

Dr. James A. Behan, Ph.D. Chargé de Recherche CNRS



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PROFILE

- Assistant Professor (Chargé de Recherche CNRS) at the Institut des Sciences Chimiques de Rennes. My research interests include nanocarbon electrochemistry, electrocatalysis, bio-nanoscience and bioelectrochemical systems for applications in energy and the environment.
- Former Marie Skłodowska-Curie Fellow, Irish Research Council Postdoctoral Fellow and Trinity Scholar in Chemistry.
- 22 publications (8 as first author, 4 as corresponding author) in peer-reviewed journals; 3 peer-reviewed book chapters in electrocatalysis of carbon electrode materials and electroactive bacteria; 10 oral and 11 poster communications; h-index = 11.
- Expert in electrochemistry, electrocatalysis, carbon nanomaterials, nanomaterial synthesis and nanomaterial surface-biomolecule interactions. Current specialisation in bio-nanoscience, bioelectrochemistry and interactions of electroactive bacteria with interfaces.
- Experienced lecturer and scientific communicator with years of chemistry teaching and lecturing experience at university level in both English and French.
- Strong commitment to scientific outreach and engaging the public in research.

EDUCATION

2014 – 2018	PhD in Chemistry School of Chemistry Trinity College Dublin
2016 – 2017	Certificate in Statistics DISTINCTION School of Computer Science and Statistics Trinity College Dublin
2010 – 2014	Bachelors in Chemistry FIRST CLASS HONORS AND GOLD MEDALIST School of Chemistry Trinity College Dublin

SUCCESSFUL GRANTS

2024	Scientific Installation Grant - 40k€ Rennes Metropole
2024-2025	CNRS MITI AAP Pollution/Dépollution- 36k€ CNRS
2024-2025	Défi Scientifique Projet de Recherche- 16k€ Université de Rennes

2023 – 2024	Maimonide Fellowship - 60k€ French Government & Israeli Government
2022 – 2024	Ulysses Fellowship - 8.5k€ French Government & Irish Research Council
2022	Marie Skłodowska-Curie BIENVENUE Fellowship European Commission & Region Bretagne
2020 – 2021	Postdoctoral Fellowship Award Irish Research Council

AREAS OF EXPERTISE

ELECTROCHEMISTRY	Electrocatalysis, Microbial Fuel Cells, Electropolymerisation Fundamental Kinetic Studies Supported Metal Catalysts, Oxygen Reduction Reaction
INTERFACES	Covalent Modification of Nanomaterials Biofilms Biomolecule-Nanoparticle Interactions Electrochemical Quartz Crystal Microbalance
MICROBIOLOGY	Aseptic Anaerobic Culturing Electroactive bacteria DNA extraction and 16S rRNA sequencing Electrochemistry on electroactive bacteria
CARBON MATERIALS	Amorphous Carbons, Nitrogen-Doped Carbon, Carbon Supports in Electrocatalysis
CHARACTERISATION	XPS, UV-Vis Spectroscopy IR Spectroscopy, AFM Ellipsometry, TEM, SEM Raman Spectroscopy

AWARDS

2022	EuroScience Open Forum Poster Prizewinner Euroscience Open Forum Satellite Event, Leiden
2022	Laureate of AMI Emergence Programme Technopole de Rennes
2012-2017	Full Academic Scholarship Award Trinity College Dublin
2016	Young Student Award for Best Presentation European Materials Research Society Fall Meeting
2016	Teaching Award in Practical Chemistry School of Chemistry, Trinity College Dublin
2014	Gold Medal in Natural Sciences - Chemistry School of Chemistry, Trinity College Dublin
2013	Dr George A. Lonergan Prize in Chemistry School of Chemistry, Trinity College Dublin
2011	Billy Robertson Memorial Prize in Biology School of Chemistry, Trinity College Dublin

WORK EXPERIENCE

OCT 2023 - PRESENT

CNRS - Institut des Sciences Chimiques de Rennes

Chargé de Recherche CNRS

I was appointed to the CNRS as Chargé de Recherche in 2023, taking up my post at the Université de Rennes in October. My current research focuses on interface modifications for the development of electroactive biofilms and the synthesis of nanomaterials with a biological and electrochemical identity. I teach photoelectrochemistry for the international masters course LUMOMAT as well as practical electrochemistry for first year engineering master students at the École de Chimie and for the international two-year masters in materials science course MaMaSELF.

