ProGEO NEWS
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ProGEO-Kosova

Activity 2021

by: **Fadil Bajraktari**
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As it is known, in 2021, Kosovo, like the entire world, was faced with the Covid 19 pandemic. The measures taken by the Health Institutions for the prevention of the Covid 19 pandemic have affected the work and activities in many institutions, as well as in the Association ProGEO-Kosova.

The ProGEO-Kosova, like other associations in Kosova, faces a lack of funding and institutional support. It is worth mentioning that during 2021 some new members also joined the association ProGEO-Kosova with great will to work in the protection and conservation of Geo-heritage. Following are some activities carried out by the Association ProGEO-Kosova during 2021.

During 2021 ProGEO-Kosova continued its activity in identifying and completing the list of geo-heritage in Kosova, mainly of geomorphological and hydrological character. Several caves were visited and explored (Kishnareka Cave, Bali Aga Cave, Inhabited Cave, etc.), karst springs (Drini i Bardhë Spring, Istog Spring) and Mirusha River Canyon.

ProGEO-Kosova in cooperation with ProGEO-Albania and the Department of Geography of the University of Tirana, during 2021 realized ProGEO-Tour 2021 in Albania, where a large number of geo-monuments of national and international character were visited. ProGEO - Tour 2021 was realized in one of the most beautiful, but not much explored areas of Albania, (Kolonje-Përmet). The two-day trip was a bit challenging, but many natural and historical places were seen (Pogradec, Korca, Boboshtica, Erseka, the Museum of Kolonja, Rehova, Gramoz mountain, Germenji protected reserve, Shelegur lake, Leskovik Plane-tree, Nemercka Cirques, Vjosa River, City Stone in Permet, Benja Spas, Katiu's Bridge, Kelcyra, etc.). In addition to the beautiful nature and rare landscapes, the food, accommodation and hospitality in Boboshtice and Erseke have been impressive. The festive atmosphere on the Bus and at the dinner was extraordinary.

ProGEO-Kosova in cooperation with ProGEO-Albania have financially supported and realized the documentary "Prof. dr. Afat Serjani, outstanding employee of science" which on 09.05.2021 was shown in the National Historical Museum in Tirana. The idea and the scenario of this documentary was Prof. Dr. Merita Dollma, in collaboration with Prof. dr. Adil Neziraj, Florion Serjani, Nevila Serjani and Fadil Bajraktari. Realized by Francesco Forino film studio under the direction of Francesco Forin. (You can watch the full documentary on youtube. https://youtu.be/H0RWI3_pSY0).

Representatives of ProGEO-Kosova on 16 and 17 December 2021 participated in the international conference organized by the Department of Geography, University of Tirana, (Albania) on the topic "Geographical changes throughout the Covid 19 pandemic"

The scientific conference was a good opportunity for scientific discussions among the pedagogues, researchers, specialists and students interested in the geographical debate in order to solve the problems caused by the Covid-19 pandemic. The research fields of the conference studies rely on all dimensions of geographical expertise: physical, environmental and human, in local, regional and global geospatial perspectives.

Fadil Bajraktari (ProGEO-Kosova) delivered a lecture at the Department of Geography at the University of Tetova (Northern Macedonia) on the topic "Karst Terrains and Caves", as well as an online lecture at Logos University of Tirana, on the topic "Natural Heritage of Kosova". In both these lectures the interest of pedagogues and students was extremely great to understand the scientific importance of karst terrains, caves and natural heritage. In these lectures students have gained basic knowledge on scientific, educational values, sustainable protection of geo-heritage and its use for geotouristic purposes.

Also, Progeo Kosova during 2021 attended online two important international events: ProGEO's 10th Symposium, and IUCN Congress, Geological heritage and protected areas Session.

Mr. Bajraktari, and Mr. Behrami (ProGEO-Kosova) have contributed to the Publication of the monograph SPELEOMEDIT. SPELEOMEDIT is a monograph on the Speleology of the Mediterranean countries where the speleology of Kosova has also been presented. In the scope of the activities to mark 2021 as the International Year of Caves and Karst, the International Union of Mediterranean Speleology has published the monograph "Speleomedit - Panoramic views of caves and karsts of Mediterranean countries", which includes a collection of works presenting caves and karst phenomena of Mediterranean countries.

The basic idea of the project is collection and disseminataion of information on the speleological activities of the Mediterranean, thus giving the opportunity to the countries of this region to promote research and activities carried out by organizations and speleologists of these countries.

The project aims to provide an important contribution to joint awareness and to strengthen the ties among the speleological groups and the scientific research institutions in the Mediterranean countries, in order to increase capacities and actions to support karst and cave protection.

UNESCO IGCP 737-SMART

Project Of The Progeo Regional Working Group

by: **Ljerka Marjanac**
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Members of the ProGEO Regional Group of Southeast Europe (13 countries involved), agreed to propose a project upon the UNESCO International Geoscience Programme (IGCP) and the IUGS Call for proposals under the special theme Geoheritage for Sustainable Development in 2019. The project "Smart Geology for Better Community – Integrating geological heritage of the Southeast European countries into sustainable development strategies" was accepted for UNESCO financial support in 2020-2021. Due to specific conditions caused by COVID-19 pandemia, the Project is conducted in 2022-2023, with the hope of an extension to the full five years as planned.

The UNESCO's mandate acknowledges the research on geological heritage as an important instrument for the holistic approach to the sustainable development of UNESCO Member States.

The project activities aim to (1) strengthen and empower local communities to ensure that the geological importance of an area can be preserved and promoted for science, education and culture, (2) change the position and rating of geodiversity to equal with biodiversity, (3) exchange knowledge and best practices through networking, meetings, workshops, short courses, and successful projects, (4) organize or participate in promotional and educational events/activities with media coverage, (5) collaborate with other active IGCP projects to implement geoheritage as an added value, (6) harmonize and improve the geoheritage and geosite frameworks for national and aspiring global geoparks. Since the 1970s geoheritage has been approached in different ways in many European countries and various approaches were undertaken to evaluate and categorize geoheritage to produce national inventories of geosites, from the first ProGEO framework to a very developed methodology applied in Portugal and Spain.

