



# IX Symposium **ProGEO** Poland 2018

Geoheritage and Geoconservation:  
Modern Approaches and Applications  
Towards the 2030 Agenda  
**Chęciny, Poland**  
**25-28th June 2018**

## PROGRAMME AND ABSTRACT BOOK

Edited by

Ewa Główniak, Agnieszka Wasiłowska, Paulina Leonowicz



The European Association for the Conservation  
of the Geological Heritage



# **IX ProGEO Symposium**

## **Geoheritage and Conservation: Modern Approaches and Applications Towards the 2030 Agenda**

**Chęciny, Poland  
25-28th June 2018**

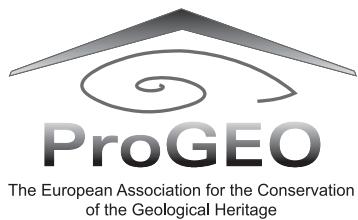
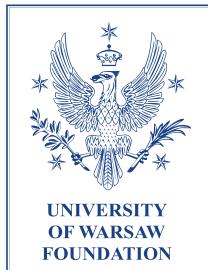


## **PROGRAMME AND ABSTRACT BOOK**

Edited by

Ewa Główniak, Agnieszka Wasiłowska, Paulina Leonowicz

This publication was co-financed by Foundation of University of Warsaw and ProGEO – The European Association for the Conservation of the Geological Heritage



*Editors:*

Ewa Głowniak, Agnieszka Wasiłowska, Paulina Leonowicz

*Editorial Office:*

Faculty of Geology, University of Warsaw,  
93 Żwirki i Wigury Street, 02-089 Warsaw, Poland

*Symposium Logo design:*

Łucja Stachurska

*Layout and typesetting:*

Aleksandra Szmielew

*Cover Photo:*

A block scree of Cambrian quartzitic sandstones on the slope of the Łysa Góra Range – relict of frost weathering during the Pleistocene. Photograph by Peter Pervesler

*Example reference:*

Dunlop, L. 2018. Natural Capital – placing a value on geoconservation within a landscape framework in the UK. In: E. Głowniak, A. Wasiłowska, P. Leonowicz (Eds), Geoheritage and Conservation: Modern Approaches and Applications Towards the 2030 Agenda. 9th ProGEO Symposium, Chęciny, Poland, 25-28th June 2018 Programme and Abstract Book, p. 25. Faculty of Geology, University of Warsaw.

*Print:*

GIMPO Agencja Wydawniczo-Poligraficzna, Marii Grzegorzewskiej 8, 02-778 Warsaw, Poland

©2018 Faculty of Geology, University of Warsaw

ISBN 978-83-945216-5-3

The content of abstracts are the sole responsibility of the authors

## ORGANISING COMMITTEE

Chair:	<b>EWA GŁOWNIAK<sup>1</sup></b>
1 <sup>st</sup> Secretary:	<b>PAULINA LEONOWICZ<sup>1</sup></b>
2 <sup>nd</sup> Secretary:	<b>MAŁGORZATA BIEŃKOWSKA-WASILUK<sup>1</sup>,</b>
Online Registration Attendant:	<b>AGNIESZKA KŁOPOTOWSKA<sup>1</sup></b>
Session Programme Convener:	<b>AGNIESZKA WASIŁOWSKA<sup>1</sup></b>
Workshop Kielce Geopark Convener:	<b>MICHał POROS<sup>3</sup></b>
Pre-symposium Field Trip Convener:	<b>JAN URBAN<sup>2</sup></b>
Post-symposium Field Trip Convener:	<b>STANISŁAW SKOMPSKI<sup>1</sup></b>
Field trip co-leaders:	<b>MACIEJ BĄBEL<sup>1</sup></b> <b>WIESŁAW TRELA<sup>4</sup>,</b> <b>PIOTR ZIÓŁKOWSKI<sup>1</sup></b>
Chęciny Guided Tour Convener:	<b>BARTOSZ PIWOWARSKI<sup>3</sup></b>
Helpdesk and logistics:	<b>MARCIN STĘPIEŃ<sup>1</sup></b>

<sup>1</sup> Faculty of Geology, University of Warsaw; <sup>2</sup>Institute of Nature Conservation, Polish Academy of Science, Kraków;