JAN 2022-SEPT 2023

Institut des Sciences Chimiques de Rennes, Université de Rennes 1

Marie Skłodowska-Curie Fellow

My Marie Curie research project was entitled "BioNanoCat: Biogenic Nanoparticles Derived from Bacterial Biofilms for Electrocatalysis." Working at the Institut des Sciences Chimiques de Rennes with Dr. Frédéric Barrière, my research focused on the application of biofilms of exoelectrogenic bacteria as 'living factories' for the formation of biogenic nanoparticles/nanocatalysts for catalytic applications. Bacteria possess a plethora of defense mechanisms against the presence of toxic metal ions in their environment, including the capacity to bind ions at their surface and reduce them to form nanoparticles. This provides possible avenues of biosynthesis of metal nanoparticle-based catalysts for important processes, such as the oxygen reduction and hydrogen evolution reactions.

APR 2019 – NOV 2021

Centre for Bio-Nano Interactions

Postdoctoral Fellow

My first postdoctoral fellowship project was in the area of biological system - nanoparticle interactions. With Prof. Kenneth Dawson at the Centre for BioNano Interactions (CBNI) at University College Dublin, I worked at the interface of chemistry and biology in nanosynthesis, especially of ligand-decorated nanoparticles for biological applications. My project, which was funded by the Irish Research Council, focused on protein-decorated nanoparticle interactions with target receptors *ex-situ*. This field has important implications for nanomedicine, as drug delivery and diagnostic technologies are increasingly based on the use of nanoparticle-based formulations to target specific cells.

SEPT 2014 – SEPT 2018

School of Chemistry, Trinity College Dublin

PhD Student

My PhD project was carried out under the supervision of Prof. Paula E. Colavita at Trinity College, Dublin. This project focused on the synthesis and characterisation of carbon nanomaterials for applications in electrocatalysis and electroanalysis. I focused specifically on nitrogen doping of carbon scaffolds and its effects on the oxygen reduction reaction, with a secondary focus on interfacial modifications of carbon electrodes for anti-biofouling applications and the analysis of biologically-relevant redox species such as dopamine and other catechols. Electrochemical properties were correlated to carbon nanostructure using a combination of spectroscopic techniques including infrared spectroscopy, x-ray photoelectron spectroscopy and spectroscopic ellipsometry. My thesis was titled *Electrochemical probing of the nanostructure of non-crystalline nitrogenated carbon materials for electrocatalysis*.

SEP 2018 – APR 2019

School of Pharmacy, Trinity College Dublin

Adjunct Lecturer in Physical Chemistry

In parallel with the final year of my PhD, I took on a temporary post as a lecturer in the School of Pharmacy, Trinity College Dublin. Here I was tasked with delivering a lecture series (3h/week) in physical chemistry for pharmacy students, focused mainly in the areas of molecular interactions, thermodynamics and chemical kinetics. I prepared the lecture series in collaboration with the course coordinator, Prof. Eduardo Ruiz-Hernandez, set the final exam and defined the marking scheme for the course.

PUBLICATIONS

- [1] Maida Aysla Costa de Oliveira, Marc Brunet Cabré, Christian Schröder, Hugo Nolan, Filippo Pota, James A. Behan, Frédéric Barrière, Kim McKelvey, and Paula E. Colavita. Single-Entity Electrochemistry of N-Doped Graphene Oxide Nanostructures for Improved Kinetics of Vanadyl Oxidation. *Small*, n/a(n/a):2405220.
- [2] Filippo Pota, Maida Costa de Oliveira, Christian Schröder, Marc Brunet Cabré, Hugo Nolan, Aran Rafferty, Olivier Jeannin, Franck Camerel, James Behan, Frederic Barrière, and Paula E Colavita. Porous N-doped carbon-encapsulated iron as a novel catalyst architecture for the electrocatalytic hydrogenation of benzaldehyde. *ChemSusChem*, n/a(n/a):e202400546.
- [3] Timothé Philippon, James A. Behan, and Frédéric Barrière. Microbial nitrate reduction electro-assisted by exo-electrogenic reduction of dioxygen with a *Pseudomonas* dominated cathodic biofilm. *Electrochimica Acta*, 497:144573, September 2024.

