



KGK

SPACE RESOURCES CONFERENCE

PROGRAM

CONFERENCE PROGRAM

**23-24 May 2024 – VIIth Space Resources Conference –
Towards Artemis Generation (KGK 2024)**

| Faculty of Materials Science and Ceramics |
| AGH University of Krakow Campus |
| Building B-8 | Halls A & B |

21 May 2024 – 18:00 (MS Teams) Preconference Online Workshop for Presenting Authors ***Pitching your research to diverse audiences*** led by Anna Krukiewicz-Gacek and Sonja Bretschneider

DAY 1 – THURSDAY

8:00 – 8:20 Registration

8:20 – 10:00 Opening Speeches and Plenary Lectures –
Hall A

8:20 – 8:40

Conference Chairman - prof. Tadeusz Uhl - *Opening and Welcome*
Rector of AGH University of Krakow, Vice-Rector for Cooperation of
AGH University of Krakow - *Opening Speech*

8:40 – 9:10 Plenary Lecture – Enrico Stoll (Technical University of Berlin) *NanoSatellite Robotics: from Formation Flight to On-Orbit Servicing*

9:10 – 9:40 Plenary Lecture - Tanja L Masson-Zwaan (International Astronautical Federation). *An update about the governance of space resource activities*

9:40 – 10:00 Nicolas Peter (International Space University) *The Importance of human capital for a successful space sector* + short introduction of ASTRAIOS workshop and invitation to all participants to join it

10:00 - 10:30 Coffee Break

HALL A**HALL B**

10:30 – 12:30 Session – Space Resources I Chairperson – Jakub Ciałęża	10:30 – 12:30 Session – Space Structures and Materials Design and Operations Chairperson – Czesław Kapusta
10:30 – 10:45 Jakub Ciałęża (Polish Academy of Sciences, Institute of Geological Sciences) <i>Introduction to the session: the role of asteroids, Mars and the Moon in the space resource system</i>	10:30 – 10:45 Arturs Korotkijs (Lulea University of Technology) <i>Concept Research of Piloted Spacecraft Radiation Protection</i>
10:45 – 11:00 Sumit Goski (University of Luxembourg) <i>Far-Infrared Spectral Characterisation of commonly found ore minerals in metal-rich asteroids</i>	10:45 – 11:00 Oksana Kosar (Precarpathian National University) <i>Features of Comparison Function for Simulating the Reaction Control System Using Analytical Networks</i>
11:00 – 11:15 Gabriela Opila (AGH University of Krakow) <i>Study of composition and magnetic properties of NWA 869 meteorite</i>	11:00 – 11:15 Bartosz Sawik (AGH University of Krakow) <i>Statistical Approach for Monitoring the Lack of Quality in Aerospace Manufacturing Operations</i>
11:15 – 11:30 Maciej Fitt (Polish Academy of Sciences, Institute of Geological Sciences) <i>Ore resources on Mars: evidence from comparative meteorite study</i>	11:15 – 11:30 Anna Jarosz (AGH University of Krakow) <i>Exploring the Potential of Smart Grid Technology for Sustainable Space Resource Utilization</i>
11:30 – 11:45 Marta Ciałęża (Polish Academy of Sciences, Institute of Geological Sciences) <i>Planetary analog studies - ore prospecting using remote sensing data</i>	11:30 – 11:45 Olexandr Petrenko (Oles Honchar Dnipro National University) <i>Electric propulsion systems in the remote sensing application</i>
11:45 – 12:00 Volodymyra Boychuk (Precarpathian National University) <i>X-ray structural analysis of lunar and Martian soils as a prerequisite for future human missions – NAWA project Visiting Researcher Invited Lecture</i>	11:45 - 12:00 Solomiia Botiuk (Precarpathian National University) <i>Comparative analysis of the Space Elevator and Sky Hook concepts</i>
12:00 – 12:15 Keynote Lecture – Yousef Nazzal (Zayed University) <i>Chronological and mineralogical characterization of Apollo 12 lunar landing site: An investigation to divulge the hidden insights</i>	12:00 – 12:15 Iryna Uhorchuk (Precarpathian National University) <i>Water as the main component of cosmic radiation shielding: spacecraft wall modelling</i>
12:15 – 12:30 Veronika Chudyk (Ivano-Frankivsk National Technical University of Oil and Gas) <i>Processing digital data from lunar surface surveys for selecting future drill sites</i>	12:15 – 12:30 Brieuc Spindler (Tractebel ENgineering S.A.) <i>Nuclear Power Systems for Space exploration including production of nuclear fuel - Pu238 Production feasibility study</i>

