting quartz grains (EM/RM; from 79 to 98 %) in sandy fraction. Simultaneously, lack of grains with shiny surface (EM/EL) is observed. Contents of quartz in sandy fraction achieve more than 90 %. A corollary of mentioned analysis is connecting sediments with eolian environment.

**E. KALTENBERG, A. KLESZCZEWSKA, J. FLIS, M. MANECKI and T. BAJDA: Assaying arsenate and phosphate concentrations using the blue molybdate method**

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Arsenate ions are ubiquitous in the polluted environment due to both – natural processes and anthropogenic activities. There is a demand for simple and precise methods of assaying arsenate concentration in polluted solutions containing other compounds, particularly phosphates. The colourimetric blue molybdate method, proposed in 1972 by Johnson and Pilson, is complicated and of limited use. Our goal is to take advantage of modern spectrophotometers and modify the method to extend its limits and applications.

Due to interference, determination of  $\text{AsO}_4^{3-}$  concentration in the presence of  $\text{PO}_4^{3-}$  requires two parallel measurements: (1) assaying total sum of arsenates and phosphates, and (2) measurement of phosphates concentration (arsenates are masked by reduction). The concentration of blue coloured complex in solutions, formed by phosphates and arsenates in the presence of ascorbic acid, ammonium molybdate, antimonyl potassium tartrate, and sulfuric acid, is determined by spectrophotometric measurement of the absorbance at 870 nm. In the parallel measurement, the sample is treated by a solution containing  $\text{Na}_2\text{S}_2\text{O}_5$ ,  $\text{Na}_2\text{S}_2\text{O}_3$ ,  $\text{H}_2\text{SO}_4$  which removes arsenates by reduction of As (V) to As (III) before colour development. Final arsenate concentration is constituted by the difference between two measurements. Our modifications of the method increase the precision of the method and extend the limits of detection and determination.

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**M. KASINA and M. MICHALIK: Experimental study of slag transformation under hydrothermal conditions: Preliminary results**

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Blast furnace slag is a co-product of metallurgical processes, formed in pig iron production. Huge amount of slag is used in many fields of industry (e.g. in cement production, in agriculture, as a landfill cover material) or as building material. The aim of the study is to simulate processes of slag decomposition in natural conditions.

The output samples of the following study are composed of mineral phases typical for slag. The sample 628 consists of akermanite, gehlenite, rankinite and orthoclase. The sample 629 is composed of akermanite, gehlenite, cyclo-wollastonite and tremolite.

After 24 h lasting hydrothermal experiment (using distilled water) in Soxhlet instrument slag composition changed slightly. In sample 628 we observed the same mineral phases, however after evaporation of water solution we determined hydrated phases rich in sulphur: gypsum and hannebachite but also sulphur and calcite. In sample 629 experiments caused hydration of Ca-silicates and xonotlite appeared. We can also observe an inheritance of  $\text{Mg}^{2+}$  content and crystallization of merwinite instead of tremolite. After evaporation of water solution we identified gypsum, calcite and dolomite.

Leaching of sulphur can cause harmful influence on environment and also can cause accelerated damage of concrete constructions.

**A. KĘDZIERSKA, B. ZYCH-HABEL and M. MICHALIK: Mobility of major and trace elements during hydrothermal alteration, and episyenitization in Strzeblów granite (Strzegom-Sobótka granitic massif)**

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The Strzegom-Sobótka granitic massif (Fore-Sudetic Block; SW Poland) is a post-tectonic intrusion of young Paleozoic age, which underwent multistage hydrothermal processes (including episyenitization and albitization) and kaolinization. Samples were collected in Strzeblów quarry and analysed using ICP-MS and ICP-AES methods.

All studied samples exhibit different stage of hydrothermal alteration. During these processes almost all major and trace elements have been mobilized and they were enriched or depleted. The isocon method of Grant (1986) was applied in order to estimate mass transfer. Changes of concentration of major elements are characterized by general, strong gains in  $\text{Na}_2\text{O}$ ,  $\text{Al}_2\text{O}_3$ , and LOI (loss by ignition), and losses in  $\text{K}_2\text{O}$ ,  $\text{SiO}_2$ ,  $\text{Ti}_2\text{O}$  and  $\text{Fe}_2\text{O}_3$ . Behaviour of trace elements is characterized by increasing Ba, Sr, Hf, Zr, Th, U and Y contents, and decreasing Sn, Zn, Rb and Nb contents. Enrichment in  $\text{Na}_2\text{O}$  and depletion in  $\text{K}_2\text{O}$  and CaO are

related to albitization of feldspars. Enrichment in  $\text{Al}_2\text{O}_3$  is probably connected with sericitization and crystallization of kaolinite or other clay minerals. Depletion in  $\text{K}_2\text{O}$  is the effect of biotite degradation.

Mobility of REE in Strzeblów granitic rocks is significant. The REE increasing in all samples and slight shift towards lower LREE/HREE ratio were observed. This behaviour is typical for strongly albitized granites.

#### J. KLASA, J. FLIS, M. MANECKI and T. BAJDA: The synthesis of vanadinite $\text{Pb}_5(\text{VO}_4)_3\text{Cl}$

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Pyromorphite  $\text{Pb}_5(\text{PO}_4)_3\text{Cl}$ , mimetite  $\text{Pb}_5(\text{AsO}_4)_3\text{Cl}$ , and vanadinite  $\text{Pb}_5(\text{VO}_4)_3\text{Cl}$  are minerals isostructural with apatite. The precipitations of pyromorphite and mimetite are effective methods of immobilizing toxic ions in contaminated soils and wastes. Natural pyromorphite, mimetite and vanadinite often exhibit some anionic substitutions. The influence of substitutions upon the properties, stability and consequent environmental behaviour of the lead apatites is observed. Unlike the wide knowledge about crystal chemistry and thermodynamic properties of pyromorphite, mimetite and their solid solutions, the influence of vanadate  $\text{VO}_4^{3-}$  on the properties from the series is still poorly understood. A notable characteristic of this ion in aqueous solutions is its tendency to polymerize. Lack of reliable thermodynamic data creates difficulty in effective synthesis of vanadinite, which is crucial for further research.

As a result of numerous experiments and computer modeling the complete and simple method for synthesis of vanadinite has been proposed. Conditions of the synthesis meet the strict requirements of applications. This method is based on dropwise mixing of  $\text{NaVO}_3$ ,  $\text{Pb}(\text{NO}_3)_2$  and  $\text{KCl}$  at  $\text{pH} = 3$  and temperature equal to  $90 \pm 10^\circ\text{C}$ . The excess of chlorine ions in the final solution is critical. SEM-EDS and X-ray diffraction analysis of the precipitates confirm the effectiveness of the method.

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#### M. KLÚZ: Proposition for drainage of building pit according to the model of groundwater flow

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This research has been a part of hydrogeological survey for company INSTA s. r. o. which was conducted in May 2007 in industrial area of city Prievidza. Main aim of this study was to design and verify the optimal drainage system for building pit. Problem was solved by mathematical model of groundwater flow for the first aquifer.

Conceptual model was built-up on geological and hydrogeological properties of surrounded area and

boundary conditions. First layer is low permeable clay three meters thick which confine second layer – shallow aquifer. Aquifer consist coarse sand and gravel with fine permeable property. Hydrogeological aquitard was considered by impermeable clays founded 8 meters below the ground (Potančok, 2007). Depth of groundwater level below ground surface depends on season and varies from 0.85 to 1.2 meters. Short term pumping test determinates: maximum specific discharge ( $q = 1.246 \text{ l}\cdot\text{s}^{-1}\cdot\text{m}^{-1}$  with maximum well discharge  $Q = 4.5 \text{ l}\cdot\text{s}^{-1}$  and groundwater level lowering  $s = 3.61 \text{ m}$ ), hydraulic conductivity ( $k_f = 4.43\cdot 10^{-4} \text{ m}\cdot\text{s}^{-1}$ ) and storage ( $S_y = 4.43\cdot 10^{-4}$  (-)). Boundary conditions with constant head were assigned for Handlovka and Nitra rivers. Model was calibrated on steady state flow. Result of model provide optimal design of 8 drainage wells with well discharge of  $Q = 3.7 \text{ l}\cdot\text{s}^{-1}$  and common infiltrated rate  $1200 \text{ m}^3$  per day (Klúz, 2007).

#### A. KOCHMAN: Different methods for reconstruction of compaction applied to estimate the primary thickness in the Upper Jurassic limestones

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The primary thickness of carbonate sediments was reconstructed at the Zalas quarry in the Cracow-Wielun Upland in southern Poland. The outcrop contains an initial, sponge bioherm and equivalent interbiohermal sediments. Researches involved selection of one lithological profile in carbonate buildup, three profiles in equivalent basinal facies and distinguishing of all lithological succession types. After that the compactional reduction of thickness was estimated. The selective profiles are of the same age. The Upper Jurassic (Oxfordian) limestones and marls were sampled.

Total compaction was measured by using of the Carbonate Compaction Law (Ricken, 1986). The law requires data on the carbonate content, insoluble residue content of the sample and rock porosity. The carbonate content and non-carbonate content were determined by Atomic Absorption Spectrometry. The porosity was measured in the laboratory.

The original depositional thickness was calculated using simple expression between final thickness (after compaction) and compaction of sediments (Martire and Clari, 1994). However, many aspects of the compaction in carbonate sediments are still poorly understood. Using this law for estimating, the primary thickness needs setting up some assumptions.

