

**FINAL ANNOUNCEMENT**

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European Microbeam Analysis Society

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## **EMAS 2023**

**17th  
EUROPEAN WORKSHOP**

**on**

# **MODERN DEVELOPMENTS AND APPLICATIONS IN MICROBEAM ANALYSIS**

**7 to 11 May 2023  
at the  
Jagiellonian University, Auditorium Maximum  
Krakow, Poland**

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Under the auspices of the Rector of the  
Jagiellonian University, Krakow, Poland  
Organised in collaboration with the  
Institute of Metallurgy and Materials Science of  
the Polish Academy of Sciences, Krakow, Poland

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## Scope of the workshop series

The primary aim of this series of Workshops is to assess the state-of-the-art and reliability of microbeam analysis techniques.

The Workshops are organised in such a way as to maximise transfer of knowledge among the participants and to provide a comprehensive exhibition of the latest analytical equipment. The programme includes time and opportunities for participants to visit the technical exhibitions and interact with the manufacturers.

Previous Workshops in this series were held in Antwerp (1989), Dubrovnik (1991), Rimini (1993), St. Malo (1995), Torquay (1997), Konstanz (1999), Tampere (2001), Chiclana de la Frontera (2003), Florence (2005), Antwerp (2007), Gdansk (2009), Angers (2011), Porto (2013), Portorož (2015), Konstanz (2017), and Trondheim (2019). They included sessions covering electron (EPMA, TEM, SEM, Auger, EELS), ion (SIMS, FIB), and nuclear (RBS, NRA) microbeam methods.

The main topics of the **Seventeenth Workshop** (EMAS 2023) are: electron probe microanalysis (EPMA); electron backscatter diffraction (EBSD); software tools; focussed ion beam; Combined techniques in SEM; and materials applications of microbeam analysis. Time will also be devoted to problem orientated applications in material science, geological science, environmental studies, astrophysics, microelectronics, forensics, cultural heritage and archaeology, nanomaterials, surfaces and interfaces, catalysts, sensors, ...

## Round-table discussions

Our *round-table discussions* are panel discussions taking place at the end of each scientific session on a main topic. They are moderated by a leading expert, assisted by the invited speakers of the corresponding session.

The idea is to stimulate the exchange of information and experience among the participants on a number of important problems in microbeam techniques. Such activities need careful preparation, both with regard to structure and subjects. Therefore, we would kindly request you to complete the discussion questionnaire on the on-line registration page. If you have specific questions, these can also be mentioned in 'Other suggestions' on the questionnaire.

Brief presentations or contributions to the round-table discussions are encouraged (please contact the round-table chairperson at the beginning of the Workshop).

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## Posters

Poster contributions are welcome on subjects within the scope of the workshop (see Scope). The abstracts will be refereed by the International Scientific Committee and will be published, together with the text of the invited lectures, in the *Book of Tutorials and Abstracts* of the Workshop.

**There will be three *Oral Poster Sessions* in which selected authors will be given 5 minutes to present the highlights of their poster using two or three powerpoint slides. Those authors selected will be notified some weeks prior to the workshop.**

Authors have the opportunity to discuss their posters during the three poster sessions. Posters will be on display during the whole Workshop. Size of the display area: 1.18 m high by 1.00 m wide.

Two awards will be given: a) an *EMAS Award* for the best poster an Early Career Scientist encompassing a certificate and an invitation from AMAS - Australian Microbeam Analysis Society to present his/her work at a microbeam event in Australia (the invitation will include a free conference registration and financial support from AMAS and EMAS for travel and living expenses), and b) an *EMAS Workshop Poster Award* encompassing a certificate and a cash prize of € 500.

## Early Career Scientists' session

One session is dedicated to giving Early Career Scientists (ECS) the opportunity to present their work in a 15-minute oral presentation (including 3 minutes for discussion) (Eligibility criteria for ECS status can be found on the [‘EMAS Bursaries and Grants’](#) subpage of the EMAS website). There will be up to six such presentations selected from the submitted abstracts.

The best contribution and presentation will be awarded the *EMAS Early Career Scientist Award*, encompassing a certificate and an invitation from the Microanalysis Society of America (MAS) to present his/her work at the Microscopy and Microanalysis 2024 Meeting to be held in Cleveland, Ohio (the invitation will include a free conference registration and financial support from MAS and EMAS for travel and living expenses).

