

**Vocational College of Natural Resources Research
and Utilization
Annual Report 2022**



January 2023



**EMBERI ERŐFORRÁS
TÁMOGATÁSKEZELŐ**



**EMBERI ERŐFORRÁSOK
MINISZTERIUMA**



**Nemzeti
Tehetség Program**

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TEKH student members in 2021/2022. Spring semester

1. Csilla Balassa
2. Szabolcs Bartók
3. Benedek Bodnár
4. Bence Czímer
5. Barna Erdélyi
6. Péter Fodor
7. Gábor Hornyák
8. Fanni Juhász
9. Julianna Juhász
10. László Tamás Kaposvári
11. Lívia Leskóné Majoros
12. Mária Nagy Gáborné Ambrus
13. Mihály Nagy
14. Bernadett Oláh
15. Zsombor Oláh
16. Máté Orosz
17. Péter Papszász
18. Dóra Patócs
19. Lilla Sipeki
20. Dorina Spekker
21. Gábor Szarvas
22. Noémi Szász
23. Balázs Szeleccki
24. Ágota Melinda Tresánszki
25. Mohammed Ali Belay
26. Khouloud Jlaiel
27. Richard Ayisi Mensah
28. Rafael Valadez Vergara
29. Agra Adipta
30. Hezha Saleem Sedeeq
31. Rim Khedhri
32. Florence Gamal
33. Siti Natrah Abd Bakil
34. Mohamed Abdelnaby Oraby
35. Alaa Abbadi Ih
36. Selly Ayu Janetasari
37. Moataz Mohamed Gomaa
38. Abdalmajeed Alrawi
39. Idris Olabisi

The most active mentors in the talent management program in 2021/2022.

Spring semester

- Dr. Ljudmilla Bokányi;
- Prof. Dr. János Földessy;
- Dr. László Gombár;
- Dr. Ferenc Kristály;
- Dr. Ferenc Máдай;
- Dr. Viktória Mikita;
- Dr. Norbert Németh;
- Dr. Beáta Siskáné Szilasi;
- Prof. Dr. Sándor Szakáll;
- Richárd Tompa;
- Dr. Hazim Dmour.

Our programs in 2021/2022. Spring semester

16 February | General meeting – TEKH on a new path. Thoughts after a successful general meeting

The college held its first general assembly of this year online on 16 February, with more than 20 participants in the virtual conference room.

At the general meeting, the 2021 annual report of the Vocational College was distributed among the members, in which the individual and group research work of the members, the competitions and the numerous lectures and short courses were reported in detail.

18 new applicants submitted applications for admission to the general assembly, which were unanimously accepted by the members. 22 participants confirmed their existing membership, so the number of students at the College increased to 40, a 38% increase compared to last year. 60% of the new students are Hungarian, while 40% are foreign, including students from Indonesia, Egypt, Palestine, Syria, Tunisia, and Nigeria.

Within the framework of the joint PROSKILL project with the Hantos Elemér Vocational College (the vocational college of the Faculty of Economics), the joint talent management program continues. Within this framework, two of our members received mentors from the European Federation of Geologists.

25 February | TEKH members under the wings of Croatian and Portuguese mentor professionals

Three TEKH members applied for the opportunity to work under the mentorship of renowned foreign specialists, within the framework of the European Federation of Geologists mentorship program, which was announced within the framework of the EIT Raw Materials project, PROSKILL, coordinated by the Faculty of Economics.

Kenéz Ambrus, our graduating PGE MSc student member, became the mentor of Ricardo Pereira, a Portuguese geologist, and now they already had their second (online) meeting, and have gone deeper into discussing the basics of professional relationship building.

Lilla Sipeki, who has just completed her BSc degree and is waiting to start her MSc studies in the fall, received a Croatian mentor, Ratko Vasiljevic, and they have had the first meeting.

Ágota Tresánszky and her mentor are still struggling with building online relationships, and the start of the work was scheduled for the end of February.

It is hoped that very valuable experiences will be transferred, since these mentors are the top European geological experts.

7 March | Our team is in the semi-finals of the EAGE competition

The EAGE (European Association of Geoscientists and Engineers) Laurie Drake 2022 Challenge is one of the most prestigious global competitions for geoscience engineering students. This year, the Antasena Energy team (geophysicist Agra Adipta, team leader, geophysicists Rafael Valadez Vergara and Idris Olabisi, geologist Richard Ayisi Mensach and oil engineer Abdmajeed Alrawi) was recruited this year from ME geophysicist, geologist and petroleum geoscience engineering students who was selected as the best European team to the semi-finals for the seven best team in the world. From there, the best four go on to the final in Madrid. Their next task is related to field development, based on technical and economic aspects. The team is mentored by Dr. Károly Kiss, Dr. László Gombár and Dr. Hazim Dmour.

11 March | “Spend a day with a company manager” – Our TEKH member student spends a day in the limestone mine in the Mexico valley

The goal of the PROSKILL project is for engineering students to acquire significant business and economic skills. The coordinating University of Miskolc is attended by four partner universities from V4 countries. In the "Spend a day with the manager" program, the participating students could spend a day one-on-one with company managers and experience the diversity of management tasks.

The TEKH Vocational College was represented in the program by Lilla Sipeki, a geoscience and engineering undergraduate student. On 15 February, she spent a workday in the Mexico Valley mine.

Together with a fellow student from the college of economics, they got together with the mine manager Ottó Csordás to get an insight into an average day in the limestone mine. The morning opened with Ottó's presentation about the company, its structure, daily tasks and accident prevention, and then they went on a trip to the mine.

The rest of the day was spent in the office, in addition to an informal lunch, Ottó Csordás willingly answered all questions about the company, profession, mine and operations, and even provided the students with job search advice. All in all, it was a very educational and informative day, and both are grateful for the opportunity.



17–18 March | Innovative geotechnical solutions – Successful field trip at soproni road tunnel driving works

Through professional contacts, the invitation came from Attila Kerékgyártó, the plant manager of the DS Konzorcium, so that our students could see the works being carried out on the outskirts of Sopron.

The trip was led by assistant teacher Richárd Tompa, the participants were the TEKH members and MSc and PhD students specializing in mining-geotechnics, a total of 17 people.

Thanks to the early departure on Thursday, it was also possible to visit the city and visit the Central Mining Museum that day.