<sup>3</sup>Kielce Geopark; <sup>4</sup>Polish Geological Institute – National Research Institute, Świętokrzyski Department

## HONOR COMMITTEE

**ZOFIA ALEXANDROWICZ      TYMOTEUSZ WRÓBLEWSKI**

Institute of Nature Conservation,  
Polish Academy of Science, Poland      Polish Geological Institute – National Research  
Institute, Poland

## SCIENTIFIC COMMITTEE

**LOVÍSA ÁSBJÖRNSDÓTTIR      ZDZISŁAW MIGASZEWSKI**

Icelandic Institute of Natural History, Iceland      Jan Kochanowski University in Kielce, Poland

**ALEXANDRU ANDRASANU      KEVIN PAGE**

University of Bucharest, Romania      Secretary General of International Commission on  
GeoHeritage; Plymouth University, United Kingdom

**JOSÉ BRILHA      DANIEL PIVKO**

University of Minho, Portugal      Comenius University in Bratislava, Slovakia

**MAREK DOKTOR      BARBARA RADWANEK-BĄK**

AGH University of Science and Technology,  
Poland      Polish Geological Institute – National Research  
Institute, Poland

**AGNIESZKA GAŁUSZKA      GÜNTER SCHWEIGERT**

Jan Kochanowski University in Kielce,  
Poland      Staatliches Museum für Naturkunde, Stuttgart,  
Germany

**KURT GOTTH      PAULO PEREIRA**

Sächsisches Landesamt für Umwelt, Landwirtschaft  
und Geologie, Germany      University of Minho, Portugal

**ANNA KALINOWSKA      KYUNG SIK WOO**

Research Centre for Natural Environment and  
Sustainable Development, University of Warsaw, Poland      Chair of IUCN WCPA Geoheritage Specialist Group;  
Department of Geology, Kangwon National University

**GUILLERMO MELÉNDEZ      ZBIGNIEW ZWOLIŃSKI**

University of Zaragoza, Department of Earth Sciences,  
Spain      Adam Mickiewicz University in Poznań,  
Poland

*Organised by*

Faculty of Geology, University of Warsaw  
Institute of Nature Conservation, Polish Academy of Science  
Kielce Geopark  
Polish Geological Institute – National Research Institute

*Under the auspices of*

ProGEO – The European Association for the Conservation of the Geological Heritage  
IUGS International Commission on GeoHeritage  
IUCN WCPA Geoheritage Specialist Group  
Marshal of the Holy Cross Province  
Mayor of the Chęciny Town and Municipality  
Rector of the University of Warsaw

*Co-financed by*

Faculty of Geology, University of Warsaw  
ProGEO – The European Association for the Conservation of the Geological Heritage  
Rector of the University of Warsaw  
University of Warsaw Foundation

*Partners*

European Center of Geological Education of the University of Warsaw  
Bochnia Salt Mine  
Museum of the Kielce Village  
Ojców National Park  
Journal of GeoHeritage

