

FINAL ANNOUNCEMENT



European Microbeam Analysis Society

EMAS 2019

**16th
EUROPEAN WORKSHOP**

on

MODERN DEVELOPMENTS AND APPLICATIONS IN MICROBEAM ANALYSIS

19 to 23 May 2019
at the
NTNU, Realfagbygget
Trondheim, Norway

Organised in collaboration with:
Norwegian University of Science and Technology
(NTNU)

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), and Konstanz (2017). They included sessions covering electron (EPMA, TEM, SEM, Auger, EELS), ion (SIMS, FIB), and nuclear (RBS, NRA) microbeam methods.

The main topics of the **Sixteenth Workshop** (EMAS 2019) are: electron probe microanalysis (EPMA); electron backscatter diffraction (EBSD); automated mineralogy; μ -XRF fluorescence; complementary techniques such as combined Raman and EDS, 3D SEM-EDS microanalysis, combined TEM and atom probe tomography; 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).

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: 1.33 m high by 0.96 m wide.

Two awards will be given: a) an EMAS Award for the best poster by a young scientist (< 30 years of age) 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.

Young scientists' session

One session is dedicated to giving young scientists (post-graduates and scientists under 30) the opportunity to present their work in a talk lasting 15 minutes including time for discussion. There will be six such presentations selected from the submitted abstracts

The best contribution and presentation will receive a certificate and an invitation from the Microanalysis Society of America (MAS) to present his/her work at the Microscopy and Microanalysis 2020 Meeting to be held in Milwaukee, Wisconsin (the invitation will include a free conference registration and financial support from MAS and EMAS for travel and living expenses).

Young scientists wishing to be considered for this session should submit a written application to the Workshop Secretariat, reaching it before **15 November 2018**, and should be member of EMAS. Recipients of an EMAS bursary are also eligible to apply.

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). 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 2018**. Authors will be notified of the acceptance of their poster by 15 January 2019.

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 2018** : submission of abstracts for poster presentations
closing date for EMAS bursary applications
 - * **15 January 2019** : notification of acceptance of contributions
notification of Young Scientists' Session allocations
 - * **15 March 2019** : early registration deadline
hotel accommodation deadline
 - * **19 May 2019** : short courses (morning and/or afternoon)
start of the EMAS 2019 Workshop
 - * **15 June 2019** : submission of manuscripts for publication in the
proceedings
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EMAS bursaries

A number of EMAS bursaries are available to (student) **members** of the Society. They include a free “student” registration and free accommodation package for the duration of the Workshop (in a shared twin room) in a hotel assigned by the Workshop. The conditions for the award of an EMAS bursary are as follows:

- the applicant must submit an abstract for a poster contribution;
- the applicant must be a young scientist (under 30) and a member of EMAS;
- a letter from the applicant's supervisor supporting the application must be supplied together with the application (see further).

A number of EMAS bursaries are available to **technician members** of the Society. They include a free “student” registration and free accommodation package for the duration of the Workshop (in a shared twin room) in a hotel assigned by the Workshop. The conditions for the award of an EMAS bursary are as follows:

- the applicant must submit an abstract for a poster contribution;
- the applicant must be a member of EMAS;
- a letter from the applicant's supervisor/manager supporting the application must be supplied together with the application (see further).

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 2018**. Applicants will be notified of the allocation of an EMAS bursary by **15 January 2019**.

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.

Short courses (Sunday May 19th, 2019)

For detailed course descriptions, see: www.microbeamanalysis.eu.

Each course is limited to maximum 25 participants. The courses are open to non-workshop participants. Cost per course, covering course material, a refreshment break and lunch, is € 60 for ½-day courses and € 100 for the full-day 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. We will also demonstrate the advantages of distortion correction for large area scans and offline EBSD capabilities, which will be shown during a practical demonstration.