The team's accommodation was in *Hotel Szieszta* in Lővér.

The professional program started on Friday morning. The local leaders of the work site tour were Laura Tari, Ágnes Krupa, Gábor Somodi, Milán Horváth, and János Borsody.

After the successful program, the long journey home followed, arriving back on Friday evening.



30 March | Participation of TEKH members in the Survey of Young Professionals

The Survey of Young Professionals is a joint annual event of the Association of Hungarian Geophysicists and the Hungarian Geological Society, the most serious professional competition for young people.

Six of us participated in the 2022 Young Professionals Survey in Orosháza, representing the Faculty of Earth Science Engineering of the University of Miskolc. Sabuhi Tapdigli, Omar Al Marashly, Emad Nageh Masri from the Institute of Geophysics and Geospatial Informatics, and Csilla Balassa (mentor Norbert Németh), Abbas Mohammed and Péter Fodor (mentor Ferenc Kristály) from the Institute of Mineralogy and Geology.

The two days were entirely filled with lectures and poster presentations on geological and geophysical topics, of an applied or theoretical nature, where, at the special request of the organizers, the presenters of the given profession structured their presentation in such a way that it was also accessible to the other half of the audience.

Csilla Balassa won the special prize of the Youth Committee of the Hungarian Geological Society with her presentation "A new axinite occurrence from the Bükk Mts., NE-Hungary".



1 April | The Vocational College at the Academy of the Elderly

The Academy of the Elderly is the most successful continuation series of the University of Miskolc for the general public. The current one is the 15th season of the Academy.

At the Academy, the participation rate of lecturers belonging to the ME MFK faculty is traditionally high, as the initiative was also implemented based on the ideas of faculty instructors.

This year's lectures included the lecture by Professor Emeritus János Földessy offered to the general public at TEKH, which is entitled We and the Earth – Challenges and possible answers. It was presented online on 1 April.

The 55-minute lecture takes the students around the earth sciences, their current role in society, the most important challenges - e.g. earthquakes, volcanism, climate change, etc. – questions, and the natural resources to be provided for the rapidly growing population – mineral raw materials, energy carriers, water, etc. on the difficulties of its creation.

9 April | Painting the F8 Imperial Walker

The students of the Faculty of Earth Sciences and the Faculty of Mechanical Engineering and Informatics - University of Miskolc renewed the F-8 trenching machine on the university premises. Two students from the TEKH Vocational College participated in the team, and the Vocational College also contributed to feeding the hungry painters. The work was organized by the Dudujkavölgyi Rókák team, led by assistant teacher Richárd Tompa.



11 April | TEKH debate event: Our changing climate – in peace and war

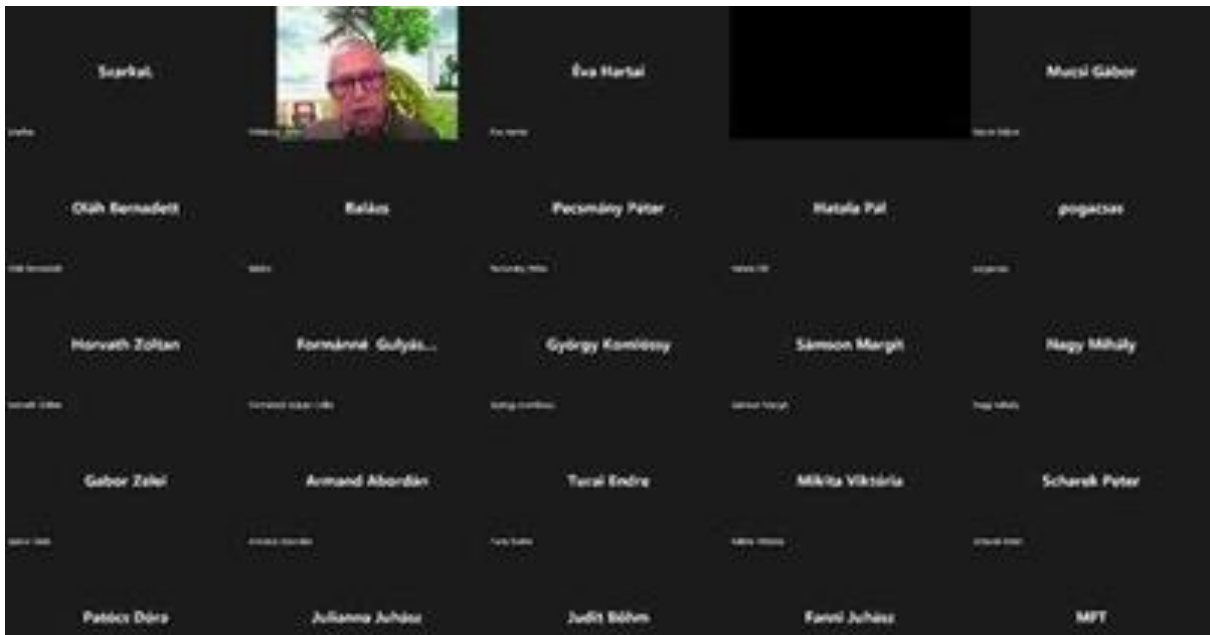
The Vocational College's 2021/2022 academic year events take place under the motto of Our Changing Climate. During this, a debate evening took place on Monday, 11 April 2022, in which 29 people participated.

Its co-organizers were the Miskolc Academic Committee of the Hungarian Academy of Sciences and the Northern Hungarian Territorial Organization of the Hungarian Geological Society.

The members of the panel of experts who played a major role in the debate were geologist Dr. Éva Hartai, honorary university professor (University of Miskolc), Dr. László Szarka, geophysical engineer, regular member of the Hungarian Academy of Sciences, and economist Dr. Péter Kaderják (director of the BME Zero Carbon Center). The evening's moderator was geologist János Földessy, professor emeritus, president of TEKH. As the coordinator of the European Union's INTRAW project, Professor Hartai dealt with the vision of the continent's supply of raw materials. Academician Mr. Szarka studies the natural causes of climate change and is a scientist who argues in favour of natural causes. Mr. Kaderják, director, was the head of the Corvinus Regional Energy Management Research Center, then managed the energy sector as state secretary, and is currently the director of the Zero Carbon Center established within the BME, a dedicated expert in reducing greenhouse gas emissions.