- [4] James A. Behan and Frédéric Barrière. Effects of Polydopamine Incorporation on the Nanostructure and Electrochemical Performance of Electrodeposited Polypyrrole Films. *C*, 10(1):20, March 2024.
- [5] James A. Behan and Frédéric Barrière. Electrochemistry of elements | Iron. In *Reference Module in Chemistry, Molecular Sciences and Chemical Engineering*. Elsevier, January 2024.
- [6] Fatima-Zahra Ait-Itto, James A. Behan, Mathieu Martinez, and Frédéric Barrière. Development of bioanodes rich in exoelectrogenic bacteria using iron-rich palaeomarine sediment inoculum. *Bioelectrochemistry*, 156:108618, April 2024.
- [7] Timothé Philippon, Fatima-Zahra Ait-Itto, Alicia Monfort, Frédéric Barrière, and James A. Behan. Fe(III) oxide microparticles modulate extracellular electron transfer in anodic biofilms dominated by bacteria of the *Pelobacter* genus. *Bioelectrochemistry*, 151:108394, June 2023.
- [8] James A. Behan, Zengchun Xie, Yi-Feng Wang, Xiaoliang Yang, Teodor Aastrup, Yan Yan, Laurent Adumeau, and Kenneth A. Dawson. Quartz Crystal Microbalance Method to Measure Nanoparticle–Receptor Interactions and Evaluate Nanoparticle Design Efficiency. *JACS Au*, 3(6):1623–1633, June 2023.
- [9] James A. Behan, Ricardo O. Louro, and Frédéric Barrière. Respiration in Electroactive Bacteria: Bioinorganic Aspects. In *Encyclopedia of Inorganic and Bioinorganic Chemistry*, pages 1–13. John Wiley & Sons, Ltd, 2023.
- [10] Aisling Fleming, Lorenzo Cursi, James A. Behan, Yan Yan, Zengchun Xie, Laurent Adumeau, and Kenneth A. Dawson. Designing Functional Bionanoconstructs for Effective *In Vivo* Targeting. *Bioconjugate Chemistry*, 33(3):429–443, March 2022.
- [11] Emily Sheridan, Silvia Vercellino, Lorenzo Cursi, Laurent Adumeau, James A Behan, and Kenneth A Dawson. Understanding intracellular nanoparticle trafficking fates through spatiotemporally resolved magnetic nanoparticle recovery. *Nanoscale Advances*, 3(9):2397–2410, 2021.
- [12] James A. Behan, Adam Myles, Alessandro Iannaci, Éadaoin Whelan, Eoin M. Scanlan, and Paula E. Colavita. Bioinspired electro-permeable glycans on carbon: Fouling control for sensing in complex matrices. *Carbon*, 158:519–526, March 2020.
- [13] Carlota Domínguez, James A Behan, and Paula E Colavita. Electrocatalysis at nanocarbons: Model systems and applications in energy conversion. *Nanocarbon Electrochemistry*, pages 201–249, 2020.
- [14] Md Hoque, James A Behan, James Creel, James G Lunney, Tatiana S Perova, Paula E Colavita, et al. Reactive Plasma N-Doping of Amorphous Carbon Electrodes: Decoupling Disorder and Chemical Effects on Capacitive and Electrocatalytic Performance. *Frontiers in chemistry*, page 1020, 2020.
- [15] Alessandro Iannaci, Adam Myles, Thomas Flinois, James A. Behan, Frédéric Barrière, Eoin M. Scanlan, and Paula E. Colavita. Tailored glycosylated anode surfaces: Addressing the exoelectrogen bacterial community via functional layers for microbial fuel cell applications. *Bioelectrochemistry*, 136:107621, December 2020.
- [16] James A. Behan, Alessandro Iannaci, Carlota Domínguez, Serban N. Stamatina, Md Khairul Hoque, Joana M. Vasconcelos, Tatiana S. Perova, and Paula E. Colavita. Electrocatalysis of N-doped carbons in the oxygen reduction reaction as a function of pH: N-sites and scaffold effects. *Carbon*, 148:224–230, July 2019.
- [17] James A. Behan, Filip Grajkowski, Dilushan R. Jayasundara, Laia Vilella-Arribas, Max García-Melchor, and Paula E. Colavita. Influence of carbon nanostructure and oxygen moieties on dopamine adsorption and charge transfer kinetics at glassy carbon surfaces. *Electrochimica Acta*, 304:221–230, May 2019.
- [18] James A. Behan, Eric Mates-Torres, Serban N. Stamatina, Carlota Domínguez, Alessandro Iannaci, Karsten Fleischer, Md Khairul Hoque, Tatiana S. Perova, Max García-Melchor, and Paula E. Colavita. Untangling Cooperative Effects of Pyridinic and Graphitic Nitrogen Sites at Metal-Free N-Doped Carbon Electrocatalysts for the Oxygen Reduction Reaction. *Small*, 15(48):1902081, November 2019.
- [19] Md Khairul Hoque, James A Behan, Serban N Stamatina, Federico Zen, Tatiana S Perova, and Paula E Colavita. Capacitive storage at nitrogen doped amorphous carbon electrodes: Structural and chemical effects of nitrogen incorporation. *RSC advances*, 9(7):4063–4071, 2019.
- [20] James A Behan, Md Khairul Hoque, Serban N Stamatina, Tatiana S Perova, Laia Vilella-Arribas, Max García-Melchor, and Paula E Colavita. Experimental and computational study of dopamine as an electrochemical probe of the surface nanostructure of graphitized N-doped carbon. *The Journal of Physical Chemistry C*, 122(36):20763–20773, 2018.
- [21] Adam Myles, James A Behan, Brendan Twamley, Paula E Colavita, and Eoin M Scanlan. Spontaneous aryldiazonium grafting for the preparation of functional cyclodextrin-modified materials. *ACS Applied Bio Materials*, 1(3):825–832, 2018.
- [22] James A. Behan, Serban N. Stamatina, Md Khairul Hoque, Guido Ciapetti, Federico Zen, Leticia Esteban-Tejeda, and Paula E. Colavita. Combined Optoelectronic and Electrochemical Study of Nitrogenated Carbon Electrodes. *The Journal of Physical Chemistry C*, 121(12):6596–6604, March 2017.