Introduction to quantitative EDS X-ray microanalysis (morning)

This half-day course is aimed at new users to X-ray microanalysis in the SEM utilising the energy-dispersive X-ray detector (EDS). We will overview the generation of X-rays under electron beam bombardment, review the factors controlling emission of those X-rays and consider the performance characteristics of the EDS and discuss the benefits and limitations of the resulting energy-dispersive spectrum. We will then apply EDS to the acquisition of quantitative analysis of materials (including a consideration of standards-based analysis and standardless analysis) and mapping and phase identification in unknown samples.

Quantitative compositional mapping by EPMA - An introduction to XMapTools software (morning)

Over the last decade, quantitative compositional mapping has emerged as a powerful technique to aid petrological interpretations. Chemical maps of major and minor elements can both depict the spatial distribution of each mineral phase and capture their compositional variability at the micro-scale.

However, computer tools are required to calibrate the maps and to produce numerical datasets that enable quantitative investigation of specific petrological processes. The software solution XMapTools is at the cutting edge of progress in this sector, and aims to simplify the data processing by providing statistical toolboxes and functions embedded in a user-friendly graphical user interface.

This half-day short course is designed as an XMapTools beginner course, where participants will be introduced to the software and learn how to calibrate and analyse compositional maps acquired by EPMA. It will provide an important foundation accessible to high-level undergraduate students, graduate students, and professional researchers who are using or planning to use quantitative compositional maps in their own studies.

Introduction to transmission electron microscopy (TEM) (morning)

TEM – transmission electron microscopy – comprises a series of invaluable characterisation tools covering a wide field of materials research. The combination of unparalleled spatial resolution ($<1\text{\AA}$) with a range of diffraction, imaging and spectroscopic techniques means that researchers within fields ranging from protein analysis in life science through chemistry and geology to metal, semiconductor and nanomaterials technology will encounter the technique as TEM data or in literature.

This half-day course will give you a short introduction into this generic technique with a focus on possibilities and limitations. The general principles will be explained and relevant TEM expressions and abbreviations will be explained, so that after this class you will both have an insight into whether or not TEM will be useful in your research (and how to proceed), and be more confident in understanding TEM data presented in literature and talks.

Introduction to WDS X-ray microanalysis (afternoon)

Here we will consider both the parallel beam and Rowland circle wavelength-dispersive spectrometer (WDS) as applied to SEMs and EPMA respectively. We will compare performance characteristics of the WDS with the energy-dispersive spectrometer (EDS) and consider various aspects of the resulting WD spectrum. A lecture on optimising the WDS setup in EPMA will precede discussions on the quantification of the WDS signal detailing its strengths and limitations. We will conclude by looking at mapping using WDS.

Participants would ideally have an understanding of theory of X-ray generation under electron beam bombardment or have undertaken the course on EDS analysis in the morning.

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 half-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. Taking advantage of their respective possibilities, different programmes will be demonstrated in the course, including Casino, NISTMonte, PENELOPE, Monaco, MC X-Ray and PyMonteCarlo. Participants of the short course at the EMAS 2017 Workshop are welcome to attend as well. This short course will cover different Monte Carlo programmes and examples than in Konstanz. Attendees are encouraged to bring a laptop.

Electron probe maintenance (afternoon)

The care and correct maintenance of an SEM is the key aspect for a correctly operating instrument. This workshop will cover many aspects of SEM maintenance. Some of the topics to be covered include: vacuum systems and their maintenance, cleaning of microscopes parts such as apertures and wehnelt assembly, basic monitoring of instrument, testing of instrument operation (resolution, magnification calibration), EDS maintenance and calibration, monitoring filament conditions (filament life improvement and setting), and sorting out imaging problems.

Shielded EPMA for use in irradiated nuclear fuel analysis: Problems and opportunities (afternoon)

Shielded EPMA has been used in the analysis of irradiated nuclear materials for several decades; however, significant areas for improvement remain. This short course is intended for shielded EPMA users proficient in its application to the analysis of irradiated nuclear fuels. The course will focus on best practices in sample handling and preparation, addressing common problems with software and hardware, and devising common goals for future improvements in analytical capabilities.

The fee of this short course includes a social event on either Mo.- or Tu.-evening for the course participants.