## PATRONS



UNIVERSITY  
OF WARSAW



MARSZAŁEK  
WOJEWÓDZTWA  
ŚWIĘTOKRZYSKIEGO



THE ORGANISING COMMITTEE WOULD LIKE TO  
ACKNOWLEDGE THE VALUABLE SUPPORT  
OF OUR PATRONS AND PARTNERS

# CONTENTS

<b>Programme Timetable</b> .....	11
<b>Keynote Speakers</b> .....	18
<i>Juana Vegas</i> .....	18
<i>Kyung Sik Woo</i> .....	18
<b>Abstracts in thematic order</b> .....	19
<b>Keynote Lectures</b> .....	19
<i>Vegas Juana</i> . Geoconservation from the public administrations: Fifty years of work at the Geological Survey of Spain (IGME) .....	19
<i>Woo Kyung Sik, Ju Seong Ok, Brilha José</i> . Key Geoheritage Area: A potential new programme in IUCN for geoheritage conservation .....	20
<b>Session A: Geoconservation and landscape management</b> .....	21
Oral presentations .....	21
<i>Cernatič Gregorič Anica</i> . Typical landforms of Kras (Slovenia), an important constituent part of the Karst landscape and possibilities for their conservation .....	21
<i>Díaz-Martínez Enrique, Charles Nicolas, García-Cortés Ángel, Vegas Juana</i> . European cooperation towards the promotion of geoconservation in Africa .....	23
<i>Dunlop Lesley</i> . Natural Capital – placing a value on geoconservation within a landscape framework in the UK .....	25
<i>Forte João, Matias Maria Isabel, de Moura Pereira Pascal, Brandão Coelho Luís</i> . Geodiversity in the Terras de Coura Landscape Plan .....	26
<i>Karancsi Zoltán, Horváth Gergely, Csüllög Gábor, Szabó Mária</i> . The role of the landscape aesthetic values in the geotourism .....	28
<i>Lah Marvy</i> . Evaluation of Cultural Landscape within the Cultural Heritage Protection System .....	30
<i>Lee Kuang-Chung</i> . Enhancing Community–School Partnership for Rural Landscape Conservation: a case study in Taiwan .....	31
<i>de Siqueira Canesin Thais, Brilha José, Díaz-Martínez Enrique</i> . Geoconservation and management strategies: A case study with two Spanish UNESCO Global Geoparks .....	33
<i>Urban Jan, Margielewski Włodzimierz, Radwanek-Bąk Barbara</i> . Concepts of geoheritage and geosites in a strategy and practice of geoconservation and geology promotion .....	34
Posters .....	36
<i>Bajraktari Fadil, Behrami Sami, Zogaj Nazmi, Avdia Blerta</i> . Protected areas at the cross-border region Kosovo–Albania .....	36
<i>Moura Pâmella, Motta Garcia Maria da Glória, Brilha José</i> . Enhancing geoconservation strategies by quantitative assessment of geosites in the Ceará Central Domain, Northeastern Brazil .....	37
<i>Zboińska Katarzyna, Tarka Robert, Szadkowski Mateusz</i> . Protection of inanimate nature in Lower Silesia (Poland) .....	39
<i>Zwoliński Zbigniew</i> . Spatial scales of geodiversity and landform taxonomic hierarchy .....	41
<b>Session B: Geoheritage and cultural heritage: mines, quarries, science and communities</b> .....	42
Oral presentations .....	42
<i>Bąbel Maciej, Jarzyna Adrian, Lugowski Damian, Bogucki Andriy, Yatsyshyn Andriy,         Nejbert Krzysztof, Olszewska-Nejbert Danuta</i> . 3D documentation, monitoring and origin of the hydration caves from the unique outcrop of weathering anhydrites at Pisky near Lviv (Ukraine) .....	42