Moreover compaction can be evaluated quantitatively by the different methods. Reconstruction of compaction included observation of deformation of fabric components, organic microfossils and degree of burrow deformation. Compaction was also determined by observation of numerous stylolites and dissolution seams in thin-sections, polished-sections and outcrop.

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**A. KOSTKA: Factors affecting spatial distribution of metals in bottom sediments of Wigry lake**

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The aim of this study was to find main factors which influence the spatial distribution of heavy metals in bottom sediments of Wigry lake. This lake is located in NE Poland and is characterized by complicated morphology and bathymetry. Its sediments are represented by calcareous gyttia (~75 % of lake area), lacustrine chalk (~25 %), detritus gyttia and clastic sediments (<1 %). The GIS techniques were used in research. They allow examining correlations between individual factors and concentrations of metals. Following spatial factors were examined: depth of the lake, distance from Czarna Hańcza estuary (main river feeding Wigry waters), distance from lake banks, distance from calcareous gyttia, distance from lacustrine chalk, distance from detritus gyttia, distance from clastic sediments, distance from roads.

Concentrations of two metals (Fe, Mn) were investigated in the upper 5 cm of bottom sediments being dissolved in mixture of  $\text{HNO}_3/\text{H}_2\text{O}_2$  and measured by AAS method.

Analysis showed that the main factor influencing the spatial distribution of Mn is depth of the lake which is probably connected with sediment type (in deeper parts of Wigry lake there dominates calcareous gyttia rich in organic matter and fine-grained substances which both bond heavy metals). Fe mostly depends on distance from Czarna Hańcza estuary which can indicate the anthropogenic impact on enrichment of bottom sediment of Wigry lake with this metal.

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**J. KRASNOYAROVA: Conditions for forming carbonate rocks in early carbonic period in area Kvarkensky (South Ural)**

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The material for this work has been selected during field seasons of 2006–2007 in the southern part of Magnitogorsk tectonic zone (area Kvarkensky, the Chelyabinsk area). As objects for limestones study the Birgildinsk and Kamorzinsk suites have been used. The age of suites was revealed by brachiopods and foraminifers as Lower Carboniferous – Serpukhovian. The work aimed the detail lithological description of rocks and restoration of their forming conditions. Limestones according to classification by R. S. Duncham belong to boundstones. Their strong metamorphic differences are exceptional, reaching to coarse-crystalline marbles. The rocks consist from calcite 90–95 %, quartz 5–3 %, hydromica 3–2 % and talk <1 %. Limestones contain a large amount of organogenic detritus, brachiopods of Productida group, by microscopy we found bryozoa, spiculas sponges and foraminifers. A small share of terrigenous material, a variety and a degree of preservation of fossils specify active hydrodynamical mode of shallow-sea pool which had depths of a continental shelf.

**E. KRÓL: Impact of geology on land use management in the Busko and Solec spas areas**

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The Busko and Solec spas are located in southern Poland within the three physiographic regions – Solec Trough, Pińczów Rise and Vistula River Lowland. Mineral waters, solid mineral resources, variety of soils, landscape, hydrogeology and geological-engineering conditions are bound to regional geology. All these factors are decisive in local economic development.

On the basis of sulphurous groundwater deposits (Busko Zdrój, Solec Zdrój, Welńin and Las Winiarski) the health resort function is predominating. Groundwater reservoirs are located in Senonian marls, Cenomanian sands and sandstones, and Kimmeridgian bedrock limestones. They are covered by unpermeable Miocene Krakowiec Clays. Total dissolved solids (TDS) are considered relic of the saline formation (Zuber, 2007). The mineral waters are slowly renewed.

Balanced development of the spas depends on proper land use management. The main constraint is the degree of groundwater endangering. Land use analysis reveals potential environmental conflicts.

Groundwater vulnerability and grade of the mineral water protection depend on areal distribution of Krakowiec Clays. In Solec Spa considerable thickness of the cover results in resistance of mineral waters to pollution. In Busko area the clays are lacking, therefore permanent lowering of piezometric surface leads to mineral water quality reduction (Porwisch et al., 2002). Well discharge limits expressed in hydrogeological reports should be carefully assured there.

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**K. KRONOME and M. SÝKORA: Microfacial study of Hallstatt limestones near Silická Brezová**

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The outcrops are located ~1 km west of the village Silická Brezová, southern Slovakia. The studied Hallstatt limestones represent layered bioclastic limestones of greyish-pinkish to red colour with signs of nodularity, often fragmentary bioclasts and bioturbation marks.

Base of the outcrop is Tuvanian in age, built by Tisovec-(Waxenec-) type limestones, e.g. shallow-water grainstones with microfacies of agglutinated foraminifera and gastropoda. The facies in the upper parts of the Tuvanian obtains deeper-water character with appearance of Hallstatt-type wackestones and mudstones with thin-crust bivalvia microfacies and radiolaria.

During the Norian this deep-water sedimentation continues including five layers of carbonatic stilobreccias.

The typical limestone type of the Alaun are wackestones,

with two layers of bivalvian lumachella and hydrozoa *Heterastridium* cf. *conglobatum* REUSS.

Sevastian limestones are built by wackestones and packstones with two layers of peloid grainstones.

The uppermost layer of the outcrop belongs to Dachstein limestones being in tectonic contact with the underlying complex.

On the basis of the obtained data limestones were classified according to schemes of Wilson (1975) and Flügel (1982).

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### M. KUČERA: New view on genesis of caves in the High Tatra Mts.

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The studied area is located in the part of High Tatra Mts. – the Belianske Tatry Mts. within the Kobyly vrch massif, representing eastern ridge of the Mt. Bujačí. Cave system is situated in Gutenstein massive organogenic limestone. The formation and development of caves is in principle influenced by a tectonic predisposition. Underground water in rock massive migrated along failure zones and thus formed cave channels and chambers. There were found five monogenetic groups of discontinuities in this region. The most dominated group is based on Podtatranský – Ružbašský fault system. The circulation of water in the partial nappe of Bujačí was most probably upward along this fault system. Engagement of moderately thermal water caused spacious upward cave chambers. Rising and meteoric waters were mixed in the upper parts of the underground cavities and this effect is expressed by the morphology of cave corridors. The active process of cave development lasted mainly in pre-Quaternary period.

### J. KUČEROVÁ: Extended results from the research of Miocene macroflora (Kalonda, Southern Slovakia)

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The locality Kalonda is situated in Southern Slovakia and belongs to the same paleofloristic complex as the localities Lipovany (Slovakia) and Ipolytarnóc (Hungary). Studied plant assemblage occurs in the Bukovinka Formation, Eggenburgian in age. Preliminary research yielded determination of 21 angiosperms, most abundant are Magnoliaceae, Lauraceae and Arecaceae. Following research is focused on the anatomical interpretation of leaf macrofossils, statistics, quantitative paleoecology and taphonomical interpretation. Floral composition, diversity, equitability and dominance are discussed.

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### M. A. KUSIAK<sup>1</sup> and B. BUDZYŃ<sup>2</sup>: Monazite chronology: A brief review on microprobe dating method

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Monazite (REE, Th, U)PO<sub>4</sub> is a common accessory mineral in the igneous, metamorphic and sedimentary rocks, and widely used as a U-Th-Pb geochronometer. Isotopic dating techniques (particularly mass spectrometry) were used for long decades, whereas non-isotopic method was developed in the fall of the twentieth century. The chemical method assumes that all Pb in the mineral structure is radiogenic (or at least common Pb can be neglected) and the system remained closed. The latter condition can be verified using Chemical Th-U-total Pb Isochron Method (CHIME; Suzuki and Adachi, 1991). Recently improved dating technique and development of the analytical equipment gives a powerful tool that allows combining obtained age data from the in-situ microanalyses with a structural position of analysed grains (Williams et al., 2007). The presentation will provide a brief review on development and improvement of the electron microprobe monazite dating technique.

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### N. B. KUZNETSOV<sup>1</sup>, J. MAJKA<sup>2, 4</sup>, J. CZERNY<sup>2</sup>, T. Yu. TOLMACHEVA<sup>3</sup>, M. MICHALIK<sup>5</sup>, A. KAWALEC-MAJKA<sup>2, 6</sup> and M. MANECKI<sup>2</sup>: Do the oldest conodonts in the world come from Svalbard?

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We report the first findings of Cambrian conodonts fauna in Spitsbergen and their meaning for stratigraphy of the bottom horizons of a Lower Paleozoic sequence in the southern part of Wedel Jarlsberg Land (southwestern Spitsbergen). The conodonts were found in the rocks of Blåstertoppen Formation. The bottom of this formation is underlined by the Neoproterozoic/Cambrian in age Jarlsbergian unconformity. The Blåstertoppen Formation is overlain by Lower Cambrian Vardepiggen Formation. The age of the Vardepiggen Formation was determined with the use of trace trilobite fossils. Summarizing such data, we assumed that it is necessary to redefine stratigraphy of whole Cambrian sequence in Svalbard Archipelago or to redefine the age of fossils occurring within the investigated rock sequence.

