

BIANNUAL NEWSLETTER

A MESSAGE FROM :: the editor

Dear ISMET community,

Fitting into the theme of 2020 where everything has been delayed, postponed or cancelled whilst we all re-adjust and learn to cope in a different world – here is the slightly (actually very) late ISMET summer newsletter. In it we celebrate achievements and reflect on the impacts to individuals and our community of a global pandemic that has affected us all.

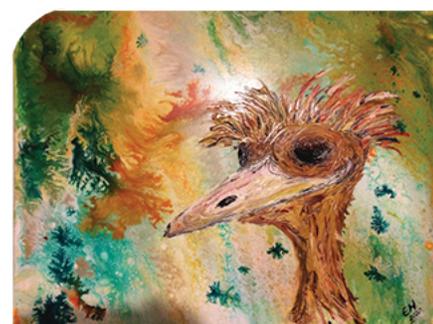
In this edition we have a feature article on some great outreach work being carried out by the LEQUIA group at the University of Girona, complete with photos of people all working together in the same room, let's hope this is something we return to soon. We have a summary of the first ever virtual ISMET conference which I am sure many of you attended. It was also important to us to reflect on our current situation, and so thanks to those members of our community who gave us their personal thoughts about the good, the bad and the useful aspects of the global pandemic. We also celebrate the ISMET competition winners and new board members.

I would like to thank all those who contributed to this newsletter and helped pull it together, in particular Frauke Kracke who co-ordinated the COVID reflections section, Pavlina Theodosiou who wrote the conference summary, and Ramiro Blasco, Narcis Pous and Raquel García Pacheco for their outreach work. I would also like to thank Annemiek for her support and Belén Barroeta and Matt Yates for their great help in co-ordinating this issue. Most importantly I thank you the ISMET community; please do share the info on how to join ISMET, located at the end of this newsletter, with colleagues so they too can benefit.

Finally, there are no sketches in this issue – I have limited time for artistic pursuits, however I will share a painting I did within the first few weeks of lock-down, it is a reflection of how I felt being shut in a house with three children and no kitchen (we had unfortunately just ripped it out just before the UK belatedly woke up to the reality the world was in).



Dr. Elizabeth Heidrich



Crazed Ostrich, oil on pouring media

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v.ISMET 1 :: my take on the first virtual ISMET

by Pavlina Theodosiou



**“In the midst of chaos, there is also opportunity”
– Sun Tzu (544–496 BC)**

This time, last year, everything was so different. We were all together in Okinawa, discussing about our research projects and ideas, enjoying the great hospitality that OIST offered us and of course immersing ourselves in the Japanese culture one way or another.

As we all know, at the moment we are living in strange times that have not allowed us to physically be together again and benefit from the great ISMET community spirit that characterises these meetings. Nonetheless overcoming this hurdle the creative organisers of the 1st-Virtual ISMET made it not only a reality but a successful event, and of course the warm ISMET spirit was conveyed through the screens.

One of the upsides was that the virtual conference this year gave the opportunity to members that usually are unable to attend the meetings overseas, due to family and children responsibilities or budget restrictions to join in and engage with everyone. This is a fantastic bonus and a lesson that we can learn from, to make future conferences more accessible for everyone. Also, the organisers allowed time for casual discussions to take place in the Zoom lounge rooms which almost felt the same as chatting over a warm cup of coffee in the conference lounge. Personally, one of the highlights of the event was the "Meet the researcher sessions" which I wish lasted longer. There, PhD students and other PostDocs like myself were able to speak with and get valuable answers from scientists we admire and have followed for years. These discussions covered a range of topics from academic career advice to technical questions. The ZOOM medium enabled the otherwise shy and reserved students to come forward and make use of the chat function to ask questions to senior academics. Also, the chat functionalities allowed conversations to arise and continue after each presentation between audience and speakers which otherwise may not have happened in an in-person conference due to the busy schedules of the conference days.

The take home message from this event is that the organisers took the time to embrace the virtual environment and organise this conference in order to give us the ISMET experience we would have liked to have in person, even when we were all sitting thousands miles away. Thanks a lot Catarina, Fernanda and Lucinda for your hard work.

Hopefully, see you all in person in the next meeting, until then stay safe!

