



recent advances
in geology
of fine-grained
sediments

24-26 September, 2014
Warsaw, Poland

THE 2ND INTERNATIONAL CONFERENCE
DEDICATED TO MUDROCKS

organized by

**POLISH GEOLOGICAL INSTITUTE
NATIONAL RESEARCH INSTITUTE**

2nd Circular

**REGISTRATION NOW OPEN
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www.geoshale.com

modified – new deadlines



PATRONAGE:

The conference is organized under the auspices of:



MINISTRY
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Ministry of Science
and Higher Education

Republic of Poland



Business support:



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GENERAL INFORMATION

The 2nd scientific conference – **GeoShale 2014** – dedicated to fine-grained sediments will be hosted by the Polish Geological Institute – National Research Institute in Warsaw, 24-26 September, 2014.

The conference brings together geoscientists from around the world, who are engaged in shale research studies...

The conference brings together geoscientists from around the world, who are engaged in shale research studies. The conference will continue the work of the GeoShale 2012, which ended up with a great success! 180 scientists from 19 countries for three days discussed shale sedimentology, stratigraphy, physical and geochemical properties, and gas exploration and production issues.

Mudrocks make up to 70% of sedimentary record and attract attention of scientists representing a wide spectrum of geological disciplines. Recently, gas- and oil-bearing shales have received a rapid advancement in understanding of shale fabric, pore networks, geomechanical properties, and depositional processes. It was possible due to an interest of the petroleum industry that treated shales as an important source and seal rocks as well as reservoir of the hydrocarbons released from them. Moreover, fine-grained terrigenous clastics provide insight into an evolution of sedimentary basins in time and space as well as climatic and sea-level changes in the Earth history.



SESSIONS

Three days of parallel lectures and poster sessions are planned, including a series of keynote lectures.

- **Shale Basins Stratigraphy, Paleoenvironment and Paleoclimate**
- **Shale Geochemistry, Diagenesis and Reservoir Properties**
- **Shale Basins Geophysics and Tectonics**
- **Shale Gas Exploration and Production**

..... **about sessions**

- **Shale Basins Stratigraphy, Paleoenvironment and Paleoclimate**

This session is dedicated to a wide spectrum of sedimentological and stratigraphical studies and their contribution to understanding of the mudrock depositional system from the basin scale to microscale. The recent stratigraphic approach to mudrocks focuses not only on traditional biostratigraphic and lithostratigraphic aspects but also on sequence stratigraphy, event stratigraphy, chemostratigraphy and tephrostratigraphy. Multi-stratigraphic data provide a basis for dating of shale depositional processes and evolution of sedimentary basins. Mudrocks have previously been regarded as deposits accumulated from suspension of fine-grained sediment in low-energy environments.

However, recent advances in sedimentological investigations show that these seemingly monotonous and homogenous rocks reveal discrete lithological changes reflecting fluctuations of depositional conditions. In many cases, their deposition was influenced by current activity, which is supported by numerous sedimentary structures, including current and wave ripples, hummocky cross-stratification, graded beds, water escape structures and scours.

Moreover, sedimentological studies are crucial for the recognition of mudrock facies type as well as their spatial and temporal distribution in sedimentary basins. They are supported by investigation of trace fossils and distribution of pyrite framboid diameters that are useful tools in deciphering of abiotic sedimentary features, e.g., energy, oxygenation, salinity, sedimentation rate as well as type and cohesion of substrate. Thus, combined stratigraphic and sedimentological data provide insight into tectonic, climatic and eustatic controls on the depositional dynamics of shale.

- **Shale Geochemistry, Diagenesis and Reservoir Properties**

Fine-grained sediments like shales may contain an abundance of organic matter, and its most important contributors are zooplankton, phytoplankton, bacteria and higher plants. Organic material in shales is the source for hydrocarbons when subjected to increasing burial, heat and pressures. That is why, just a few years ago, Polish geoscientists perceived organic-rich fine-grained sediments mainly as a seal and source rocks for oil and gas accumulation. Nowadays, shales are considered not only the source rocks or the seal, but also the reservoir rocks in the shale gas/shale oil petroleum systems. Thus, methods of organic and inorganic geochemistry are widely applied to decipher hydrocarbon properties and paleoredox condition of fine-grained sediments.