### M. KUŹNIAKOWSKA: Trace metals in industrial waste disposals of Nitric Plant in Tarnów



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Waste landfills of the Nitric Plant in Tarnow (Czajki and Za Rzeką Białą) have a long history. During the time of exploitation many types of wastes were disposed there (lime, soot, slugs from Nitric Plant, fly ashes, sewage and others). Waste landfills are located in the vicinity of the Nitric Plant in Tarnow, private households, fields and gardens but also close to the four rivers (the Dunajec river, the Biała Tarnowska river, the Chyszowski draining ditch and the Klikowski stream).

The aim of the research was to determine trace metals concentrations in the different waste samples, to assess metals potential mobility and evaluate potential environmental risk connected with disposals storage. Samples of wastes (fly ash, soot, sludge) and wastewater were collected from several sectors in both Czajki and Za Rzeką Białą disposals. The waste samples were processed in the microwave oven, using concentrated nitric acid. Total concentrations of trace metals (Zn, Pb, Cu, Cr, Ni, Co, Cd, Ti, V, As, Fe and Mn) were determined by ASA and ICPMS methods. Aqueous leaching tests, buffer capacity and six step sequential extractions were carried out to evaluate potential binding forms of metals and possibility of their mobilization. X-ray diffraction was conducted to determine mineral composition of waste samples.

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**M. LAHO and R. HOLZER: Properties and evaluation of building stone in historical monuments in Bratislava and outskirts**

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Paper deals with the study and characterization of dimension stone rock blocks in monuments in Bratislava. First task was the actualization of all original facade plans. Actualization consisted of photographic documentation of the facade fields and then the digitization in ArcView 3.2 software. The dimension stone size was georeferenced, so that blocks size corresponded with the plan scale. Their visualization was done in ArcView 3.2 software. The main aim of the project, beside the determination of lithology of the dimension stone on selected presbytery fields, was to determinate the degree of deterioration and create the weathering typological classification. From the possible replacement stone sources the basic physico-mechanical rock properties were determined, emphasizing the quality of replacement stone material. Microscopic study (thin sections) was realized with the aim to determine the basic rock components and binds – both for comparison with rocks from historic and potential new quarry sites. The methodological procedure and its application is a small contribution to the knowledge of important properties and behaviour of natural dimension stone, being important for reconstruction works emphasizing the prevention and protection of historical monuments.

**P. LENIK and D. CZAJA: Cobalt, nickel and arsenic in pyrites from copper deposit in Fore-Sudetic Monocline, SW Poland**

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Iron sulphides – pyrite and marcasite are the most common ore minerals found in copper deposits in Fore-Sudetic Monocline. Special attention should be paid to pyrite which sometimes contains considerable amount of metals of transition groups, such as Co, Ni, Cu and As.

Altogether 24 concentrations of pyrite differing in structural formation and position in deposit were analysed with EPMA. Depending on structures of analysed sulphide the different quantities of cobalt, nickel and arsenic were found. The maximal determined content of cobalt was 8.78 wt.%, although in 15 analysed pyrites it was below 0.5 wt.%. Nickel appears in definitely smaller quantities. The maximal content of nickel was 1.3 wt.%, but in most cases it was below determination limit of EPMA method. The maximal content of copper was 8.18 wt.%. Moreover, only in a few cases it was below 1.0 wt.%. The maximal content of arsenic in pyrite was established as 7.28 wt.%.

While analysing obtained results one can observe a linear correlation between contents of cobalt, nickel and arsenic in pyrite. With the increasing content of cobalt in pyrite the increase in content of nickel can be noticed, even though its quantity is ten times smaller. In the case of cobalt and arsenic that correlation can be observed only within content of cobalt above 1.0 wt.%.

Strong correlation between cobalt and arsenic can be the result of the presence of cobaltite molecule in pyrite formed as submicroscopic small inclusions or substitution of both elements in pyrite structure. However, it requires microdiffraction X-ray examination. The presence of copper in pyrite shows that pyrites with heightened content of copper were formed at the same time as the main of copper mineralization, meaning during the late diagenesis.

**E. LYGINA: Sedimentation conditions of Danian and Eocene basins of the mountain in Crimea**

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In the history of Paleocene-Eocene formation of Crimean sedimentary basin there existed two stages of accumulation of relatively thick shallow-water shelf carbonates – Danian and Eocene. Such formations refer to carbonate platforms. Carbonate ramps are the most typical for Crimea in studied time interval.

During Danian in Southwestern Crimea the tendency to shallowing of a basin with progradation of facies toward the Simferopol raising is present. It is expressed in transition upwards on a section of detrital relatively deep-water limestones to organic-fragmentary serpulid-crinoid-bryozoan

and pellet shallow-water limestones. Depths less than 10 m are characteristic.

There are sponge-foraminiferal layered limestones with silicification in Central Crimea. Such deposits formed in depth of 100–150 m. Lens of carbonate breccia located in lower part of section is specified on very fast local regression.

In Eastern Crimea the detrital and micrite limestones alternate with foraminiferal-crinoid limestones with remains of sponges. Such deposits are characteristic for deep-water slope of carbonate platforms with depth 100–200 m.

Deposits of Eocene represent nummulitic bank from paleogeographical point of view. Its center is dated for east wing of the Simferopol raising. Absolute paleodepths changed from 10–30 m in the central part of nummulitic bank and up to 120 m in more deep-water shelf conditions. Nummulitic limestones of Eocene can theoretically be good reservoirs of hydrocarbons.

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#### **B. MAGULOVÁ and M. BEDNARIK: Landslide hazard assessment: Case study in railway Kralovany – Liptovský Mikuláš**

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Landslides and other slope deformations are the most widespread geodynamic events in the West Carpathians. Taking into account that the socioeconomic and technological level will increase in the future, the landslide hazard assessment is important for the urbanized areas and can reduce sanitation expenses. Selected area of our case study spreads 50 km along railway between towns Kralovany and Liptovský Mikuláš in a width of 200 m (100 m buffer) around the railway.

Effectivity of landslide hazard assessment using geographical information systems (GIS) and statistics is dependent on the suitable selection of geological factors, which play a dominant role in slope stability state. In presented case study six factors influencing the slope stability are evaluated – lithology, slope aspect, slope angle, hypsographic level, actual landuse and registered landslides. These factors have been prepared in a vector form (parametric maps) and consequently processed to the raster form. Bivariate statistical analyses were used for the construction of final landslide hazard map.

The case study affords the prognosis of landslides space distribution, not the time frequency of their activation. Result of the landslide hazard assessment is a map of landslide hazard substantiality in the scale 1 : 10 000.

#### **J. MATUSIK, T. BAJDA and M. MANECKI: Removal of aqueous cadmium by hydroxylapatite and fluoroapatite**

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Reducing the bioavailability of heavy metals in soils by phosphate addition is an effective technique known from literature. Equilibria in the soil solutions are mainly controlled by sorption/desorption and crystallization/dissolution processes. Therefore the goal of this study was to examine the effectiveness and mechanism of aqueous cadmium uptake by hydroxylapatite and fluoroapatite particles.

*In situ* reactions were performed by adding solid forms of synthetic hydroxylapatite and natural fluoroapatite to cadmium solutions within pH range from 3 to 7. The changes in concentrations of Cd, PO<sub>4</sub> ions and pH were measured for reaction times 2–1440 hours. The solids after reactions were characterized by XRD and SEM-EDS.

Percentage reduction of cadmium concentration in the experiments with fluoroapatite and hydroxylapatite, regardless of pH, did not exceed 17 % and 25 %, respectively. Cadmium uptake from the solution resulted from the formation of cadmium phosphates and/or Ca-Cd phosphates solid solutions on the surface of apatites. Various sizes of formed phosphates may be connected with different solubilities of apatites. Hydroxylapatite with higher solubility faster releases phosphate ions and this promotes crystallization of a large number of small crystals. Whereas fluoroapatite with lower solubility slower releases of phosphate ions and in this way enables formation of big crystals. There is no clear evidence for ion-exchange mechanism.

#### **E. NIESIOŁOWSKA: Biostratigraphy of the Upper Cretaceous deposits of the Homole area, Niedzica succession (Polish part of the Pieniny Klippen Belt)**

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Within the Upper Cretaceous deposits of the Niedzica Succession of the Polish part of the Pieniny Klippen of the Homole area the micropaleontological analyses have been performed. On the basis of studied samples the local biostratigraphic biozones (*R. appenninica*, *R. reicheli*-*R. greenhornensis*, *R. cushmani*) have been recognized and established, based on foraminiferal assemblages. These zones have been correlated with the standard planktonic zonation. The age of the studied samples was estimated as Lower–Upper Cenomanian. Planktonic index foraminiferids were numerous and well preserved. Some of these species were described and illustrated in details.

Based on qualitative and quantitative analyses, studied foraminiferal assemblages indicate the external shelf and upper part of the continental slope as depositional environment of the studied deposits, within the Niedzica subbasin.

#### **P. OLCHOWY: The influence of a secondary porosity within a sediment on a development of stromatolite structures in the Upper Jurassic sediments from**

### the Wielkanoc quarry near Gołcza (Kraków-Wieluń Upland, southern Poland)

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Isolated stromatactis-like cavities (*sensu* Matyszkiewicz, 1997) are found in the microbial-sponge type carbonate buildup from the Wielkanoc quarry (35 km north from Cracow). The structures have flat base and digitated or arch shape roof. They reach 1 cm width with some millimetres height and are filled by multigeneration carbonate cements as well as by internal sediment. Its genesis is controversial including the presence of primary cavities within sediment on which stromatactis-like cavities developed.