- [23] Joana M Vasconcelos, Federico Zen, Serban N Stamatin, James A Behan, and Paula E Colavita. Determination of surface ζ -potential and isoelectric point of carbon surfaces using tracer particle suspensions. *Surface and Interface Analysis*, 49(8):781–787, 2017.
- [24] Federico Zen, M Daniela Angione, James A Behan, Ronan J Cullen, Thomas Duff, Joana M Vasconcelos, Eoin M Scanlan, and Paula E Colavita. Modulation of protein fouling and interfacial properties at carbon surfaces via immobilization of glycans using aryl diazonium chemistry. *Scientific reports*, 6(1):1–10, 2016.
- [25] Federico Zen, Vasilios D Karanikolas, James A Behan, Jenny Andersson, Guido Ciapetti, A Louise Bradley, and Paula E Colavita. Nanoplasmonic sensing at the carbon-bio interface: Study of protein adsorption at graphitic and hydrogenated carbon surfaces. *Langmuir*, 33(17):4198–4206, 2017.

COMMUNICATIONS

Oral Communications at Conferences

As speaker:

- **Invited Presentation:** CHEMICY Workshop, École Nationale Supérieure de Rennes, 27 November 2024, *Nanoparticle Characterisation Using Differential Centrifugal Sedimentation*
- **Invited Presentation:** Groupe Française de Bioélectrochimie (French Bioelectrochemistry Group) 2024, *Environmental and depollution applications of electroactive bacteria: from denitrification to iron bioremediation* – Webinar - 24 September 2024.
- 04 September 2023 - 74th meeting of the International Society of Electrochemistry, Lyon, France. «Modulation of extracellular electron transfer in anodic biofilms dominated by bacteria of the genus *Pelobacter* by Fe(III)-oxide microparticles». **Behan, J.A.***, Barrière, F.; Philippon, T.; Ait-Itto, F.; Monfort, A.
- 26 September 2022 - XVIIth Colloquium of the Groupe Français de Bioélectrochimie, Saint-Dié-des-Vosges, «Tailoring Carbon Nanomaterial Interfaces for Electrochemical applications in Catalysis, Electroanalysis and Microbial Fuel Cells» **Behan, J.A.*** Myles, A.; Ianacci, A., Barrière, F.; Colavita, P.E.
- 30 May – 3 June 2022 -European Materials Research Society Spring Meeting «Tailored Carbon Nanomaterial Interfaces for Electrocatalysis, Electroanalysis and Microbial Fuel Cell Applications» **Behan, J.A.**; Myles, A.; Ianacci, A., Barrière, F.; Colavita, P.E.
- 04 April 2019 – Centre for BioNano Interactions, University College Dublin, Modification of Carbon Nanomaterials for Energy and Sensing Applications. **Behan, J.A.**; Hoque, M.K.; Stamatin, S.N.; Myles, A.; Garcia-Melchor, M.; Colavita, P.E.
- 02-17 September 2018 - 69th Annual Meeting of the International Society of Electrochemistry, Bologna, Italy- Experimental and Computational Study of Dopamine as an Electrochemical Probe of the Surface Structure of Carbon Surfaces. **Behan, J.A.**; Hoque, M.K., Grajkowski, F.; Garcia-Melchor, M.; Colavita, P.E.