---

## CONTENTS

---

<i>Corbí Hugo, Martín-Rojas Ivan, Martínez-Martínez Javier.</i> Linking geological and architectural heritage through a 3D geological model of a historical quarry .....	44
<i>Cropp David.</i> The Geo-Village: from concept to reality .....	46
<i>Evans Ben.</i> TIPical Valleys: reintroducing local people to iconic mineral spoil landscapes in the South Wales Coalfield. ....	47
<i>Kubalíková Lucie.</i> Bringing geoheritage to people: developing geotourism within urban areas – a case study of Brno (Czech Republic) .....	48
<i>Machalski Marcin, Liwiński Wiesław.</i> Geotourism as a vehicle for geoconservation: the case of an abandoned phosphorite mine at Annopol, Poland .....	50
<i>Pieńkowski Grzegorz, Fijałkowska-Mader Anna.</i> Geological and cultural heritage of the proposed Kamienna Valley Geopark, Holy Cross Mountains, Poland .....	52
<i>Pivko Daniel.</i> Stones in history of Slovakian territory and tourist interesting places .....	54
<i>Prosser Colin.</i> Using quarries to link communities to their geoheritage .....	55
<i>Schweigert Günter, Roth Sigfried.</i> Geopark Schwäbische Alb – an outstanding area for Jurassic and Miocene palaeontology and Pleistocene human culture. ....	57
<i>Telbisz Tamás, Gruber Péter, Kőszegi Margit, Mari László, Standovár Tibor, Bottlik Zsolt.</i> Geoconservation – an opportunity for people living on karst terrains? A case study of the Aggtelek National Park (Hungary) .....	59
<i>Vajskebrová Markéta, Gúrtlerová Pavla, Svítíl Radek.</i> Systematic data collecting and appropriate ways of their presentations for effective protection of the geological heritage .....	61
<i>Zgłobicki Wojciech, Gajek Grzegorz, Kołodyńska-Gawrysiak Renata.</i> Educational value of quarries located within the proposed Geopark Małopolska Vistula River Gap, Eastern Poland .....	63
<b>Posters</b> .....	<b>65</b>
<i>Bąbel Maciej, Jarzyna Adrian, Ługowski Damian, Vladi Firouz, Bogucki Andriy, Yatsyshyn Andriy, Nejbert Krzysztof, Olszewska-Nejbert Danuta, Kotowski Jakub, Kremer Barbara, Tomeniuk Olena.</i> The hydration caves as a unique geological heritage .....	65
<i>Baráz Csaba, Holló Sándor, Telbisz Tamás.</i> Creation of a new geopark in the Bükk Region (Hungary) – a bottom-up initiative .....	67
<i>Brzezińska-Wójcik Teresa, Skowronek Ewa.</i> Heritage of the Brusno stone work centre as an opportunity to develop and promote rural areas of Roztocze Region (Southeastern Poland) .....	69
<i>Fermeli Georgia, Koutsouveli Anastasia.</i> The conglomerates of Meteora: a geological heritage monument of Greece .....	71
<i>Jamorska Izabela, Karasiewicz Tomasz, Tylmann Karol.</i> Geodiversity and geoheritage of the glacial landscape areas in Poland .....	73
<i>Kałaska Maciej, Siuda Rafał, Sierpień Paula.</i> Application of Light Detection and Ranging (LiDAR) and geochemical survey to investigations of old mining center in Radzimowice (Lower Silesia, SW Poland) .....	74
<i>Kazancı Nizamettin, Suludere Yaşar, Saroğlu Fuat, Gürbüz Alper, Özgüneylioğlu Aysen, Müllazimoğlu Necip S., Mengi Hamdi, Arslan Sonay Boyraz, Gürbüz Esra, Yücel Tahsin Onur, Ersöz Merve, İnaner Hülya.</i> Archaeological and historical mines in Turkey as instruments for public awareness on geoconservation: JEMİRKO Project .....	76
<i>Kociuba Waldemar, Brzezińska-Wójcik Teresa, Skowronek Ewa.</i> High-resolution Terrestrial Laser Scanning as a tool for acquisition and analysis data of geo-and cultural heritage: an example from the Roztocze Region (Southeastern Poland). ....	77
<i>Koźma Jacek.</i> The use of post-mining landscape for geotouristic purposes in Geopark – by the example of the Polish part of UNESCO Global Geopark Muskau Arch .....	79
<i>Nikolić Gojko R.</i> Geodiversity and biodiversity complementary in nature protection in Montenegro .....	81