The Upper Jurassic (late Oxfordian) massive limestones from a quarry include numerous *Stylosmilia* corals, which are observed mainly in the upper part of ca. 10 m profile. Polished slabs reveal pores with elongated as well as oval shapes. The latter reach 4 mm in diameter and are a result of corals dissolution.

The dissolution of aragonite skeletons led to development of a secondary porosity within an unlithified sediment. Simultaneously, the primary stress field changed into the secondary one. Periodic tectonic shocks, induced by Kraków-Lubliniec Fault Zone (Żaba, 1995, 1999; Buła et al., 1997), resulted in a collapse of sediment above a roof of secondary voids. Compressive stresses in the walls and tension stresses in the roof of the voids were responsible for an arch shape of stromatactis-like cavities in homogeneously lithified sediment. The border between host rock (wackestone) and internal sediment (packstone) at the bottom of stromatactis-like cavities is oval and thus copy an original shape of corals.

### O. A. ORLOVA: First finding of permineralized wood remains of *Eristophyton* in the Lower Carboniferous of North Russia

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Permineralized wood fragments were found in ferruginous sandstones of the Lower Carboniferous age in two boreholes, which are situated on the south of the Arkhangelsk Region. Anatomical features of the wood have been studied with a scanning electron microscopy (SEM CAMSCAN). Because of fragmental preservation there is no information on the pith. The secondary xylem and some elements of primary xylem are well-preserved in the stem fragments. Metaxylem tracheids are narrow, hexagonal in shape. They have scalariform thickening both on radial and tangential walls. Secondary xylem is of pycnoxylic type of the wood. In radial section the polygonal tracheids are narrow and relatively long. The tracheids have uni-, bi-, and triseriate bordered pitting. Multiseriate pits are contiguous and alternate, while uniseriate ones are free. The pits are from rounded to hexagonal in shape, 5.2–13 µm in diameter with inclined split-

-like apertures. There is no pitting on tangential walls. Xylem rays are uni- and biseriate, 14–20 µm wide, relatively short – commonly 7–10 cells high. Ray cells are rectangular in shape. Cross-fields show 1–8 rounded-hexagonal pits. Cross-field pit apertures are inclined elliptic or split-like in shape. Growth rings are invisible. Among Lower Carboniferous plants of gymnospermous affinities, wood remains under study most closely resemble in ray organization and pitting the taxon *Eristophyton* sp. described by J. Galtier, J. L. Schneider and L. Grauvogel-Stamm from the Upper Visean of France.

### M. OSACKÝ<sup>1</sup>, V. ŠUCHA<sup>1</sup>, J. MADEJOVÁ<sup>2</sup>, A. CZÍMEROVÁ<sup>2</sup> and P. UHLÍK<sup>1</sup>: Stability of smectite in the presence of metal iron

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To predict the long-term properties of clay barriers in high-level nuclear waste (HLW) repository, it is essential to study the interactions between clay minerals, and more especially smectite, and metal iron. Studies of iron-clay interactions have shown the systematic destabilization of the initial clay material and the subsequent crystallization of reaction products. The aim of the present work was to investigate smectite stability in the presence of metal Fe.

In our experiments the <2 µm fraction of Na-saturated smectites (SAz-1, STx-1, SBa-1, SWa-1, SCA-3) was used for interaction with iron powder (Fe<sup>0</sup>). The experimental mixtures of smectite/iron powder/distilled water = 1.5 g/1.5 g/70 ml were prepared in an glove-box (N<sub>2</sub> atmosphere). A batch experiment was performed at 75 °C for 35 days in oxygen-free system. The reaction products were examined by X-ray diffraction (XRD), infrared spectroscopy (IR), HRTEM, BWA method.

In all reacted samples the residual metal Fe was present together with newly-formed magnetite. Small amount of 1 : 1 phyllosilicates and lepidocrocite was formed too. All diffraction peaks of smectite decreased significantly. Significant changes were observed in the octahedral sheet of smectites. These spectral changes are consistent with dehydroxylation and changes in bonding between tetrahedral and octahedral sheet. Fe oxide and oxyhydroxides were formed consequently from OH groups. BWA technique reveals decreasing of crystallite thickness of smectites after experiments. The same result was confirmed by HRTEM. The layer charge was determined by methylene blue method. During experiments the layer charge of all smectites decreased as documented by increased amount of monomers and H-dimers.

### S. OZDÍNOVÁ: Biostratigraphic and paleoecological interpretation of the Veľké Kršteňany borehole (Upper Nitra region) based on the calcareous nannofossils

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The Velké Kršteňany borehole is situated in the Upper Nitra Paleogene basin, belonging to the Inner Carpathian Paleogene Basins.

In the Eocene sediments from the Velké Kršteňany the calcareous nannoplankton was studied for the biostratigraphical and paleoecological purposes. The studied assemble of the calcareous nannofossils was quantitatively and qualitatively rich.

Nannoplankton zones NP 12–NP 16 (sensu Martini, 1971), characteristic for Middle and Upper Eocene deposits, were determined.

In the basalmost part of the borehole the Nannoplankton Zone NP 12 – *Tribrachiatulus orthostylus* was recognized, basing on the presence of the species *Ellipsolithus macellus* and *Tribrachiatulus orthostylus*. This species have last occurrence on the top of this zone.

The Zone NP 13 – *Discoaster lodoensis* was recognized in the interval between samples VK 013 and VK 08 basing on the absence of *Tribrachiatulus orthostylus*. This species has its last occurrence on the top of zone NP 12.

The Zone NP 14 – *Discoaster sublodoensis* was recognized basing on the appearance of *Laneternithus minutus*, which have his first occurrence on the base of Zone NP 14. In this zone radiated bloom of the family *Discoasteraceae* – with more than 10 % partition in the assemblage, which is indicated by EECO (Early Eocene Climatic Optimum; Agnini et al., 2006). The most common species were *Discoaster barbadiensis* and *D. saipanensis*.

The top of *Discoasteraceae* – bloom was recognized in the samples VK 08–VK 05. In the next samples their number decreased.

The Zone NP 15 – *Chiphragmalithus alatus* was recognized as a very poor nannofossil assemblage in the interval between samples VK 4–VK 10. In this zone, diskoasters were very rare, replaced by placoliths, such as *Dictyococites bisectus*, *Coccolithus pelagicus*, *Cyclicargolithus floridanus* and *Reticulofenestra* sp.

The Zone NP 16 – *Discoaster tani* nodifer was assigned basing on the presence of *Helicosphaera compacta*, which is characteristic for the upper part of the Zone NP 16. This zone was designated for the interval VK 1–VK 15.

Foraminifers were also studied by Soták (2007) with comparable results. In the interval VK 015–VK 02 Soták recognized Middle Eocene – Ypresian, foraminiferal biozone P9 with species *Subbotina (T) boweri*. The interval VK 02–VK 8 was assigned as Lower-Middle Lutetian with foraminiferal zones P10–P11, with characteristic species *Acarinina cuneicamerata*, *A. bullbrookii*, *A. interposita*, *A. matthewsae*, Upper Lutetian – foraminiferal biozones P11–P12 with significant species *Morozovella aragonensis*, *M. crater*, *M. spinulosa* and Upper Lutetian – Bartonian, foraminiferal biozones P13–P14, with species *Acarinina (T) topilensis* and *Morozovelloides crassata* (Soták, 2007).

Basing on the study of the calcareous nannofossils in the Velké Kršteňany borehole we can reconstruct the paleoenvironment. The nannofossil assemblage characterizes the period before EECO (interval between samples

VK 015–VK 08), EECO – period, characterized by the *Discoasteraceae* – bloom (interval between samples VK 08–VK 4) and cooling term (from samples VK 5).

## L. PIXOVÁ: Engineering-geological conditions on stage highway D1 between Budimír and Bidovce

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Proposed highway construction of stage D1 Budimír – Bidovce directly connects to existing highway D1 Prešov – Budimír and is 13.7 km long. Route leads to the south from existing ending, next to village Budimír up to village Košické Olšany, where heads east and goes ahead up to crossroad, which is south of the village Budimír. The aim of this study was to give information about geological setting of the region, its engineering-geological and hydro-geological conditions, and stability of the stage of the highway, as well as engineering-geological and geotechnical evaluation of proposing stage of highway and main objects, such as open cuts, road embankments and assemble the map of engineering-geological zoning at a scale 1 : 10 000. Final map was made up in 300 m wide belt that is 300 m on each side from planning axis of the highway. Map of engineering-geological zoning offers image of individual districts of the region with detailed physical and mechanical characteristics of Quaternary sediments and rocks and subsoil of pre-Quaternary age. The engineering-geological map and statistic values can be a valuable aspect in realization of engineering-geological exploratory works, designing and construction of given engineering work as well as other building objects in given region.

## A. ROGÓŻ and E. KOSZOWSKA: Fe-Ti oxides in Lower Paleozoic rocks from Będkowska valley, near Cracow

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The studied oxide minerals occur in the Lower Paleozoic rocks, drilled in the Będkowska valley, situated at the boundary zone of the Małopolska and Upper Silesia Blocks. These primarily sedimentary rocks have been altered in the orthoclase-cordierite hornfels, hornblende hornfels and albite-epidote hornfels facies of contact metamorphism connected with a granitoid intrusion.