- 03 Oct 2017 – International Society of Electrochemistry Student Satellite Meeting, Tyndall Institute, Cork, Ireland – Combined Optoelectronic and Electrochemical Characterisation of Nitrogenated Amorphous Carbon Electrodes **Behan, J.A.**; Hoque, M.K.; Stamatin, S.N.; Colavita, P.E.
- 10-12 September 2017 – Electrochem 24th Annual Conference, Birmingham, United Kingdom – Combined Optoelectronic and Electrochemical Study of Nitrogenated Carbon Electrodes **Behan, J.A.**; Hoque, M.K.; Stamatin, S.N.; Colavita, P.E.
- 30 May 2017 – Dublin Chemistry (DubChem) Eli Lilly PhD Presentation, University College Dublin, Ireland – Synthesis and combined optoelectronic and electrochemical studies of nitrogenated carbon electrodes Behan, J.A.; Hoque, M.K.; Stamatin, S.N.; Colavita, P.E.

As Co-Author:

- 10 July 2024 - 9th EuChemS Meeting, Dublin, Ireland «Heteroatom doped carbon-based materials as non-precious metal catalysts for electrocatalytic hydrogenation of biomass-derived organics» Pota, F.; Costa De Oliveira, M.; Schroder, C.; Behan, J.A.; Barrière, F.; Colavita, P.E.
- 26 September 2022 - XVIIth Colloquium of the Groupe Français de Bioélectrochimie, Saint-Dié-des-Vosges, «Impact of iron oxide in the development of specific exoelectrogens bacteria in anoxic environment» Ait-Itto, F.Z.; Philippon, T.; Monfort, A.; **Behan, J.A.**; Barrière, F.
- July 2018 – Carbon – Madrid, Spain. "Carbohydrate Coatings for Biofouling Mitigation: Diazonium-based Saccharide coatings for improved electrochemical sensors". Myles, A.; **Behan, J.A.**; Scanlan, E.M.; Colavita, P.E.
- Oct 2017, ISE Satellite Regional Symposium – Tyndall National Institute, Cork, Ireland – Lactose coatings for improved implantable electrochemical sensors. Myles A.; **Behan, J.A.**; Scanlan, E.M.; Colavita, P.E.
- 10-12 September 2017 – Electrochem 24th Annual Conference, Birmingham, United Kingdom «Study of model carbon materials with graphitic-N sites for oxygen reduction reaction» Domingue, C.; **Behan, J.A.**; Hoque, M.K.; Stamatin, S.N.; Vasconcelos, J.M.; Perova, T.; Colavita, P.E.

- May 22-26 2017 – European Materials Research Society Spring Meeting, Strasbourg, France – Bioinspired carbohydrate coatings modulation of protein fouling and interfacial properties at carbon surfaces. Zen, F.; Vasiliou, K.D.; **Behan, J.A.**; Vasconcelos, J. M.; Andersson, J.; Duff, T.; Scanlan, E.M.; Bradley, L.; Colavita, P.E.
- May 22-26 2017 – European Materials Research Society Spring Meeting, Strasbourg, France – Surface modification studies of carbon thin films for applications in carbon-based biodevices Vasconcelos, J.M.; Zen F.; **Behan, J.A.**; Hoque, M.K.; Cullen, R.J.; Colavita, P.E.

