

# People Create Pollution Problems, PEOPLE Help Find Solutions.



PEOPLE Bulletin  
March 2021

PEOPLE  
Network

# Front Message

**D**ear PEOPLE members and partners: We are delighted to announce our first issue of PEOPLE Bulletin in celebrating the achievements of our Network and updating our continued progress. The population growth and the associated accelerating demands for energy and natural resources have produced significant pressure and growing risks to the environment. Besides the traditional environmental pollution, our environment is facing new threats caused by a fast-growing group of persistent, emerging and organic pollutants (PEOPs). They mainly include but not limited to petroleum hydrocarbons, pesticides, disinfection by-products (DBPs), fire retardants, chemical surfactants, pharmaceutical and personal care products (PPCPs), aquaculture therapeutants, engineered nanomaterial, micro-plastics, and metals. They are either new or recently recognized contamination phenomena caused by traditional contaminants (e.g., co-contamination of heavy metals and petroleum hydrocarbons, oil spills in ice-infested waters, and micro-plastics) or man-made products which are recently developed or whose environmental impacts have not been well studied (e.g., engineered nanomaterial and PPCPs). A large number of these pollutants are recalcitrant to degradation, toxic or carcinogenic, and bio-accumulative, and currently not included in regulatory guidelines and routine monitoring programs. The understanding of their fate, behavior and effects in the environment and the development of prevention, control and remediation technologies are lacking but becoming increasingly crucial for protecting community health and ecosystems, making evidence-based policies and decisions, and supporting the sustainable development of natural resources.

In light of these facts, a new pan-Canadian/global research and training Network on the Persistent, Emerging, and Organic Pollution in the Environment (PEOPLE) has been established. Based on the concept developed in 2016, the initiative was made by the researchers and partners from over 30 institutions and partnering organizations in Canada, USA, China, France, Norway, and Ireland. On October 16-17, 2017, the network was officially launched during its first event, PEOPLE 2017, in St. John's, Canada. PEOPLE is

to promote scientific research, engineering and social-economic development, cross-disciplinary education and training, community engagement and knowledge transfer in order to help address the growing, emerging problems caused by PEOPs, leading to long-term benefits to Canadian and global communities and environments. Special attention and efforts have been made to address environmental challenges in the cold and marine environments. As the first of its kind in North America, PEOPLE bridges natural and social sciences, facilitates collaborative R&D and training, and advances science and technology through integrated approaches and synergetic efforts by the following:

- Collaborate within and beyond PEOPLE at regional, national and international scales focusing on innovative research and partnerships with a goal to address the urgent R&D needs of government, industry and communities.
- Reach out to collaborators with different expertise and experience to enhance its diversity and capacity and to improve better collaboration on scientific understanding the PEOPs, particularly in the cold and marine environments.
- Provide a unique platform and mechanism to gather researchers and form integrated knowledge and technology inventory and build an open, efficient channel to connect the researchers with the end users from private and public sectors as well as the communities.
- Seek and secure funding support to the operation and activities of PEOPLE, the collaborative and innovative research by PEOPLE's researchers and partners, and the development and the promotion technologies transfer opportunities.
- Consider reflecting more social science and health science in future research and training efforts, and particularly taking the health and social-economic needs of communities into account.
- Educate and train the highly qualified personnel (HQP), professionals from industry and governments, and communities particularly from remote and Indigenous groups.

Our PEOPLE Network team has been awarded 1.65 million Canadian dollars for the training program in Persistent, Emerging, and Oil PoLLution in cold marine Environments (PEOPLE CREATE) by the Natural Sciences and Engineering Research Council's (NSERC) CREATE Program. It will promote the collaborative consortium with world-class expertise and facilities for leading-edge research on the emerging environmental problems caused by PEOPs, as well as the cross-disciplinary education and training for the next generation of highly qualified personnel and professionals. Together, the program will make important contributions to address the PEOPs challenges and protect Canada's oceans and coastal communities.

Over the past three years, we have together made so many great achievements. During this unprecedented pandemic, we have been progressing and staying connected virtually. We are grateful for your continues support and cooperation and look forward to achieving more milestones with you. Best wishes to all of you for a healthy, happy, and prosperous 2021 and beyond.