Organic geochemistry plays an important role, especially when it comes to explanation of the hydrocarbon generation and retention processes within the shales. Geochemical parameters may answer the question why one shale interval is productive and why the other is not. Organic carbon content, referred to as TOC, and organic matter thermal maturation are the only two basic pieces of the puzzle to predict the productivity potential of shales. These two might also be the first indicators of proper location for the shale gas/shale oil exploration in the regional scale.

Inorganic geochemistry provides good proxies to reconstruct redox condition in the sedimentary basin. Some redox-sensitive trace metals (V, Ni, U, Cr, Co) are useful tools used to constrain benthic oceanic redox conditions since they can co-precipitate with organic matter or metal sulphides under anoxic conditions.

Moreover, useful geochemical parameters providing basic information about oxygenation of paleoenvironment include S and Mo isotopic signatures. Molybdenum isotopes have appeared as a new tool in paleoredox investigation because the $\delta^{98}\text{Mo}$ seawater value varies with the relative magnitude of the oxic, suboxic and anoxic (euxinic) depositional sinks in the world ocean.

- **Shale Basins Geophysics and Tectonics**

Each basin is unique and should be separately investigated by a set of different methods. Among the most important are geophysical methods which are essential to understand the geology of sedimentary basins, including shale formations. Until the advent of “unconventional hydrocarbons boom”, shale had not been the main target in geophysical analyses. Because of that, the geophysical methods and knowledge applied to shale rocks are still in its development phase.

The varying properties of shales require applying sophisticated geophysical methods by the geoscientist for better understanding of the heterogeneity of shale reservoirs to maximize production. The conference provides the possibility to exchange information about recent advances in geophysical methods applied to shale plays, such as seismic, micro-seismic, magnetic, gravimetric, well logging measurements and others.

The role of structural geology is crucial in basin analysis. Dealing with shale reservoirs requires characterization of fractures and stress on a daily basis. Correct analysis of recent and paleostress regimes allows planning successfully a horizontal well path and hydraulic fracturing. The understanding of rock deformation processes and timing of formation of structures helps better planning of exploration strategies. The GeoShale 2014 conference is a great event to share scientific knowledge and case studies about the tectonics of shales in all ranges, from basin scale through outcrop to thin section scale.

- **Shale Gas Exploration and Production**



Session: **Shale Gas Exploration and Production**
is organized under the auspices of ORLEN Upstream

The GeoShale 2014 conference is good opportunity to exchange experiences in the shale gas exploration and production (E&P). Currently, economical shale gas production is carried out in the United States and Canada. Outside the United States, the most intense exploration works are carried out in European countries like Poland, Ukraine and Great Britain. A purpose of exploration works in Europe is the characterization of prospective shale formations and the assessment of their gas potential.

The informal term “unconventional gas” (like shale gas) refers to the method of extraction used for natural gas. The process of shale gas exploration and production is long and complex. Gas from unconventional gas fields is more difficult to extract, compared with gas from conventional gas traps, therefore properly made exploration works decide about future economical production.

The stages of prospecting include designation of the most prospective shale gas areas called “sweet spot”, based at first on the number of archived geological and geophysical data. Then, seismic research and drill core analysis are performed. The next stage is building a geological model, which is necessary to designate sweet spot areas and to select the drilling location. Drilling is the most important stage of exploration operations, because we can or cannot observe gas shows in the well. Furthermore, we obtain very important data like drill cores and well logs. If the result of drilling is positive, we can proceed to the production stage. Shale gas production is preceded by the drilling of horizontal section of well and then hydraulic fracturing is performed. Systematic observation of shale gas production from well in the first few months is the basis for the assessment of potential gas production.

Designation of the sweet spot and the use of appropriate fracturing technology is a challenge for countries outside the United States, which are thinking about economical shale gas production. For the shale gas exploration and production industry, it is a great challenge, because each shale is different and the approach to exploration and production must be specific.