Poster Communications

As Presenter:

- 13 January 2025 - CNRS Interdisciplinary Mission Colloquium - *Clean Separation of Iron from Bauxites using Electroactive Bacteria*, **James A. Behan**, Ahmed Riad Boughezal, Mathieu Martinez and Frédéric Barrière.
- 02-05 July 2024 - Journées d'Électrochimie - July 02-06 2024, Saint Malo, France - *Modulation of Electroactive Anodic Biofilm Performance in Microbial Fuel Cells Developed from Iron-Rich Sediment Inoculum* **James A. Behan**, Fatima-Zahra Ait-Itto, Timothé Philippon, Alicia Monfort, Frédéric Barrière.
- EuChemS 2024, July 07-11 2024, Dublin, Ireland. Modulation of charge transfer properties in electroactive anodic biofilms developed from iron-rich sediment inoculum. James A. Behan, Frédéric Barrière, Fatima Ait-Itto, Mathieu Martinez, Timothé Philippon, Alicia Monfort
- 12-13 July 2022 – EuroScience Open Forum Satellite Event, Lieden, Netherlands. Biogenic Nanoparticles Prepared from Bacterial Biofilms for Electrocatalysis **Behan, J.A.**, Ait-Itto, F.; Barrière, F.
- Sept 07-08 2017 – Royal Society of Chemistry Carbohydrate Section Meeting, Trinity College Dublin, Ireland – Anti-Fouling Properties of Lactose-Modified Carbon Electrodes: A Fundamental Study. **Behan, J.A.**; Myles, A.; Ciapetti, G.; Zen, F.; Scanlan, E.M.; Colavita, P.E.
- May 22-26 2017 – European Materials Research Society Spring Meeting, Strasbourg, France – Nitrogen-Incorporated Amorphous Carbon Thin Films with Tuneable Optoelectronic Properties Prepared via DC Magnetron Sputtering **Behan, J.A.**, Stamatin, S.N.; Hoque, M.K.; Ciapetti, G.; Colavita, P.E.
- May 22-26 2017 – European Materials Research Society Spring Meeting, Strasbourg, France – Combined Optoelectronic and Electrochemical Study of Nitrogenated Carbon Electrodes **Behan, J.A.**, Stamatin, S.N.; Hoque, M.K.; Ciapetti, G.; Colavita, P.E.
- Sept 19-22 2016 – European Materials Research Society Fall Meeting, Warsaw, Poland – Nitrogen-Incorporated Amorphous Carbon Thin Films: An Optical and Electrochemical Characterisation **Behan, J.A.**, Stamatin, S.N.; Hoque, M.K.; Ciapetti, G.; Vasconcelos, J.M.; Colavita, P.E.
- July 8 2016 – United Kingdom Surface Analyst Forum Meeting, University College Dublin, Ireland – Optoelectronic and Electrochemical Characterisation of Nitrogenated Amorphous Carbon Thin Film Electrodes **Behan, J.A.**, Stamatin, S.N.; Hoque, M.K.; Ciapetti, G.; Colavita, P.E.

As Co-Author:

- 12 May 2019 – Royal Society of Chemistry Organic Division Regional Meeting, Queen's University, Belfast – Multipurpose Cyclodextrin Grafting: From Crystals to Coatings. Myles, A.; **Behan, J.A.**; Scanlan, E.M.; Colavita, P.E.
- 10-12 September 2017 – Electrochem 24th Annual Conference, Birmingham, United Kingdom – Capacitive Properties of Nitrogen Doped Amorphous Carbon Materials for Electrocatalytic Applications, Hoque, M.K., **Behan, J.A.**, Stamatin, S.N.; Hoque, M.K.; Ciapetti, G.; Colavita, P.E.; Stamatin, S.N.; Zen, F. Colavita, P.E.
- May 22-26 2017 – European Materials Research Society Spring Meeting, Strasbourg, France – Plasmonic sensing of carbon thin films for biological applications. Zen, F.; Vasiliou, K.D.; **Behan, J.A.**; Stamatin, S.N.; Hoque, M.K.; Ciapetti, G.; Colavita, P.E.; Vasconcelos, J. M.; Andersson, J.; Duff, T.; Scanlan, E.M.; Bradley, L.; Colavita, P.E.