12:30 – 13:30 Lunch Break / Group Photo**HALL A****HALL B**

<p>13:30 – 14:00 Session – Space Resources II Chairperson – Jakub Ciałęła</p>	<p>13:30 – 15:00 Session – Moon exploration and exploitation Chairperson – Karol Seweryn</p>
<p>13:30 – 13:45 Mateusz Józefowicz (MIRORES Mining Data Services) <i>Data distribution platform for terrestrial and space mining</i></p>	<p>13:30 – 13:50 Keynote Lecture – Gunter Just (ESA) <i>Robotic Lunar Exploration and ISRU Activities at ESA</i></p>
<p>13:45 – 14:00 Adam Zwierzyński (AGH University of Krakow) <i>Cold traps as a source of raw materials on the Moon and technological challenges related to their exploration</i></p>	<p>13:50 – 14:05 Kamil Grassmann (Space Research Centre PAS) <i>Medium TRL technologies at CBK PAN for sampling and excavation of lunar regolith</i></p>
<p>14:00 – 14:30 Keynote Lecture – Kris Zacny (Exploration Systems, HoneyBeeRobotics) <i>TRIDENT Ice Mining on the Moon with NASA's PRIME-1 and VIPER missions (online)</i></p>	<p>14:05 – 14:20 Thomas Uhlig (DLR) <i>The European Moon analog LUNA</i></p>
<p>14:30 – 16:05 Session – Space Law & Management Chairperson – Katarzyna Malinowska <i>Cyber insurance for space systems. Building efficient risk management practice</i></p>	<p>14:20 – 14:35 Arkadiusz Tkacz (Space Research Centre PAS) <i>Moon Mining: A Model for Open Pit Operations on the Moon</i></p>
<p>14:30 – 14:50 Keynote Lecture - Mahulena Hofmann (University of Luxembourg) <i>USA, Luxembourg and their followers</i></p>	<p>14:35 – 14:50 Piotr Kasza (AGH University of Krakow) <i>Cohesive Strength Tests of Lunar Regolith Simulants During Flow and Storage</i></p>
<p>14:50 – 15:05 Bartosz Malinowski (Space Research Centre PAS) <i>Will space resources customary law have its 'Sputnik' moment?</i></p>	<p>14:50 – 15:05 Przemysław Młynarczyk (Cracow University of Technology) <i>Enhancing Regolith Analogs Analysis through DEM: A Focus on Repose Angle Test Optimization</i></p>
<p>15:05 – 15:20 Laszlo Mezey (Central European Academy) <i>A Guide for Space Actors on Benefit Sharing in Resource Activities</i></p>	<p>15:05 – 15:20 Izabela Świca (University of Warmia and Mazury in Olsztyn) <i>Magnetic separation and beneficiation by microalgae biomass of lunar regolith as a beneficiation method for growing on the Moon</i></p>

HALL A**HALL B**

15:20 – 15:35 Katarzyna Malinowska (Kozminsky University) *The Globalized Law Making Failing To Stop Or: How We Should Stop Worrying And Love The 'Artemization' Of Space Law*

15:35 – 15:50 Kamil Muzyka (Prawo i Kosmos, PAS) *Space mining and manufacturing as basis for discussing a Copernican Space Law*

15:50 – 16:05 Miloslav Machon (University College Prague) *Space diplomacy toward a legal regime for the Artemis generation*

15:20 – 16:05 Space Education Workshop by ISU (ASTRAIO project)
Danijela Ignjatovic

16:05 – 16:30 Coffee Break**HALL A****HALL B**

16:30 – 18:30
Session – Cybersecurity in Space
Chairperson – Magdalena Ostasz
Co-Chair – Enrico Stoll

16:30 – 15:30
Session – Astronaut Health for ARTEMIS Generation
Chairperson – Virginia Wotring