It was found that the ore minerals are represented by sulphides (pyrite, pyrrhotite) and oxides (magnetite, ilmenite, rutile and Fe-Ti oxides, which are the phases of the ilmenite-hematite solid solution). The parageneses of opaque minerals depend on the change of thermal and redox conditions. Pyrite is the most common ore mineral, being present in all above mentioned facies, whereas the remaining minerals occur in the altered rocks, formed under conditions of the orthoclase-cordierite-hornfels facies.



The oxides of the ilmenite-hematite solid solution consist from lamella, which contain different amounts of Fe and Ti. These lamella are hemoilmenite (0.55–0.85 mol.% Ti) and ilmenohematite lamella (0.2–0.45 mol.% Ti) in composition and they were formed during a decrease of crystallization temperature. The presence of the association: hemoilmenite + ilmenohematite + magnetite indicates that the metamorphic changes occurred in the temperature range 550–680 °C, representing the most thermally altered zone.

**K. RUBTSOVA: Neogene paleochannels of the Black Sea-Caucasian region and their relationships with location of hydrocarbons**

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The reduction of traditional structural collectors (anticline rises) found in the North-Black Sea shelf and in the Fore-Caucasus has caused searching for another required types of hydrocarbon collectors in particular lithologic and stratigraphic types. At present the collectors formed in channel terrigenous sediments of buried river paleovalleys look the most perspective. The lithologic structural characters of these paleochannels sediments determine the existence of sizeable areas with high porosity and, as a sequence – the good-quality collector rocks within them. Buried river paleochannels are widespread in the Miocene sediments in the West and Central Fore-Caucasus, the Crimea Mountains and the Shatsky swell (the Black Sea water area). The characteristic paleogeographic features of the Eastern Black Sea region in the Neogene time were coastal alluvial valleys; paleorivers streamed down from growing the Great Caucasus orogene. Many well-known oil and gas fields in the West Fore-Caucasus are concerned such with the buried channel's sediments. Taking into account the widely developed clayey sediments with high content of organic substance in this region (such as the Maikopian Series), the sediments of paleochannels, including the same in the Shatsky swell region, are quite perspective from the point of view of oil-fields searching.

**D. SALA and G. RZEPA: Preliminary results of geochemical investigations of landslide lakes in the Babia Góra National Park**

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Babia Góra (Diabłak) is the highest summit of the Polish Western Carpathians chain, reaching 1725 m above sea level. The massif is built of flysch sediments of the Upper Cretaceous–Paleogene age. The entire mountain is within the Babia Góra National Park. Within the Polish part of the BPN there are about 19 natural still water reservoirs, formed mostly by landslides. They are located mainly on the forested northern slope of the mountain (the lower and upper forest belts). Only the highest three ponds belong to the dwarf-pine belt. Fall

waters reinforce these small lakes (up to ca. 450 m<sup>2</sup>) and for this reason most of them are periodical in character, being usually completely evaporated during summer. The aim of this study is the estimation of pollution in particular ponds. For this purpose, 12 water as well as bottom sediment samples were collected. Electrolytic conductivity (EC), pH and temperature of the water were measured in situ. Detailed chemical analyses, including main cation and anion concentrations, trace metal levels and selected physicochemical parameters were also performed.

It was determined that the waters are acidic to neutral (pH 4.08–7.44) and with low mineralization – the EC values range from 22 up to 225 µS/cm. Most of them are of calcium–bicarbonate type. The high COD values ranging from 8.0 up to 238 mg O<sub>2</sub>/L indicate the presence of large amount of organic matter. The minor and trace element concentrations are usually very low. Only iron reaches elevated levels in most cases (up to 1.6 mg/L). Several samples contain rather high Mn and Al concentrations, up to 0.3 mg/L and 0.9 mg/L, respectively. Therefore, preliminary results suggest that the landslide ponds are not polluted and elevated values of some parameters are probably related to natural geochemical processes.

**M. SIMCIKOVA: DAG 391 meteorite as a product of basaltic volcanism on asteroid (4)Vesta**

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In the light of current knowledge, we expect the occurrence of basaltic rocks on terrestrial planets and also on the asteroid (4)Vesta, as evidenced by the resemblance of the spectra of this asteroid and probably its meteorites – eucrites. Basic differences in basaltic formations in the Solar system are caused by different P-T conditions and different activity of volatiles. The polymict eucritic breccia DaG 391 (Grossman, 1999), which was found in 1997 in the Libyan desert, has not yet been thoroughly studied. Eucrites, in general, have less Mg and alkali in comparison with mantle sources of the Earth and Moon, and are also depleted of K, Na. Like other eucrites, DaG 391 is relatively rich in Fe. There are sharp-edged basaltic clasts (18 mm in diameter) in the grey matrix, with rare presence of gabbroic clasts and with spherical glass inclusion (0.3 mm). Ruptured grains show signs of low degree of shock metamorphism. The gabbroic part consists of basic plagioclase (An<sub>76–90</sub>) and pyroxenes with ferrohypersthene and ferroaugite lamella (composition of low-Ca pyroxene is Wo<sub>1–4</sub>En<sub>30–72</sub>Fs<sub>30–67</sub>). Olivine does not occur in gabbroic clasts. Accessories include ilmenite, troilite, Cr-spinel and SiO<sub>2</sub> phase. The second clast type represents basalt with hemicrystalline matrix. Olivine is present as rare porphyritic crystals (Fa<sub>49–61</sub>). Pyroxenes have analogous chemical composition, often zonal with Fe enriched margins. Accessories are represented by ilmenite, troilite, SiO<sub>2</sub> phase, chromite and rare zircon. It is obvious that a similar material forms most of the observable surface of Vesta or vestoids (smaller pieces of the asteroid thrown to space by cosmic bombardment and sometimes crossing the Earth's orbit). The study of basaltic achondrites leads to the understanding of the processes of accretion, heating, melting,

fractionation and differentiation of their parent bodies, which play an important role in the research of the formation the Earth as well as other terrestrial planets.

### S. SITEK: Temporal and spatial variability of tetrachloroethene and trichloroethene concentrations in aquifer system MGB Gliwice

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It is almost fifteen years since chloroethenes pollution was detected in the major groundwater basin (MGB) Gliwice. The contaminations were found in the Tarnowskie Góry area where the Triassic carbonate aquifer is recharged. This situation causes a serious problem, because pollution of trichloroethene (TCE) and tetrachloroethene (PCE) can easily spread with the flow of groundwater across the aquifer. The aim of this work is to evaluate spatial and temporal concentration variations of TCE and PCE in groundwater of MGB Gliwice. The longest observed data are for groundwater intake "Staszic". Although the investigation of concentration chlorinated solvents in groundwater comes from the years 1994–2007 it still does not reveal downward trend of concentration TCE and PCE in aquifer. Some wells situated in the probable area of pollutant sources present continuing upward tendency, which concludes that the transport of pollutions into saturated zone is not finished. The contaminant plum is widespread on the west and northwest direction according to the main path flow in carbonate aquifer. Variability of TCE and PCE in MGB Gliwice should be continuously monitored to predict risk of contaminating another groundwater intake. MGB Gliwice supplies 72 173 m<sup>3</sup>/h drinking water which shows the importance of abound aquifer, especially when even the smallest amount of concentrated TCE and PCE in groundwater of above 10 µg/dm<sup>3</sup> rendering water supplies is unusable for drinking and agricultural purposes.

### B. SOPKOVÁ, J. HLAVATÁ and R. PROCHÁČ: Sarmatian depositional environment of the Northern Vienna Basin

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Study area is located in the northern part of the Vienna basin in the vicinity of Hrušky structure (SE Czech Republic). The Sarmatian sedimentary record of the Central Moravian Depression (CMD) contains fully preserved alternating sand and clay deposits displaying gradual transition from marine to freshwater depositional environment. In the central part of the CMD the Sarmatian sediments reach the average thickness 850 m. The record of examined sediments represents one third order cycle of the relative sea-level change, which can be identified in the entire area of the Vienna basin. This cycle is assigned to Haq's TB 2.6 cycle.

Apart from this main third order cycle, based on the well log responses and seismic data interpretation, additional

higher-order cycles can be recognized. Sarmatian sedimentary fill is divided into two four order cycles; the Lower Sarmatian Sa1 cycle of marine character and Upper Sarmatian Sa2 cycle revealing evidently freshwater features.

Whereas the Lower Sarmatian units deposited in quiet conditions during transgression exhibit lower rate of clastic input, the Upper Sarmatian units display dynamic sediment supply in brackish to freshwater environment during the sea-level highstand.

Recognized cycles of relative sea-level change are more or less comparable with the development in the southern Slovak part of the Vienna basin.

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### M. SOŚNICKA, A. SZLEMP and S. SUMARA†: Evolution of the Salt Dome Dębina up to the Upper Cretaceous

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The salt dome Dębina is situated in the central part of the Kleszczów tectonic graben. It is built of Zechstein salts which intrude into the Wartanian tills (Middle Pleistocene). We have analysed lithostratigraphic logs of more than 700 boreholes, which were rendered accessible by the authorities of the open-cast brown coal mine "Bełchatów".

Selected lithostratigraphic horizons (the base of gypsum-clayey cap rocks, horizons of condensed sedimentation within Upper Cretaceous rocks, erosional scours in Tertiary strata) were presented in structural maps created in the Surfer 8 programme. The database was worked out in the Microsoft Excel 2000.