~Pavlina Theodosiou

Cell Challenge to Engage High School Students



High School Teacher Training Session

LEQUIA, the researcher group of the University of Girona, will organize the postponed 5th edition of the International Society for Microbial Electrochemistry and Technology European Conference, EU-ISMET 2020. It will take place in Girona (Spain) from 13th to 15th September 2021. Within this context, it has been proposed an innovative activity, Cell Challenge, to engage high school students in science and research. Cell Challenge is a competition to design an innovative bioelectrochemical system, which enable to improve wastewater quality and to recover nutrients contained in it.

To face up the challenge, firstly teachers have been previously trained during 8 hours to acquire the basic knowledge required. Along three sessions, fundamental concepts about bioelectrochemical systems, their main components, materials and needs for good performance were explained. Teachers learned how to scale up from laboratory scale systems to full scale through the experiences of already implemented systems. Moreover, they complemented the training visiting LEQUIA laboratories. During the upcoming months, teachers will appeal to students of their high schools to participate in this challenge. According to Ramiro Blasco Gómez, Narcís Pous Rodríguez and Raquel García Pacheco (technical supportive researchers), teachers seemed highly motivated after the training.

“Indeed, some of them will encourage students to carry out a -high school thesis work- about bioelectrochemical systems”, they told us. “It is a completely new world for them, but it is so interesting due to its integral approach. Student will have to research about microbiology, chemistry, energy, wastewater issues... It is a real challenge!”, they finally pointed out.

Thus, students developed the bioelectrochemical cells from early January 2020 following their teachers' guides and the telematics support of researchers of LEQUIA group. Students had a common objective: design a bioelectrochemical cell prototype with specific size (up to 20x20x20 cm) able to remove organic matter and nitrogen contained in wastewater. During July, students will develop the prototype at LEQUIA laboratories supervised by researchers. Finally, in September, students will have the opportunity to show their prototype in the Cell Challenge competition. It will be evaluated the prototype, the student oral presentation (in English) and the material they used. Student will have to explain how the cell works (or how potentially would work) and the reactions that happen within the system. Originality, future economic viability and sustainability (from material point of view) are the main pillars to win the Cell Challenge. Finalists will show their prototype to the international scientific community within EU-ISMET 2021. Then, EU-ISMET 2021 attendants will be in charge of selecting the best prototype. The winner team and their classroom colleagues will be granted with a prize.

Courage and good luck to achieve the challenge! It is an additional effort for everyone, but knowledge will be acquired in a different and funny way. “We are sure that the teamwork will show great ideas that only students of their age would have. And who knows, maybe in the near future we will see some of their systems in the industry”, concluded the researchers.

-Dr Ramiro Blasco, Dr Narcís Pous and Dr Raquel García Pacheco, LEQUIA-UdG, Girona, Spain



ISMET 2021 Conference Headquarters

What are the good, the bad, and maybe the useful things that have come out of the pandemic?



Catarina M. Paquete, ITQB NOVA, Portugal

The good: I am able to spend more time at home with my family (husband and three children)

The bad: My social life had to be restricted, including being with my family/friends, and my children with their friends

The useful stuff: I can schedule my day better: manage better my stay in the laboratory and time at home.



Jinyue Jiang, Andlinger Center, USA

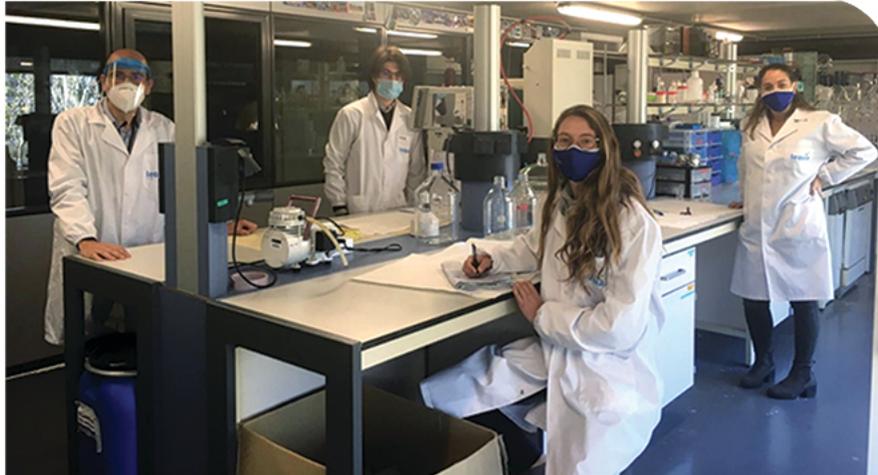
Being a fresh PhD student starting in a new lab during the pandemic is certainly something unforgettable. Everything is starting virtually: Orientation, lab trainings, classes, and even meeting some of my lab mates. This certainly retards familiarizing with the new environment (especially for wet lab researchers) and also weakened some of the excitement of beginning a new stage of life. But what I do appreciate is