PROGRAMME

Sunday 19 May 2019

- 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)
Jarle Hjelen (Norwegian University of Science and Technology (NTNU), Department of Materials Science and Engineering, Trondheim, Norway)
Bjørn E. Sørensen (Norwegian University of Science and Technology (NTNU), Department of Geoscience and Petroleum, Trondheim, Norway)
- Short course: **Introduction to quantitative EDS X-ray microanalysis.**
Stuart L. Kearns (University of Bristol, School of Earth Sciences, Bristol, Great Britain)
- Short course: **Quantitative compositional mapping by EPMA - An introduction to XMapTools software.**
Pierre Lanari (University of Bern, Institute of Geological Sciences, Bern, Switzerland)
- Short course: **Introduction to transmission electron microscopy (TEM)**
Randi Holmestad (Norwegian University of Science and Technology (NTNU), Department of Physics, Trondheim, Norway)
-
- 14.00 - 18.00 Short course: **Introduction to EBSD - part II.**
- Short course: **Introduction to WDS X-ray microanalysis.**
Stuart L. Kearns (University of Bristol, School of Earth Sciences, Bristol, Great Britain)
- Short course: **Monte Carlo simulation.**
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)
- Short course: **Electron probe maintenance.**
Richard Wuhler (University of Western Sydney, Advanced Materials Characterisation Facility, Penrith, NSW, Australia)
- Short course: **Shielded EPMA for use in irradiated nuclear fuel analysis: Problems and opportunities.**
Karen Wright (Idaho National Laboratory, Dept. Advanced Characterization, Idaho Falls, ID, U.S.A.)
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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 20 May 2019

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- 09.00 Welcome and opening address
Michael B. MATTHEWS (President of EMAS)
Bjørn E. SØRENSEN (EMAS 2019 Workshop chairperson)
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- 09.15 **About the reliability of EBSD measurements: data enhancement.**
Gert NOLZE (Federal Institute for Materials Research and Testing (BAM),
Department 5 - Materials Engineering, Berlin, Germany)
-
- 10.00 **A dictionary indexing approach for EBSD.**
Marc DE GRAEF (Carnegie Mellon University, Materials Science and
Engineering Department, Pittsburgh, PA, U.S.A.)
-
- 10.45 Refreshment break / Exhibition visit
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- 11.15 Presentation by the MAS-USA President: **to be defined.**
N. N. (Australia)
-
- 11.45 Presentation by the AMAS Student Award Winner: **title to be defined.**
to be announced
-
- 12.00 Lunch break / Exhibition visit
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- 13.30 **Presentation of new equipment and software by the exhibiting companies.**
chairpersons: Jan-Pieter VERMEULEN (Micro to Nano, Haarlem,
The Netherlands)
Xavier LLOVET (University of Barcelona, Scientific and
Technological Centers (CCIT), Barcelona, Spain)
-
- 15.30 **Oral presentations of the contributed posters: I.**
chairperson: Philipp PÖML (European Commission, JRC Directorate G -
Nuclear Safety and Security, Karlsruhe, Germany)
-
- 16:30 Poster session I / Refreshment break
-
- 17.00 **Recent features in EBSD, including new trapezoidal correction for
multi-mapping.**
Bjørn E. SØRENSEN (Norwegian University of Science and Science
(NTNU), Department of Geoscience and Petroleum, Trondheim, Norway)
-
- 17.45 **Advances in electron channelling contrast imaging and electron
backscatter diffraction for imaging and analysis of structural defects
in the scanning electron microscope.**
Carol TRAGER-COWAN (University of Strathclyde, Department of Physics,
SUPA, Glasgow, Great Britain)
-
- 18.30 Round-table discussion: * **Electron backscatter diffraction (EBSD).**
chairpersons: François BRISSET (University of Paris-Sud, Institut de
Chimie Moléculaire et des Matériaux d'Orsay, Orsay, France)
Enrico LANGER (Technical University of Dresden, Institute
of Solid State Physics, Dresden, Germany)
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PROGRAMME