The analysis shows that close to the main salt body that builds the dome, the lower salt culminations occur additionally, hitherto not described in the literature. They occur both on the east and west of the salt diapir, making the structure of the Dębina salt dome more complicated. Above the cap rocks, within Upper Jurassic strata, salt motions are evidenced by lithological differences within sediments of the same age, for instance the oolitic limestones and their facies counterparts, i.e. detrital limestones. Salt motions within Upper Cretaceous strata are documented by condensed sedimentation horizons of either hard- or soft-bottom type in Coniacian-Santonian rocks. Sediments enriched in drilled phosphorites and penetrations testify to shallowing of the sedimentary basin. Salt rising in the Tertiary is well portrayed by numerous erosional scours. We conclude that the analysed salt bodies revealed rising motions in the Jurassic and Upper Cretaceous, well before the main episode of movement in the Miocene.

*Acknowledgement.* Authors express their thanks to scientific adviser: Dr. Ewa Szewczyk.

**P. SPANEK: Modern methods of mineral deposits evaluation**

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Calculation and evaluation of reserves is very important for economic evaluation and price determination of mineral deposit. We should apply modern methods of mineral deposits evaluation, which are used nowadays, to reach good results in calculation of reserves.

In geological research the geostatistical methods are used already several decades, but their application in Slovakia started only some years ago. Geostatistics is an inevitable tool in solving of many problems in geology of mineral deposits. The results of geostatistics are used in calculation of reserves and economic evaluation of mineral deposit.

Geological information, which was obtained by exploitation, has to be analysed all the time, therefore geographical informations systems (GIS) were introduced to the modern geological research. Application of GIS is also very significant in evaluation of mineral deposit.

Modelling and presentation of the mineral deposit body in GIS environment has many advantages in comparison with classical maps in paper form. Data of the mineral deposit are connected with themes in our project interactively and therefore we can find the blocks or parts of the mineral deposit with specific conditions.

New methods in economic evaluation of mineral deposits (calculation of reserves exerted in many variants, price determination of mineral deposits) represent complicated task, which depends on many factors. Economical evaluation of mineral deposits represents very important part of geological research in each country.

**K. STANECZKO: Current problems in paleontological education at high schools and the future of geological studies in academical departments**

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The main aim of education at high schools is preparing youth to raise individual decisions. The educational reform introduction (1999), which still raises abundant discussions, creates new possibilities to academies, in which such department as geology may have some difficulties.

Among the first year attending students of geology at the University of Silesia,  $\frac{3}{4}$  leaved grammar school, while the rest leaved technical schools. There are persons among those  $\frac{1}{4}$  of students, which were able to begin the geology studies after the mentioned earlier reform. It has added the biology lessons and has made the geography subject range more wide. 90 % of respondents claims, they were interested in geology already at secondary school.

Precisely this student's group presence at geological studies may take the risk of drop in education quality. Among the last years students we observed alarming symptoms, which

are indicative of educational wants. There are a lot of reasons of such situation, among other things – the educational equipment lack, such as fossils. Almost half of respondents (students and pupils) declares that there was no paleontological collection at their schools and the remaining part did not know if such collection existed there. 50 % high school teachers claim, that there is no problem to create the collection, but it has no reflection in reality. Alike teachers, pupils and students call attention to relevance comparing theory with practice.

Maybe it is supposed to be paid attention on closer cooperation between university and secondary schools in order to provide continuity of education.

**I. STRÍČEK, V. ŠUCHA and P. UHLÍK: Bentonite stability testing using the mock-up experiment**

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The mock-up experiment simulates vertical placement of radioactive waste in the underground repository. Relatively small model is basically a stainless steel cylinder (400 mm diameter and 600 mm height), simulating a section of gallery in which the radioactive waste will be disposed. The cylinder is equipped with a 140 mm diameter central tube, in which heating elements – simulating the heat produced by the waste – are placed. Heating temperature is 120 °C. The annular gap between the central tube and the outer lining is backfilled with pre-compacted bentonite blocks. Major part of blocks is made of pure Ca-Mg bentonite from Jelšovský Potok deposit and the other from Lieskovec deposit, both milled into <250 µm fraction. Some blocks contain either 5 % of pyrite concentrate to simulate pyrite presence in a gallery host rock or 5 % of powdered elementary iron to determine iron-bentonite interactions (iron components in gallery).

In the host rock the bentonite water saturation occurs naturally. In the experimental mock-up the hydration is ensured from the external water source. Water is distributed using 23 hydration holes placed outside of the backfill block. The water chemistry is based on the composition of the original water present in the most perspective area for geological radioactive waste repository in Slovakia.

Changes in temperature, pressure and relative humidity are continuously measured and recorded in order to be in the position to assess long-term stability of bentonites used in the experiment.

**M. STRYCHARCZYK: Porous clay heterostructures (PCHs) based on montmorillonites as large-pore materials for selective catalysis**

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Layered silicates used in catalyst design are represented by the family of smectites. Material used in this study represents less than 2 µm fraction of montmorillonite extracted by



sedimentation from Milowice and Jelšový Potok bentonites.

The mineralogical compositions of the material were studied by X-ray diffractometry (XRD). The microstructures were studied by scanning electron microscopy (SEM). Specific surface areas were determined from adsorption isotherms by applying BET and Langmuir equations.

The starting material was the Na-montmorillonite. Long-chained Quaternary ammonium cations (surfactants) are introduced onto the clay solid by exchange with the  $\text{Na}^+$  ions in the first step of PCH's synthesis. A second step is an intercalation of the co-surfactants or neutral amines in the clay interlayer region. Upon addition of the Si-source, tetraethylorthosilicate, the amines and surfactants form micellar templates. A dense Si-network is formed *in situ* on the clay host, basing on the polymerization of the silicate species. Removal of the surfactant by calcination leaves a mesoporous solid with thermally stable pores of widths in the range 14–22 Å.

These materials, so-called porous clay heterostructures, might provide new opportunities for the rational design of heterogeneous catalysts and extend the field of application into processes of redox nature.

#### B. STYRNOL: Selected technological quality of coal seam from the "Kozmin" lignite deposit (KWB "Adamów")

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The "Kozmin" – Central Field lignite deposit, which is being prepared for exploitation, is situated on the Polish Lowland, in north-east part of Łódź Syncline. Researched lignite deposit belongs to 1 Middle Miocene Lignite Group. During research around 300 boreholes were used. The geological structure of the seam is mostly regular. Thickness of seam varies from 0.2 meter in eastern part, up to 13 meters in the western part. Average total moisture in "Kozmin" deposit is 51 mass per cent. The value of this parameter varies from 30 % in western part of deposit to around 62 mass per cent in the east.

The lignite of "Kozmin" deposit is of first technological quality. It contains average 51 mass per cent total moisture, 11.5 mass per cent of ash recalculated to dry basis. Calorific value recalculated to total moisture, the ash basis of it is in average 9330 KJ/kg (2230 kcal/kg). The most caloric are northern and western parts of deposit. Average content of total sulphur, recalculated to dry basis, is 0.42 mass per cent, which means a low content of total sulphur.

According to international standards (ECE-UN 2003), lignite code from "Kozmin" deposit is: Ortho-Lignite (huminitic low B) 25 51 23 04, and in Polish classification it is: Soft Brown Coal 21,2 N-9.0/14 PN-81/G-97051.01.

#### K. SZOPA and A. GAWĘDA: Monazites associated with schlieren from granitoid rocks (the High Tatra Mts.)

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Several types of enclaves were distinguished in the granites in the High Tatra Mts. There were found two types of schlieren, which could be produced by mineral sorting during magma flow and they could be remnants after partial melting of the metapelitic xenoliths (Szopa et al., 2007). The enclaves in mafic parts contain accessory minerals as: monazite, zircon, xenotime, thorite, huttonite, apatite, allanite, REE-epidote, titanite and opaque minerals.

The monazites connected with enclaves reach 30–170 µm in size, and are enclosed in most cases by biotite, quartz, alkali feldspar or plagioclase. The monazite crystals can be classified as monazite-(Ce). The average concentrations of the elements have the following values:  $\text{ThO}_2 = 1.66\text{--}8.47$  wt.%;  $\text{UO}_2 = 0.05\text{--}1.56$  wt.%;  $\text{PbO} = 0.03\text{--}0.39$  wt.%;  $\text{Y}_2\text{O}_3 = 0.39\text{--}3.34$  wt.%;  $\text{La}_2\text{O}_3 = 11.28\text{--}16.25$  wt.%;  $\text{Ce}_2\text{O}_3 = 24.55\text{--}31.33$  wt.%;  $\text{Pr}_2\text{O}_3 = 2.76\text{--}3.55$  wt.%;  $\text{Nd}_2\text{O}_3 = 10.53\text{--}13.91$  wt.%;  $\text{Sm}_2\text{O}_3 = 1.38\text{--}2.97$  wt.%;  $\text{Gd}_2\text{O}_3 = 0.60\text{--}2.45$  wt.%;  $\text{Dy}_2\text{O}_3 = 0.03\text{--}1.07$  wt.%. Some grains of monazite reveal also the concentrations of CaO up to 1.98 wt.% and  $\text{SiO}_2$  up to 1.39 wt.%, respectively. Based on monazite chemical composition, according to CHIME (Montel et al., 1996) procedure, mostly Variscan ages were obtained. The episode dated at 260 Ma is also present. Sometimes, evidences of metasomatism and hydrothermal transformations of monazites are observed. In some cases, monazites show a loss of LREE, and replacement of them by Y+HREE. This can be interpreted as an evidence of the metamorphic overprint.