Sincerely,

**Dr. Bing Chen, PEng, FEIC, FCSCE**

Director, PEOPLE Network

Professor and Head, Department of Civil Engineering, Memorial University

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### PEOPLE 2017 Symposium and Workshop



### PEOPLE 2019 Symposium and Workshop



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# PEOPLE CREATE

NSERC CREATE training program in Persistent, Emerging, and Oil  
PoLlution in cold marine Environments

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**\$1.65M** Research & Training Grants

**4** Project Topics

**30** Collaborators

**8** Knowledge & Skills Sets

**15** Co-leads

**24** Partners

# The NSERC PEOPLE CREATE Program

## Eight (8) Knowledge and Skills (KS) sets

- KS 01** monitoring, sampling and characterization of persistent, emerging and oil pollutants (PEOPs) and their transformation products, and database development
- KS 02** measurement and simulation of PEOP fate and behaviors in cold marine environments
- KS 03** prevention and treatment technologies
- KS 04** control and remediation technologies
- KS 05** exposure/risk analysis, impact assessment, socio-economic impacts and decision/policy making
- KS 06** marine ecotoxicological and ecological effect analysis
- KS 07** impact evaluation for seafood safety, human health, and coastal communities
- KS 08** community engagement, technology transfer and entrepreneurship

### PI & KS co-leads

#### Bing Chen

Memorial University  
PI, PEOPLE CREATE

#### Manuel Rodriguez

Université Laval  
KS 01 co-leads

#### Baiyu (Helen) Zhang

Memorial University  
KS 01 co-leads

#### Feiyue Wang

University of Manitoba  
KS 02 lead

#### Pascale Champagne

Queen's University  
KS 03 co-leads

#### Pierre Bérubé

University of British Columbia  
KS 03 co-leads

#### Uta Passow

Memorial University  
KS 04 co-leads

#### Stanislav Stoyanov

Natural Resources Canada  
KS 04 co-leads

#### Faisal Khan

Memorial University  
KS 05 co-leads

#### Rehan Sadiq

UBC (Okanagan)  
KS 05 co-leads

#### Paul Snelgrove

Memorial University  
KS 06 co-leads

#### Viviane Yargeau

McGill University  
KS 06 co-leads

#### Peter Ross

University of Victoria  
KS 07 co-leads

#### Atanu Sarkar

Memorial University  
KS 07 co-leads

#### Carlos Bazan

Memorial University  
KS 08 co-leads

#### Dale Booth

Pikwakanagan First Nation;  
Innovation Seven  
KS 08 co-leads

### PEOPLE Network Website

[www.people-network.ca/](http://www.people-network.ca/)

Note: Memorial websites have been under server upgrade recently. PEOPLE Network website may be temporarily inaccessible to certain browsers.

### Collaborators (academic and non-academic) and Partners

Dr. Bao, Mutai	Ocean University of China
Dr. Brown, Carl	Environment and Climate Change Canada (ECCC)
Dr. Guo, Huaicheng	Peking University
Dr. Hardesty, B. Denise	Commonwealth Scientific and Industrial Research Organisation (CSIRO)
Dr. Husain, Tahir	Memorial University
Dr. Lee, Jongho	University of British Columbia (UBC)
Dr. Lee, Kenneth	Fisheries and Oceans Canada (DFO)
Dr. Li, Pu	Sun Yat-Sen University (Zhuhai Campus)
Dr. Li, Xuemei	Memorial University
Dr. Lordwin Jeyakumar	Agriculture and Agri-Food Canada (AAFC)
Dr. Lye, Leonard	Memorial University
Dr. Moore, Sylvia	Memorial University
Dr. Morrill, Penny L.	Memorial University
Dr. Palace, Vince	IISD Experimental Lake Areas Inc. (IISD-ELA)
Dr. Singaas, Ivar	SINTEF Ocean AS
Dr. Slobodnik, Jaroslav	NORMAN Association Slovak Republic
Dr. Stern, Gary	University of Manitoba
Dr. Storesund, Rune	University of California, Berkeley
Dr. Wang, Shuguang	Shandong University
Dr. Zhang, Yan	Memorial University
Dr. Zhao, Yuming	Memorial University
Dr. Ziels, Ryan	University of British Columbia (UBC)
Mr. Alarcon, Michel	Global Energetix Company Ltd.
Mr. Janes, Greg	Suncor Energy
Mr. Puestow, Thomas	C-Core
Ms. Gaultois, Hannah	Memorial University