Early Career Scientists wishing to be considered for this session should submit a written application, including an abstract, to the Workshop Secretariat, reaching it before **15 November 2022**, and should be member of EMAS. Applicants will be notified of the allocation of an Early Career Scientists' session slot by **15 January 2023**. Applicants for an EMAS Bursary are also eligible to apply.

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## Abstracts

Abstracts to be presented during the workshop should fit **two A4 pages** using the Word-template available on the EMAS website ([www.microbeamanalysis.eu](http://www.microbeamanalysis.eu)). Detailed guidelines are mentioned on the template. Online submission details are given on the workshop webpage.

The abstract has to be submitted before **15 November 2022**. Authors will be notified of the acceptance of their poster by **15 January 2023**.

## Publication

Authors of accepted contributions are encouraged to submit a manuscript for publication in a volume of the IOP - Institute of Physics Conference Series: Materials Science and Engineering, appearing some months after the Workshop. Note that there is no transfer of copyright upon publication; you are at liberty to publish a rewritten or extended version in another journal at a later date.

All submitted papers will be peer-reviewed. Owing to limitations imposed by the publisher, the editors will apply a stringent selection procedure based on quality, diversity, and adherence to the manuscript preparation rules. Manuscripts will have to be submitted in the format outlined by the publisher to the EMAS Workshop Secretary.

## Workshop language

The official language of the Workshop will be English.

## Key dates

- \* **15 November 2022** : submission of abstracts for poster presentations  
closing date for Early Career Scientists' session applications  
closing date for EMAS Bursary applications
  - \* **15 January 2023** : notification of acceptance of contributions  
notification of Early Career Scientists' session allocations  
notification of EMAS Bursary allocations
  - \* **15 March 2023** : early registration deadline  
hotel accommodation deadline
  - \* **7 May 2023** : short courses (full day or afternoon)  
start of the EMAS 2023 Workshop
  - \* **11 May 2023** : end of the workshop  
working group meetings (afternoon)
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## EMAS Bursaries

A number of EMAS Bursaries are available to:

- i) Early Career Scientist (ECS): They include a free student registration and free accommodation package for the duration of the EMAS Workshop (in a shared twin room) in a hotel assigned by the Workshop. The conditions for the award of an EMAS ECS Bursary are as follows:
  - the applicant must submit an abstract for a poster contribution;
  - the applicant must be an ECS and a member of EMAS;
  - a letter from the applicant's project supervisor or principal investigator supporting the application must accompany the abstract.
- ii) Early Career Technician (ECT): They include a free student registration and free accommodation package for the duration of the EMAS Workshop (in a shared twin room) in a hotel assigned by the Workshop. The conditions for the award of an EMAS ECT Bursary are as follows:
  - the applicant must submit an abstract for a poster contribution;
  - the applicant must be an ECT and a member of EMAS;
  - a letter from the applicant's line manager supporting the application must accompany the abstract.

(Eligibility criteria for ECS and ECT status can be found on the [‘EMAS Bursaries and Grants’](#) subpage of the EMAS website).

The quality and relevance of the work presented in the abstract are the main criteria on which successful applications will be judged. A maximum of 2 bursaries per person can be awarded.

Bursary applications must be sent to the Workshop Secretariat referring to the relevant poster contribution abstract, reaching it before **15 November 2022**. Applicants will be notified of the allocation of an EMAS bursary by **15 January 2023**.

## Exhibition

Ample space, immediately adjacent to the lecture and poster areas, will be available for the exhibition of instruments, equipment, leaflets and books. Interested companies are invited to contact the Workshop Secretariat.

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## Short courses (Sunday May 7th, 2023)

For detailed course descriptions, see: [www.microbeamanalysis.eu](http://www.microbeamanalysis.eu).

Each of these is limited to 25 participants. They are open to non-workshop participants. Cost per course, covering course material, a refreshment break is € 60 for ½-day courses, and € 100 for the full day course including lunch.

### *Short course: Introduction to EBSD (full day)*

A full-day short course to introduce the physical and practical methods of electron backscatter diffraction (EBSD). The course is given as a series of short lectures. The course is aimed at students, technicians, engineers and researchers with either no or limited experience of EBSD although some familiarity with basic SEM techniques would be beneficial. The course will cover different aspects of EBSD including overview of EBSD and historical aspects, some basics of sample preparation, EBSD on non-conductive materials, and some clues for transmission EBSD work. Practical work will also cover basic and advanced EBSD data analysis. In addition, some more advanced courses/practical would take place later after morning break and during practical work in the afternoon. These could cover some work on physics of EBSD diffraction, geological materials, simulation of EBSD patterns for EBSD data analysis and possibly in-situ acquisition. In the morning, attendees will choose from a list the practical work they would like to follow during the afternoon.