16:30 – 16:50 Enrico Stoll (Technical Univeristy of Berlin) *Cybersecurity of Small Satellites as a joint adventure*

16:30 – 16:45 Keynote Lecture - Virginia Wotring (ISU) *Technologies to support health in space and on Earth*

16:50 – 17:10 Magdalena Ostasz (AGH University of Krakow) *Cybersecurity management of small satellites, in particular CubeSats, on the basis of European Union regulations - the NIS2 and RCE Directives*

16:45 – 17:00 Mateusz Daniol (AGH University of Krakow) *Challenges of Healthcare Technologies Beyond Low Earth Orbit*

17:10 – 17:30 Mariusz Głabowski (Poznan University of Technology) *Securing the Space-Air-Sea Integrated Network (SAGSIN)*

17:00 – 17:15 Ryszard Błażej (AGH University of Krakow) *Challenges with wearable heart monitors for astronauts*

17:30 – 17:50 Katarzyna Malinowska (Kozminsky University) *Cyber insurance for space systems. Building efficient risk management practice.*

17: 15 – 17:30 Mateusz Daniol (AGH University of Krakow) *Energy-Neutral Power Solutions for Wearable Sensors in Long-Term Space Exploration*

HALL A**17:50 – 19:00****Session – *Entrepreneurship and Space Innovations*****Chairperson – Justyna Topolska****17:50 – 18:05** Dokhe Pawan (TBS Education) *Navigating the Commercial Space: The Intersection of Economics and Innovation in the Space Industry***18:05 – 18:20** Natalia Marszałek (Rzeszow University of Technology) *Space Technology Transfer for Clean Hydrogen: An innovative approach to hydrogen purification based on the ESA Advanced Fluidic Filter patent***18:20 – 18:35** Aleksander Kopyto (AGH University) *Screen-based Electrostatic method of repelling charged regolith off of Solar Panels for Lunar Surface Applications***18:35 – 18:50** Conall De Paor (ISAE SUPAREO) *Moneyball - Finding Low Cost Mission Architectures For Space Resource Transport Using Pattern Languages and Houbolt Questions***18:50 – 19:00** Justyna Topolska (AGH University of Krakow) *Session closing by Chairman (woman)***HALL B****17:45 – 19:00****Sessions – *ISRU and Additive Manufacturing in Space + Lunar Navigation and Telecommunication*****Chairperson – Danijela Ignjatovic****Chairperson – Miranda Fateri****17:30 – 17:45** Marta Gajewska (AGH University of Krakow) *Testing Smart Sensor for Space Menstrual Health Control***17:45 – 18:00** Miranda Fateri (Aalen University) *3D Printing for lunar applications + Danijela Ignjatovic (ISU) Importance of regional lunar navigation and positioning system***18:00 – 18:15** Rafał Krenz (Poznań University of Technology) *C-Band Communication System for CubeSats (online)***18:15 – 18:30** Denis Schreider (University Aalen) *Lunar Fibre Fabrication for Additive Manufacturing on the Moon***18:30 – 18:45** Gabriela Opła (AGH University of Krakow) *Nanoparticles for space theranostics***18:45 – 19:00** Tomasz Adach (ISU) *Surface and geotechnical surveying, a preparation for lunar landing and launch pad construction***20:00 – 23:00 Space Gala Dinner (Kraków Opera)****Kamil Muzyka 150th anniversary of the birth of Jerzy Zulawski**

Day 2 – FRIDAY

8:00 – 8:30 Registration

8:30 – 9:30 Plenary Lectures (Hall A)

8:30 – 9:00 – Plenary Lecture – Kazuya Yoshida (Tohoku University) *Collaborative AI Robot System for Lunar Surface Missions*

9:00 – 9:30 – Plenary Lecture – Larry Martinez (California State University) *Cyberspace Security in the Outer Space Legal Regime: Commercial Satellite Systems in the Crosshairs of International Conflict*

9:30 – 10:30 Poster Session with Coffee (Chairman: Piotr Kulinowski) – part 1

HALL A

10:30 – 12:30

Session – *Deep Space Exploration*

Chairperson – Olga Sergijenko

10:30 – 10:50 – Keynote Lecture

Olga Sergijenko (AGH University of Krakow) *Today and tomorrow of multimessenger astronomy*