PROBLEMS

Low position and rating of geodiversity (geological heritage and geoconservation) in society and state management and planning

Insufficient knowledge about geological heritage, geodiversity and landscape diversity as fundament of the well recognized biodiversity

Lack of harmonized framework for geoheritage and geosites in aspiring geoparks

Local communities hardly recognize importance and values of the geological heritage in strategic planning for sustainable development

AIMS

Provide state of art in geoconservation in countries of the ProGEO Regional Group for Southeast Europe

Transfer and exchange knowledge of best practices in geoconservation through scientific meetings, field courses and publications

Promote national geoparks that strengthen and empower local communities to ensure that the geological importance of an area can be preserved and promoted for science, education, tourism and culture.

Develop an educational program on geoheritage, geoconservation and its application for sustainable development

Harmonize and improve geoheritage and geosite frameworks for aspiring geoparks

Implement the program into regular school curricula, faculty programs (especially for Geology, Geography, Tourism), and lifelong learning

ACTIVITIES
(international and national)

Popular scientific events to promote geoheritage and geodiversity

Training workshops and field courses for scientists and volunteers

Symposia in Geoparks to promote geosciences, geodiversity and geotourism

Lifelong learning and inclusive Earth sciences education

Publications on geoheritage and geoconservation

GO DIGITAL

Awareness campains in collaboration with media

EXPACTED OUTCOMES

- More educated geoconservationists and geoscience communicators
- Enhanced knowledge base of SE European geoheritage
- Improved laws and statues on geodiversity and geoconservation
- Regulated statutes for national geoparks
- Raised awarenes about importance and values of geoheritage and geodiversity
- Geological heritage taking part in local communities strategic planning for sustainable development
- New job opportunities

A standardized methodology summarised in a manual on how to evaluate geoheritage sites, how to apply methods and make inventories, and how to protect, manage and promote geoheritage, does not exist. Therefore, a geoheritage "cookbook" that any country can use and adapt to its needs according to its geological framework would benefit strategic solutions based on Nature and help decision-makers in geoconservation. Being able to select geological formations essential to keeping the memory of the evolution of the Earth, and to learn from evolving processes to solve emerging problems leads to the success of future sustainable development of local communities. Emerged good practices in geoheritage management will contribute to the strengthening and empowering of local communities to ensure that the geological importance of an area can be preserved and promoted for science, education, culture and prosperity.

The Project is summarized in four figures with identified problems, aims, activities and expected outcomes. News about Project activities can be followed on FaceBook page https://www.facebook.com/igcp.smart.geology.

The main Project activity in 2022 is the 1st International Symposium GEOPARK & SCIENCES – From research to geotourism that will take place in Rab town in Croatia. The Island of Rab is a geopark in development, an island of great geodiversity. More information on this event is available on the Symposium website https://progeocroatia.wixsite.com/geopark-and-sciences.

Ashfall Fossil Beds
A National Natural Landmark

by: **Priscilla C. Grew**
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In celebration of the ProGEO transition from a European to an International Association in 2021, this is the first article in ProGEO News to encourage members to visit a geoheritage site in the United States. There are over 30 diverse types of designations for geoheritage areas in the U.S. (NPS AGI 2015). In 2022 we are observing the 60th Anniversary of the National Natural Landmark program of the U.S. National Park Service (NPS) which promotes public-private partnerships in geoheritage stewardship. The University of Nebraska State Museum's Ashfall Fossil Beds State Historical Park is an excellent example of how private philanthropy can help promote the conservation of areas of exceptional importance to geology, paleontology, and biology. Ashfall Fossil Beds has been a unit of the University of Nebraska State Museum since 1991, and the Museum curates all excavated fossils.

Logo 60th Anniversary National Natural Landmarks. Courtesy U.S. National Park Service

Natural Landmark designation "recognizes and encourages the conservation of sites that contain outstanding biological and geological resources" designated for their "condition, illustrative character, rarity, diversity and value to science and education" (Eggleston and Connors, 2017). Among the 602 Natural Landmarks, Ashfall Fossil Beds is one of the 50 that have been designated for their paleontological resources, including the famous Rancho La Brea tar pits in California, designated in 1964 as one of the first Natural Landmarks.

In what National Geographic magazine has called a "Pompeii of Prehistoric Animals," the skeletons of animals at Ashfall Fossil Beds are preserved in a deposit of light gray vitric ash 2 to 3 meters thick, entirely composed of the walls of microscopic broken bubbles of volcanic rhyolite glass. The ash is so fine that to the touch it feels like talcum powder. The animals lie where they died. The fully articulated skeletons are not flattened or compacted as at most other fossil localities.

Upon entering the Rhino Barn at Ashfall Fossil Beds, visitors suddenly confront the death scene at a seasonal watering hole in a Serengeti-like savanna of 12 million years ago (Tucker et al. 2014). Instead of hippopotamus, there are hippo-like rhinoceros (Teleoceras); instead of giraffes, there are long-necked "giraffe camels" (Aepycamelus); instead of antelopes, there are llama-like camels (Protolabis), 3-toed horses, and a saber-tooth deer (Longirostromeryx). To paleontologists, Ashfall Fossil Beds is a world-class terrestrial Konservat-Lagerstätte, meaning that it is a mass-death assemblage with fossil preservation so exceptional that feather impressions and tendons are visible in the remains of fossil cranes, and the last meals of silicified grass fragments are still in the mouths of the rhinos (Voorhies and Thomasson 1979).