<i>Özkul Mehmet, Gökgöz Ali, Yiksel Ali Kamil.</i> Travertine Spring Towers as rare depositional morphologies in geothermal fields: the example of the Hisaralan Geothermal Field in NW Turkey .....	83
<i>Weis Robert, Di Cencio Andrea.</i> Geoheritage in the Red Rock Region, Southern Luxembourg: towards an integrative view of natural diversity in a cultural landscape? .....	84
<i>Woodward Dilyara, Ivanova Natalya, Yegemberdieva Kamshat, Akiyanova Farida, Fishman Il'ya.</i> Mangistau Aspiring Geopark (Kazakhstan) .....	86
<b>Session C: Moveable geoheritage and science</b> .....	88
Oral presentations .....	88
<i>Kazancı Nizamettin.</i> Mucurtachylites: an ‘astrobleme category’ geosite in the inventory list of Turkey .....	88
Posters .....	89
<i>Fijalkowska-Mader Anna.</i> Use of ‘rose-like’ calcite for determination of age and origin of the calcite minerals in the Holy Cross Mountains (Southern Poland) .....	89
<i>Özgen Erdem Nazire, Kazancı Nizamettin.</i> Local fossil sites: a new proposal to be included in the national geological frameworks of Turkey .....	91
<b>Session D: Geoconservation in protected areas and nature conservation strategies</b> .....	92
Oral presentations .....	92
<i>Ásbjörnsdóttir Lovísa, Þorvarðardóttir Guðríður.</i> Selecting important geoheritage for a conservation strategy plan in Iceland .....	92
<i>Mari László, Telbisz Tamás.</i> European National Parks with karst landscapes .....	94
<i>Matthews Jack J., McMahon Sean.</i> Exogeococonservation: Protecting Geological Heritage on Celestial Bodies .....	96
<i>Monge-Ganuzas Manu, Salazar Ángel, Herrero Nadia, Guillén-Mondéjar Francisco, Hilario Asier, Lorente Javier, Mata-Perelló Josep Maria, Utiel Juan Carlos, Díaz-Martínez Enrique.</i> Spanish achievements and initiatives towards geoconservation: 2018 update .....	97
<i>Monge-Ganuzas Manu, Salazar Ángel, Herrero Nadia, Guillén-Mondéjar Francisco, Hilario Asier, Mata-Perelló Josep M., Utiel Juan C., Díaz-Martínez Enrique.</i> The inclusion of the geodiversity and geoheritage in the Ordesa-Viñamala Action Plan 2017 – 2025 for the Spanish Network of Biosphere Reserves (SNBR) .....	99
<i>Motta Garcia Maria da Glória, Brilha José, de Gouveia Souza Célia Regina, Del Lama Eliane Aparecida.</i> Preliminary assessment of ecosystem services provided by geodiversity in the coastal region of the state of São Paulo, Southeastern Brazil .....	101
<i>Novak Matevž, Stupar Martina.</i> Geoheritage in Slovenia – a short overview .....	103
<i>Seghedi Antoneta.</i> Geosites in the area of Dobrogea, Romania, and the need for local geodiversity action plans .....	105
<i>Woo Kyung Sik, Sohn Young Kwan, Kil Youngwoo.</i> The aspiring Hantangang Global Geopark in Korea: its international geological significance and justification for UNESCO Global Geopark .....	107
Posters .....	108
<i>Grabarczyk Anna, Stróżyk Katarzyna.</i> Natural and social aspects of the selection of the GSSP; the case of the Słupia Nadbrzeżna river cliff section (Central Poland), the candidate stratotype for the basal boundary of the Coniacian Stage (Upper Cretaceous) .....	108
<i>Matthews Jack J.</i> Discovery Aspiring Geopark: A candidate for UNESCO Global Geopark from the Bonavista Peninsula of Newfoundland .....	110
<i>Trela Wiesław, Szrek Piotr, Salwa Sylwester.</i> Land of Tetrapod and Petrified Dunes: geoheritage of proposed geopark in the western part of the Holy Cross Mountains, Poland .....	111