10:50 – 11:10 Olena Kompaniets (Main Astronomical Observatory of National Academy of Sciences of Ukraine) *Multiwavelength properties of the low-redshift isolated galaxies with active nuclei modelled with CIGALE*

11:10 – 11:30 Daria Dobrycheva (Main Astronomical Observatory of National Academy of Sciences of Ukraine) *Random Forest Approach to Unveil Exocomets in TESS Data*

11:30 – 11:50 Hanna Yaremii (Precarpathian National University) *The use of machine learning in the study of space debris*

HALL B

10:30 – 12:30

Session – *Earth observation and Sensors issues*

Chairperson – Michał Lupa

10:30 – 10:45 Keynote Lecture – Denys Kukhtar (Ivano-Frankivsk National Technical University of Oil and Gas) *Modeling the movement of Antarctic glaciers using the Copernicus Earth observation data - NAWA project* Visiting Researcher Invited Lecture

10:45 – 11:00 Jayabharath Jayanthi Baskaran (Lulea University of Technology) *Assessing CO2 and Methane Emissions from Mining and Steel Plants Using Earth Observation and Remote Sensing Techniques*

11:00 – 11:15 Viktoriia Babala (Precarpathian National University) *Redundancy Reducing of the Telemetry Data Based on Discrete Wavelet Transforms*

11:15 – 11:30 Aleksandra Krzywicka (University of Warsaw) *Change detection in the Tatra Mountains forests using Landsat time series and the BFAST Algorithm*

HALL A**HALL B**

<p>11:50 – 12:10 Dariia Khoma (Precarpathian National University) <i>Didymos system before and after the DART impact</i></p>	<p>11:30 – 11:45 Marta Hasiuk (Precarpathian National University) <i>Usage of remote sensing methods for monitoring urban heat islands</i></p>
<p>12:10 – 12:30 Yuliia Petrenko (Precarpathian National University) <i>Approach of the asteroid 99942 Apophis to the Earth in 2029</i></p>	<p>11:45 – 12:00 Diana Yavorska (Ivano-Frankivsk National Technical University of Oil and Gas) <i>Geodynamic monitoring of the Earth's surface over the potash salt mine deposits using sar interferometry: a case study on Kalush Mine, Ukraine</i></p>
	<p>12:00 – 12:15 Aram Takmadzan (University of Warsaw) <i>Vegetation condition changes of the tree stands in the Tatra Mountains from 1984 to 2022 using Landsat satellite images</i></p>
	<p>12:15 – 12:30 Jakub Hempel (AGH University of Krakow) <i>Unraveling the Odra River Catastrophe: Satellite Imaging and the Future of Inland Water Quality Monitoring</i></p>

12:30 – 13:30 Lunch Break/ Poster Session (Chairman: Piotr Kulinowski) – part 2

HALL A**HALL B**

<p>13:30 – 15:30 Session – Society and space, space education, sustainability Chairperson – Joanna Pyrkosz-Pacyna</p>	<p>13:30 – 15:30 Session – Space Biology & Space Health Chairperson – Agata Rudolf</p>
<p>13:30 – 13:45 – Keynote Lecture – Joanna Pyrkosz-Pacyna (AGH University of Krakow) <i>How is Space Exploration Perceived among the General Public? Results from the study in Poland and in the US</i></p>	<p>13:30 – 13:50 – Keynote Lecture – Masafumi Muratani (University of Tsukuba) <i>Integration of multi-omics approaches in space life science</i></p>
<p>13:45 – 14:00 Katarzyna Cieślak (AGH University of Krakow) <i>Exploring Space Exploration Perception: Insights from a Comprehensive Literature Review</i></p>	<p>13:50 – 14:05 Alexa Sadier (Universite de Montpellier) <i>How to build an alien: exploring the evolutionary rules of complex life (online)</i></p>