Wednesday 22 May 2019

- 09.00 **Oral presentations of the contributed posters: III.**
chairperson: Fernanda GUIMARÃES (Laboratório Nacional de Energia e Geologia, I.P., Laboratório Ciência e Tecnologia Mineral, S. Mamede de Infesta, Portugal)
-
- 10.00 Poster session III / Refreshment break
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- 10.45 **Upscaling of 2D mineralogical information to 3D volumes for geoscience applications using a multi-scale, multi-modal and multi-dimensional approach.**
Alan BUTCHER (Geological Survey of Finland (GTK), Geomaterials and Applied Mineralogy, Espoo, Finland)
-
- 11.30 **Applications of automated mineralogy.**
Bernard DOLD (Luleå University of Technology, Division of Geosciences and Environmental Engineering, Luleå, Sweden)
-
- 12.15 Round-table discussion: * **Automated mineralogy.**
chairperson: Maarten A.T.M. BROEKMANS (Geological Survey of Norway, Mineral Resources / Laboratory, Trondheim, Norway)
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- 13.00 Lunch break / Exhibition visit
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- 14.30 EMAS Annual General Meeting
-
- 15.15 **A deeper insight into materials – Potentials and limitations of μ XRF.**
Roald TAGLE (Bruker Nano GmbH, Berlin, Germany)
-
- 16.00 Refreshment break / Exhibition visit
-
- 16.30 **SI traceable characterisation of nanomaterials by X-ray spectrometry.**
Burkhard BECKHOFF (Physikalisch-Technische Bundesanstalt (PTB), X-ray Spectrometry, Berlin, Germany)
-
- 17.15 Round-table discussion: * **μ -XRF fluorescence.**
chairperson: Silvia RICHTER (RWTH Aachen, Gemeinschaftslabor für Elektronenmikroskopie (GFE), Aachen, Germany)
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- 19.30 Workshop dinner at the Banksalen hall, Trondheim.
Awards ceremony.
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PROGRAMME

Thursday 23 May 2019

- 09.00 **Recent developments in soft X-ray emission spectroscopy.**
Masami TERAUCHI (Tohoku University, Institute for Multidisciplinary Research for Advanced Materials, Sendai, Japan)
-
- 09.45 **Spatial resolution limits of EPMA.**
Ben BUSE (University of Bristol, School of Earth Sciences, Bristol, Great Britain)
-
- 10.30 Contribution by a Honorary Membership recipient.
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- 10.50 Refreshment break
-
- 11.10 **Development and validation of standardless and standards-based X-ray microanalysis.**
Philippe T. PINARD (Oxford Instruments NanoAnalysis Ltd., High Wycombe, Great Britain)
-
- 11.55 **U-Th-Pb dating with the EPMA.**
Julien M. ALLAZ (Eidgenössische Technische Hochschule, Institut für Geochemie und Petrologie, Zürich, Switzerland)
-
- 12.40 Round-table discussion: * **Electron probe microanalysis (EPMA).**
chairpersons: Kristian DRIVENES (Norwegian University of Technology and Science (NTNU), Department of Geoscience and Petroleum, Trondheim, Norway)
Xavier LLOVET (University of Barcelona, Scientific and Technological Centers (CCiT), Barcelona, Spain)
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- 13.40 Concluding remarks
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Registration fees

Online registration is available at: www.microbeamanalysis.eu. Participants are encouraged to complete registration and arrange for their payment, preferably before **15 March 2019** 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, until 31 March 2019, 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 15
<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 19 May 2019)		
- Introduction to EBSD (full-day)	€ 100.00	
- Introduction to quantitative EDS (morning)	€ 60.00	
- Introduction to the XMAP Toolbox (morning)	€ 60.00	
- Introduction to TEM (morning)	€ 60.00	
- Introduction to WDS (afternoon)	€ 60.00	
- Monte Carlo simulation (afternoon)	€ 60.00	
- Electron probe maintenance (afternoon)	€ 60.00	
- Shielded EPMA (afternoon)	€ 100.00	

Social programme

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

The workshop dinner, on Wednesday evening, will be held in Banksalen hall in the centre of Trondheim. 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) 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 15 April 2019. 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.