### *Short course: Introduction to X-ray microanalysis (afternoon)*

A ½-day short course for new and novice users of both SEM and EPMA. The course involves a series of lectures covering some of the fundamental aspects of EDS and WDS microanalysis. Four major themes are: X-ray generation in the SEM/EPMA, Characteristics of ED and WD detectors, X-ray mapping, and quantitative microanalysis at major, minor and trace element level. Participants will be encouraged to post questions via a pre-course online questionnaire, concerning their own requirements, which will be addressed in short discussion sessions between lectures. A final round-table style discussion will conclude the course. All participants will receive a booklet of course notes and suggestions for further reading.

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### *Short course: Monte Carlo simulation (afternoon)*

In electron microscopy and its analytical methods, the electron- and photon-matter interactions play a dominant role. The electrons and the atoms of a sample are the reactants, and the backscattered, transmitted, secondary electrons, the characteristic, and Bremsstrahlung X-rays, the products. As only the products of these interactions can be measured, Monte Carlo simulations have been developed over the years to help microscopists understand, visualise, predict and get results obtained from their measurements.

This ½-day short course aims to be as practical as possible, providing tutorials how modern and freely available Monte Carlo programmes can be used to address common microanalysis problems and situations, including the reconstruction of simple geometries. Taking advantage of their respective possibilities, different programmes will be demonstrated in the course, including Casino, DTSA-2, PENELOPE, Monaco, MC X-Ray and PyMonteCarlo. Attendees are encouraged to bring a laptop.

### *Working group meetings (Thursday May 11th, 2023)*

For detailed course descriptions, see: [www.microbeamanalysis.eu](http://www.microbeamanalysis.eu).

Each of these is limited to 25 participants. They are open to non-workshop participants. Cost per meeting, covering a refreshment break and lunch, is € 60 for ½-day working group meetings, and € 100 for the 'Shielded EPMA' working group meeting.

### *Working group: EPMA of Earth Science materials (afternoon)*

A ½-day working group meeting for those interested in the EPMA of Earth Science Materials. The meeting will focus on four or five ten-minute presentations on a particular theme followed by group discussions on the subject and any related issue. Those registering for the WGM will be invited to propose topics which will be selected by the hosts, with the proposers of the subject invited to make the presentations. The subject areas will be known to all in advance and attendees will be able to table questions to the group. Some areas for consideration might include calibration standards; sample preparation; trace element analysis; low voltage high resolution EPMA of small phases; ash particle analysis; analysis of glasses; monazite dating; particular spectrometer configuration and protocols for certain minerals; contamination mitigation; sample charging; Fe2/3 analysis; SXES for Earth Science materials; quant mapping, etc.

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### *Working group: Facility management (afternoon)*

This ½-day working group meeting is an opportunity to discuss the management of a microanalytical facility, such as a scanning electron microscope or an electron microprobe laboratory (among others). One of the primordial tasks of the lab manager is to ensure optimum working conditions for the instrument(s), and to ensure that the analysts – students or researchers – get the data they need with the excellent precision and accuracy they deserve. These instruments are expensive and need care to ensure high quality results, and the manager should be able to easily identify the problem and sometimes even fix it, and to run periodically performance and quality tests.

The working group meeting will consist of a series of talks from Dirk Berger (leader of the IGEME: German interest group of electron microscopic facilities) and Julien Allaz (former leader of FIGMAS: Focussed interest group on microanalytical standards), both being experienced SEM and EPMA lab managers. There will be ample time for group discussion. Additional talks from invited speakers will likely be added. Subjects to be discussed will notably include:

- Instrument maintenance: service contract vs. single repair orders.
- Quality controls and testing of instrument performance.
- Designing and testing an efficient analytical protocol.
- Standards and reference materials.
- Teaching & training for lab users and students.
- Lab organization.
- Comparison of different research environment.
- etc.

As these subjects can be quite broad, participants will be encouraged to provide a list of their preferred topics they would like to see covered during this meeting.