#### M. SZYDŁOWSKI: Stone artefacts from early Bronze settlement in Bruszczewie 5, near Kościan

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Excavations on position 5 in Bruszczewo were led by Z. Pieczyński from 1964 to 1968 and next again in 1995 under direction of J. Czebreszuk. The presented collection of artefacts was gained during the first phase of investigation in the 1960s. All stone artefacts connected with the early Bronze Age settlements phase were analysed. The material structure of collection was estimated on the basis of macroscopic and microscopic analyses for selected part of artefacts. Altogether 90 stone objects were subjected to macroscopic analysis. In presented work among 90 analysed objects of 13 categories of relics were distinguished with respect to the form and traces of use. The early Bronze Age settlement in Bruszczewo is situated in Lowland zone, which is free from natural deposits of rock material. Living here prehistoric communities used to production of stone tools first of all the local erratic material, transported through glacier from terrain Skania. The present analysis confirms the early Bronze Age stone production dominating with erratic sandstones, beside essential part of granite. This article presents the first phase of the wider conceived researches over early Bronze Age stone work on settlement in Bruszczewo. Studies of this topic, being enlarged by analyses of the source materials, still continue.



**V. ŠIMONOVÁ and D. PLAŠIENKA: Tectonic evolution of Krížna nappe in the Strážov Mts.**

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The Strážovské vrchy Mts. provide a possibility for the study of originally distant sections of the Zliechov unit in a comparatively small area. The deformation in Jurassic-Lower Cretaceous sediments resulted in the intensive development of the secondary foliation, so-called cleavage S1. Initial phase of compression, including inversion of the Zliechov basin basement, was accompanied by shortening of upper sedimentary successions during sub-horizontal orientation of the principal stress axis  $\sigma_1$  (Prokešová, 2002). This phase advanced by the layer parallel shortening including development of a steep and fan-wise cleavage. The modification of the cleavage orientation, as it can be seen today, was caused by the vertical compression and simple shearing. In general we can say that the cleavage as a secondary foliation originated during the deformational state D1, in the initial compression phase, connected with intensive shortening of the basement of Zliechov basin. This deformational style is not in an agreement with the concept of "digitation" and the large recumbent folds (Mahel, 1985), and we understand them as a result of the deformation during the final emplacement of the nappe body.

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**Ľ. ŠTRBA and J. JANOČKO: Sedimentological analysis of Lúžna Formation in Litvor's groove, High Tatra Mts.**

Fac. of Mining, Ecology, Process Control and Geotechnology, Technical Univ., Košice, Slovakia

The High Tatra Mts. represent young positive structure modified by several geological processes. Research of these processes is complicated because of inaccessible terrain but there are some places allowing investigation in these hard conditions. One of these areas is Litvor's groove representing a lateral promontory of Biela voda valley, near border between Slovakia and Poland. At this place there is a contact between the crystalline complex of Tatricum and its Mesozoic envelope. The crystalline complex is mainly represented by leucogranites and the Mesozoic envelope is represented by Lower Triassic and Jurassic sediments. The sedimentological research was focused on Lúžna Formation mainly represented by quartzites. Inside the formation we differentiated eight lithofacies: massive conglomerate with matrix-supported structure, normally graded conglomerate with matrix-supported structure, massive quartzite sandstone, quartzite sandstone with hummocky cross stratification, through cross bedded quartzite sandstone, ripple cross laminated quartzite sandstone, quartzite sandstone with parallel lamination, and parallel laminated siltstone. These facial associations indicate

shallow-water deposits of the sediments comprising the Lúžna Formation.

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**Ľ. ŠTRBA, M. PREKOPOVÁ, J. JANOČKO and S. JACKO: Sedimentological analysis of storm deposits: Case study from Miocene deposits, Romanian Flysch Zone**

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Romanian Flysch Zone groups together cover nappes built up essentially of sedimentary formations detached from their primary basement and overthrust eastward above the underthrust Foreland. This work presents results of an investigation of the Flysch in Maneciu, south from Ploiesti, county Prahova as a part of research of Carpathian Flysch Zone. Studied area is predominantly built by fine-grained sandstones and claystones. Using method of lithostratigraphical logging there were studied hundreds of meters of outcrops from sedimentological point of view and the logs were used as primary data for sedimentological analysis. We described eleven lithofacies: massive conglomerate with matrix-supported structure, normally graded conglomerate with matrix-supported structure, symmetrically graded conglomerate with matrix-supported structure, coarse-grained massive sandstone, massive sandstone, parallel laminated sandstone, ripple cross laminated sandstone, through cross bedded quartzite sandstone, sandstone with hummocky cross stratification, parallel laminated siltstone, and parallel laminated claystone. Hummocky cross-stratification, planar lamination, and ripple stratification reflect deposition in shallow-marine, storm-influenced environment with southern sediment transport as indicated by paleocurrent data.

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**J. ŠURKA: Depositional environments of the Borové Formation from the Orava and Liptov basins**

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The contribution deals with depositional environments of the basal formation of the Central-Carpathian Paleogene Basin in the Orava and Liptov areas. The sedimentological study has been carried out at the eight sections of the Borové Fm. (Biely Potok near Ružomberok, Komjatná, Zázrivá and Oravice). Due to these latest data, we found that each studied locality represents different sedimentary environment. Generally, sediments of the Borové Fm. have softened character upward, which corresponds to transgressive sequence according

to Soták et al. (2001). There was found also an abnormal succession at profile "Ježov vrch" on the Oravice locality and also at profile "Čremoš 1" on the Zázrivá locality. Deposits from these localities most probably represent sediments of protected lagoon. In the bottom part of the Borové Formation we found sediments belonging before transgression among deposits of the alluvial fans and delta fans, which do not occur at all of the studied profiles. Close-grained shallow marine shoreface sediments begin to appear in the upward direction of the profiles. These sediments are rich in fossil remnants (nummulitic sandstones) and show bioturbations in the uppermost part of the formation. Sediments in the uppermost part of the Borové Formation change into grey clays of the Huty Formation with the exception of "Čremoš 2" profile, where the Borové Formation changes erosionally to Pucov Conglomerates. Coarse-grained sediments of the Borové Formation are located at the edge of the Západné Tatry Mts. and Chočské vrchy Mts., with the exception of "Ježov vrch" hill. The sediments located westwards are close-grained, what can be explained by the progressive lowering of segmentation relief.

#### M. UDIČ and S. JACKO: Sandstone dikes in the Rača Unit of the Slovak Outer flysch belt

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Using geological mapping in the studied area we localized the Zlín Formation, situated in north-eastern part of the area of Outer Western Carpathians, around 10 km south of the Svidník, near the Nová Polianka village. In the Zlín Formation (Middle–Upper Eocene) we have distinguished 3 types of lithofacies – sandstone lithofacies (Makovica sandstones), sandstone-mudstone lithofacies and mudstone lithofacies. Sediments represent part of a deep-marine deposition system as well as depositional environment of the submarine slope. Sandstone intrusions in the Zlín Formation were interpreted in terms of their geometry and relating to ambient sediments. Their distribution is connected only with massive mudstone, in which they extend in two vertical directions. We suggest, that occurrence of the synsedimentary sandstone dikes is the evidence of extensional opening slits in time of depositions of sediments of the Magura basin. They were probably injected during synsedimentary tectonic movements connected with the earliest stage of flysch deformation in this part. This assumption is supported by the presence of synsedimentary structures, which are documentations of the active basin margin. These are the synsedimentary slide solids in overhead part of the Makovica sandstones and the presence of the sediments distribution channel. This indicates the orientation of local dynamic evolution in time of their formation.

#### L. VAROVA: Beryllium mineralization in greisens of Pitkyaranta ore field

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Apo-scarn and apo-gneiss greisens in Pitkyaranta ore field were formed in conditions of reduced temperatures and undersaturated solutions (in comparison with classic topaz-mica greisens).

The sources of beryllium are Salmi rapakivi granites. Beryllium minerals appear in associations already under primordial concentration of beryllium 1 g/t in granites.

Time sequence of changing beryllium minerals during the repeated passing solution over enclosing strata is:

In apo-gneiss greisens: Beryl+phenacite → Chrysoberyl+phenacite → phenacite+bromellite → bertrandite. Temperature maximums of appearance beryllium minerals are: beryl – 400°, phenacite – 450°, bromellite – 400°, chrysoberyl – 350°, bertrandite – 200°.

In apo-gneiss greisens: chrysoberyl → gelvin (?) → phenacite+bromellite. Temperature maximums: helvin (?), phenacite – 450°, bromellite – 400°, bertrandite – 200°.

#### L. VIZI: Towards to the multivariate modelling of the spatial phenomenon

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The information available on a natural phenomenon is rarely limited to the values assumed by a single variable over a set of sample points. Most real studies involve more than one variable. Direct measurements of the primary attribute, or variable under study, are often supplemented by secondary information originating from other related categorical or continuous attributes, or secondary (auxiliary) variables. Taking some random examples, we note that climatic variables depend on an elevation of area under study, or that permeability values are related to porosity ones, and so on. The greatest challenge in the spatial modelling is "an integration" of different sources of information, describing the same phenomenon in different ways. But the real theoretical challenge is: How can we model the relationships between different variables in a globally coherent manner? And practical challenge is: How can we infer this model from an often undersampled data set? Geostatistics, and its multivariate techniques, provides space and tools to build such consistent models. Except general cokriging, extending kriging to multivariate interpolation for non-exhaustive secondary information integration, there are another, more sophisticated, methods for spatial data integration for exhaustive secondary information available at all locations being estimated like DEM or geophysical survey.