The panel's detailed discussion was complemented by student questions. All members of the panel agreed with the answer given to the final question: Reducing consumption and extending responsible behavior to all aspects of life is the best way to avoid the climate crisis.

The video and audio recording of the discussion can be downloaded from the following link:
drive.google.com/file/d/1YdeISzMJ-LCKGLBW0h_ValOAqL_zyXM-/view?fbclid=IwAR1RzVe6CkzF96Ketzisqixu-IHtcXB05VX5QHS2fE_dZb2MIzo2nYIEG4



20 April | EAGE GeoQuiz 2022 world competition - the MFK national team is a bronze medalist again.

Like last year, the MFK national team took third place in this year's competition (behind a Brazilian and a Colombian team): Abdelrahman Moataz (Egypt), Ábel Antonovits (Hungary), Tapdigli Sabuhi (Azerbaijan) and Valadez Vergara Rafael (Mexico). The presidency and membership of TEKH Vocational College warmly congratulate you on the excellent result.



MISKOLCI
EGYETEM
UNIVERSITY OF MISKOLC

STUDENT CHAPTER

EAGE

UNIVERSITY OF MISKOLC

*Congratulations EAGE Miskolc
student team!!!*

**3rd place at
EAGE Online
Geo-Quiz 2022**

Team members:

Ábel Dániel Antonovits - Hungary

Moataz Abdelrahman - Egypt

Rafael Valadez Vergara - Mexico

Sabuhi Tapdigli - Azerbaijan



3 May | Energy from water

By visiting the villages of Gesztely, Gibárt, Felsődobsza and Damak, a field trip was carried out as part of the session entitled "Energy from Water", where the participating students were able to learn about the operation of dams and hydroelectric power plants. In the framework of the event, those interested could first see yield measurements at Hernád and Gesztely, and then visited the facilities of the hydroelectric power plants in Upper Dobsza and Gibárt. Finally, the interested parties looked at the storm reservoir established on the Damakon Stream in Edelény.

4 May | Geothermal energy use in the Northern-Eastern-Hungarian region

During the program, the attending TEKH members learned about the water elevation and its effects in the Bükkábrány lignite mine, the geothermal potential of Tardona, and the Mályi geothermal system, a pair of geothermal wells.

3–5 May | Telkibánya DIM ESEE-2 Spin-off workshop 2022 for students – Innovation in exploration

The program was aimed at MSc and PhD students. Participants came from many countries, such as Serbia, Croatia, Greece, Ukraine, Bulgaria and Hungary.

The staff of the ME - MFK Institute of Mineralogy and Geology and TEKH members excelled in the organization. The Vocational College also supported related purchases.

The event took place both in person and online. The programs were extremely diverse: among other things, there were presentations on various methods related to raw materials research in geochemical and geophysical topics, and the participants could learn about the basics of 3D modeling and the mysteries of underwater research and robotics. In addition to the lectures, there was also a significant proportion of practical and field programs: there was an opportunity for geochemical analyzes with hand-held measuring instruments in the Mária reservoir, famous for its former gold mining, multispectral imaging of drill cores and a visit to the perlite mine in Pálháza. The official program ended on Thursday with a wine tasting in Tállya, so that the participants could return home the next morning enriched with many experiences.



8 May | Virtually in the storm of the stock market (Lilla Sipeki's report)

As part of the ProSkill project, in the spring of 2022 I had the opportunity to participate in an international stock market game related to mineral raw materials. Two of my fellow students and I started the competition on the 1st of April with virtual money worth ten million Forints, which we had the chance to multiply - or lose - in the demo version of the Erste Trader stock market application. We could only trade with the shares of specified companies and predetermined raw materials, and based on our perceived risk, we tried to choose companies that have more than one product in their portfolio, so they "stand on more than one foot". According to that, we chose the organizations AngloGold Ashanti Limited, Rio Tinto PLC, Teck Resources Ltd and Vale SA, and within a few days we distributed our virtual money among them, waiting for a lower price, based on the "buy low, sell high" principle. Unfortunately, only the Teck shares met our expectations, which we sold in the middle of the month with

~15% profit, but unfortunately this was not enough to offset our losses from the other companies. We ended the month with a loss of 700,000 virtual forints, and although we did not win, we learned a lot about the world of the stock market, its operation, risks and difficulties, which we can even use "live" on occasion.

10 May | Good news from the EAGE conference in Madrid (Agra Adipta's report)

I am happy to announce that the team of the University of Miskolc took first place in the world competition organized in the field of applied geophysics projects, won the EAGE Laurie Dake Challenge 2022 Champion award, which nominated our university and our team to the EAGE Laurie Dake Challenge Hall of Fame.

An extensive four months of effort, work, and continuous learning experience finally paid off. 40 teams from all over the world participated in the competition and 5 teams made it to the finals, namely: IFP School (France), Pandit Deendayal Energy University (India), University of Kasdi Merbah Ouargla (Algeria) and Petroleum University of Technology (Iran). Judges came from industry and academia from various disciplines at Repsol, Total E&P, IFP School and Dalhousie University.

The team members were:

- Abdelmajeed Alrawi (petroleum engineer),
- Idris Olabisi (geophysicist),
- Richard Ayisi Mensah (geologist),
- Rafael Valadez Vergara (petrophysicist),
- Agra Adipta (team lead, geoscientist).

We would like to thank the Faculty of Earth Sciences and Engineering of the University of Miskolc and the TEKH college for supporting our participation. Last but not least, we would like to thank our faculty advisor and mentors Mr. Károly Kiss, Dr. Hazim Dmour and Dr. László Gombár for their guidance and mentoring. It was a great trip!



10 May | The Oxford – Miskolc team came together at Telkibánya

Smaller rural towns can also have effective university education in earth sciences. The field trip of the summer school of the TIMREX international MSc program launched with the participation of Miskolc, was an excellent opportunity for earth science specialists from the University of Miskolc and the University of Oxford to meet.

In the field trip, one of the big guns of global earth science education, Professor Laurence Robb from South Africa, currently teaching at Oxford, gave a lecture to a large number of international students. The subject of this was the geological and geochemical model of hydrothermal mineralization of magmatic origin.