INVITED SPEAKERS INCLUDE:

MARK HOUNSLOW |

Lancaster Environment Centre,
Lancaster University, United Kingdom

PIOTR KRZYWIEC |

Institute of Geological Sciences,
Polish Academy of Sciences, Warsaw, Poland

PAWEŁ LIS |

GeoFutureConsulting, Warsaw, Poland

NAZMUL HAQUE MONDOL |

Department of Geosciences, University of Oslo, Norway

NIELS H. SCHOVSBO |

Geological Survey of Denmark and Greenland, Denmark

JAN ŚRODOŃ |

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IMPORTANT DATES:

- **25th June 2014 – Deadline for submissions of abstracts**
- **25th June 2014 – Early registration and payment deadline**
- **7th July 2014 – Notification on the abstracts' acceptance**
- **15th July 2014 – Technical program**
- **18th August 2014 – Normal registration and payment deadline**

CONFERENCE CALENDAR:

- **21-23.09.2014** – Pre-conference field trip: **The Holy Cross Mountains – Paleozoic mudrocks and carbonates**
- **24-26.09.2014 – CONFERENCE**
- **24.09.2014** LAB TOUR: **Shale research in the Polish Geological Institute – NRI**
- **24.09.2014** (evening) – Social - integration meeting
- **26.09.2014** – Workshop: **Tectonics of gas-bearing shales**
- **27-28.09.2014** – Post-conference field trip: **Pomerania – unconventional oil & gas exploration**
- **27-29.09.2014** – Post-conference field trip: **The Sudetes – metalliferous black shales in SW Poland**



PRE-CONFERENCE **FIELD TRIP**

THE HOLY CROSS MOUNTAINS – PALEOZOIC MUDROCKS AND CARBONATES

21-23.09.2014



Leaders: **Wiesław Trela**, Ph.D; PGI-NRI Professor, wieslaw.trela@pgi.gov.pl & **Sylwester Salwa**, Ph.D (PGI-NRI), sylwester.salwa@pgi.gov.pl

Participants: Minimum 15, Maximum 25

Cost: 350 EURO (1470 PLN)

Includes: field trip guidebook, transportation, full board & accommodation (single rooms)

Start: 21.09.2014 | Sunday > Warsaw (Polish Geological Institute – NRI, 4 Rakowiecka St.)

Finish: 23.09.2014 | Tuesday > Warsaw (Polish Geological Institute – NRI, 4 Rakowiecka St.)

Transport: bus

Field trip route: Warsaw – Kielce – Sandomierz – Warsaw --700 km

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THE 3-DAY FIELD TRIP WILL FOCUS ON THREE SHALE FORMATIONS

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- **Zachełmie – Kajetanów – Ślichowice – Czerwona Góra (Red Hill)**

Participants will have an opportunity to visit the Zachełmie quarry providing insight into early evolution of the Devonian carbonate platform in the Holy Cross Mountains with the oldest Tetrapod trackway preserved on the bed surfaces. The Ślichowice quarry is a famous outcrop of the Upper Devonian limestones and mudstones developed on the platform slope that were folded during the Variscan tectonic deformations. Moreover, the post-Variscan sedimentary facies will be visited in Kajetanów (Zechstein black limestones) and Czerwona Góra (Permian conglomerates).

- **Święty Krzyż (Holy Cross)– Bardo Stawy – Prągowiec – Konary/Kamieniec – Sandomierz**

This day will be dedicated to the Cambrian and Silurian shales and mudstones interrupted by short touristic stop in the earth of the Holy Cross Mountains – the Holy Cross Monastery. The oldest Cambrian rocks in the Holy Cross Mountains are represented by mudstones predominating in the southern region of this area (Konary/Kamieniec). The Ordovician/Silurian boundary in Bardo Stawy shows a direct sedimentary relation to paleoclimatic and sea-level changes during this time interval. The upper part of the Silurian mudrocks represented by the Wenlock/Ludlow graptolite shales is exposed in Prągowiec. Both of these outcrops provide accordingly insight into the Hirnantian and Mulde biotic events in the peri-Baltica area.

- **Sandomierz – Góry Pieprzowe (Pepper Mountains) – Międzygórz – Warsaw**

The third day will focus on Cambrian shales and mudstones outcropped in the Pepper Mountains, which are hilly area, up to 1 km long, located nearby Sandomierz. This area provides insight into geology of the eastern part of the Holy Cross Mountains. In the old Międzygórz quarry participants will see the Early Ordovician transgressive glauconite sandstones and their tectonic relation to the upper Llandovery graptolite shales wedged between the Ordovician rocks. A short tour across Sandomierz – the old historical town in SE Poland – will be an attractive interruption of the geological field trip.