HALL A**HALL B**

<p>14:00 – 14:15 Jakub Mirek (AGH University of Krakow) <i>Sustainability in the Space Sector: A Literature Review</i></p>	<p>14:05 – 14:20 Wojciech Kajfosz (AGH University) <i>Plant growth potential on regolith-based substrates</i></p>
<p>14:15 – 14:30 Bartosz Sawik (AGH University of Krakow) <i>Multi-Objective Optimization for Space Mission Planning</i></p>	<p>14:20 – 14:35 Paweł Rukat (Warsaw University of Technology) <i>Investigation of Laser Stimulation on Garden Cress Germination and Growth in Microgravity Conditions</i></p>
<p>14:30 – 14:45 Augustin Gallois (ISAE-SUPAERO) <i>Expanding Environmental Life Cycle Impact Assessment for Crewed Lunar Exploration</i></p>	<p>14:35 – 14:50 Dawid Jurczyński (Silesian University of Technology) <i>Impact of Pollution on the Normalized Difference Vegetation Index (NDVI) in the Tatra Mountains</i></p>
<p>14:45 – 15:00 Jacques Masson (ClearSpace) <i>SpaceSustainability - ClearSpace from General Principles to Implementation</i></p>	<p>14:50 – 15:05 Justyna Topolska (AGH University of Krakow) <i>Does stability of minerals depend on gravity? Will our bones and teeth dissolve more in space?</i></p>
<p>15:00 – 15:15 Roman Yaremak (National Technical University of Oil and Gas) <i>The current state and future prospects of space education in Ukraine</i></p>	<p>15:05 – 15:20 Mikołaj Gąbka (AGH University) <i>INNOFOOD - Automated aquaponic system</i></p>
<p>15:15 – 15:30 Barzantny Cordula (Toulouse Business School) <i>European Research collaboration across Platforms and equipments: Building trust while sharing resources</i></p>	<p>15:20 -15:30 Agata Rudolf (AGH University) <i>Introducing the space biology laboratory of Space Technology Centre AGH</i></p>

15:30 – 16:00 Coffee Break

HALL A**HALL B**

<p>16:00 – 18:00 Session – Habitats, Bioastronautics & Life Support Systems Chairperson – Agata Kołodziejczyk</p>	<p>16:00 – 18:00 Session – Space Robotics Chairperson – Karol Seweryn</p>
<p>16:00 – 16:10 Agata Kołodziejczyk (AGH University) <i>Simulations of space missions toward commercial astronautics</i></p>	<p>16:00 – 16:15 Mehmet Kara (AGH University of Krakow) <i>How Planetary Robots Utilize Machine Learning for Immediate Decision-Making</i></p>
<p>16:10 – 16:25 Amir Mohammad Mokhtari (University of Life Science in Poznań) <i>From Earth's Laboratories to Interplanetary Bases: Cultured Fruits as a Sustainable Food Production System- Futuristic Fare for Moon & Mars Settlers</i></p>	<p>16:15 – 16:30 Arfa Hassan (AGH University of Krakow) <i>Photorealistic Landscape Generation for Space Rover Mission Simulation</i></p>
<p>16:25 – 16:40 Marina Mileni Munari (ISAE Supaero) <i>Modelling and Optimization of the Design of a Robotic Hydroponic System</i></p>	<p>16:30 – 16:45 Andrzej Skulimowski (AGH University of Krakow) <i>Highly autonomous proactive robot teams for Icy Moon exploration</i></p>
<p>16:40 – 16:55 Ewelina Dobosz (AGH University of Krakow) <i>Design and Testing of a Passive Microbiological Purity Sensor for Life in Isolation</i></p>	<p>16:45 – 17:00 Tolga Ors (Team Tumbleweed) <i>Towards a comprehensive Location and Attitude Determination for a rolling, wind-driven Mars rover</i></p>
<p>16:55 – 17:10 Magdalena Mrozek (Silesian University of Technology) <i>Conception of geopolymer as a building material of a base located on the Moon</i></p>	<p>17:00 – 17:15 Filip Wylęgała (AGH University of Krakow) <i>Investigating Lunar Regolith Adhesion through the Lunar Payload</i></p>
<p>17:10 – 17:25 Przemysław Gawęda (ARCHIGEUM) <i>Concepts of lunar habitats based on their form, function and location</i></p>	<p>17:15 – 17:30 Grzegorz Ambroszkiewicz (ESA) <i>Safeguarding the Earth: The Vital Role of Nuclear Safety in Space Missions</i></p>
<p>17:25 – 17:35 Agata Kołodziejczyk (AGH University of Krakow) <i>Kombucha derived biomaterials from bio waste of closed-loop life support systems</i></p>	<p>17:30 – 17:45 Xiaoqian Gao (AGH University of Krakow) <i>Analyzing the advantages of Soft Robotics for CubeSat On-Orbit Servicing</i></p>
<p>17:35 – 17:50 Alexander Getimis (ESA) <i>Safeguarding the Earth and Low Earth Orbit: Safety processes in Human Space Missions</i></p>	<p>17:45 – 18:00 Karol Seweryn (AGH University of Krakow) <i>Session Closing</i></p>
<p>17:50 – 18:00 Gabriela Bergiel (AGH University of Krakow) <i>BioStrat 2.0 - exploring communication and lab-on-chip possibilities</i></p>	