how the scientific community is holding together: holding virtual seminars, organizing online meetings, tweeting about newest discoveries. For me as a new PhD student, I came to realize, amid this pandemic, how the ongoing research can potentially affect every one of us and it also reminds me of how many important scientific challenges are there awaiting solutions. I guess COVID is a lesson for every single researcher: Take pride in our research while stay humble and recognize there are so many things not yet done, tackle the emerging issues while never forget that we still haven't conquered some of the oldest scientific challenges.



Korneel Rabaey, Ghent University, Belgium

The Covid period has accelerated electronic meetings and that is a good thing – we have gotten much better at it and realize that we can save so much time by not travelling around the whole time. But, it has also made clear that personal interactions are very, very important and that we cannot spend our lives in electronic meetings. It appears as if serendipity has gone, we only meet who we want to meet and only under formal conditions. There is thus a major value in meeting people in person, and spending the time to go and meet someone. I believe we are thus going to a new equilibrium between electronic and in person meetings, and we will be better from it. as well as the environment and traffic.



Laura Rovira-Alsina, and Sebastià Puig, Universitat de Girona, Spain

Consequences of COVID-19 pandemic have been devastating, but not all of them are completely negative. It has promoted social cooperation and distribution of goods to cover the most basic needs. From my perspective, the fact that the overexploitation of natural resources stopped for a while was favorable for the environment. The emissions of CO₂ were reduced, the air in the big cities was purified and it provided time for the people to take care of themselves. Nevertheless, after this period, the world has raced to catch up what it had left behind. Pollution is once again a problem to be dealt with, which has even worsened to some extent. We are plasticizing all surfaces to reduce contact with people, we promote only single-use products, we no longer recycle and we follow rules that have no sense at all. On the other hand, we have developed new skills at work. We have realized what kind of things are no longer necessary and never have been. Now we know how to optimize time and resources.

The question is: can we get any useful advice out of this? I believe we can learn from previous experiences, and I believe we can potentially live in a more just and sustainable world where the planet's limited resources are used responsibly and equally distributed. We just need to take care of what we have and use wisely the skills we have developed.

The pandemic has changed our personal and professional lives, especially during the 3-months lockdown. All our plans were cancelled or postponed. However, humans may be the most adaptive species and after some week, we got used to new ways of communication (zoom, Google Meet, FaceTime), social activities (wearing the mask, limited number of people, preferable meetings outside), research (swifts in the lab, teleworking), and teaching (on-line, hybrid lectures). We have been able to shift our priorities and needs to the minimum. Now, the second COVID's wave is approaching and I have the feeling that we are better prepared as society for the fight.



Ola M. Goma, Cairo University, Egypt

The good: I had the opportunity to spend precious time with my family, teach my daughter how to cook Egyptian food and enjoy the company of my parents who live in the same building. I also got time to finish writing a couple of manuscripts and 3 proposals, in addition to enroll in an online course about metabolomics.

What are the good, the bad, and maybe the useful things that have come out of the pandemic?

The bad: delay in submitting the final report for a project and delay in starting a new project due to closed labs during quarantine. We also lost some important isolates that we never got the chance to store due to lock down period. Too many hours on laptop and zoom meetings has led to neck and back problems.

The useful: Finally, the slower pace resulted in adjusting my priorities and trying to achieve the balance between my career and my family.

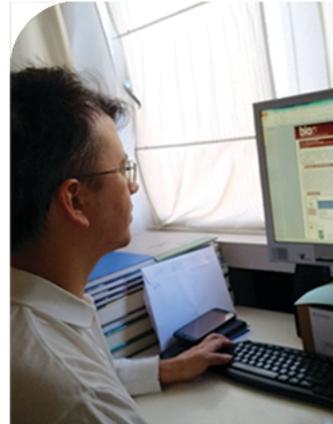


Anna Prokhorova, OIST Graduate University, Japan

The good: I had time for myself and for my hobbies: some old one, that I always didn't have time to come back, and also some new one, that I was happy to explore. I finished some online courses that improved my scientific, writing and computational skills.