---

## CONTENTS

---

<i>Woo Kyung Sik, Chun Seung Soo, Moon Kyong O.</i> Outstanding Universal Values of the Korean Archipelago Getbol: Its potential for World Heritage Nomination .....	113
<b>Session E: Geoconservation for science, education, and tourism.</b> .....	<b>114</b>
<b>Oral presentations.</b> .....	<b>114</b>
<i>Corbí Hugo, Alfaro Pedro, Andreu José Miguel, Baeza José Francisco, Benavente David, Blanco-Quintero Idael F., Cañaveras Juan Carlos, Cuevas Jaime, Delgado José, Díez-Canseco Davinia, Giannetti Alice, Martín-Rojas Ivan, Martínez-Martínez Javier, Medina-Cascales Ivan, Peral Juan, Rosa-Cintas Sergio.</i> ‘Geogymkhana’: an outreach activity to bring closer the geoheritage to high schools. ....	114
<i>Glowacki Wiktor.</i> Diversified approach to dynamic fluvial geoheritage of Western Outer Carpathians – selected problems of conservation and use .....	116
<i>İnaner Hülya, Sümer Ökmen, Akbulut Mehmet.</i> Geosites and protected areas in the western termination of the Büyük Menderes Graben and their importance of science education and tourism....	118
<i>Kananoja Tapio.</i> Geoconservation for education – from classroom to reality .....	120
<i>Ludwikowska-Kędzia Małgorzata, Wiatrak Małgorzata.</i> Geotourism potential of small river valleys of the Holy Cross Mountains (Central Poland) .....	122
<i>Lyakhnitsky Yury, Ivanova Tatiana.</i> Creation of a geotouristic underground route in the Ruskeala Mining Park (the Republic of Karelia, Russian Federation).....	124
<i>Macadam John, Popa Răzvan-Gabriel, Toma Cristina, Kudor Stefan George, Popa Diana-Alice.</i> Cooking, Culture and Concretions: The Three Cs for compulsive, creative communication in Buzau Land Aspiring Geopark (Romania).....	126
<i>Manjon Mazoca Carlos Eduardo, Costa Mucivuna Vanessa, Motta Garcia Maria da Glória, Henriques Renato, Del Lama Eliane Aparecida, Bourotte Christine.</i> Panoramic 360° images and 3D models as tools to promote cultural and geological heritage: the example of Bertioga, central coast of São Paulo State, Brazil .....	128
<i>Matthews Jack J.</i> Threats to Geoheritage at the Mistaken Point World Heritage Site: Identification, Monitoring, and Management.....	130
<i>Migoń Piotr, Duszyński Filip, Różyczka Milena, Jancewicz Kacper.</i> Tracing landform evolution through time along a thematic trail in Elbsandsteingebirge (Germany) – application of ergodic principle in interpreting geoheritage.....	131
<i>Page Kevin, Pereira Lola, Schouenborg Björn, de Wever Patrick.</i> The International Commission on Geoheritage (ICG): A new partner for developing global geoconservation policy and practice.....	133
<i>Pereira Paulo, Insua Pereira Diamantino, Gonçalves Bruno, Viveiros Carla, Afonso Andreia.</i> Assessment of tourism value in geological heritage: why, what and how .....	134
<i>Pijet-Migoń Edyta, Migoń Piotr, Rozpędowska Ewelina.</i> Between geoconservation, tourism, education and local community involvement – the past, present and future of volcanic geosites in the Land of Extinct Volcanoes (Pogórze Kaczawskie, SW Poland).....	135
<i>Roberts Raymond.</i> Brymbo: Derelict former steelworks to internationally important geoconservation and geotourism site .....	137
<i>Serjani Afat.</i> Geological context of geosites.....	139
<i>Vegas Juana, Cabrera Ana, Prieto Ángel, Díez-Herrero Andres, García-Cortés Ángel, Díaz-Martínez Enrique, Carcavilla Luis, Salazar Ángel.</i> ‘Watch over a rock’, a Spanish programme towards geosite stewardship .....	141
<b>Posters</b> .....	<b>143</b>
<i>Afonso Andreia, Pereira Paulo.</i> Assessment of the geological heritage tourism value in the Peneda-Gerês National Park (Northern Portugal): a site selection .....	143
<i>Akiyanova Farida, Adilbekova Fariza, Atalikhova Aksholpan, Jussupova Zulfira, Simabtova Aliya, Dolbeshkin Maxim, Akishev Nurzhan.</i> Conservation and sustainable recreational use of unique ecosystems of the Burabay State National Nature Park (Northern Kazakhstan) .....	145