#### Four (4) Project Topics (PT)

**PT1** PEOP monitoring, analysis, fate and transport | Leads: Rodriguez, Zhang, F Wang; Collaborators: Chen, Passow, Snelgrove, Sarkar, Ross, Morrill, YM Zhao, Y Zhang, Brown, K Lee, Jeyakumar, P Li, Alarcon, Puestow, Palace, Slobodnik, Guo, SG Wang, Bao, Hardesty, Singaas

**PT2** PEOP prevention, treatment and remediation | Leads: Champagne, Bérubé, Stoyanov,

Passow; Collaborators: Chen, Zhang, YM Zhao, Y Zhang, Husain, Ziels, J Lee, Stern, Brown, K Lee, Jeyakumar, Janes, Alarcon, Puestow, Palace, Storesund, Slobodnik, Guo, SG Wang, Bao, Hardesty, Singaas

**PT3** Ecological impact, toxicological analysis, and risk management | Leads: Yargeau, Snelgrove, F Khan, Sadiq; Collaborators: Ross, Passow, Husain, Ziels, Stern, Brown, K

Lee, P Li, Alarcon, Puestow, Palace, Storesund, Slobodnik, Singaas

**PT4** Community health effects and technology transfer | Leads: Sarkar, Ross, Bazan, Booth; Collaborators: Bérubé, Champagne, Chen, Yargeau, Stoyanov, Sadiq, Lye, Moore, XM Li, Gaultois, Brown, K Lee, P Li, Janes, Alarcon, Puestow, Storesund, Slobodnik, SG Wang, Singaas

## PEOPLE CREATE Program Committee (2021-2022)

The Program Committee (PC) will guide the strategic direction of the CREATE training initiative, in an advisory capacity. It will not be assessing the research program per se; rather it will play a role in challenging the group of researchers to think innovatively as they establish their group of students and postdoctoral fellows who will participate in the training initiative. It will provide input and guidance in the conduct of program reviews, any related major changes in the program, and in the setting of performance indicators and program evaluation.

### Dr. Carlos Bazan

Assistant Professor, Engineering Chair in Entrepreneurship, Memorial University

### Mr. Dale Booth

Band Manager, Pikwakanagan First Nation; President, Innovation Seven

### Dr. Bing Chen

Professor & Head of Civil Engineering; PI, PEOPLE CREATE; Memorial University

### Mr. Greg Janes

Manager of Environment, Health and Safety, Suncor Energy

### Dr. Faisal Khan

Professor & Associate Dean of Engineering, CRC T1, Memorial University

### Dr. Kenneth Lee

National Senior Scientific Advisor, Fisheries and Oceans Canada (DFO)

### Dr. Xuemei Li

Associate Professor of Education, Memorial University

### Mr. Ethan Matchinski

Graduate student, Environmental Engineering, Memorial University

### Dr. Catherine Mulligan (Chair)

Professor of Building, Civil, and Environmental Engineering and Concordia Research Chair T1, Concordia University

### Dr. Jaroslav Slobodnik

Chairman, NORMAN Association

### Ms. Annette Tobin

Program Lead of Hydrometric, Climate & Water Quality Agreements, Environment, Climate Change and Municipalities, Government of Newfoundland and Labrador