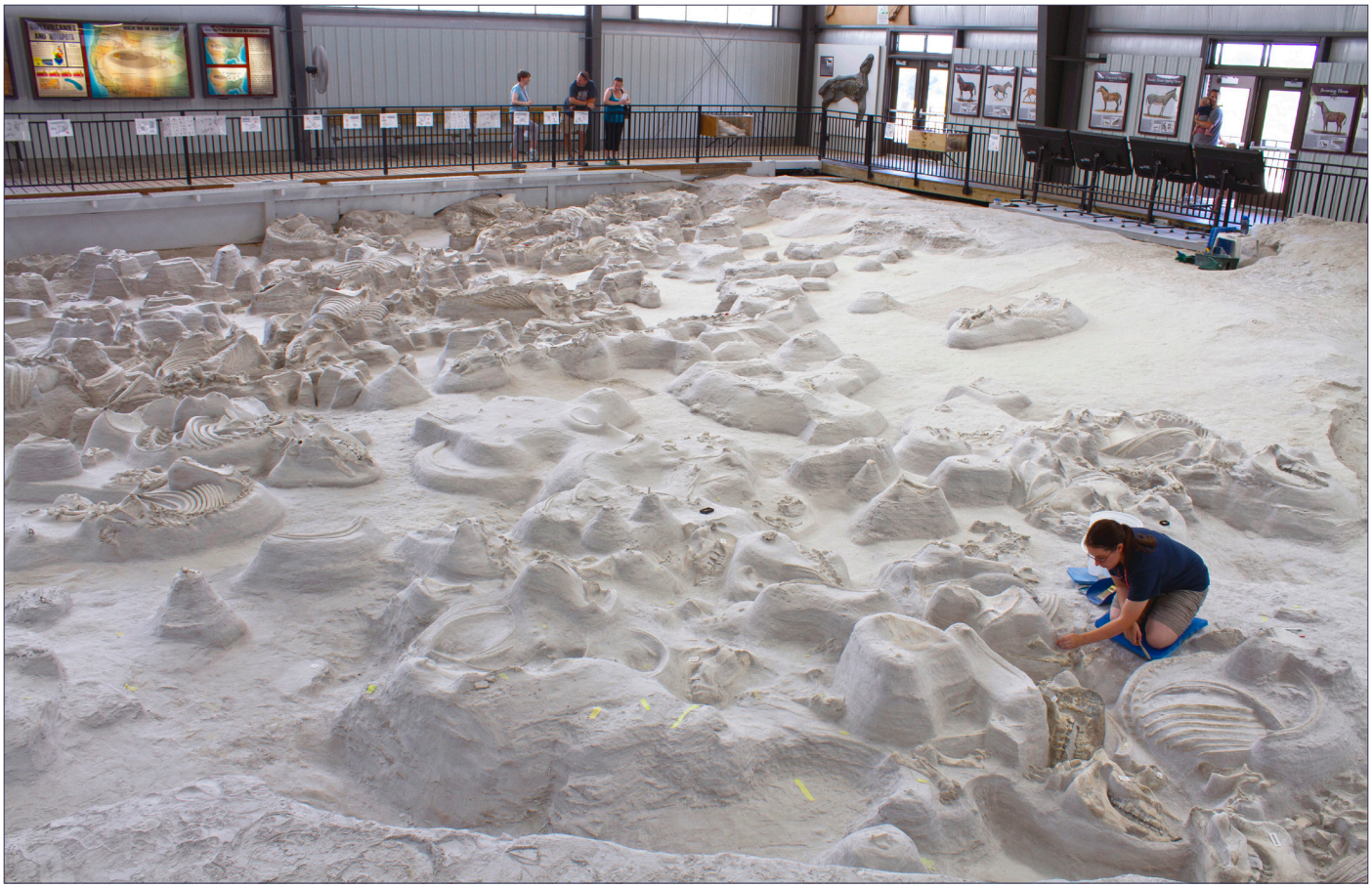

Figure 1 - The Hubbard Rhino Barn dedicated in 2009 protects the site so that visitors can watch excavation in progress. Posters by Mark Marcuson display artist reconstructions of the animals in the ash. Photo: Courtesy of University of Nebraska State Museum.

The uranium-lead age (Smith et al. 2018) of 11.86 ± 0.13 Ma (million years ago) of zircons at Ashfall is correlated to tuffs originating from the Bruneau-Jarbidge caldera in southwestern Idaho. Yellowstone National Park today lies over the Yellowstone Hot Spot, a long-lived thermal plume in the Earth's mantle. The map shows earlier eruptive centers which were produced as the North American tectonic plate slowly drifted southwest over the hot spot. Prevailing westerly winds have repeatedly carried ash from these eruptions eastward over Nebraska and the Great Plains. Thus, there is a direct genetic relationship between Ashfall Fossil Beds in Nebraska and the mantle plume presently under Yellowstone, which the U.S. Congress set aside in 1872 as the world's first national park. In 1978 Yellowstone was one of the first two areas in the U.S. to be designated as a UNESCO World Heritage site.

The Bruneau-Jarbidge caldera which erupted the ash is 1,600 km west of Ashfall Fossil Beds. According to the calculations of Rose et al. (2003), ash drifting east would have started to settle out over Nebraska about 20 hours after the eruption. In order to account for the unusual thickness of ash locally at Ashfall Fossil Beds, Rose et al.(2003) proposed that the ash might have been concentrated by thunderstorm activity and then blown and drifted by the wind so that it filled depressions in the landscape where there were seasonal watering holes.