<i>Alenicheva Antonina A., Semenova Ljudmila R.</i> Geosites of the Sakhalin and Moneron: geotourism development . . . . .	147
<i>Brilha José.</i> The establishment of geoconservation standards: the ProGEO glossary of geoconservation terms . . . . .	149
<i>Corbí Hugo, Asensio-Montesinos Francisco, Abellán Antonio, Pardo Vicent, Martínez-Martínez Javier.</i> 3D geological models for promoting geoheritage: the Messinian atoll reef of Santa Pola (SE Spain) . . . . .	150
<i>Gogin Ivan Ya.</i> Regional type-sections of GSSPs as Geological Heritage sites of practical importance . . . . .	152
<i>Górcka-Zabielska Maria, Witkowska Kinga, Pisarska Magdalena, Musial Rafał.</i> Erratic boulders in Świętokrzyskie Region and their geotouristic potential . . . . .	154
<i>Krzeczyńska Monika, Wierzbowski Andrzej, Woźniak Paweł.</i> For the sake of protection of geodiversity implemented through geological education and geotourism . . . . .	156
<i>Lundqvist Sven, Ransed Gunnar, Dahl Rolv.</i> Geological heritage in the central part of Scandinavia (GEARS) – a Norwegian-Swedish transboundary Interreg Project (2017–2019) . . . . .	158
<i>Lyakhnitsky Yury, Ivanova Tatiana.</i> The Kapova Cave (Shulgantash Cave) – one of the well-known geosites of South Ural (Russian Federation) . . . . .	160
<i>Macadam John, Popa Răzvan-Gabriel, Toma Cristina, Kudor Stefan George, Popa Diana-Alice.</i> Using provocative interpretation to manage visitors to the fragile, dynamic geoheritage of mud volcanoes in Aspiring Geopark Buzau Land in Romania? . . . . .	162
<i>Mizerski Włodzimierz, Skurczyńska-Garwolińska Katarzyna.</i> The educational role of the outcrops in qualified geotourism in which one may define the age and process of the tectonic movements – some examples from the Holy Cross Mountains, Central Poland . . . . .	164
<i>Niculiță Mihai.</i> Bahluieț Valley at Costești village (Romania) geoarchaeosite: the need for its protecting, promoting and managing . . . . .	166
<i>Semenova Ljudmila R.</i> A Significant Geosite – The Lovozero Alkaline Massif (Russia) . . . . .	167
<i>Stróżyk Katarzyna, Grabarczyk Anna, Machalski Marcin.</i> Reasons behind plans to conserve the Cretaceous–Paleogene Boundary site at Lechówka, southeast Poland. . . . .	169
<i>Stupar Martina, Laganis Jana.</i> Recommendations for visitors in the Danube Geoparks . . . . .	171
<i>Szente István, Takács Bence, Harman-Tóth Erzsébet, Weiszburg Tamás G.</i> Geological Garden at Tata (Hungary) – cleaned and beautified . . . . .	172
<i>Szrek Piotr.</i> Geoeducation potential of the Łagów area in the Holy Cross Mountains, Poland . . . . .	174
<i>Trela Wiesław.</i> Scientific and educational aspects of Ordovician and Silurian geosites at Mójcza and Bardo Stawy in the Holy Cross Mountains, Poland . . . . .	175
<i>Vdovets Marina S., Petrov Oleg V., Gogin Ivan Ya., Semiletkin Sergei A.</i> Representative and unique geosites of the Russian Plate and prospects for their conservation . . . . .	177
<b>Abstracts in alfabetic order</b> . . . . .	179
<b>List of Contributors</b> . . . . .	185

## Mangistau Aspiring Geopark (Kazakhstan)

Dilyara Woodward<sup>1</sup>, Natalya Ivanova<sup>2</sup>, Kamshat Yegemberdieva<sup>3</sup>, Farida Akiyanova<sup>4</sup>, Il'ya Fishman<sup>5</sup>

<sup>1</sup> Al-Farabi Kazakh National University, Al-Farabi Av. 71, 050040, Almaty, Kazakhstan; e-mail: Dilyara.Woodward@kaznu.kz

<sup>2</sup> LLP 'Areal', Institute of Geology, Kabanbai Batyr 69, 050010 Almaty, Kazakhstan; e-mail: nativi\_51\_60@mail.ru

<sup>3</sup> LLP Institute of Geography, Kabanbai Batyr 67, 050010 Almaty, Kazakhstan; e-mail:kamshat\_yegemberdieva@mail.ru

<sup>4</sup> International Science Complex 'Astana', Kabanbai Batyr 8, of. 313 Astana, Kazakhstan; e-mail: akiyanovaf@mail.ru

<sup>5</sup> LLP KazZarubezhGeology, Samal-2, block-A, 12<sup>th</sup> floor, 58, Almaty, Kazakhstan; e-mail: fil\_35@mail.ru

**Keywords:** Kazakhstan, Mangistau, geoparks, fossils, sand concretions, key geological section, iridium horizon, landscapes, Red Data Book, geotourism

**Physical and human geography:** Mangistau Aspiring Geopark is situated in the west of the Republic of Kazakhstan in an arid zone and occupies the territory on the shore of the Caspian sea. It embraces part of the Mangystau Peninsula and Tupkaragan Peninsula. The Shetpe village is the administrative center of the geopark and is situated 158 km from the Aktau city with the international airport and developed tourism infrastructure. The climate is extreme continental here. It results in the formation of a typical desert relief, with markedly

pronounced erosional and aeolian processes. The relief includes mountains (with maximum elevation of 532 m above sea level), plains and depressions. Ridges and cuesta forms of Karatau Mountains are of low relief. In addition, ravines and isolated hills occur, armored by limestones of Neogene age.