### Dr. Zhiwen (Joy) Zhu

Postdoctoral Fellow, Environmental Engineering, Memorial University

## Strength and novelty of the program

#training at the sea

#cross-disciplinary

#PEOP

#mobility

#collaboration

#conference & symposium

#market-oriented training

#public / private sectors

#entrepreneurship

#tailored course sets

#internships

#international training

#NGOs

#community engagement

#cross-institution supervision

#national

#Indigenous engagement

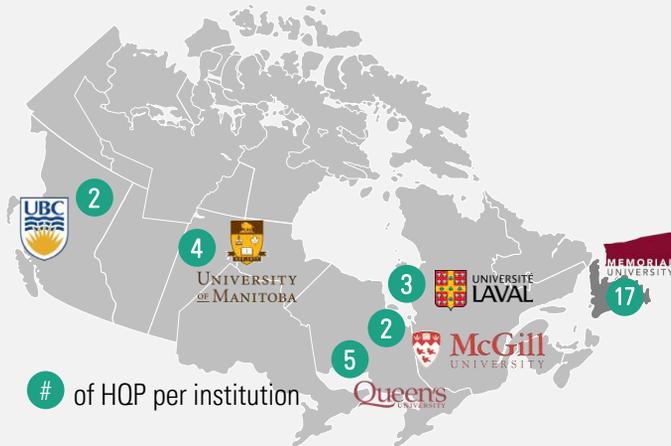
#student exchange

#workshop

#professional skills

# HQP Summary

## HQP data 2019-2020 (program year 1)



33 HQP recruited  
 7 Universities  
 1 Bachelor, 14 Master  
 12 PhD, 6 PDF  
 29 NSE v.s. 4 non-NSE  
 48% female v.s. 52% male

### Publications ([complete list](#))

17 Articles published in or accepted by refereed journal  
 4 Article submitted to refereed journal  
 27 Conference presentations

## Off-shore oil spill response training - Atlantic Kingfisher (September 24, 2019)



## Off-shore oil spill response training - Skandi Vinland (October 2, 2019)



# 2020 Virtual Events

**Indigenous Engagement in Research.** Speaker: Dale Booth, Band Manager, Pikwakanagan First Nation; President, Innovation Seven, Online workshop, June 8, 2020

**NORMAN 12th General Assembly Meeting,** December 2-3, 2020. PEOPLE officially joined NORMAN Association in 2019



**LEADERS & PEOPLE  
2020 Virtual Symposium**  
August 31-September 1, 2020



	<b>39</b>	<b>4</b>
	Technical presentations	Roundtable discussion
<b>2</b>	<b>120+</b>	<b>14</b>
Keynote	Registrants	Institutions

# Current and Upcoming Events

## Call for paper: Special Issue on Water Management in a Changing Climate, Environmental Systems Research (Springer)

You are invited to submit research articles, reviews, or comments for a special issue titled "**Water Management in a Changing Climate**". This issue will showcase state-of-the-art advancements on Persistent, emerging, and organic pollutants (PEOPs) especially within the climate change context. Potential topics include, but are not limited to:

- PEOPs monitoring, analysis, fate, and transport
- PEOPs prevention, treatment, and remediation
- Ecological impact, toxicological analysis, and risk management
- Community health effects and technology transfer, etc.

This special issue is resulted from the LEADERS & PEOPLE 2020 Virtual Symposium on August 30-September 1; however, it is open to everyone.

There is no deadline for the submission. The special issue will be published progressively based on submissions. The Editorial team will speed up the review process to make research results available as early as possible.

Submitted manuscripts should not have been published previously, nor be under consideration for publication elsewhere. All manuscripts are refereed through a peer-review process. The

manuscript must fully comply with the ESR submission guidelines and should be submitted via Editorial Manager.

For any queries regarding submission, please contact the special issue guest editors via email.

### Guest Editors

Dr. Chunjiang An, Concordia University, Canada, [chunjiang.an@concordia.ca](mailto:chunjiang.an@concordia.ca)

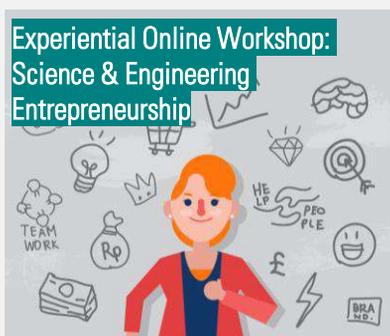
Dr. R. Stephen Brown, Queen's University, Canada, [stephen.brown@chem.queensu.ca](mailto:stephen.brown@chem.queensu.ca)

Dr. Wendy Huang, University of Calgary, Canada, [wendy.huang3@ucalgary.ca](mailto:wendy.huang3@ucalgary.ca)

Dr. Weiyun Lin, Memorial University, Canada, [peoplenetwork@mun.ca](mailto:peoplenetwork@mun.ca)

Dr. Helen Zhang, Memorial University, Canada, [bzhang@mun.ca](mailto:bzhang@mun.ca)

### [For more information](#)



Instructor: **Dr. Carlos Bazan**, Assistant Professor & Engineering Chair in Entrepreneurship, Memorial University

Date & Time: March 2021 (details TBD)

Translating the university's scientific and technological advances into value-creating products and services is becoming a priority for both the university and funding agencies. Notwithstanding the commercial potential of the university's discoveries and inventions, turning those innovations into market-ready products and services, let alone successful businesses, can prove extremely difficult.