The other foreign specialist with vast practical experience, István Márton (Romania, Cluj, Dundee Precious Metals senior geoscientist) presented the most modern tools of raw material research geochemistry and the modern integration of data in theory and practice.

In the field, underground mine sampling, surface sampling, evaluation of drone footage, and the use of field spectrometers are included - among others.

The team organizing the event was recruited from the Institute of Mineralogy and Geology of the Faculty of Earth Sciences of the University of Miskolc, led by Institute Director Ferenc Mádai. Congratulations on a great idea and implementation.

In the hope-for continuation, the MSc course in raw material research of four European universities will start soon. Let's hope for the best.

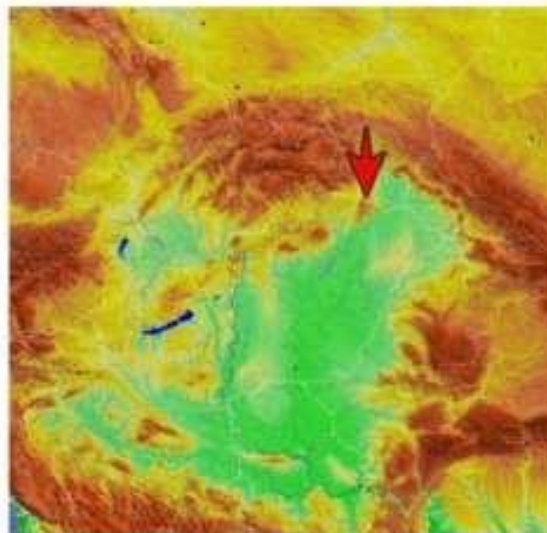
TIRMEX summer field school
on innovative mineral exploration
7-11 June 2022, Telkibánya, Hungary



The objective of the school is to introduce innovative mineral exploration methods and techniques with special focus on exploration of hydrothermal ore deposits. Keynote lectures about magmatic-hydrothermal ore forming processes will be given by prof. Laurence Robb. The program is designed for earth science master students, primarily from the East-South-Eastern European (ESEE) region. Master students from field of mining engineering are also welcome.

Telkibánya is a well-known historical mining site of the Carpathian region, and the locality provides a good environment for field practice complementing the theoretical parts of the summer school.

Lectures can be followed online for registered participants. You can register to the online participation at <https://forms.gle/PWK67QoTY42yAPLWA>



12–14 May | Carbon neutrality and new coal utilisation methods short course – TEKH short course in Siófok

Climate change is the main topic of the 2021/2022 academic year of the TEKH Professional College of the Faculty of Earth Sciences of the University of Miskolc. The final program of the series of events was the Towards zero carbon emission – new trends in coal application and organic waste management Short Course held on 12–14 May.

The short course was realized with the joint support of the Transdanubian Regional Water Works (DRV Zrt.) and Dudari Coal Mines (Duszén Kft.). The main organizer on behalf of TEKH is associate professor Dr. Ljudmilla Bokanyi, founding member of the College, "Development of a product range of bio raw materials - taking into account the local technology range - usability tests by optimizing operating conditions" GINOP-2.2.1-15-2017-00069, the research and development project manager awarded jointly with DRV Zrt.



The three-day program started with a conference, followed by a visit to the state-of-the-art sewage treatment plant in Siófok, then a visit to the mine of the innovative Duszén Kft. in Dudar, and finally ended with a city tour of the nearby Zirc.

The presentations were given by University staff and industrial partners: presentation of the technological background of the innovative utilization of coal in municipal wastewater treatment (Dr. Ljudmilla Bokányi - György Krizsán); description of coal pyrolysis and gasification (Dr. András Kállay); coal-bound methane geology and rare elements in coal (Prof. Dr. János Földessy), production of geopolymers from fly ash of coal-burning power plants (Mária Nagy Gáborné Ambrus), adsorption properties of huminite-rich Dudar coal (Ákos Pintér-Móricz - Dr. Ljudmilla Bokányi).

The wastewater treatment plant visit that afternoon was led by DRV engineers, the Dudar mine visit the next day by the Dudar mine engineers. The industrial sponsors provided the venue and the participants' lunches.

Several foreign students from the Stipendium Hungaricum program also participated in the short course, a total of 20 people were present at the event.

20–21 May | XV. National High School Earth Science Student Conference

The mentors and board members of the TEKH Vocational College participated in the organization of the XV. High School Earth Science Student Conference.

The main goal of the Student Conference is to bring together high school students who deal with a branch of earth sciences and raw materials beyond the curriculum, conduct research, and provide them with the opportunity to share the knowledge they have acquired with each other and with interested parties within the framework of a conference.



25 May | Youth Presentation Day



A Miskolci Egyetem Geofizikai Intézeti Tanszéke,
a Magyar Geofizikusok Egyesülete Észak-magyarországi Csoportja,
az MTA MAB Geoinformatikai és Térinformatikai Munkabizottsága,
az MTA MAB Földtudományi Munkabizottsága,
az EAGE Miskolci Hallgatói Tagozata,
valamint a Természeti Erőforrás-Kutatás és Hasznosítás Szakkollégium

meghívja Önt és Munkatársait

az „*Ifjúsági Előadói Nap 2022*” rendezvényre.

PROGRAM

9:00 – 9:20	Potential geophysical methods applied for high resolution near surface investigations	Denis Silas
9:20 – 9:40	Evaluation of well logging data inversion using advanced industrial system	Khoulood Bael
9:40 – 10:00	Geochemical analysis of alkali metals	Belay Mohammed Ali
10:00 – 10:20	The application of parameters to discriminate pore-fluid and lithology	Agra Adipta
10:20 – 10:40	How acoustic velocities and elastic rock characteristics are affected by pressure	Piri Goyusov
10:40 – 11:00	Ground penetrating radar surveys – case studies for geotechnical applications	Julianna Juhász
11:00 – 11:20	Well-logging measurements assisted to seismic interpretation in Tokaj area	Viktória Kiss
11:20 – 11:40	Histogram-based noise reduction methodology and validation methods for geoscientific data	Roland Kilić
11:40 – 12:00	Sensitivity analysis in inversion of well logging data	Rafael Valadez Vergara
12:00 – 12:20	Processing of regularly and randomly sampled incomplete datasets using inversion-based 1D and 2D Fourier transformation	Mahmoud Ibrahim
12:20 – 12:40	Conceptual model redefinition of Southern Nyirseg-Hajduság shallow groundwater aquifer system applying log-correlation for stratigraphic interpretation	Yetzabbel Flores

Kezdési időpont:

2022. május 25. (szerda) 9⁰⁰

A konferencia a Miskolci Egyetem, Geofizikai Tanszékének **Csókás János** termében (A/2. II. em. 213.) kerül megrendezésre.