### *Working group: EPMA optimisation in irradiated and nuclear material analysis (afternoon)*

Numerous difficulties are encountered when performing EPMA analysis on irradiated and radioactive nuclear materials. These include, but are not limited to: lack of reliable standards, difficulty handling samples, complex overlaps (e.g., Kr-K $\alpha$ ), lack of reliable  $\phi(\rho Z)$  corrections, etc.

This working group will focus on EPMA analysis of nuclear and radioactive materials. The goal is to identify high priority issues that can be addressed collaboratively by session members following the meeting. This year's meeting will feature a talk by Michael Matthews entitled, "Low voltage EPMA of uranium".

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# PROGRAMME

**Sunday 7 May 2023**

- 09.00 - 13.00 Short course: **Introduction to EBSD - part I.**  
François Brisset (University of Paris-Sud, Institut de Chimie Moléculaire et des Matériaux d'Orsay, Orsay, France)  
Bjørn E. Sørensen (Norwegian University of Science and Technology (NTNU), Department of Geoscience and Petroleum, Trondheim, Norway)  
Aimo Winkelmann (AGH University of Science and Technology, Krakow, Poland & University of Strathclyde, Department of Physics, SUPA, Glasgow, Great Britain)
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- 14.00 - 18.00 Short course: **Introduction to EBSD - part II.**  
  
Short course: **Introduction to X-ray microanalysis.**  
Stuart L. Kearns (University of Bristol, School of Earth Sciences, Bristol, Great Britain)  
  
Short course: **Monte Carlo simulation.**  
Xavier Llovet (University of Barcelona, Scientific and Technological Centers (CCiT), Barcelona, Spain)  
Philippe T. Pinard (Oxford Instruments NanoAnalysis, High Wycombe, Great Britain)  
Silvia Richter (R.W.T.H. Aachen, Central Facility for Electron Microscopy (GFE), Aachen, Germany)
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- 19.00 - 20.00 Registration
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- 20.00 - 22.00 Informal buffet reception hosted by the International Scientific Committee and the Local Organising Committee
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# PROGRAMME

## Monday 8 May 2023

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- 09.00 Welcome and opening address  
Hans DIJKSTRA (President of EMAS)  
Marek FARYNA (EMAS 2023 Workshop chairperson)
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- 09.15 **Exploring the limits of low voltage EPMA of coated samples.**  
*Michael B. MATTHEWS* (AWE Plc., Reading, Great Britain)
- 
- 09.45 **Badger Film: A new thin film analysis programme for EPMA.**  
*Aurelien MOY* (University of Wisconsin, Department of Geoscience, Madison, WI, U.S.A.)
- 
- 10.15 Refreshment break / Exhibition visit
- 
- 11.00 **Presentation of new equipment and software by the exhibiting companies.**  
Chairpersons: Arnold KRUIZE (JEOL (Europe) BV, Nieuw Venneep, The Netherlands)  
Silvia RICHTER (RWTH Aachen, Gemeinschaftslabor für Elektronenmikroskopie (GFE), Aachen, Germany)
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- 12.30 Lunch break / Exhibition visit
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- 14.00 Presentation by the MAS-USA President: **to be defined.**  
*Heather LOWERS* (US Geological Survey, Denver, CO, U.S.A.)
- 
- 14.30 Presentation by the MAS-USA Student Award Winner: **title to be defined.**  
*to be announced*
- 
- 14.45 **Oral presentations of the contributed posters: I.**  
Chairperson: Philipp PÖML (European Commission, JRC Directorate G Nuclear Safety and Security, Karlsruhe, Germany)
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- 15.45 Poster session I / Refreshment break
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- 16.30 **Improving soft X-ray EPMA - Choosing the right MACs.**  
*Xavier LLOVET* (University of Barcelona, Scientific and Technological Centers (CCiT), Barcelona, Spain)
- 
- 17.00 **Subscale inversion of X-ray emission in electron probe microanalysis based on deterministic transport equations.**  
*Manuel TORRILHON* (R.W.T.H. Aachen, Mathematics Division, Center for Computational Engineering Science, Aachen, Germany)
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- 17.30 **Round-table discussion: \* Electron probe microanalysis (EPMA).**  
Chairpersons: Stuart L. KEARNS (University of Bristol, School of Earth Sciences, Bristol, Great Britain)  
Michał ŻELECHOWER (Silesian University of Technology, Institute of Materials Science, Katowice, Poland)
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# PROGRAMME