POST-CONFERENCE **FIELD TRIPS:** **POMERANIA – UNCONVENTIONAL OIL & GAS EXPLORATION** 27-28.09.2014



Leaders: **Grzegorz Uścińowicz**, Ph. D (PGI-NRI), grzegorz.uscinowicz@pgi.gov.pl & **Ireneusz Dyrka**, M.Sc. (PGI-NRI), ireneusz.dyrka@pgi.gov.pl

Participants: Minimum 15, Maximum 25

Cost: 260 EURO (1100 PLN)

Includes: field trip guidebook, transportation, full board & accommodation (single rooms)

Start: 27.09.2014 | Saturday > Warsaw (Polish Geological Institute – NRI, 4 Rakowiecka St.)

Finish: 28.09. 2014 | Sunday > Warsaw (Polish Geological Institute – NRI, 4 Rakowiecka St.)

Transport: bus

Field trip route: Warsaw – Gdańsk – Kosakowo – PGNiG shale gas drill site – Żarnowiec – Dębki –Jastrzębia Góra – Mechowskie Groty – Warsaw — **1,000 km**

The field trip of two days is primarily focusing on unconventional (including shale) oil and gas exploration in Pomerania – Poland’s most prospective region. Other interesting sites to be seen include two unique geosites: an active marine cliff at Jastrzębia Góra and the Mechowo Suffosive Cave formed in glaciofluvial sediments (the only one of this kind in the European Lowlands).

..... DURING THE TRIP, THE FOLLOWING
SITES ARE PLANNED:

- **A Drill Site of PGNiG (Polish Oil and Gas Company)** – Poland’s gas market leader. The site of a shale gas exploration/appraisal well will be visited during the trip. PGNiG experts will be there to present the geology of that exploration area. Drilling technology and environment monitoring methods applied in subsequent stages of work will be discussed, too.
- **Kosakowo Underground Natural Gas Storage Facility** – a cavern storage facility commissioned in January 2014, where natural gas supplied from the transmission system is injected to the underground caverns located at a depth of approx. 1300 m. Ultimately, its working capacity is to reach approx. 600 million cubic meters of gas. For obvious reasons, only on-the-surface facilities will be visited.
- **Żarnowiec Crude Oil and Natural Gas Production Facility** – where tight oil trapped in Middle Cambrian sandstones and mudstones has been produced since the 1970’s.
- **Dębki Crude Oil Production Facility** – an active oil well that has been operated for over 40 years in an attractive and popular tourist resort. The oil well is located some 300 meters away from the seashore. Tight oil is produced from Middle Cambrian formations.
- **Jastrzębia Góra Cliff.** Geodynamics of the cliffed Baltic coast and methods of coast protection will be presented. Due to a complex geology and hydrogeology, the cliff is prone to intense landsliding. The cliff is monitored by PGI-NRI using a ground-based laser scanning method which provides an image of the coast erosion rate and patterns. Jastrzębia Góra is an attractive seaside resort with the northernmost point of the Polish coast. Impressive sunsets over the Baltic can be admired there.
- **Mechowo Cave** – this suffosive cave formed in glaciofluvial deposits of the Baltic Glaciation is a unique geological feature in the lowlands. It occurred as a result of sand washing away from between calcite-cemented sedimentary rocks. The cave is approx. 65 m long and up to 2 m high. The cemented sediments appear as intricate pillars that form the entrance and support the cave’s ceiling.



GDAŃSK

When traveling in a coach we will admire the beauty of the morainic landscape with its various landforms left by the continental glacier. The landscape of the Kaszuby Region is interspersed with lakes, pine and beech forests in the setting of undulated expanses of post-glacial morainic hills. The post-glacial high plain was formed in the latest stages of the Vistulian Glaciation (the Pomeranian and Gardno Stages).

Gdańsk, the capital of the Pomeranian Province, which is counted among the most beautiful cities in Poland, also will be visited during the trip. While sightseeing the Main Town we will visit the most prominent historic buildings: the Basilica of the Assumption of the Blessed Virgin Mary, the Golden Gate or the Main Town Hall, the historic Royal Route with its Long Market Square and the peculiar harbour crane built in 1444.