Large settlements include Fort-Shevchenko city, Bautino and Shetpe villages. Economic activity includes: livestock farming, mining industry and fishery. Agricultural lands are used as grazing lands. The development of Fort-Shevchenko city –



Fig. 1. Torysh Valley in Mangistau Aspiring Geopark. Photograph by K. Plakhov.

which is regarded as a promising industrial and service centre with specializations in transportation and servicing, the construction industry, fisheries and agro-industry – is stipulated in the strategic plan for the region's development. Infrastructure includes roads of national importance, ethnic villages, hotels and guest houses in Shetpe village.

**Geological features:** Geological structure of the Geopark contains rocks which vary in age from Permian (Palaeozoic Epoch) through Triassic, Jurassic, and Cretaceous (Mesozoic Epoch) up to Paleogene, Neogene, Pleistocene and Holocene (Cenozoic Epoch). All rocks represent sedimentary formations, including coal-bearing ones.

The Permian and Triassic rocks are exposed within the ranges of the Western and Eastern Karatau and Karataushyk. There they form the central part of the anticlinal folds. Sediments of Lower to Upper Cretaceous form the extended depressions around these mountain bridges.

**Palaeontological highlights:** Sections are fossiliferous. All stratigraphic units are characterized to some extent by fossils, for example: large ammonites, belemnites, bivalves, echinoid, pelecypods, oysters, fishes, teeth of sharks, microfauna, *etc.*

At the foot of the North and South Ak-Tau in valleys is tracing the ravine-catoctin relief, which form stunning landscapes for the sake of which tourists from all over the world come to Kazakhstan to enjoy the splendor and charm of these views.

**Gigantic sandstone concretions:** The area where the gigantic (6.5 m in diameters) concretions appear extends from Karataushyk mountain to Western Cliff of Ustyrt. The concretions are a great geologic attraction of this area. Moreover, this region is known for another unique geological event –

the astroblame. This geological structure is related to a cosmic catastrophe which occurred at the K/Pg boundary (66 million years ago) in the area of Gulf of Mexico. There in this area a large asteroid collided with the Earth. The consequences of this collision are well represented in many marine sediments around the globe, including some sections of Mangistau and Usturt. This extraterrestrial catastrophe caused some global ecological changes which were disastrous for many organisms, dinosaurs included. In the Mangistau area, where Cretaceous dinosaurs apparently did not live, the main witness of the asteroid impact is the iridium horizon. It is well represented on the Axiyrtau Mount (to the northeast from Shetpe village).

**Conclusions:** The most interesting geological objects in Mangistau Aspiring Geopark are: Zhygylgan pit located in the northern part of the Tubkaragan Peninsula, a number of picturesque gorges, Axiyrtau Mount with iridium horizon and some sacred places – Sultan Epe and Shakpak ata cave mosques.

## References

- Bekzhanov, G.R., Koshkin, V.Ya. 2000. Geological structure of Kazakhstan, pp. 1–396. Academy of mineral resources of Republic Kazakhstan; Almaty.
- Fang, Y., Yin, J. 2015. National Assessment of Climate Resources for Tourism Seasonality in China Using the Tourism Climate Index. Switzerland, Atmosphere, 6, 183–194.
- Map 'Mangistay oblast' scale 1:1 000 000. 2012. National cartographo-geodetic fund. Agency of Republic Kazakhstan on land resources management; Almaty.
- Visloguzova, A.V., Vladimirov, N.M., Medeyov, A. 1991. Relief of Kazakhstan (Explanatory note to geomorphological map of Kazakhstan scale 1: 1 500 000), 1. Sapayev K.I. Institute of Geology, Academy of Sciences of Republic Kazakhstan; Almaty.