Accommodation

We have arranged for favourable room rates (incl. breakfast and taxes) in two hotels near the city centre of Trondheim and within walking distance of the workshop venue. Please be advised that the mentioned rates are only valid for a minimum stay of 3 nights. It is advisable to book your hotel accommodation as soon as possible to benefit from these preferential rates.

	single	double for single use	double or twin
Comfort Park Hotel – 50 rooms co.park@choice.no tel: +47-73-83.39.00 booking code: 121418	NOK 994	NOK 1094	NOK 1199
Quality Hotel Augustin – 60 rooms q.augustin@choice.no tel: +47-73-54.70.00 booking code: 130038	NOK 994	NOK 1094	NOK 1199

It is not possible to book with the mentioned booking code through the hotel's website; it must be booked by e-mailing or calling the hotels.

Venue

Norwegian University of Science and Technology
Realfagbygget
Høgskoleringen, Trondheim, Norway

The Realfagbygget is a modern concrete building, with natural downlights and high ceilings, at the centre of the NTNU campus and has hosted several conferences.

Trondheim is a famous city from the Middle Ages in the centre of Norway with one of the most famous attractions being the Nidaros Cathedral. The cathedral is built from soapstone and is the most famous attraction in Trondheim.

The Nidelva river runs through the city centre, quite close to the hotel accommodation. Walking paths follow the river all the way through the city, from the famous wooden buildings in the city centre through the forest and the big dam of "Nedre Leirfossen". The river is famous for its good salmon fishing, which also takes place in the city centre, and in June one sometimes can see and hear salmon jumping while enjoying refreshments in the local pubs.

Trondheim is also situated right next the large Trondheimsfjord, which host a rich population of fish and wildlife such as small whales (porpoise) or even white tailed eagles.

Though Trondheim is a medium-sized city (\pm 190,000 inhabitants) it is closely surround by wild natural resorts, including Bymarka and Estenstadmarka, that in winter are used for cross country skiing (October/November through April/May), and hiking in the summer. The resorts host many of the common northern Scandinavian animals, such as moose, and small predators like lynx and foxes. The resorts can be reached in less than 20 minutes by bus or train from the city centre.

How to get to the Workshop venue

- a) By air: Participants arriving by plane are advised to arrange travel through Trondheim Værnes airport, from where an airport bus leaves for the city centre, with stops at all the hotels, including the two proposed hotels. From the city centre, the workshop venue is within walking distance, but bus number 5, having stops close to the proposed hotels, stops at the NTNU campus, with the “NTNU North” stop being next to the Realfagbygget building, which is the workshop venue.
- b) By car: Trondheim can be reached by the E6. This is a 7-hour plus drive from Oslo, taking you past some quite spectacular Norwegian Mountain terrains.

The weather in Trondheim in May

Trondheim has 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 Trondheim.

International Scientific Committee

Kurt Aasly	<i>Norway</i>
François Brisset	<i>France</i>
Maarten Broekmans	<i>Norway</i>
Miran Čeh	<i>Slovenia</i>
Hans Dijkstra	<i>The Netherlands</i>
Kristian Drivenes	<i>Norway</i>
Fernanda Guimarães	<i>Portugal</i>
Jarje Hjelen	<i>Norway</i>
Stuart L. Kearns	<i>Great Britain</i>
Enrico Langer	<i>Germany</i>
Xavier Llovet	<i>Spain</i>
Michael B. Matthews	<i>Great Britain</i>
Philipp Pöml	<i>Germany</i>
Silvia Richter	<i>Germany</i>
Bjørn E. Sørensen (chair)	<i>Norway</i>
Giovanni Valdrè	<i>Italy</i>

Local Organising Committee

Wenche Finseth
Morten P. Raanes
Bjørn E. Sørensen (chair)
Luc Van't dack

Workshop Secretariat

EMAS 2019 Workshop Secretariat
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Updated information on the workshop can be found at the EMAS 2019 website: www.microbeamanalysis.eu.