You will be accommodated in Sopot, a leading Polish resort, which is notable, among other things, for Poland's longest (over 500 m long) pier.



POST-CONFERENCE **FIELD TRIPS:** **THE SUDETES – METALLIFEROUS BLACK SHALES IN SW POLAND** 27-29.09.2014



Leaders: **Stanisław Wołkowicz**, Ph.D; PGI-NRI Professor, stanislaw.wolkowicz@pgi.gov.pl & **Stanisław Mikulski**, Ph.D; PGI-NRI Professor stanislaw.mikulski@pgi.gov.pl & **Sławomir Oszczepalski**, Ph.D; PGI-NRI Professor, slawomir.oszczepalski@pgi.gov.pl

Number of participants: Minimum 15, Maximum 25

Cost: 350 EURO (1470PLN)

Includes: field trip guidebook, transportation, full board & accommodation (single rooms)

Start: 27.09.2014 | Saturday > Warsaw (Polish Geological Institute – NRI, 4 Rakowiecka St.)

Finish: 29.09. 2014 | Monday > Warsaw (Polish Geological Institute – NRI, 4 Rakowiecka St.)

Transport: bus

Field trip route: 1st day > Warsaw – Kielniki near Częstochowa (core review in the PGI-NRI core repository at Kielniki) – Lubin (lodging)

2nd day > Lubin – outcrops in the North Sudetic Basin, exposure of Lower Paleozoic Kaczawa Series in the Radzimowice area – Lubin (lodging)

3rd day > Rudna deep copper mine operated by KGHM Polish Copper S.A. – Warsaw.

The total distance of this excursion is around — **1,300 km**

The Sudety Mts region belongs to the most interesting and diversified in geological structure in Poland. Igneous, metamorphic and sedimentary rocks exposed in that region are varying in lithology and age, from the Neoproterozoic to Paleozoic and Mesozoic to Cenozoic, represented by cones of basaltic volcanoes which can be seen the route of the field trip. In the outcrops and core repositories we will be able to study shale, claystone and mudstone rocks as well as metamorphic quartz-sericite schists, rich in organic material and exhibiting different degrees of thermal maturity. The displayed material will also show effects of geological processes to which these rocks have been subjected (various types of mineralization and alteration and tectonic deformations).

THE MAIN POINTS IN THE FIELD TRIP

ITINERARY WILL INCLUDE VISITS

IN THE FOLLOWING LOCALITIES:

- **Core repository at Kielniki near Czestochowa**

Because of very limited access to outcrops, the borehole section of Lower Permian claystones and mudstones with uranium mineralization will be displayed. The gathered core material will mainly include Lower Permian Walchia shales deposited in Carboniferous-Permian intermontane basin of the Mid-Sudetic Depression. This is a series of fine-clastic lacustrine sediments up to 400 m thick and with 12 horizons of uranium mineralization. The mineralization is mainly related to black claystones and mudstones, often calcareous and rich in organic matter.

- **North-Sudetic Basin**

Outcrops of Zechstein copper-bearing shale (Kupferschiefer)

In eastern part of the North Sudetic Basin, we will see copper-bearing shales of the Zechstein, exposed in Nowy Kościół and Lena outcrops, where their exploitation was abandoned in 1968 and 1973, respectively. Those outcrops are displaying typical black copper-bearing shales with mineralization of copper and lead and zinc sulfides as well as shales with red hematite-rich patches and spots. The latter are characterized by high degree of degradation of organic matter and high levels of its thermal maturity. This along with the wealth of aromatic hydrocarbons indicate secondary alteration of originally black shales under influence of oxidating solutions. Oxidized rocks are very poor in copper and silver at the advantage of gold and platinum group elements.

In the Lena area it will be possible to visit the Mining and Metallurgy Heritage Park in Leszczyna and Dymarki Kaczawskie ancient blast furnaces exposition.