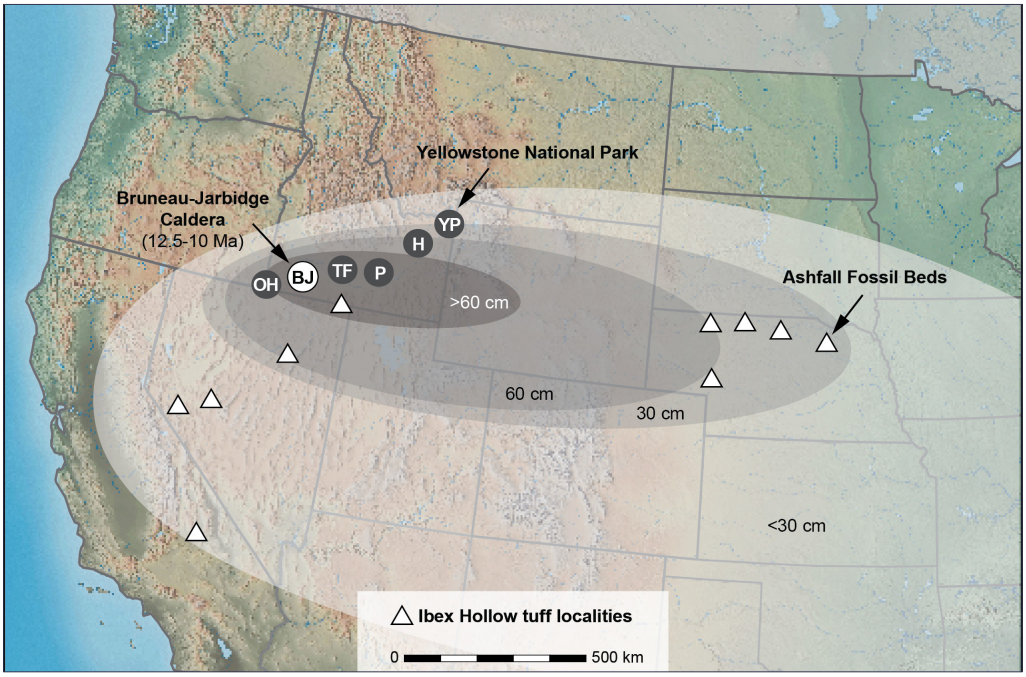

Figure 2 - Index map shows location of Ashfall Fossil Beds and Yellowstone National Park. Ibex Hollow Tuff with ash thickness indicated originated from a supervolcanic eruption at the Bruneau-Jarbidge Caldera (today in Idaho) 12 million years ago. As the North American tectonic plate drifted southwest, the Yellowstone Hot Spot in the Earth's mantle produced a series of eruptive centers and today underlies Yellowstone National Park. Image: Courtesy of Geological Society of America (Tucker et al. 2014) and the University of Nebraska State Museum.

Birds, turtles, and small animals died first and are preserved in the basal ash. Larger animals (horses, camels and finally the rhinos, ingested and breathed in the ash over a period of weeks and show evidence of progressive respiratory disease in the "frothy" pathological surface texture of bone characteristic of hypertrophic osteopathy ("Marie's disease").

Figure 3 - Teleoceras mother "3" and nursing calf (above mother's neck and head). Photo: Courtesy of University of Nebraska State Museum.

The recognition of Ashfall as a geoheritage site began with a fossil discovery in 1971 by Dr. Michael Voorhies, Professor and Curator Emeritus in the University of Nebraska State Museum. While conducting field work, he happened to notice the jaw of a fossil rhino calf embedded in ash on private land located just 16 km from his boyhood home in Orchard, Nebraska (population 342). This led to the National Geographic Society funding major excavations in 1978-1979 adding to the collections of the University of Nebraska State Museum. In 1986, private donations to the Nebraska Game and Parks Foundation enabled the purchase of 146 hectares of private land and the creation of a State of Nebraska Historical Park in 1991 by the Nebraska Game and Parks Commission, to be operated jointly by the Nebraska Game and Parks Commission and the University of Nebraska State Museum. Rick Otto, the Superintendent since the Park's creation, and other staff are employees of the University of Nebraska State Museum.

In 2003, the Ashfall Chapter of the Friends of the University of Nebraska State Museum donated funds to expand the Ashfall Fossil Beds Visitor Center. Private donors Loren Toohey and the David B. Jones Foundation funded student interns. However, excavations had to be paused until private funding could be obtained to construct a larger protective pavilion over the bone bed.

On May 9, 2006, Acting U.S. Department of the Interior Secretary Lynn Scarlett designated Ashfall Fossil Beds as a federal National Natural Landmark (NNL), the first Natural Landmark put forward by Interior after a hiatus of 18 years. "This designation recognizes a one-of-a-kind paleontological treasure and initiates a reinvigorated National Natural Landmarks Program," Scarlett stated. National Park Service Director Fran Mainella added, "The natural wonders preserved at Ashfall Fossil Beds through an ancient volcanic eruption are as significant as the cultural wonders preserved at Pompeii. Designating this remarkable site a National Natural Landmark recognizes this significance, which will strengthen conservation efforts and educate the public about Ashfall's natural wonders."

National recognition enabled new private fundraising, and in December 2007, the Theodore F. and Claire M. Hubbard Family Foundation of Omaha announced a $1.2 million gift to the University of Nebraska Foundation to construct the Hubbard Rhino Barn, a protective building 8 times larger than the original "Rhino Barn" to accommodate new areas for excavation. Without the new building, further excavation and new fossil discoveries would have been impossible. Hubbard funding also expanded the student intern positions to encourage Nebraska students to become career paleontologists.

As a unit of the University of Nebraska, activity at Ashfall Fossil Beds fulfills the three-fold mission of the land grant University: teaching, research, and public engagement. Each summer, students are trained both in paleontology and in science communication to the public. The Hubbard Family Foundation also helped support the "Cherish Nebraska" renovation of Morrill Hall in Lincoln opened in 2019 with a new "Visible Lab" like the one at Ashfall Fossil Beds. In the Rhino Barn and both Visible Labs, visitors can watch Museum fossil preparation in progress and talk science with the preparators.