30 June | Our silver medalists at the 2022 PDAC-SEG Student Minerals Colloquium – Csilla Balassa

This year's PDAC Convention, which is one of the world's most prestigious international events related to raw materials research, was held both in person and online, organized by the Prospectors and Developers Association of Canada. The online event took place on 28-29 June 2022. Within the framework of the convention, a geoscience student conference called the 2022 PDAC-SEG Student Minerals Colloquium took place.

HFSE enrichment in the Bükk Mts., NE-Hungary – Geochemistry and mineral composition

Csilla Balassa¹, Ferenc Kristály, Norbert Németh
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Introduction

In the Bükk Mts., NE-Hungary a formerly unknown rare earth elements (REE)-Nb-Zr-Th-Ta enrichment was found recently. The elements enriched belong to the group of high field strength elements (HFSE), which are usually stable during the processes of metamorphism and weathering, and their enrichment is connected to carbonates and alkaline magmatism. In the Bükk Mts. there is no known magmatic source, but based on our results, the enrichment has a metasomatic origin. It is proven by the textural position of the alteration minerals: disseminations, small veinlets, nests and pseudomorphs are characteristic.

Applied methods

The alteration associated with HFSE enrichment is unvisible with naked eye. To localise the enriched rock bodies spectral gamma measurement was used, as this is also enriched together with other HFSE elements. The collected samples were analysed by the following methods:

- ICP-AES, ICP-MS, XRF chemistry
- XRD mineral composition
- scanning electron microscopy (SEM) (BSE images, X-ray element maps, EDX) mineral composition, chemical composition of the individual minerals.

From the above methods the EDX analyses only were capable to detect the HFSE-bearing minerals, due to their low quantity, but the exact chemical quantification remained uncertain, because of the small grain size (maximum a few tens of µm).

Geology of the locations

The age of the outcropping rocks of the Bükk Mts. extends from Late Carboniferous to Jurassic. The Middle-Upper Triassic succession is characterized by metavolcanics and deformed sedimentary layers, affected by a Cretaceous dynamothermal anchizonal-regional metamorphism. Based on the different deformation styles three main tectofacies groups can be specified: the North-Eastern, Central, and South-Eastern Units, among them the Central Unit is the most deformed. The units are divided from each other with fault zones which contain the HFSE-mineralized rock bodies. Mineralized bodies occur in two groups: at the boundary of the North-Eastern and Central Units in Lillafüred, NE Bükk Mts. and at the boundary of the Central and South-Eastern Units in the SE Bükk Mts. At the NE occurrence siliciclastic sediments host the enrichments, while at the SE location both siliciclastic sediments and metavolcanics, the latter often periplegitic.

Fig. 1. Satellite image of Europe. Location of the Bükk is marked with star.

Fig. 2. Geotectonic geological map of the Bükk Mts. Number 1 and 2 represent the two locations of HFSE enrichment.

Fig. 3 and 4. Cross-sections along the strike of the Bükk Mts.

Trace element geochemistry

Fig. 5. Bar and line graphs showing REE and HFSE patterns in rock samples.

Fig. 6. Diagram showing the relationship of element concentration and enrichment rate.

Mineralogical composition

Fig. 7. Stacked bar chart showing mineralogical composition of the altered rock bodies.

HFSE-minerals

The enriched HFSE-elements are hosted in various minerals, such as REE-phosphates (morsazite-(Ce), rarely xenotime), zircon, Nb-bearing Ti-oxides, apatite, rarely REE-carbonates and oxides. All of them are micrometric in size and only observable with electron-microprobe analyses. These minerals often form nests and pseudomorphs, or occur in veinlets. More detailed features can be found below the BSE images and element maps. Sample ID-s are the same as in Fig. 3, 7, 6 and 8. N/S correspond to the SE or NE location.

Fig. 8. Backscattered electron (BSE) image of morsazite.

Fig. 9. Backscattered electron (BSE) image of zircon.

Fig. 10. Backscattered electron (BSE) image of apatite.

Fig. 11. Backscattered electron (BSE) image of Nb-bearing Ti-oxide.

Fig. 12. Backscattered electron (BSE) image of REE-carbonate.

Fig. 13. Backscattered electron (BSE) image of oxide.

Fig. 14. Backscattered electron (BSE) image of another mineral.

Conclusions

In the Bükk Mts., NE-Hungary a formerly unknown HFSE-mineralisation was found. The enrichment was caused by hydrothermal solutions penetrated along the fault zones, leading to mineral and geochemical changes. The solution was alkaline in pH, as the wall rock limestones does not show any sign of the alteration. Reaction with the siliciclastic and metavolcanics layers caused changes in the p-T conditions, causing the instability of the dissolved HFSE-complexes. The higher the phyllosilicate and feldspar content of a rock body is, the higher is the enrichment rate, which means that the dissolved HFSE-complexes became unstable during reaction with silicate material, while remain stable in the carbonate rocks. Potassium is enriched generally, leading to potassic feldspar and mica generation from albite and chlorite. The paragenesis is not uniform. Although potassic feldspar generation are characteristic in feldspar-rich metavolcanics, in mica-rich sedimentary rocks feldspars remain albite, and only the phyllosilicates are affected by the potassic metasomatism.

Not only element enrichments, but also element losses occurred during the process, which is most significant in the case of Ba, P and Ti. The last two are reflected in the general breakdown of apatites and Ti-oxides, although both phases can regenerate during the mineralisation process. Nb is incorporated partly into relic Ti-oxides grains and partly it forms new Nb-bearing Ti-oxides with braided appearance; furthermore P-content of pre-existing apatites contributes to the formation of morsazite.

Although such kind of mineralisation is usually connected to carbonatite and alkaline magmatic bodies, in the Bükk Mts. the source is not known. It is possible that somewhere in the depth a buried, highly HFSE-enriched magmatic body is present, from where the solutions were originated, and traveled kms until reaching the studied rock bodies and causing the enrichment. This body could be in a tectonically disconnected position.