Tuesday 9 May 2023

09.00	<b>Oral presentations of the contributed posters: II.</b> Chairperson: Julien M. ALLAZ (Eidgenössische Technische Hochschule, Institut für Geochemie und Petrologie, Zürich, Switzerland)
10.00	Poster session II / Refreshment break
10.45	<b>Early Career Scientists' session.</b> Chairperson: Marek FARYNA (Polish Academy of Sciences, Alek. Krupkowski Institute for Metallurgy and Materials Science, Krakow, Poland)
12.15	Lunch break / Exhibition visit
13.45	Presentation by AMAS President: <b>to be defined.</b> <i>William RICKARD</i> (Curtin University of Adelaide, Advanced Resource Characterisation Facility, Perth, WA, Australia)
14.15	Presentation by the AMAS Student Award Winner: <b>title to be defined.</b> <i>to be announced</i>
14.30	<b>In-situ EBSD martensitic phase transformation and recrystallisation.</b> <i>Robert CHULIST</i> (Polish Academy of Sciences, Alek. Krupkowski Institute for Metallurgy and Materials Science, Krakow, Poland)
15.00	<b>Developments and applications in transmission Kikuchi diffraction.</b> <i>Tomasz TOKARSKI</i> (AGH - University of Science and Technology, Academic Centre for Materials and Nanotechnology, Krakow, Poland)
15.30	Refreshment break / Exhibition visit
16.15	<b>Local, absolute residual strain measurements using combined ring-core milling and cross-correlation EBSD in a SEM.</b> <i>Stefan ZAEFFERER</i> (Max-Planck Institut für Eisenforschung GmbH, Diffraction and Microscopy Group, Düsseldorf, Germany)
16.45	<b>EBSD versus Kossel.</b> <i>Enrico LANGER</i> (Technical University of Dresden, Institute of Solid State and Materials Physics, Dresden, Germany)
17.15	Round-table discussion: * <b>EBSD and related techniques.</b> Chairpersons: François BRISSET (Université Paris-Sud, Institut de Chimie Moléculaire et des Matériaux d'Orsay, Orsay Cedex, France) Grzegorz CIOS (AGH - University of Science and Technology, Academic Centre for Materials and Nanotechnology, Krakow, Poland)



# PROGRAMME

Thursday 11 May 2023

- 09.00 **Low voltage electron energy-loss spectroscopy in a scanning electron microscope: A realistic option for routine materials characterisation?**  
*Nicolas BRODUSCH* (McGill University, McGill Electron Microscopy Research Group, Montréal, Québec, Canada)
- 
- 09.30 **FIBTOFSIMS - Recent advances in secondary ion mass spectrometry for analytical dual beam focussed ion beam instruments.**  
*Johann MICHLER* (Swiss Federal Laboratories for Materials Testing and Research, Laboratory for Mechanics of Materials and Nanostructures, Thun, Switzerland)
- 
- 10.00 **Contribution by a Honorary Membership recipient.**
- 10.30 Refreshment break
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- 11.00 **Coupled SEM-EDS-Raman: A complementary approach for characterisation - Application to geomaterials.**  
*Guillaume WILLE* (BRGM - Bureau de Recherches Géologiques et Minières, LAB/MIN, Orléans, France)
- 
- 11.30 **Cathodoluminescence in STEM.**  
*Mathieu KOCIAK* (Université Paris-Sud, Laboratoire de Physique des Solides, Orsay Cedex, France)
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- 12.00 Round-table discussion: \* **Combined techniques.**  
Chairpersons: Maria SOZAŃSKA (Silesian University of Technology, Faculty of Materials Engineering & Metallurgy, Katowice, Poland)  
Pawel ZIĘBA (Polish Academy of Sciences, Alek. Krupkowski Institute for Metallurgy and Materials Science, Krakow, Poland)
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- 13.00 Concluding remarks
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- 14.00 - 18.00 Working group: **EPMA of Earth Science materials.**  
Stuart L. Kearns (University of Bristol, School of Earth Sciences, Bristol, Great Britain)  
Jon Wade (University of Oxford, Department of Earth Sciences, Oxford, Great Britain)
- Working group: **Facility management.**  
Julien M. Allaz (Eidgenössische Technische Hochschule, Institute für Geochemie und Petrologie, Zürich, Switzerland)  
Dirk Berger (Technical University Berlin, Center for Electron Microscopy (ZELMI), Berlin, Germany)
- Working group: **EPMA optimisation in irradiated and nuclear material analysis.**  
Karen Wright (Idaho National Laboratory, Department for Advanced Characterization, Idaho Falls, ID, U.S.A.)
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## Registration fees

Online registration is available at: [www.microbeamanalysis.eu](http://www.microbeamanalysis.eu). Participants are encouraged to complete registration and arrange for their payment, preferably before **15 March 2023** to qualify for reduced rates.