This workshop will present a systematic framework to help university investigators initiate, plan, execute, and close a translational research and development project with the intent of commercializing the research outcomes. It will also show the essential aspects of the entrepreneurial process (venture creation). That is, the iterative process (lean start-up approach) that starts by recognizing a business opportunity (problem), followed by conceiving a business idea (solution), assessing the idea, developing a business model, and ending by launching and then growing a sustainable business.

Registration to be announced soon

## PEOPLE 2022 International Conference, China

The PEOPLE 2022 International conference: location proposed in China with confirmed interest of co-hosting the conference with Chinese institutions.

# News from Members

## Drs. Catherine Mulligan and Rehan Sadiq inducted to Canadian Academy of Engineering (CAE)



Drs. Catherine Mulligan (Professor, Concordia Research Chair in Geoenvironmental Sustainability, Concordia University) and Rehan Sadiq (Professor, Executive Associate Dean, The University of British Columbia) were elected as new fellows into the Canadian Academy of Engineering in June 2020.

Photo credit: Dr. C. Mulligan – Concordia University.

[Read more](#)

## Concordia's Dr. Catherine Mulligan named CSCE president

Dr. Catherine N. Mulligan was named president of the Canadian Society for Civil Engineering (CSCE). Previously CSCE's senior vice-president (SV) and president-elect, she now becomes the first 'Concordian'—and third woman—to lead the Montreal-based society as president for a one-year term.

[Read more](#)

## Dr. Bing Chen inducted as Fellow of the Engineering Institute of Canada



Dr. Bing Chen (Professor, Memorial University) was named fellow of the Engineering Institute

of Canada (EIC). The EIC, founded in 1887, is a Canadian federation of 14 constituent societies in mechanical, civil, geotechnical, chemical and electrical engineering presenting over 30,000 Canadian engineering professionals. The institute recognizes outstanding engineers among its academic and industry-based member societies by annually inducting up to 20 fellows for their "exceptional contributions to engineering in Canada."

[Read more](#)

## Dr. Paul Snelgrove named science advisor to Fisheries and Oceans Canada



Dr. Paul Snelgrove (Professor, Memorial University; Associate Scientific Director of the Ocean Frontier

Institute (OFI)) was appointed departmental science advisor for Fisheries and Oceans Canada (DFO) in February 2020 for a two-year term.

Dr. Snelgrove joins a group of science advisors across federal government departments. They will work closely with senior departmental officials, providing a neutral sounding board for decision-makers and facilitate the incorporation of evidence in decision-making processes, acting as a link between the department and external stakeholders.

[Read more](#)

## Dr. Bing Chen appointed as the Editor-in-Chief of Environmental

## System Research (Springer)

Environmental Systems Research (Springer) publishes high-quality, interdisciplinary and refereed research papers, review and comment articles, and topical collections on all aspects of environmental systems from water (terrestrial and marine), air, soil and biota. The journal aims to advance and apply scientific knowledge and practical methods to improve our understanding of environmental and sustainability issues and support evidence-based policymaking and eco-friendly practice at regional or global scales. The journal particularly encourages innovative, original and cross-disciplinary research on the development and use of new or improved methodologies and technologies for scientific studies and practical work in environmental fields.

## Dr. Jongho Lee selected as Early Career Editorial Board member of Journal of Membrane Science



Dr. Jongho Lee (Assistant Professor, The University of British Columbia) was selected as an Early

Career Editorial Board member of Journal of Membrane Science, a prestigious journal in the membrane field. Dr. Lee was one of the 18 selected from about 100 applicants over the world. He was one among the three members in the North America and the only one in Canada.