If the magmatic body does not exist, the HFSE mineralisation in the Bükk is a completely unparalleled phenomenon compared to the known occurrences of the world.

Acknowledgment

The research was supported by the National Research, Development and Innovation Office (NKFIH) under the grant number K-131/2019-2021. The authors would like to thank the anonymous reviewers for their constructive comments and suggestions. We are also grateful to the members of the Institute of Mineralogy and Geology, University of Miskolc for their kind assistance during the fieldwork and laboratory work.

20. / 29 pages

For the competition, the participants had to make a poster, as well as an approx. 6-minute video in which they briefly report on their results. The conference was also a competition, where the participants competed in three categories – BSc, MSc and PhD. In the online competition, among TEKH students, geologists Csilla Balassa and Livia Leskóné Majoros achieved shared second place in the PhD category, "HFSE enrichment in Bükk Mts., NE-Hungary - Geochemistry and mineral composition" and "Comparison of critical mineral and element content of black schists from NE-Hungary" with their posters.

Apart from them, our university was also represented by Mohamed Badawi, whose poster was titled "Structural evaluation and mapping of hydrothermal alteration in the Fatira-Abu Zawal area of the Eastern Desert, Egypt".

Publications of the TEKH members 2021/2022

The list was made partly on the basis of the MTMT and partly on the basis of the individual reports of the members.

Moataz Mohamed	MSc	6 pieces
Livia Leskóné Majoros	PhD	5 pieces
Csilla Balassa	PhD	4 pieces
Lilla Sipeki	BSc	4 pieces
Agra Adipta	MSc	2 pieces
Mária Nagy Gáborné Ambrus	PhD	2 pieces
László Tamás Kaposvári	undivided	2 pieces
Noémi Szász	PhD	2 pieces
Rafael Valadez Vergara	PhD	1 piece
Péter Fodor	BSc	1 piece
Summa:		29 pieces

In our evaluation system, a published scientific publication (on paper or online) is worth 3 credit points.

The TEKH student members in 2022/2023. Autumn semester

1. Csilla Balassa
2. Szabolcs Bartók
3. Péter Fodor
4. Fanni Juhász
5. László Tamás Kaposvári
6. Lívia Leskóné Majoros
7. Péter Mátyás
8. Mária Nagy Gáborné Ambrus
9. Mihály Nagy
10. Noémi Németh
11. Dóra Patócs
12. Lilla Sipeki
13. Dorina Spekker
14. Noémi Szász
15. Balázs Szeleccki
16. Ahmed Oraby
17. Bagaine Aidan Birimbi
18. Edwyn Andrés Pérez Ortiz
19. Emad Nageh Masri
20. Khouloud Jlaiel
21. Moataz Mohamed Gomaa
22. Mohamed Ahmed Abdelhadi Badawi
23. Mohamed Hamdy Eid Hemida
24. Mohamed Oraby
25. Mohamed Rajhi
26. Natra
27. Rafael Valadez Vergara
28. Rebecca Nambooze
29. Rudolf Kraitl
30. Selly Ayu Janetasari

The most active mentors in the talent management program in 2022/2023.

Autumn semester

- Dr. Ljudmilla Bokányi;
- Prof. Dr. János Földessy;
- Dr. László Gombár;
- Dr. Ferenc Kristály;
- Dr. Ferenc Máдай;

- Dr. Viktória Mikita;
- Dr. Norbert Németh;
- Dr. Beáta Siskáné Szilasi;
- Prof. Dr. Sándor Szakáll;
- Richárd Tompa;
- Dr. Hazim Dmour.

Programs in 2022/2023. Autumn semester

20 August – 3 September | Mohamed Oraby at EIT competition 2022 supported by TEKH

A few weeks ago, I had a great opportunity to represent the University of Miskolc and I got a huge support from TEKH to participate in the RACE 2022 Program (supported by EIT, EIT RawMaterials Academy) which took place in 2 fantastic Scandinavian countries (Sweden and Finland). EITRACE 2022 started on 20 August in Stockholm and ended in Helsinki (Finland) on 3 September 2022. It was a great opportunity to be among 59 Master's students from various fields of business and materials science and more than 30 nations around the world.

We looked at how to solve the security of raw material supply for Europe's green economy. Over the course of two weeks, we traveled over 3,400 km by bus through the stunning Sweden and Finland, learning from industrial and research partners during site visits and hearing from experts and entrepreneurs about solutions to raw materials challenges. We participated in educational expert seminars in Stockholm on topics such as circular economy, recycling and industrial symbiosis. We also received competition challenges at the end of the RACE event.



Later we went to STENA Recycling Company in Hamstad, Sweden. We then went to the world's largest iron ore mine, Kiruna in Sweden. The adventure took us to Oulu, Finland, where we attended engaging start-up presentations on innovative geophysical methods. In addition, we went all the way to Espoo, Finland, where Aalto University is located. We went to the VTT plant and the Geological Survey of Finland (GTK)/ Geological tutkimuskeskus, GTK). I was lucky to be able to represent my team (TEAM 5) at the Aalto event, presenting the University of Miskolc and the academic part of our proposal for the BHP Xplorers competition. The event had a wonderful atmosphere at the end.

So, thanks to the EIT RawMaterials Academy and the whole team of organizers including Salam Kaddouh, Megan McFarlane, Ruweyda Stillhart and Ferdi Bulmer for their brilliant work, TEKH for their support.

14–15 September | XXVIII. Endre Almássy Conference about groundwater

In 2022, the XXVIII. Endre Almássy Conference on groundwater was held again in Siófok, at *Hotel Magistern*. One mentor from the TEKH Vocational College took part in the conference.

15–17 September | Conference in Izmir

The third "*International Conference on Environmental Geotechnology, Recycled Waste Materials and Sustainable Engineering, EGRWSE-2022*" conference was held in Izmir, Turkey, with lectures on environmental geotechnology, recycling and sustainable energy sources. 2 college students took part in the conference.