18:00 – 18:10 Conference Closing**Poster Session/ Student Session (Chairman: Piotr Kulinowski)**

P1	Alicja Jagielska	Culture in space: Past of tradition, future of travel
P2	Anastasiia Kyseliuk	Harvesting the Moon: Advancing Lunar Exploration through ISRU Innovations
P3	Szymon Gogoc	Flexible conducting polymer materials based on poly(3-hexylthiophene) as a space thermoelectric harvesters
P4	Phong Dao	Analysis of Satellite Data Using Cointegration
P5	Karolina Zazakowny	Thermoelectric properties of new hybrid composites based on the polymers PEDOT:PSS and P3HT for space applications
P6	Adrianna Lis	Lightweight and flexible polymer thermoelectric composites with Cu _{12+x} Sb ₄ S ₁₃ nanoparticles for space applications
P7	Wiktoria Płoneczka	Research on material for constructing extraterrestrial objects
P8	Albert Wieczysty	Ore-bearing schists from the Stara Kamienica schist belt as an Earth analog for metal ore exploration on the Moon and Mars
P9	Katarzyna Adamek	Advancing Geological Mapping in Kosovo: A Remote Sensing Approach
P10	Jakub Staszal	Spatial Insights into Drought Severity: Multi-Index Assessment
P11	Marta Marczak-Grzesik	Design and testing of a novel kombucha-based bioreactor for water purification in isolated systems
P12	Olha Kurch	Space product innovation
P13	Martyna Kielb	Concept of Hybrid Sliding Surfaces Containing Polymeric Materials for Space Applications
P14	Filip Łabaj	Design and development of the LASPA experiment cube for dual terrestrial and ISS operations

P15	Kacper Odziomek	A freeze-dried modified hydrogel dressing as a promising active substances carrier for the treatment of astronaut wounds, infections and skin diseases
P16	Stanisław Sęka	Impact of silver nanoparticles solution on Pleurotus ostreatus mycelium growth in analog astronaut habitat
P17	Oliwia Pająk	Multicomponent spinels for Thermal Barrier Coatings
P18	Kamil Muzyka	If you give a robot a moon rock - The legal personhood and responsibility for AI and robots discussed within the space industrialization context
P19	Kacper Najdecki	Development of a Tandem Of Lunar REgolith CONveyors: Energy-Efficient and Dust-Reducing Approach
P20	Yana Romaniv	Impact of space launches on the environment
P21	Kajetan Ginter	M3Space – Multimodal Time Perception Monitoring System for Space Applications
P22	Roman Yaremak	The potential of space-based solar power
P23	Cyryl Konstantinowski Puntos	Archaeoastronomical legends and mathematics. Earth seen from space - analyzes using GIS on the example of "case studies" in Poland and North Macedonia
P24	Tetiana Dvorska	Interstellar Linguistics: Navigating Intercultural Communication Across the Cosmos
P25	Mariia Tyemchenko	Deciphering space images of the catastrophic flood of 2008 in the Carpathian region for potential forecasting of future floods
P26	Iryna Korzhak	Deciphering Space Images to Determine Areas Inundated by Catastrophic Floods
P27	Wojciech Teper	Earth and space mining- a short overview-technical and technological challenges