Thanks to the Nebraska Environmental Trust funding of a 2015 proposal to enable transmission of virtual programming, Ashfall Fossil Beds offers two virtual education programs for classroom use via Zoom. The Virtual Field Trips connect live from the Rhino Barn and can be scheduled mid-March through mid-November at https://ashfall.unl.edu/for-educators/virtual-learning.html

The virtual field trip "Fossil Finds in Volcanic Ash" is available to classrooms of international members of the Center for Interactive Learning and Collaboration (CILC) at https://www.cilc.org/ContentProvider/Program.aspx?id=7590

Exhibits at Ashfall Fossil Beds are designed to educate visitors both in paleontology and geology of ground water in Nebraska. The fossils are stratigraphically located in the Miocene Ash Hollow Formation of the Ogallala Group. The Ogallala Group underlies much of the North American High Plains and consists chiefly of fluvial sand, sandstone, silt, and siltstone, with minor eolian sediments and local lenses of volcanic ash. The Ogallala or High Plains Aquifer is the principal source of ground water for agriculture in Nebraska and other Great Plains states. After the "Dust Bowl" droughts of the 1930s, dryland farming was reduced and irrigation using ground water was massively expanded to withdraw water from the Aquifer. The Ogallala Group either lies at the surface or is covered by unconsolidated deposits including Quaternary loess that overlie much of the Aquifer in Nebraska. The outcrops of the geologic formation which forms a major part of the Ogallala aquifer exposed at the Earth's surface at Ashfall Fossil Beds are a vivid reminder to visitors of the vulnerability of our most important Aquifer to surface contaminants.

The Miocene fossil record in Nebraska (23 to 5 million years ago) is highly relevant to understanding the evolution of global grasslands when warm season grasses with C4 photosynthesis began to replace trees and shrubs using C3 photosynthesis. Plants convert carbon dioxide into either a 3-carbon or a 4-carbon intermediate compound. The C4 pathway enables plants to thrive in warmer and drier climates. The grassland transition can be studied by measuring the stable carbon isotope compositions of mammalian tooth enamel, and by observing the emergence of hypsodonty (high crowned teeth) in various taxa adapting to the spread of habitats in which animals eat grass containing silica and ingest abrasive dust with their food. The teeth of Ashfall Fossil Beds horses and rhinos are thus of special research interest. Dr. Ross Secord, Professor and Museum Curator of Vertebrate Paleontology, and his students including Willow Nguy, have been working to reconstruct Miocene biomes in Nebraska by looking for mammalian teeth with high 13C values characteristic of C4 photosynthesis (Nguy and Secord 2022). They are checking the fossils at Ashfall Fossil Beds and other Miocene sites to determine which mammals in Nebraska began to consume C4 plants and how C3 -C4 trends proceeded across a range of habitats. Nebraska is an ideal place to study paleoenvironments and paleoecology because it has the most complete record of Neogene (23.03 to 2.58 Ma) fossil mammals in North America, together with excellent geochronologic and stratigraphic control due to the abundance of ash layers available for radiometric dating.

For further information and artist reconstructions of the fossil animals, a limited number of copies of the University of Nebraska State Museum's guidebook (Voorhies et al. 2015) are available to order at https://marketplace.unl.edu/default/AFB-book.html.

Acknowledgments

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Book review

GEOTOURISM Industry in the 21st Century

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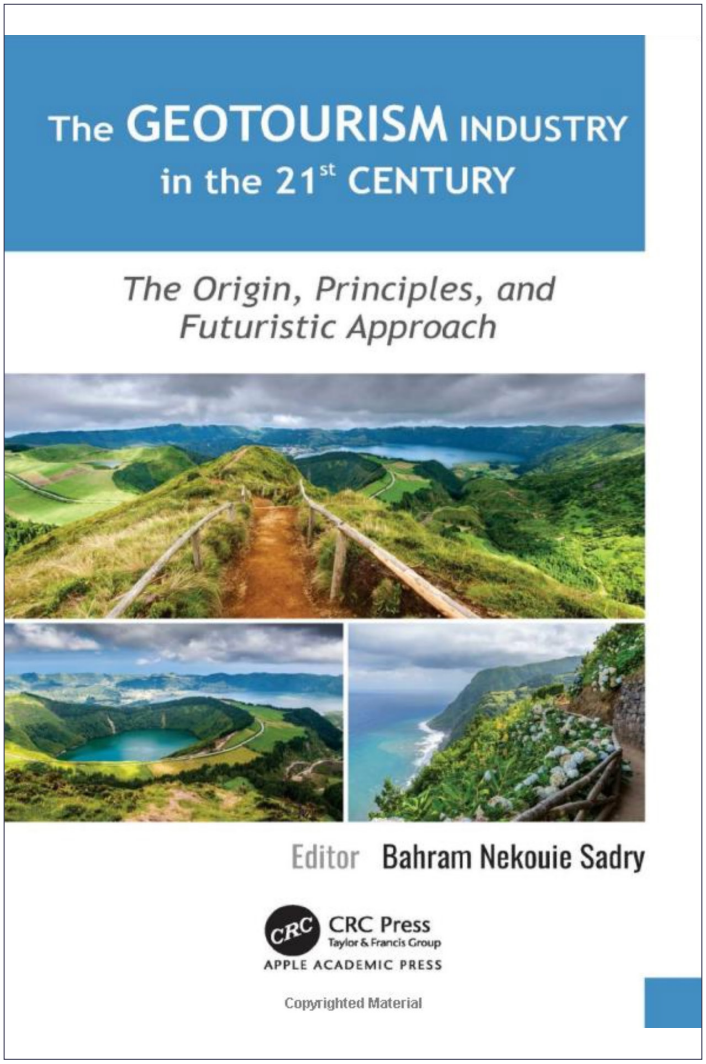
People have always been enchanted by the Earth's geological wonders, and these marvels—from shifting sand dunes and grand canyons to mighty mountain ranges—have long attracted visitors. But it hasn't been until much more recent times that natural attributes have been directly associated with the tourism industry, or that this intersection, called 'geotourism', has been utilized for the purposes of education and economic development.

Despite the fact that geotourism and geoparks are rapidly expanding across the globe, there are few international books written in English that comprehensively address these topics. The first, Geotourism by Ross Dowling and David Newsome, was published in 2006. The GEOTOURISM Industry in the 21st Century continues this tradition, reporting on the status and practice of modern geotourism to provide up-to-date information that can be shared and discussed among researchers and practitioners.



Edited by Iran's Bahram Nekouie Sadry, this volume includes wonderfully diverse contributions from 35 authors in 18 countries across four continents: Europe, Asia, and South and North America. Published by CRC Press, the 562-page volume is intended for a broad audience, including tourism professionals, planners, and managers; government and business decision makers; and students of different courses who are intent upon geotourism development. As William Witherspoon writes in the second foreword, "This is an important book because it brings together the interpretive and management aspects of geotourism on a global scale."