[Read more](#)

## Dr. Chunjiang An awarded Concordia University Research Chair (CURC) in Spill Response and Remediation (New Scholar)



Concordia University recognizes and values the role played by Research Chairs ("Chairholders") in

creating and mobilizing knowledge with the aim of achieving research excellence. As leaders in their fields, Chairholders play a critical role in deepening the knowledge base and in strengthening teaching, the training of highly qualified personnel, and research capacity. As catalysts and builders, they contribute to the university's positioning in given areas of scholarly pursuit and to the enhancement of the research training environment.

## Former PEOPLE CREATE coordinator Dr. Wendy Huang joined University of Calgary; Dr. Weiyun Lin started as the new CREATE program coordinator

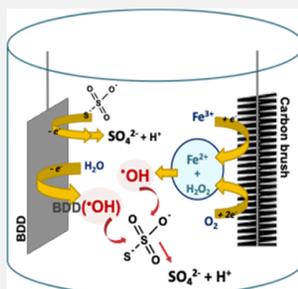


Dr. Wendy Huang, former PEOPLE coordinator and Postdoctoral Research Fellow at NRPOP Lab (Memorial University), joined the Department of Civil Engineering at the University of Calgary as a tenure-track Assistant Professor in July, 2020. Dr. Huang will be a member of the PEOPLE Network in her new position. Dr. Weiyun Lin (graduated from Memorial University in early 2020) joined the program as the new coordinator. Dr. Lin has been involved and facilitated PEOPLE since 2017.

# Featured Publication

Olvera-Vargas, H., Dubuc, J., Wang, Z., Coudert, L., Neculita, C. M., & Lefebvre, O. (2021). Electro-Fenton beyond the Degradation of Organics: Treatment of Thiosalts in Contaminated Mine Water. *Environmental Science & Technology*. 55, 4, 2564–2574.

<https://pubs.acs.org/doi/10.1021/acs.est.0c06006>



**Abstract** Electro-Fenton (EF) is an emerging technology with well-known outstanding oxidation power; yet, its application to the treatment of inorganic contaminants has been largely disregarded. Thiosalts are contaminants of emerging concern in mine water, responsible for delayed acidity in natural waterways. In this study, EF was used to treat thiosalts in synthetic and real mine water. Thiosulfate ( $S_2O_3^{2-}$ ) solutions were first used to optimize the main parameters affecting the process, namely, the current density ( $2.08\text{--}6.25\text{ mA cm}^{-2}$ ), temperature ( $4\text{ vs }20\text{ }^\circ\text{C}$ ), and  $S_2O_3^{2-}$  concentration ( $0.25\text{--}2\text{ g L}^{-1}$ ).  $S_2O_3^{2-}$  was almost completely removed in 2 h of treatment at  $6.25\text{ mA cm}^{-2}$ , while temperature played no important role in the process efficiency. The optimal conditions were then applied to treat a real sample of contaminated mine water, resulting in complete  $S_2O_3^{2-}$ – and  $S_4O_6^{2-}$  oxidation to  $SO_4^{2-}$  in 90 min at  $6.25\text{ mA cm}^{-2}$  (95% removal in only 60 min). The reaction mechanisms were investigated in detail based on the quantification of the main degradation byproducts. This study opens new possibilities for EF application to the treatment of thiosalt-contaminated mine water and other oxidizable inorganic-impacted wastewaters.

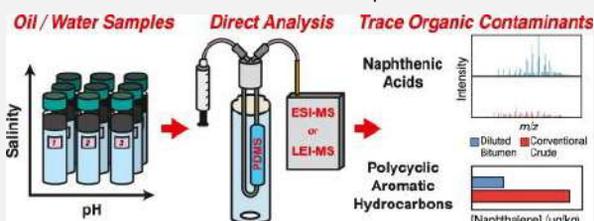
*Reprinted with permission from Olvera-Vargas, H., Dubuc, J., Wang, Z., Coudert, L., Neculita, C. M., & Lefebvre, O. (2021). Electro-Fenton beyond the Degradation of Organics: Treatment of Thiosalts in Contaminated Mine Water. Environmental Science & Technology. Copyright (2021) American Chemical Society.*

Monaghan, J., Richards, L. C., Vandergrift, G. W., Hounjet, L. J., Stoyanov, S. R., Gill, C. G., & Krogh, E. T. (2021). Direct mass spectrometric analysis of naphthenic acids and polycyclic aromatic hydrocarbons in waters impacted by diluted bitumen and conventional crude oil. *Science of The Total Environment*, 765, 144206.