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#### M. VLACIKY: Hunting came of the Gravettian site in Trenčianske Bohuslavice (Slovak Republic): Human activities on the faunal material

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The processed osteological material comes from the culture layer of Trenčianske Bohuslavice investigated in 1981–1986, encompassing 478 m<sup>2</sup> of the studied site. The village Trenčianske Bohuslavice is located at middle course and right bank of the Váh river, a few km NNW from the center of town Nové Mesto nad Váhom. The site is situated W from the village on the right bank terrace of the Bošáčka creek, which is covered by loess. The radiocarbon dates clustered around 25 500–22 500 years BP, placing the site in the Willendorf-Kostenkian.

The determined animals belong to the following species: *Rangifer tarandus*, *Equus germanicus*, *Mammuthus primigenius*, *Vulpes lagopus*, *Bos/Bison* sp., *Ursus arctos*, *Canis lupus*, *Castor fiber*, *Coelodonta antiquitatis* and *Cervus elaphus*. Based on the number of found bones and teeth, the reindeer's ones dominate, followed by the horses and those of the mammoth. Other mammal species are rare.

We focused on recording species and element identifications of all mammal remains, with special emphasis on the modifications visible on the bones. Especially were studied the traces of human activity connected with the processing of the hunted animals (cut marks, impact traces, fragmentarization). Whenever such traces were identified, the mammal species, the type, and the description of the modifications were recorded.

The largest number of human modifications on the bones was found on reindeer remains and most of them are cut marks. One of the most distinctive features of the reindeer remains is that no complete long bone was found at this site. Presence of all parts of the reindeer skeletons may indicate that complete carcasses were transported to the site. Intentional human activity is apparent also on mammoth bones.

#### M. WDOVIN and H. KUCHA: Determination of the new mineral cell parameters in the triclinic system

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The examined new mineral ( $\text{Cu}_9\text{Pb}_{0.5}\text{Fe}_{0.4}\text{S}_6$ ) occurs in sulphide-calcite veins cutting black shale in the Kupferschiefer deposits Lubin, Poland.

In order to determine minerals unit cell parameters, X-ray diffraction (XRD), Gandolfi camera and single crystal measurement by transmission electron microscope (TEM) technique were performed. Such kinds of examinations represent a procedure for finding correct values of cell parameters.

From X-ray diffraction,  $d$  (interplanar distance) values and preliminary unit cell parameters  $a$ ,  $b$ ,  $c$  were obtained, suggesting triclinic or monoclinic symmetry. On the basis of 100, 010 and 001 electron diffraction patterns,  $d$  values and  $\alpha$ ,  $\beta$ ,  $\gamma$  angles were determined.  $d$  values were calculated for both the triclinic and monoclinic systems. Measured and calculated  $d$  values (from X-ray diffraction, electron diffraction patterns and calculated values) were compared. Finally, unit cell parameters

were fitted and their values were close to the following  $a_0 = 7.40$ ,  $b_0 = 8.29$ ,  $c_0 = 9.30$  and  $\alpha = 86^\circ$ ,  $\beta = 95^\circ$ ,  $\gamma = 89^\circ$ , respectively.

As a result of applied procedure, new mineral was assigned to triclinic symmetry owing to better fitting to triclinic than monoclinic system.

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#### S. WOŁKOWICZ and P. DOBEK: Problems with development of postindustrial areas in Warsaw

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The research aimed a valorization of environment in the part of the Róża Luksemburg Polish Lamp Factory in Warsaw. This fragment of the factory, consisting of around 11-multi-storey building and land around it, was exposed to a long term industrial activities. Today it is abandoned. Future plans intend to rebuild it into flats. The presented study focuses on assessing the pollution level within building's concrete and soils around it. Concrete samples were collected from floors, walls and ceilings. Soil samples were taken from 6 boreholes (sampling levels: 0.0–0.3 m, 0.3–2.0 m and >2 m). In 14 concrete samples and 14 soil samples were determined heavy metals (As, Ba, Cd, Co, Cu, Mo, Ni, Pb, Sn, Zn, Hg, W). Mineral oils, PAHs and BTEX were determined in soils. Determinations of elements were conducted with the XRF and CV-AAS methods, mineral oils, PAHs, BTEX with spectrometry. Concentrations of heavy metals in the concrete of building are locally very high (Hg – 37 mg/kg, W – 482 mg/kg, Zn – 3326 mg/kg, Ba – 826 mg/kg, Cu – 35 mg/kg), what corresponds with historical production. The studies have shown diversifications of elements in soil around the building. In 7 from 14 samples concentrations of Hg, Ba, Cu, Ni, Pb, Zn, Sn and W were higher then Polish standards (correspondingly: 14.2 mg/kg, 634 mg/kg, 193 mg/kg, 101 mg/kg, 806 mg/kg, 687 mg/kg, 50 mg/kg and 20 mg/kg). However pollution with heavy metals locally varies and their concentration falls down with depth. Concentration of mineral oils, PAHs, BTEX in soils suits the norms.

Our research has demonstrated that building and its nearest land could not be used on housing aims. High pollution level of elements is too dangerous for human life.

#### M. WYSZOMIERSKI: Sedimentological analysis of fluvio-glacial and fluvial sediments in the southern edge of Ciechanowska Upland and their interpretation

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The investigated area is located on the border of Ciechanów Upland and Warsaw Basin in the vicinity of longitudinal Narew valley. Lower, 8-meter part of Izbica

profile is developed as varved clays (connected with older series of "Warsaw ice-dammed lake") and underlying, differential sandy series. Varvograms show the presence of 1 centimeter thick dark layers as a rule and light layers 1–4.5 cm thick. The occurrence of abnormal 17 cm thick light layer points at supplying sandy sediments to ice-dammed basin. Underlying sandy series are developed as massive sands and gravels, sands and horizontal sands and sandy fines. Cumulative curves show long, gently inclined parts

of traction and steep parts of saltation. Coarse-grained sediments are characterized by poor and very poor standard deviation. The mineral-petrographic composition analysis revealed the quartz domination and few percent presences of feldspar, crystalline stones and micas. Attendance both matt grains and shiny and non-rounded grains provide an information about changeable environment of extraglacial or/and proglacial rivers before developing the ice-dammed lake.

## Deviata česko-slovensko-pol'ská paleontologická konferencia

### 9th Czech-Slovak-Poland paleontological conference

**Varšava 11.–12. 10. 2008**

JOZEF MICHALÍK, Geologický ústav SAV Bratislava

Na podnet prof. R. Brzobohatého vznikla na prelome miléníí myšlienka obnoviť populárne česko-slovenské paleontologické semináre (posledný bol v roku 1988 na Slovensku v Ružbašskej Milave). Tieto semináre boli vynikajúcou domácou základňou na výmenu vedeckých poznatkov a platformou na organizovanie odbornej spolupráce, ale podmienky na ich usporadúvanie sa zmenili. Personálna základňa výskumníkov v paleontológii sa zmenšila a vývoj vedy v zjednocujúcej sa Európe a v globalizujúcom sa svete vyžaduje oveľa širšie založenú a komplexnejšiu spoluprácu.

Od začiatku organizovania série každoročných odborných stretnutí bola snaha vtiahnuť do diskusií odborníkov zo susediacich krajín hovoriacich blízkyimi slovanskými jazykmi. Komunikácia v materinskej reči bez zreteľnej jazykovej bariéry je jedinečnou príležitosťou pre paleontológov z Česka, Slovenska a Poľska a umožňuje diskusie o širokom okruhu aktuálnych otázok a problémov v neformálnej, „domácej“ atmosfére.

Konferencie sa konajú striedavo na území zúčastnených krajín – Praha 2000, Hodonín 2001, Bratislava 2002, Ostrava

2003, Bratislava 2004, Olomouc 2005, Brno 2006, Bratislava 2007, Varšava 2008.

Na Deviatej česko-slovensko-poľskej paleontologickej konferencii sa priamo zúčastnilo 58 odborníkov z Poľska, 12 zo Slovenska, 27 z Českej republiky, 2 z Ruska a 1 z Maďarska (dovedna 100, ale na príprave príspevkov sa zúčastnilo až 127 autorov). Organizátorom stretnutia bol prof. Andrzej Gaździcki, Dr. Maria Bittnerová a Dr. Andrzej Pisera z Paleobiologického ústavu Poľskej akadémie vied na Twardej ulici vo Varšave, kde sa konferencia aj konala. Rokovanie počas dvoch dní vyplnil program dvanástich sekcií a tvorilo ho 79 prednášok. Počas neho sa vystriedali témy orientované na paleozoickú až kvartérnu taxonómiu, funkčnú morfológiu, paleoekológiu, biostratigrafiu, paleoproduktivitu a paleobiogeografiu takmer všetkých skupín fosílnych organizmov. Prednášky doplnila bohatá posterová sekcia, ktorá pokryla povrch stien všetkých chodieb ústavu.

Návrh, aby sa jubilejný 10. ročník konferencie v roku 2009 konal na bansko-bystrickom pracovisku Geologického ústavu SAV, bol prijatý potleskom.