In this publication Sadry emphasizes that geotourism attractions and natural attributes involve scales ranging from microscopic to global to astronomical, and time frames spanning hours to eons. This stunning breadth makes the interpretation of geological features especially challenging for the public. Fortunately, there are many excellent examples from around the globe to provide insight and information to modern practitioners. In this volume alone, the case studies are geographically spread from Albania to the Azores and the Americas to Japan, further indicating the variety and wide distribution—geographically and by type—of modern geotourism.

The book begins with an overview of geotourism concepts in the 21st century, including the scope and nature, as well as historical viewpoints, of modern geotourism before delving into specific examples of urban geotourism and mining heritage. Parts II and III delve into geoheritage assessments and geointerpretation. These sections encompass many topics and landscapes of interest, from the search for the world's top geotourism destinations to interpretation of geological and mining heritage via geotrails, the evolution of interpretive writings, and the popular American Roadside Geology book series.

The volume's final sections cover two broad topics: geoparks and community development, and globalization and the future of geodestinations. Contributions to these themes range from community engagement in Japanese geoparks and geotourism development in Latin American UNESCO Global Geoparks to dinosaur, space, and celestial geotourism.

Throughout this book, Sadry highlights the potential for geoparks and geotourism development to alleviate poverty. He also emphasizes that as geotourism destinations continue to expand in both developed and developing nations, environmental conservation and protection likewise need to be advanced. Ensuring that both goals are met makes volumes like this one crucial for researchers, practitioners, and visitors alike.

International Summer School
"Madygen – 2022" - Kyrgyzstan

by: **ProGEO**
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In 2021, Madygen Geolocation entered the Geopark territory through the 727 Geological Heritage and Georisk Project. The project is supported by the UNESCO International Geosciences and Geoparks Program (IGCP). In September-October 2021, an international paleontological expedition was carried out, which showed a significant long-term potential for the study of the Mesozoic and Cenozoic formations of Madygen.

Expedition dates: – August 14 – September 14, 2022

The International Summer School will be held under the auspices of the UNESCO International Geosciences and Geoparks Programme. Project 727 implements a research program in the field of stratigraphy, general geology, paleontology and georisks. The summer school will be organized during the international scientific expedition "Madygen – 2022".

Summer School goals: Developing skills in sedimentology, palaeontology, stratigraphy, historical geology. Gaining experience of geological fieldwork and palaeontological excavations. Documentation of sections under the supervision of professionals. Upon completion of the summer school, all participants will receive certificates certified by the seals and signatures of the Kyrgyz State Geological University, the Tien Shan Geological Society and the Triassic Subcommittee of the International Commission on Stratigraphy. During the summer school, all participants will be in close contact with our scientists and experts (mentors) in the stratigraphy of Madygen, who for many years have devoted themselves to researching the geology and paleontology of Central Asia. These are scientists from the academies of sciences of Kyrgyzstan, Uzbekistan, as well as the best experts of the Madygen formations, from the Freiberg Mining Academy from Germany.

Organizers of Summer School:

– Tian-Shan Geological Society (Kyrgyzstan),

– Freiberg University of Mining and Technology (Freiberg, Germany),

– Kyrgyz State University of Geology (Kyrgyzstan).

Project 727 IGCP invites everyone to this grand event in the Madygen Geopark to explore the most mysterious region of the Southern Tien Shan.

https://geotianshan.org/en/expeditions/international-summer-school/

In parallel, a summer school on geological mapping using a drone will be held. The event aims to:master the skills of using a drone for geological mapping of georisks and geological objects.

The visibility of objects and their compact location in the geopark makes it possible to quickly calibrate data and work on errors.

https://geotianshan.org/en/expeditions/geological-mapping-using-drones/

Geological Heritage
VI Brazilian Symposium

by: **ProGEO**
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August 20-27, 2022
VI Brazilian Symposium on Geological Heritage
Conference, hybrid (remote and presential)
University of São Paulo, Brazil
Brazilian Association for the Defense of Geological and Mining Heritage (AGeoBR)
https://6sbpg.igc.usp.br/

ProGEO Symposium
2023

by: **ProGEO**
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ProGEO symposium is planned for October 2023. Check the next ProGEO NEWS issue for more information.

Geodiversity of the Middle East
Celebrating the International Geodiversity Day

by: **ProGEO**
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Geodiversity Workshop 5 Celebrating the International Geodiversity Day Geodiversity of The Middle East
27 July 2022 (Wed)
Topics and speakers:
1. Geodiversity of Lebanon - A resource for sustainable development & the need for geo-education by Dr. Soumaya Ayadi, Saint Joseph University of Beirut, Lebanon
2. Geodiversity and climate change of Egypt by Dr. Enas Ahmed, University of Matrouh, Egypt
3. Geodiversity of Iraq by Prof. Amera Ismael Hussain, Tikrit University, Iraq
4. Geodiversity of the geologist's paradise, Iran by Mr. Alireza Amrikazemi, Director of Qeshm Island UNESCO Global Geopark, Iran t

Abstract submitted to the Online Conference on Geoconservation

Contribution of ice-geoclimbing to geoheritage from sports, didactic and cultural approaches. Peñalara site in winter, Guadarrama National Park, Spain

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Geoclimbing and geotrekking. Steps towards a collective heritage

International UNESCO IGCP 714-3 project: Geo-Geoclimbing & Geotrekking in Geoparks, is devoted to disseminate geosciences. It aims to promote the potential of UNESCO Geoparks and other interesting geological areas through geoclimbing and geotrekking. The project involves nine countries and 15 research centres.

The term "geoclimbing" is used to describe the geological features of a wall present along a climbing route. From a sporting, didactic and cultural point of view, knowing the geological characteristics of the surface of the walls contributes to improve climbing practice. Also, climbing practice helps to improve the geological knowledge of some remote areas difficult to access (García and Fernández, 2017).