The bad: apart from majority of the people, which spend more time with their family, I was isolated from my family due to border closure (we are living in different countries). Coincidentally, my boyfriend was unluckily stuck abroad without chance to come back due to border closure as well. This side was very hard for me mentally.

The useful: time with myself helped me to understand what I want in my current state and where I want to move in my scientific area. Based on this I have submitted a few proposal and full of energy to explore it.



Álvaro Pun, University of Alcalá, Spain

"The disruption of the supply chains during the pandemic severely hampered investigation possibilities since the work with living organisms, as is the case of ecotoxicology assays, requires a frequent supply of such beings. Receiving materials have also been suffering from administrative issues. The research environment is also severely changed by working from home environment. Though contact with colleagues is maintained through modern technology, this requires a much more planned approach than the casual meetings in the laboratory. No longer the request for some material or equipment turns into a brief explanation of the experiment that needs it, followed by a spontaneous brain storming about how to make it work, with people casually eavesdropping and joining. Such interactions are much more limited and almost impossible to transfer to text messaging, and clumsy with video chat. The quarantine and social distancing forced people with casual social lives into a more active planning to meet relatives and friends, without the excuse "will meet at the next occasion" as no timetable can be set. Outgoing people forced to stay longer at home have been forced to face the imperfections of their living conditions, resulting into a will to change them. The pandemic fear has helped us realize how limited our time is, with our loved ones, with our hobbies, with our life. Whether this results in overindulgence (carpe diem) or a new drive to make the most of our time is up to each one.

Chelsea Catania, MIT, USA

The good: I had time to reflect on my career path and what I'd like to do after my postdoc. Being out of the lab really helped me to develop some of my other scientific ideas. I wrote a grant (that got funded!) to do research in Prof. Ariel Furst's lab on a project that I hope to eventually commercialize (if it works!). I also was able to participate in a number of entrepreneurship programs, like the NSF I-Corps program, MassChallenge, and a few others.

The bad: The pandemic exacerbated some family conflicts, which have been difficult to navigate. Emotional turbulence has definitely affected productivity.

The useful: I became very skilled/comfortable at talking to strangers on zoom! I started meditating every day. I've improved my communication skills and emotional intelligence/self-awareness. I think I'm getting the hang of "self-care"! (to... some extent.)



Cristina Villar, University of Alcalá, Spain

One of the good things is that it has become evident the importance of having good health and research systems. Obviously, the worse thing is the number of casualties, both, people affected directly by the virus and people affected psychologically by the situation. This situation could be useful if governments decide to change some things like increase the budget on research, invest in health, promote the remote working... This crisis have affected directly to my research activity because I have had to pause all the experiments in lab for three months. Also, in the new normal, is difficult to work normally, because of the capacity limit in the laboratories, some of the services are paused and there is an important delay in the orders.



Marina Ramírez, IMDEA Water, Spain

From my point of view and position, the pandemic has caused difficulties in working in a laboratory (reduced schedule, delayed orders, worse communication). Also, there are more rejections of papers in journals. On the other hand, we have gotten used to new technologies to meet up. I only hope that all the suffering serves to open the eyes to the world of how important science is.

Benjamin Korth, UFZ Leipzig, Germany

Actually, we were lucky as the lockdown of Leipzig happened relatively early so that the Covid-19 case numbers were low compared to other regions of Germany and Europe. But of course, we also had to stay at home so that many experiments simply failed with time. At least, we could organize a basic lab maintenance to save important long-term experiments. Indeed, we completely adapted our ways of communication so that we still could nicely work together even though we were quite distant from each other. Maybe this experience is also useful for the future: It doesn't matter where we are, there will be always a way to work together and to stay in touch. Nevertheless, I also missed the social events of the group and of our institute a lot (although having drinks at a zoom meeting inheres a certain appeal). At least, we made good use of the increased leisure time with fitness exercises, learning electrochemical fundamentals, 3D printing, and manual measurements.