Outcrops of Lower Paleozoic Kaczawa Series in the Radzimowice area

The outcrops make it possible to study lithology and mineralization of metamorphic quartz-sericite black schists of the Lower Paleozoic Kaczawa Series, characterized by high levels of thermal maturity of organic matter. The rocks show effects of sulfide mineralization and as well as gold-bearing polymetallic mineralization overprinted in zones of igneous Variscan intrusions.

- **Fore-Sudetic Monocline – Rudna copper mine operated by KGHM Polish Copper S.A. – the world leader in production of silver and copper**

We will spend the last day of the field trip in a place highly attractive for geologists – the Rudna copper mine. There, at the depth of over 1,000 m, mining experts of the operator of the mine - KGHM Polish Copper S.A. will be our guides and give introduction to geology of Zechstein copper-bearing shales (Kupferschiefer), with form one of the largest world reserves of copper and silver ores, and technology of their production.

The Rudna mine is located in central part of the Lubin-Sieroszowice Cu-Ag deposit in the Fore-Sudetic Monocline. The deposit is related with a mineralization zone developed in rocks belonging to three lithological types of rocks: Rotliegend sandstones and Zechstein shales and dolomites. The mined parts of the deposits are characterized by highly diversified tectonic conditions and thickness changes from 0.5 to 20 m. In almost a half of the Rudna mining area the deposit series ranges from 5 to 10 m in thickness, and in over one-fifth of the area its thickness is larger, exceeding 10 m. Daily ore production in that mine is about 39,810 tonnes and the annual - is close to 12.362 million tonnes. Copper grades are equal 1.80%, and silver - 51 g/t.

The Zechstein black shales have been deposited under highly reducing conditions which played a decisive role in origin of the Cu-Ag ores. These conditions were responsible for formation of so high concentrations of metals in that relatively narrow lithostratigraphic horizon. A special attention should be paid to wedging out of the Zechstein shale in areas elevations related to major Rotliegend dunes. The shales are very rich in organic matter with thermal maturity corresponding to early phases of oil generation and oil (0.5-1.3% Ro). The values Ro indicate temperatures of mineralizing solutions up to 135°C. The main ore minerals include here Cu-sulfides: chalcocite, digenite, cowellite, bornite and chalkopyrite. There were also identified a few dozens of accompanying and accessory minerals, often yielding priceless admixtures of recoverable elements such as silver, gold, palladium, platinum, rhenium, selenium and nickel.



SHRIMP IIe/MS



ROCK-EVAL 6

LAB TOUR: SHALE RESEARCH IN POLISH GEOLOGICAL INSTITUTE - NRI

24.09.2014

Contact: geoshale@pgi.gov.pl

The participation in the Lab Tour is free of charge. **Registration is on a first come, first served basis**

Place: PGI-NRI, 4 Rakowiecka St.

The purpose of this tour is to get the participants familiar with the methods used in different shale research studies which are conducted in different labs and rooms located in PGI-NRI in Warsaw.

The participants will have an opportunity to meet the PGI-NRI scientist, chat about their work, “touch” the apparatus and collect the general overview on how a certain method is used and what are its advantages and limitations.

The tour will include: Sensitive High Resolution Ion MicroProbe (SHRIMP) lab, Scanning electron microscopy lab, Micro-area analysis lab, Rock-Eval lab, Palaeomagnetic lab and more. Additional information about PGI-NRI laboratories can be found at PGI-NRI website.



WORKSHOP: TECTONICS OF GAS-BEARING SHALES

26.09.2014

Leader: Marek Jarosiński Ph. D, PGI-NRI Professor, marek.jarosinski@pgi.gov.pl

Cost: 50 EURO (200 PLN)

Place: PGI-NRI, 4 Rakowiecka St.

In the first part of the workshop the lecture will address:

- a specific mechanic properties of shale rock and their petrographic constraints
- meso- and micro-scale tectonic structures in shale rock
- geophysical imaging methods of tectonic structures in shale complex.
- technologically induced borehole wall and core features controlled by a present-day tectonic stress

Implication of tectonic investigations for planning stimulation of hydrocarbon production from shales will be also discussed.

In the second part of the workshop we are going to have a look at the shale core samples from the National Geological Archive, on which tectonic structures can be seen as they are exposed to the shale-gas explorer.