"Geotrekking" is a broader concept, equivalent to geological field trips. It is very useful for interpreting the landscape. In the context of the IGCP 714-3 Geo project, both terms attribute a heritage and educational value to a discipline that goes beyond a simple sporting activity (Bollati et al., 2016). E.g. the Spanish group PICG 714 has a website that exposes geological, cultural and sporting information. It includes scientific publications, current news on geology, climbing in geoparks, presentations at conferences, interviews, an image gallery, etc. (Fig. 1).

The study areas of the Spanish Working Group (IGCP 714) are La Pedriza del Manzanares and Peñalara, both within the Sierra de Guadarrama National Park. La Pedriza is the main rock climbing school at Madrid region and a world reference for friction climbing. The Peñalara massif has a glacier geomorphology and includes the highest altitudes in the Sierra de Guadarrama ridge. Peñalara has numerous vertical walls where rock climbing is practised during the summer; and ice climbing on cascades, ice sheets and corridors during the winter.

Figure 1 - PICG 714 website portal. https://www.unescogeoclimbingspain.com/proyecto-picg-714.

During the last seven years have appeared scientific publications on geoclimbing. Ice-geoclimbing, the topic treated in this paper, is then a much newer one. This concept has the same scientific, educational, cultural and sporting links like traditional (rock) geoclimbing, including a specific nuance: it also includes the study of the ice itself, and the geomorphological features of the ice-related rocks and landscape.

This work focuses on characteristics related to winter climbing in the Peñalara massif.

Context

The Peñalara massif is part of the Sierra de Guadarrama ridge, in the Spanish Central System, being Peñalara peak (2,430 m) its highest altitude. The Central System has a general NE-SW orientation, and is the main boundary between the Douro and Tagus river basins. The region is part of the Iberian Variscan Massif, which occupies most of the western part of the Iberian Peninsula. Most of the area is occupied by pre-Ordovician glandular gneiss, with small intrusions of Late Carboniferous pegmatites and aplites.

The Peñalara massif (Fig. 2) has a glacial geomorphology, conserving well-preserved structures of the Pleistocene glaciers of the Sierra de Guadarrama, with slopes and glacier cirques mostly open to the SE. The large accumulation of ice at Peñalara lake cirque area has produced steep slopes where rock and ice climbing are practised.

Figure 2 - View of the Peñalara massif with a glacier valley confined by moraines (Photo: Manuel García). In the centre of the picture are some of the rock walls for climbing practise. In the winter, ice cascades and ice sheets cover the black walls (spouts areas).

The Peñalara massif currently shows numerous glacial and periglacial structures of great scientific and didactic interest. Some of them are moraines, lakes, peatlands, rock accumulation, glacier striations, boulders, sol fluxion lobes, etc.

Most scientific work on the Peñalara Massif refer to the protection of endemic species and landscape restoration, with much less being devoted to glacial and periglacial geomorphology. The Peñalara area has traditionally been a focus for environmental education, field trips and scientific training about glacial processes in Central Spain.

Ice as a mineral and as a medium for ice geoclimbing

From a crystallophysical approach, ice is a mineral with a defined composition that can have ten polymorphic structures (i.e. same composition but different crystalline configurations) plus an amorphous state (including a huge variety of different amorphous ices). This approach has a great practical interest, as, depending on the crystallographic system and many environmental factors, two ices of different structure often show different mechanical strength and behaviour from a climber's perspective (Gordito et al., 2003).

The mechanical resistance and aspect of ices depend on several factors, such as pressure, temperature, chemical composition of water, presence and nature of inclusions (non-aqueous particles integrated into the ice structure, including air bubbles), crystalline system (predominance of one of the 10 known structures over the others), etc. The combination possibilities are enormous, and "cascadiers" and mountaineers distinguish many different ice types intuitively according to their location, nuance and general aspect (Gordito et al., 2003).

Ice is created, mostly, by direct freezing of runoff water flowing down the wall, regardless its origin. Some possible processes are the direct solidification of the fluid present, direct condensation of water vapour particles, small ice particles compaction, and metamorphosis of snow becoming impermeable and forming "glacial ice" (Harvey, 2017). Ice appears in nature in different shapes, such as twins, stars, needles, hexagonal slabs, etc. Its spatial development under normal conditions does not necessarily depend on its crystal structure at microscopic scale. It can have different aspects and morphologies despite its crystallographic system, e.g. ice sheets, flows, stalactites, stalagmites, columns, icicles, lollipops, etc. Other factors affecting the formation of ice are the absorption capacity of solar radiation, the colour, and the electrical and thermal conductivities of the surrounding rocks.

Other specific properties of ice include surface tension, which is what gives it its high capacity to immobilise particles or materials by adhesion and regelation. Their freezing potential and melting pressure influence its ability to crystallise the vapour phase (Gordito et al, 2003).

Ice-geoclimbing in Peñalara

Ice climbing in Peñalara takes place, mostly, on the waterfalls and corridors facing SE. These are the same areas where rock climbing is practised during the dry seasons. The climbing walls vary in length and altitude between 15 and 80 metres. The icefalls and winter climbing walls can be up to about 100 m high, and the alpine ice areas and corridors up to about 150 m. The ice columns rarely exceed 10 m in height (Fig. 3).

Ice climbing is an activity that requires practice and knowledge about ice features to be practised safely. Thus, an ice-climber should know the processes involved in ice crystallisation, the characteristics of the ice structures, their mechanical resistance and general behaviour.

The wall surface characteristics determine the different icefall shapes. Typical rock features supporting icefalls and ice walls are part of ice-geoclimbing. Some shared elements among rock ice climbing are cracks, roofs and ledges among others (García and Fernández, 2017).

The main forms in which icefall appears are sheets, cascades, columns, corridors, etc. Other hanging without support forms are generically named "free standing", e.g. stalactites and icicles. When the ice expands towards a certain direction, especially due to wind and gravity, ice flows are generated. Examples of other small-scale nuclear structures are mushrooms, vented slabs, hanging corridors and ice mantles covering the rock (verglass), with a bursting behaviour. The figure 3 displays most of the usual ice-geoclimbing structures at three different scales.