### The registration fee includes:

- **lunches** (Mo. – We.) and **all refreshment breaks**;
- the **welcome buffet** (Su.) and the **workshop dinner** (We.);
- the workshop programme booklet;
- a PDF-copy of the workshop's *Book of Tutorials and Abstracts* containing the detailed programme, the text of the invited lectures, and the abstracts of the poster presentations;  
a hard copy of the workshop's *Book of Tutorials and Abstracts* can be ordered, before 1 April 2023, by completing the relevant tick box on the registration page;
- a hard copy of the Workshop Proceedings (except with student registration, or equivalent).

	early rate until March 15	late rate as of March 16
<i>Workshop attendance</i>		
- Current EMAS members	€ 500.00	€ 600.00
- Registration + 2-year EMAS membership	€ 570.00	€ 670.00
- Non-member registration only	€ 650.00	€ 750.00
- Student / EMAS member in retirement (without proceedings volume)	€ 250.00	
<i>Workshop dinner</i> (additional ticket) (for exhibitors, accompanying persons)		
	€ 75.00	
<i>Proceedings volume</i> (hard copy) (for students, exhibitors, accompanying persons)		
	€ 40.00	
<i>Short courses</i> (Sunday 7 May 2023)		
- Introduction to EBSD (full-day)	€ 100.00	
- Introduction to X-ray microscopy (afternoon)	€ 60.00	
- Monte Carlo simulation (afternoon)	€ 60.00	
<i>Working group meetings</i> (Thursday 11 May 2023)		
- EPMA of Earth Science materials (afternoon)	€ 60.00	
- Facility management (afternoon)	€ 60.00	
- Irradiated & nuclear mater. analysis (afternoon)	€ 100.00	

## Social programme

All participants and accompanying persons are invited to the welcome buffet reception on Saturday evening. This informal get-together is hosted by the International Scientific Committee and the Local Organising Committee.

On Tuesday evening, a guided city visit will take us to the workshop dinner, which will be held at the National Museum at the Cloth Hall. The cost is included in the registration fee but is extra for accompanying persons.

## Payment

Payment of the registration fee should be preferentially made through the EMAS website ([www.microbeamanalysis.eu](http://www.microbeamanalysis.eu)) using the online PayPal system (no account necessary); no credit card information will be stored on the EMAS website; various payment options are available (e.g., credit cards) depending on your country. An invoice/receipt will be generated by the system.

Alternatively, if you prefer to pay by bank transfer or any other offline payment method, please choose the "pay offline" button and follow the instructions; this will generate your invoice, which includes bank transfer and contact details.

## Cancellation

Refund of the registration fee (less € 50 administrative costs) will only be granted if notification of cancellation has reached the Workshop Secretariat before 1 April 2023. After this date, no refund will be made. Refunds will be processed after the Workshop.

## Insurance

The organisers cannot be held responsible for any personal accident or damage to the property of the participants.

## Personal data

Personal information supplied to EMAS will be held on computer and may be used only for purposes connected with the activities of the European Microbeam Analysis Society.

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## Accommodation

A dedicated hotel accommodation booking webpage can be found on the following website: [emas2023.jordan.pl/](https://emas2023.jordan.pl/).

## Venue

Jagiellonian University  
Auditorium Maximum  
ul. Krupnicza 33, Krakow, Poland

The Auditorium Maximum is a modern conference and teaching facility opened in 2005. It is located in close proximity to the city centre and most hotels. It features a number of rooms of varying sizes and functionalities.

The ancient, royal city of Krakow is a unique symbol of Polish national identity. Enchantingly picturesque, rich in relics of all epochs, it represents the thousand-year-long history of the Polish nation. In Krakow you can admire many different styles of architecture, unique Romanesque objects, monumental Gothic edifices, and masterpieces by some of the most outstanding architects of the Renaissance and Baroque period. Krakow has always been a centre of Polish culture and science. Damaged by fires, wars and foreign occupation, it has always revived and continued to fascinate with its beauty.