Having the family at home all day was also often funny (not mentioning the many online meetings that were conquered by kids) but keeping everybody in a good spirit was also challenging. We were all happy when life slowly became kind of normal again. First with face masks and strict shift plans, later with almost no restrictions anymore. We even could celebrate the publications that we wrote during the lockdown with a nice group barbecue like in a former times. Nowadays, we follow once more pandemic safety requirements as it is getting worse again. Let's hope the best for the future and that we can meet again in reality soon! Stay healthy!

Sebastià Puig, Universitat de Girona



How did you first get interested in METs?

Early 2008, my PhD supervisor (Dr. Jesús Colprim) told me about a promising technology (microbial fuel cells) and started to read about it. It was fascinating, microorganisms producing electricity for wastewater. The breakthrough relevance of these results was such that I decided to flip my research on its head and devote all efforts to submit a proposal for a postdoctoral grant on this topic. Luckily, I got the grant!

In your opinion, what has been the most surprising or impactful discovery in the field over the last decade?

Electromicrobiology and its potential to contribute to a broad range of environments, from human intestine to water systems.

Why did you want to join the ISMET board?

This was a natural step for me after taking the chance to organize a regional EU-ISMET. So, I presented my candidature to the ISMET board to contribute to the growth of the society and the dissemination/communication of the research on this topic.

Looking forward to next decade, where do you see microbial electrochemistry and electromicrobiology making the largest impact on science and technology?

The research will go from fundamentals to practical application. This topic is multidisciplinary, and I am sure that new techniques/technologies/materials and unknown microbial communications/applications will pop up.

What are three things that you can share about yourself that people may not know?

- I am runner (two marathons so far, but I do prefer trail running).
- Every autumn I am giving a hand to my parents collecting hazelnuts. I am proud of my origins.
- I am a foodie.

Michaela TerAvest, Michigan State University



How did you first get interested in METs?

When I was looking for a PhD advisor I found Lars Angenent's research page and got very excited about MFCs!

In your opinion, what has been the most surprising or impactful discovery in the field over the last decade?

The discovery of full electron transfer pathways in model microbes and the more recent expansion of our understanding of extracellular electron transfer in a much broader range of microbes.

Why did you want to join the ISMET board?

I have been to a lot of great ISMET conferences and learned so much from people in this research field. Now that my own lab is getting more established I want to give back to the community.

Looking forward to next decade, where do you see microbial electrochemistry and electromicrobiology making the largest impact on science and technology?

I think the biggest impact will be on energy storage, whether through electrosynthesis, electrofermentation, or a flow batteries.

What are three things that you can share about yourself that people may not know?

- I am involved in iGEM e at MSU and helped start up our first team 5 years ago.
https://2020.igem.org/Main_Page
- I am originally from Michigan and am so glad that I got the opportunity to move back to MSU.
- I love mountain bike racing!

Sunil Patil, Indian Institute of Science Education and Research



How did you first get interested in METs?

Sometime in 2006, when I read about microbial fuel cells! The world of microorganisms that possess extracellular electron transfer capabilities fascinated me.

In your opinion, what has been the most surprising or impactful discovery in the field over the last decade?

The cable bacteria and the Electroanammox process.

Why did you want to join the ISMET board?

To contribute to ISMET growth/expansion through active participation in various initiatives and engagement with the researchers working in different areas.

Looking forward to the next decade, where do you see microbial electrochemistry and electromicrobiology making the largest impact on science and technology?

I foresee Electromicrobiology impacting the medical microbiology field and successful large-scale demonstrations of METs, particularly in the wastewater management sector, during the next decade.

What are three things that you can share about yourself that people may not know?

- Like farming (spend most of the vacation time on a farm)
- Recently became a proud parent of the second daughter
- Good chess player

Annually, ISMET acknowledges outstanding work published by postgraduate students, postdoctoral researchers and industry affiliates who are current ISMET members with two awards. These awards will acknowledge the best scientific publication and best breakthrough innovation. Nominations for the awards will be judged on a competitive basis by an awards committee and selected based on the quality and impact of the research or discovery.

Congratulations to Dario Shaw, King Abdullah University of Science and Technology and Xi Chen, Princeton University for obtaining the 2020 ISMET news awards in the categories Best Scientific Discovery and Best Technological Innovation!