Icefalls result from the spatial development of ice by surface runoff or drip flow through a given direction, generally vertical. Its shape is linked to its origin; e.g. icefalls consisting of a single crystalline column, hanging structures interconnected by ice bridges, ice flows, and other morphologies.

At the top of the icefall are the "shoulders", in climber's jargon. These are convex areas where, due to gravity, wind, and insolation, the ice is usually bursting and often stratified with the appearance of "onion layers". Other typical icefall morphologies are elements requiring specific techniques for their progression, known as cauliflowers (equivalent to mushrooms), ledges, columns, and vaults (Gordito et al., 2003).

Globular structure surfaces known as "mushrooms" have a high energetic origin and are therefore often hard and bursty. When artificially carving them, ice cleaned surfaces should be carefully chosen to ensure as much contact surface as possible.

Natural formed ice can present numerous textures, morphologies, and compositions. Its mechanical characteristics, strength and fragility depend on the combined proportion of ice types. They also depend on other factors such as sand or clay trapped inside the ice, rock slope and colour, and original water composition. There are so many combination possibilities that a mountaineer will always find different ice. Some examples of ice names are soft ice, rotten or granular ice, foamy white ice, serac ice, frost ice, white ice, firnspiegel or snow crystal, live ice, opaque white ice, brittle ice, green ice, blue ice, brown ice, black ice, verglass… (Chouinard, 1981; Gordito et al., 2003).

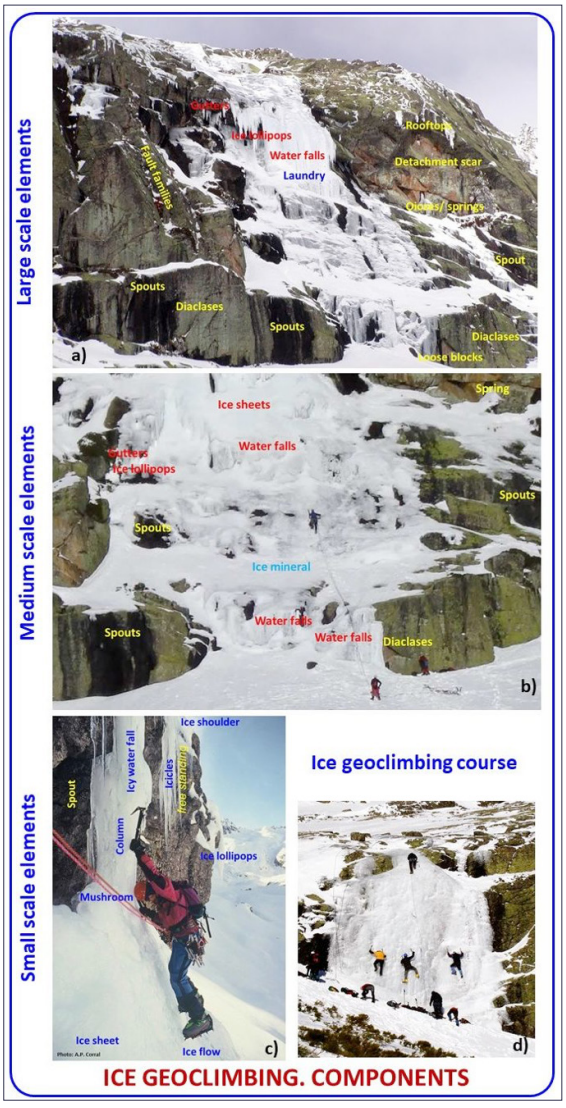

Figure 3 - Typical geomorphological features for ice-geoclimbing scales; a) large scale elements; b) intermediate scale; c) Identical for a lower scale; and d) parallel progression over an ice sheet during an ice geoclimbing course.

Conclusions

Winter climbing contributes to the diffusion of geoscience by reinforcing the parks and geoparks potential during the winter season, which gives geo-environmental education a 24/7 permanence. It also includes into the geoclimbing concept a multi-seasonal potential, broadens the number of climbers involved and motivates future young mountaineers to take up winter climbing. It is important to focus on the safety of the climbing team and possible accidents caused by ice slides, falls, slips and others.

Ice climbing is a very technical activity, not only from a sporting point of view. It requires a vast amount of knowledge and expertise about meteorology, mountain safety, and associated geological risks, such as avalanches. Therefore, ice geoclimbing represents an ideal field of work in terms of environmental education and training of high mountain guides. They must have appropriate knowledge of geological heritage and outreach.

Finally, we should remember that ice climbing can be dangerous and should only be practised by expert mountaineers and/or accompanied by specialised guides. This activity should be carried out in small groups maintaining a security distance between climbers.

Ice-geoclimbing opens up a line of action within geoclimbing and geo-environmental education. It has very scant bibliographical background yet. We wish it might be welcome within the geological heritage and geoconservation frameworks.

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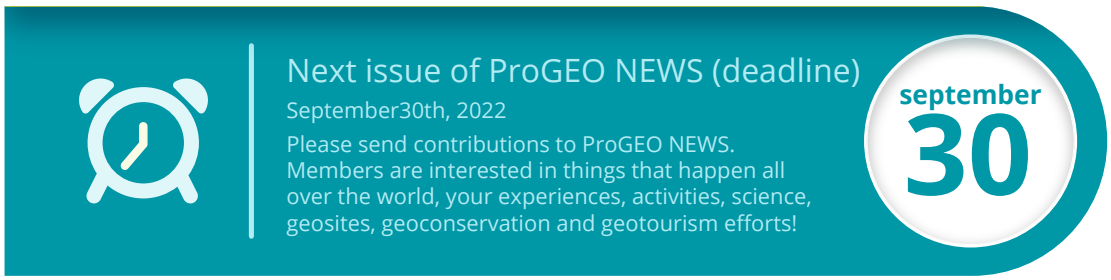

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