As long ago as the 11th century Krakow became the capital city of Poland. The Royal Castle and cathedral on Wawel Hill was the coronation and burial place of Polish monarchs. In the 13th century the layout of the city, which has been preserved till today, was established with what is still one of the biggest market squares in Europe (200 m x 200 m), a Gothic-Renaissance Cloth-Hall (Sukiennice) and the Town-hall tower. The city fortification system was built in the 13th - 15th centuries; parts of the wall, four turrets and a barbican have survived to this day. The site of the former walls has been replaced by a green belt called Planty. In the 14th century, the Academy of Krakow (later the Jagiellonian University) one of the oldest universities in Europe was founded; Nicolaus Copernicus (Mikolaj Kopernik) was one of its students.

Krakow is renowned for its numerous old churches, including the Gothic St. Mary's Church famous for its magnificent altar carved by Wit Stwosz. Probably the most famous landmark in Krakow is Wawel Castle situated on Wawel Hill overlooking the river Vistula. This Renaissance castle boasts a beautiful arcaded courtyard, magnificent interiors and a famous set of Flemish tapestries. As well as the Renaissance castle, Krakow also has a

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number of beautiful palaces of the same period belonging to the rich citizens of the city. One example is the Pod Baranami Palace. After the partition of Poland (by the end of the 18th century), Wawel became a necropolis for national heroes (Prince Józef Poniatowski, Tadeusz Kościuszko) and poets (Adam Mickiewicz, Juliusz Słowacki). Later this role was taken over by the church vault of the Paulite Fathers in Skalka. In this period, many museum collections were founded, such as the art collection of the Czartoryski family (with Leonardo da Vinci's "Lady with an Ermine"). Krakow is also the city of Karol Wojtyła (Pope John Paul II), the composer Krzysztof Penderecki, and many other famous people. Krakow is one of the greatest centres of science and Krakow University of Technology is one of its universities. In 1978, Krakow was entered in the UNESCO World Heritage Register.

For more information about the city of Krakow please visit: [www.krakow.pl](http://www.krakow.pl) or [emas2023.jordan.pl/](http://emas2023.jordan.pl/).

### **The weather in Krakow in May**

Krakow has a tempered climate. The day temperatures in May varies quite significantly between different years, sometimes with summer temperatures reaching up to 20 °C, but also with the possibility of 5 °C and snow showers. It is therefore recommended to bring a raincoat and a woollen sweater just in case, though May is the most dry month in Krakow.

### **How to get to the Workshop venue**

More information can be found on the following website: [emas2023.jordan.pl/](http://emas2023.jordan.pl/).

- a) By air: The John Paul II International Airport Krakow-Balice is located 17 km west of the city centre and can boast a brand-new passenger terminal opened in September 2015. The new terminal connects directly to the airport parking garage and the new 'Kraków Lotnisko/Airport' train station via a convenient skywalk. Offering the full services and amenities of a modern airport, here you will find ATMs and currency exchange, tourist information, taxi and public transportation stops, car rental desks, restaurants and shops, a chapel, business lounges and VIP services.
  - b) By train: The main railway station, Dworzec Główny, is conveniently situated in the very centre of the city. There is a good train connection between Warsaw and Krakow (express or InterCity trains go every hour during day, journey lasts less than 3 h). Taxi stand can be found outside of the main entrance as well as at the top floor car park. Information on local train connections is available [here](#).
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c) By car: Krakow is located 300 km south of Warsaw. The A4 motorway, via Wroclaw and Katowice, leads to Krakow from Western Europe. Traffic restriction zones are enforced in the city from Monday until Saturday, 10.00 am - 8.00 pm. The conference venue is located in the parking subzone A. It is necessary to pay parking fees within the subzones (subzone A: 6.00 PLN/hour; subzone B: 5.00 PLN/hour; subzone C: 4.00 PLN/hour). Parking is permitted only in designed areas.

We strongly suggest leaving your car on the hotel parking and use public transportation or walk.

Absolute priority is given to pedestrians and the maximum driving speed should not exceed 20 km/h.

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## International Scientific Committee

Julien M. Allaz	<i>Switzerland</i>
François Brisset	<i>France</i>
Miran Čeh	<i>Slovenia</i>
Grzegorz Cios	<i>Poland</i>
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Philipp Pöml	<i>Germany</i>
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## Local Organising Committee

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Updated information on the workshop can be found at the EMAS 2023 website: [www.microbeamanalysis.eu](http://www.microbeamanalysis.eu).

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