22–24 September | 3 college students and a mentor took part in the XII. Geology and Geochemistry Assembly

The 12th Petrological and Geochemical Assembly was held between 22–24 September 2022 in Miskolc at the MTA MAB headquarters. The traveling meeting consisted of two days of lectures and poster presentations, as well as one day of a professional field trip. During the field trip, János Földessy and Norbert Németh presented the varied geology and mineralization of the Rudabánya Mountains. The participating 3 vocational college students and 1 mentor got to know the interior of Esztramos mountain under the guidance of Erika Kereskényi, György Czuppon and Péter Gruber. During the Estramos tour, they visited Rákóczi cave No. 1, VI. and VII. to mining levels and to the cold rooms of the underground seed bank.

6 October | Forum of our regional raw material sources in Borsod

The most important global lesson of the past months is that the energy carriers and raw materials found around our house, whether from primary or secondary sources, are extremely valuable.

If we realize this, we will have a lot to do, we can take serious steps towards independence. If not, we are left with the trembling fear of a hopeless future. Here in Borsod there is definitely a large source, these are the primary and secondary sources of raw materials that the processing industry needs from here and beyond.

The approximately 80 participating professionals and local leaders received fresh information about local opportunities and challenges from industrial and university researchers and developers in understandable everyday language.

REGIONÁLIS NYERSANYAGFORRÁSAINK FÓRUM

2022. október 6. csütörtök 10 óra
MAB Székház

Miskolci Egyetem Műszaki Földtudományi Kar
Természeti Erőforrások Kutatása és Hasznosítása Szakkollégium

Borsod-Abaúj-Zemplén megye közgyűlése

Magyar Tudományos Akadémia Bányászati Tudományos Bizottsága
MTA Miskolci Akadémia Bizottsága Bányászati- Földtudományi
Környezettudományi Szakbizottsága

OMBKE Egyetemi Szakosztálya
MFT Észak-Magyarországi Területi Szervezete, Nyersanyagföldtani Szakosztálya

A részvétel ingyenes, de regisztrációhoz kötött (az ebéd tervezés érdekében).
Regisztrálni lehet az alábbi internetes oldalra kattintva október 3-ig.
<https://forms.gle/tdzbLTL9QgUwJRuh9>

PROGRAM

10:00-10:10	Fővédnöki megnyitó	Bánné dr. Gál Boglárka BAZ megye Közgyűlés elnöke
10:10-10:20	Elnöki megnyitó	Prof. Mucsi Gábor dékán, Miskolci Egyetem, MFK
ELSŐDLEGES ENERGIAHORDOZÓINK		
10:20-10:40	Borsodi medence jövőbeli barnaszén termelési lehetőségei	Törő György OMBKE Bányászati Szakosztály elnöke
10:40-11:00	Mélyművelési szénbányászati projektek földtani – bányászati előzetes értékelése	Debrecezeni Ákos tsz. egy. docens, Miskolci Egyetem, MFK
11:00-11:20	Borsodi szénünk értéke az energiaválság és a körforgásos gazdaság tükrében a Miskolci Egyetem kutatási eredményei alapján	Bokányi Ljudmilla tsz. egy. docens, Miskolci Egyetem, MFK
FÉMEK MÁSODNYERSANYAGOKBÓL		
11:40-12:00	Körforgásos gazdaság: Fémtartalmú másodnyersanyagok feldolgozhatóságának vizsgálata	Nagy Sándor int. tg. egy. docens, Miskolci Egyetem, MFK
12:00-12:20	A miskolci beruházás jelentősége nemes-és színesfémtartalmú másodlagos alapanyagok hasznosítására	Kulesár Tibor fejlesztési igazgató, Metal Shredder Kft.
12:20-12:40	Egy borsodi lépéssel Paks II felé: nyersanyagok Rudabányáról	Kasó Attila ifj. Rotaqua Kft.
12:40-13:00	Kritikus nyersanyagok dúsulása melléktermékként – további megvizsgálatlan régiós lehetőségek	Földessy János Professzor emeritus, Miskolci Egyetem MFK
13:00-13:10	Zárszó	Riz Gábor országgyűlési képviselő, miniszteri biztos
13:10-14:00	BÜFÉ EBÉD	

10 October | TEKH general assembly

The first general assembly of the academic year 2022/2023 was held by the TEKH Vocational College.

The Vocational College said goodbye to the departing members (due to graduation, too low credit points or non-renewed membership), and then the results of the online voting related to the admission of new members were announced. 18 out of a total of 22 voting members voted, and all 10 applying students were welcomed by the TEKH Vocational College with a 100% 'yes' vote.

12 October | Methyl alcohol production without greenhouse gas

At the event, the students could talk to Dr. Iván Raisz about the innovative possibilities of methyl alcohol production. A total of 16 people participated in the presentation. The majority of those present were professionals, but professional colleagues were also able to deepen their professional knowledge and learn about climate policy from several perspectives.

13 October | Our members participating in the webinars...

In the fall, a series of free presentations of continuing education value are available on the web interfaces of various institutes, including the website of the AGI (American Geological Institute). One such presentation was about the circular economy, the other about critical mineral raw materials.

Keeping materials in the loop

There is no a single way to close the loop

- **Different loops are possible** to keep materials, but also components and the functionality enabled by the material in the loop
- **Smaller loops** have generally speaking **higher environmental benefits**.
- Most of the loops share the **pivotal role of consumer** (waste holder) triggering waste management operations

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Protect. Transform. Sustain.

People

Share invite

Presenters (5)

- FM Federico Magalini
- LG Leila Gonzales
- LC **Luc Charbonneau**
Organizer
- OI Ola Isaksson
- LE Tercero Espinoza, Luis Alberto

Attendees (34)

- EM Emad N Masri (Guest)
- A1 Ambler Mapper 1
- AV Athanasios Varotsos (E...)
- BG Barbara Goodman

17–24 October | Our participation in the geophysical measurement camp organized by the ELTE SEG department

Our TEKH member student Khloloud Jlaeil participated in the geophysical field exercise with the support of the professional college. His account follows:

A few weeks ago, I had the opportunity to participate in the 4th International Eötvös SEG Field Camp organized by the ELTE SEG Student Section on behalf of the University of Miskolc and with the support of TEKH.

The field trip was mainly held in and around Mályi, where interesting geological and environmental problems were solved using near-surface geophysical methods.