Registration now open
Call for abstracts

REGISTRATION FEES:

Early registration (to 25.06.2014) 200 € (800 PLN) - professionals

Normal registration (after 25.06.2014) 250 € (1000 PLN) - professionals

Registration fee includes: abstract volume, coffee breaks, lunches at the conference site, conference accessories, social - integration meeting

Students can intend to earn the reduced price after presenting the official declaration of Thesis from supervisor.

For more information about registration and payment please visit our website www.geoshale.com

ACCOMMODATION

Need to be booked by the participants themselves.

On www.geoshale.com we present a list of hotels.

PUBLICATIONS:

Thematic issue

A thematic conference volume will be published as an issue of **Geological Quarterly (GQ)** <https://gq.pgi.gov.pl/>

All manuscripts for the thematic volume will be subjected to regular peer-review and need to follow the journal's style. GQ is an international geosciences journal with current Impact Factor of 0.843 and indexed in ISI and Scopus.



A detailed Guide
for Authors is available on
www.geoshale.com



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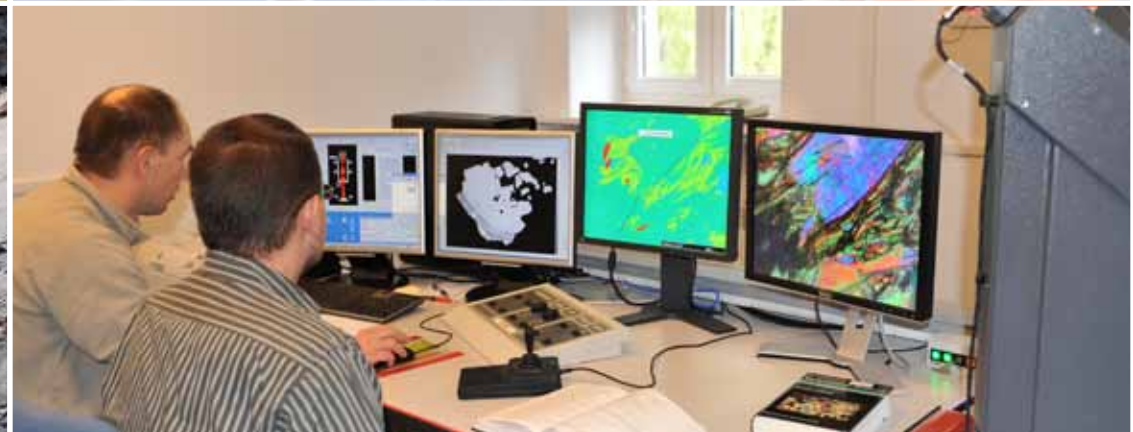


VISIT: WARSAW, POLAND

Warsaw, with over 400 years of pride as a capital, is the largest city and an economic, political and cultural centre of Poland. The fourth of its area is covered by parkland, what gives the city freshness and unique character. In Warsaw you can see the history of hundreds of years written in architecture – with unique balance between graceful old and striking new buildings surrounded by green areas.

See more about Warsaw at: <http://www.warsawtour.pl>





ABOUT PGI-NRI

The **Polish Geological Institute – National Research Institute** was founded on the 7th of May 1919 and is the oldest Polish nation-wide scientific institution. It is involved in comprehensive studies of geological structure of the country for practical use in national economy and environmental protection. In addition to scientific activities in all fields of modern geology the Institute was entrusted with the tasks of the Polish Geological Survey and the Polish Hydrogeological Survey. Moreover, it is responsible for the country's security in supply of mineral resources, the groundwater management, for monitoring of the geo-logical environment and warning against natural hazards and risks.

The Polish Geological Institute – NRI belongs to the association of European geological surveys – EuroGeoSurveys (EGS).

See more about the PGI-NRI: <http://www.pgi.gov.pl>

ORGANIZING COMMITTEE:

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– CHAIRMAN



KATARZYNA SOBIEŃ
– SECRETARY



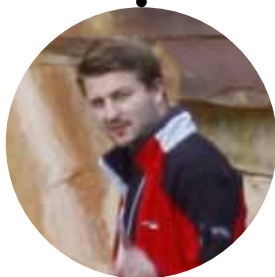
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For the latest news see our webpage:
www.geoshale.com

In case of any questions please contact:
geoshale@pgi.gov.pl