TEACHING EXPERIENCE

Lecturing

As outlined above, I worked as an adjunct lecturer in physical chemistry for the School of Pharmacy, Trinity College Dublin, in 2018. This gave me broad experience lecturing to a large audience of around 100 bachelor's students, 3h per week, as well as experience preparing lecture notes, slides, problem sheets, exam questions and marking schemes. I also designed and delivered a lecture and tutorial series aimed at first year undergraduates in chemistry in the 2017-18 academic year with 2 contact hours with 2 groups of students per week for the School of Chemistry. This gave me experience in tailoring courses and teaching styles to students who had no prior experience in chemistry before coming to university. I transferred these skills during my postdoc at the Centre for BioNano Interactions, University College Dublin. There I organised a master class as part of the *Current Trends in Nanomedicine* module for UCD's nanoscience Master's Degree program. The course was organised in collaboration with Prof. Kenneth Dawson, a leading expert in the field of nanomaterial-biological systems interactions. I also set the course assignment and marking scheme and corrected the exam.

Practical Teaching

I was an award-winning laboratory demonstrator in physical chemistry laboratory sessions to hundreds of students (3-6 contact hours/week during entire academic years of 2014-2017). After this experience I continued to organise labs and tutorial sessions: at the Centre for BioNano Interactions I organised workshops for PhD and masters students in experimental design and statistics, graphical representation of data for publication, scientific writing and preparation of scientific talks for thesis defence and international conferences. Most recently in Rennes I have carried out practical laboratory sessions in fundamental electrochemistry with my supervisor, Prof. Frédéric Barrière.

For French language teaching, I teach practical laboratory sessions in electrochemistry with Prof. Didier Hauchard at the École Nationale Supérieure de Chimie in Rennes (total of more than 60h contact time with students).

SCIENTIFIC LEADERSHIP

In my present role at the ISCR I supervise one PhD student (thesis started Sept 2023), one post-doc and one Master 2 student who will defend his project in January 2025. I previously mentored two Master 1 students (internships completed in July 2024) one student intern (internship completed in March 2023) and will supervise another masters student in the area of biofilm formation studies starting from April 2025. Along with Prof. Frédéric Barrière I have successfully co-authored two collaborative grants with labs in Ireland and Israel. Our current research is highly interdisciplinary and collaborative with colleagues in Geoscience and Microbiology - I have taken the lead in training postdoctoral colleagues in these disciplines in physical chemistry and electrochemical methods in our laboratory.

During my doctoral studies I mentored numerous project students and undergraduate visitors to our laboratory. I designed an undergraduate summer project in laboratory research and scientific writing which thanks to my guidance and mentoring resulted in a 2nd year undergraduate intern co-authoring a publication with me in *Electrochimica Acta* (2019).

At the Centre for BioNano Interactions I was the safety officer and oversaw the training and induction of new students into the team. I supervised and guided 6 Ph.D. students in their daily research activities and fully oversaw 1 masters student project (thesis submitted and defended 2020). I was the point of contact for an industrial collaboration between CBNI and Intel Ireland in the area of nanomaterials safety and environmental impact, which involved supervising and advising the project of one industrial PhD student (project completed in 2023). As a senior group member I also ran workshops in management of data, applied my Certificate in Statistics to teach short classes in statistical analysis and the production of scientific figures for publication which were delivered to the junior members of the research team as a form of training and induction.

OUTREACH

Promoting Science to the Masses

In the summer of 2023 I participated in the filming of a short programme intended for the *Esprit Sorcière* science communication programme. The segment filmed presented a step-by-step process for preparing and studying microbial fuel cell systems and is designed to inspire children and young adults to take an interest in a career in science. The programme was released on French television and online in February 2024 and can be viewed [here](#).

I am a laureate of the AMI Emergence Programme, which is an entrepreneurship and outreach programme designed to train scientists in commercialising their research and communicating its value to policymakers, investors and the general public. As part of this programme I gave a 'pitch' of my work to an audience comprised of investors and local government officials in Brittany. I also participated in the Fête de la Science, an outreach event where I carried out public demonstrations of chemical experiments to schoolchildren and the general public. My presentation (in French) can be viewed [here](#).

During my doctoral studies I was a volunteer with the Voluntary Tuition Programme, where I taught and mentored second-level students from disadvantaged schools in Dublin City Centre in science and mathematics with free one-on-one lessons every week. The programme also involved short talks to promote a career in STEM fields.

I maintain my own website where I post updates on my research and communication activities at <https://www.jamesbehan.net>

REFERENCES

Dr. Paula E. Colavita

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