The field camp started on October 17 in Budapest with a group lunch, followed by an event opening, team building and a city tour. We went to the mineral depository and the university museum. The next day (October 18) we went to Mályi together and learned about the surveying equipment at lectures, and then I visited the investigated area.

The camp tasks were as follows:

- **Survey of Lake Mályi:** One of the main tasks of the field camp is the full-scale geophysical survey of Lake Mályi with water geophysical measurements.
- **Fracture detection in the foothills of Bükk:** Another main goal of the field camp is to clarify the position of active fractures in the southern foothills of Bükk with near-surface geophysical measurements.



The measurement methods used were:

- electrical resistivity tomography (ERT),
- vertical electrical sounding (VES),
- very low frequency / magnetotelluric measurement (VLF/RMT),
- water seismic and geoelectric and radar measurements.

We learned about data processing by working on our team's field data every day after the fieldwork was completed. The event ended with a gala after data processing workshops and closing presentations. It was a fantastic opportunity to be there. Thanks to the TEKH Vocational College and the University of Miskolc for the funding and support.

19–21 October | Conference in Dubrovnik

The DIMESEE2 Implementing Innovations program Dubrovnik conference was held in online – hybrid format, in which one vocational college student took part.

20 October | Online professional day at the Faculty of Earth Science and Engineering

RIS INTERNSHIP BLOCK		
9:00-9:10	Welcome words from the Dean	Gábor Mucsi
9:10-9:20	MSc Internship at eastern European industrial partners - the RIS Internship program	Ferenc Mádai
9:20-9:30	Completing interhsip at an iron ore company in Bosnia	Malik Zhalov
9:30-9:40	Completing interhsip at a mine waste reprocessing company in Slovenia	Rudolf Klaitr
INTERNATIONAL CHALLENGES BLOCK		
9:40-9:45	Participation in international challenges, brief introduction of the EAGE as a challenge host	Ábel Antonovits
9:45-10:00	Being the world champion from the University of Miskolc - the EAGE Laurie Drake 2022 challenge	Agra Adipta
10:00-10:05	Improve your capacities! - the TEKH college introduction	János Földessy / Viktória Mikita
10:05-10:15	International team to solve a mineral exploration challenge - the NGEA experience	Mohamed Oraby
EIT RAWMATERIALS BLOCK		
10:15-10:30	Racing through Scandinavia around raw materials - the EIT RawMaterials RACE	Ábel Antonovits
10:30-10:45	Innovation in orebody characterization - riport with organizers of the Dubrovnik Internationa Mining School	Ferenc Mádai
ALUMNI BLOCK		
11:00-11:10	My journey to phd - Life as a Petroleum Engineer	Chourouk Haouel
11:10-11:20	Education is Experience - Return back to Hungary for PhD - career path in Kurdistan as a young university fellow	Mohamed Sarkhel
11:20-11:30	University of Miskolc: One Destination, multiple experiences - Environmental Engineering MSc experiences and career opportunities	Ahmed Shaheen
11:30-11:40	How to choose the best Career Path	Iqra Hassan
11:40-11:50	From pH to PhD - Career perspectives after the PhD in Geography	Daniel Kibirige

31 October | The FLINSTONE team made it to the finals of the global NGEA project evaluation competition

A real world team was assembled from Central and Eastern Europe for this year's PDAC Next Generation Explorers Award competition, sometime in early 2022. The task was to process a selected geological-geochemical-geophysical database using thorough and innovative methods. The team chose the topic of Flin Flon volcanogenic mass mineralization in Canada.

The core of the team was made up of the participants in last year's competition, and new members joined them, resulting in the final eight-member team. Behind the team was a very prestigious mentoring staff: István Marton (Romania, Cluj, geology and geochemistry), János Kiss (Hungary, Budapest, geophysics), Ferenc Mádai (Hungary, Miskolc, environmental and social issues). The team members (who completed the work of almost a year): Dávid Csomai (Romania, U Lund, team leader, geochemistry), Ivan Vujevic (Croatia, U Liege, geology, modeling), Irma Becelyte (Lithuania, U Lund, geochemistry), Veress Ervin (Romania, LTU Lulea, modeling), Kholoud Jlaeil (Tunisia, U Miskolc, geology), Mohamed Oraby (Egypt, University of Miskolc, environment), Rudolf Kraitl (Brazil, University of Miskolc, environment). Several people, e.g., Endre Nádas (Hungary, University of Miskolc), Ágnes Gál (Romania, BBTE Cluj), János Földessy (Hungary, University of Miskolc) participated in the work process as assistants or observers.

The work was finally finalized on October 31 and submitted to the jury in the form of a 50-slide presentation.

PDAC is a world organization of raw materials research with Canadian roots, it holds its conference in Toronto every year, and the NGEA finals are also held there. The competition is also supported by the largest exploration and production companies. The gold sponsors of this

year's competition are AngloAmerican, BHP, Riotinto. The majority of the competition's jury is made up of company professionals.

7–9 November | Our member Emad N Masri at the Energy Transition Conference

I would like to share my experience of attending the international scientific conference EAGE GET2022 held in The Hague, Netherlands in early November 2022.

There was a great discussion during the poster presentation on geothermal activity and energy transitions, and it was shared that AVO and model-based inversion procedures were successful in mapping the fracture zone of the study area.

I completed the entire project under the guidance of Dr. Ernő Takács, and I am grateful for his help and support. This is a huge step forward for me in the field of seismic research, I hope I can keep it up until the end of my studies, and I thank him for the opportunity that TEKH gave me to participate in the GET2022 international event.

1 December | Dancing whirlpool

On December 1, 2022, a unique water engineering presentation entitled "Dancing whirlpool" was held. Dr. Zoltán Papp presented the periodically operating water (power) machine without energy sources, which can use the kinetic energy of any flowing surface water mass (river, running water, stream, aqueduct, etc.). The purpose of the model was to present energy-saving and water-saving solutions with a simple, cheaply produced device. The other device was the Chaos wheel, the purpose of which is not to obtain energy/lift water, but to understand the complex mechanical/hydraulic system with characteristics that cannot be precisely calculated in advance.

The event attracted widespread interest, based on which it can be said that the practical demonstrations organized in addition to the lectures attract a much larger and wider target audience. In addition to high school students, university students, specialists, and instructors also participated in the lecture and demonstration. A total of 42 people participated in the event.