Dario Shaw, Discovery Award Winner

Summary of awarded work:

In the study, we reported a novel process in which anaerobic ammonium oxidation (Anammox) bacteria, a key player in the biogeochemical nitrogen cycle and sustainable wastewater treatment, can oxidize ammonium coupled with extracellular electron transfer (EET)-based respiration. With this novel process, the ammonium present in the wastewater can be removed directly together with the recovery of energy in the form of electrical current or energy-rich hydrogen gas. Compared to the conventional anammox process, in which treated wastewater requires further polishing to remove the nitrate, in the EET-dependent anammox process was achieved complete removal of ammonium to nitrogen gas with no accumulation of nitrite, nitrate, or the production of the greenhouse gas nitrous oxide. These findings have a significant implication in the context of energy-efficient treatment of nitrogen-rich wastewater using bioelectrochemical systems.

How did you get first interested in METs?

I began to get interested in Microbial electrochemical technologies since my first arrival in professor Pascal Saikaly's lab. Even though I was working on anammox bacteria, I found fascinating the interaction between living microbial cells and electrodes. The fact that bacteria that can interact with insoluble electron acceptors are widespread in several ecological niches made me realize the importance of EET-capable microorganisms in nature. It is also fascinating that METs field allows for interdisciplinary research and offers numerous applications that aim to solve different society's problems.

Looking forward to the next decade, where do you see microbial electrochemistry and electromicrobiology making the largest impact on science and technology?

In my view, I see microbial electrochemistry and electromicrobiology making the most considerable impact in urban and side stream wastewater treatment and resource recovery. However, METs cannot be used as a standalone technology. Therefore, for a successful implementation in wastewater treatment, METs require scaling up and integration with other processes and technologies. We should aim to scale up the technologies during the next decade, increase the number of pilots and full-scale testing, look for partnerships with industries, and perform research aiming at new applications and integration technologies. Once we achieve real full-scale applications, the field will make the largest impact on science and technology.



Xi Chen, Innovation Award Winner

Summary of awarded work:

In this paper, we for the first time demonstrated that renewable H₂ can be spontaneously produced from wastewater in a microbial electrochemical system without any external energy input. We accomplished this "mission impossible" method by creatively decoupling two electrochemical reactions with an electrical circuit rewiring. In the system we created, the chemical energy contained in wastewater was converted into electricity via microbial oxidation and was then boosted by a specially designed circuit to drive in situ H₂ generation. There was no external energy required, and wastewater was the only energy and electron source. This work presented the first prototype that microbial electrochemical technology may transform the wastewater industry from energy-intensive processes to energy positive practices.

How did I first get interested in METs?

I learned about METs in 2008 when I was an undergraduate in Tsinghua University. I was working in Prof. Xia Huang's lab preparing for a sustainable development innovation student challenge. At that time the first study of microbial desalination cell was on going (a year later it was recognized as the best paper on ES&T), and I luckily observed that a cubic box containing microbes can "eat" wastewater and generate electricity and at the same time desalinate saline water. I think this was a real "one stone two birds" and "waste to valuable" scenario, and was very curious about the mechanisms embedded and eager to explore what other functions MET could enable to achieve "one stone more birds".

Looking forward to next decade, where do you see microbial electrochemistry and electromicrobiology making the largest impact on science and technology?

I would expect that the investigation of the exocellular electron transfer would tell us how to accelerate microbial electrochemical reactions as well as how to enlarge the system capacity to guide pilot-scale projects in real practices. Thereafter, people's understanding of wastewater treatment would be changed from an energy-consuming process to an energy/resource mining process.

screenshot ::
v.ISMET 1

Save the dates - The next ISMET meetings are:

Harbin - May 7-10 2021

Girona - Sep 13-15 2021

ISMET-8

Chania, Crete, Greece - Sept 19-24, 2022

Become a member of ISMET and avail the following benefits

- Reduced conference fees
- Access to conference video recordings and presentations
- Access to the membership directory
- Eligibility to vote for ISMET board members
- Early information about conferences
- Eligibility to nominate and be nominated for the ISMET awards
- Online newsletter
- Involvement in the ISMET community
- Full usage of the online platform (sharing research information, protocols, posting jobs, ...)

Annual membership fees (in USD) are listed below

Associate and Full Professor: \$70

Instructor and Assistant Professor: \$60

Postdoctoral researchers: \$50

Students: \$25

Government / Not-for Profit: \$70

Industry: \$70

for registration: <https://is-met.org/register/>

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ISMET news is a semi-annual publication from the ISMET International Society for Microbial Electrochemistry and Technology.