<https://doi.org/10.1016/j.scitotenv.2020.144206>

**Abstract** Crude oil spills have well-documented, deleterious impacts on the hydrosphere. In addition to macroscopic effects on wildlife and waterscapes, several classes of petroleum derived compounds, such

as naphthenic acids (NAs) and polycyclic aromatic hydrocarbons (PAHs), may be released into the water and present aquatic contamination hazards. The concentrations of these contaminants may be affected by both oil type and water chemistry. We characterize the concentrations of NAs and PAHs in natural and constructed waters, spanning a range of pH and salinity, and directly compare the influence of diluted bitumen (DB) and conventional crude (CC) oil, using condensed-phase membrane introduction mass spectrometry (CP-MIMS) as a direct sampling, on-line technique. The concentration and isomer class profiles of classical NAs in the aqueous phase were assessed using electrospray ionization in negative-ion mode as  $[M-H]^-$  whereas PAH concentrations were monitored using liquid electron ionization (LEI) in positive-ion mode as  $[M+•]^+$ . NA concentrations (0.03–25 ppm) were highly pH-dependent, and an order of magnitude greater in water samples contaminated with DB than CC. Conversely, concentrations of naphthalene (10–130 ppb) and alkyl-naphthalenes (10–90 ppb) were three to four-fold higher in water samples exposed to CC. We demonstrate that naturally occurring dissolved organic matter does not bias results from the membrane sampling approach employed, and that DB and CC contaminated waters can be differentiated using principal component analysis of the NA isomer class distribution in both constructed and natural waters. Finally, we describe the first demonstration of the concurrent analysis of trace NAs and PAHs in the same water sample by controlling perm-selectivity at the membrane and the ionization mode of the mass spectrometer. The techniques employed here for trace analysis of petroleum derived compounds in water can be applied to rapid screening and real-time monitoring of contamination and remediation processes.



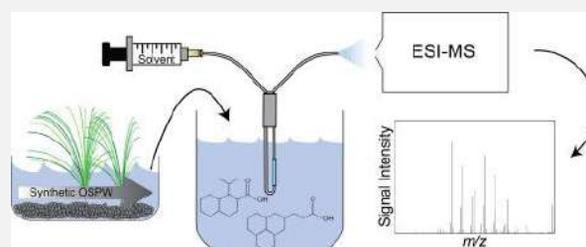
Reprinted from *Science of The Total Environment*, vol 765, Monaghan, J., Richards, L. C., Vandergrift, G. W., Hounjet, L. J., Stoyanov, S. R., Gill, C. G., & Krogh, E. T., *Direct mass spectrometric analysis of naphthenic acids and polycyclic aromatic hydrocarbons in waters impacted by diluted bitumen and conventional crude oil*, 144206, Copyright (2021), with permission from Elsevier.

Duncan, K.D., Richards, L.C., Monaghan, J., Simair, M.C., Ajaero, C., Peru, K.M., Friesen, V., McMartin, D., Headley, J.V., Gill, C.G. & Krogh, E.T. (2020). Direct

analysis of naphthenic acids in constructed wetland samples by condensed phase membrane introduction mass spectrometry. *Science of The Total Environment*, 716, 137063.

<https://doi.org/10.1016/j.scitotenv.2020.137063>

**Abstract** The application of direct mass spectrometry techniques to the analysis of complex samples has a number of advantages including reduced sample handling, higher sample throughput, in situ process monitoring, and the potential for adaptation to on-site analysis. We report the application of a semi-permeable capillary hollow fibre membrane probe (immersed directly into an aqueous sample) coupled to a triple quadrupole mass spectrometer by a continuously flowing methanol acceptor phase for the rapid analysis of naphthenic acids with unit mass resolution. The intensity of the naphthenic acid-associated peaks in the mass spectrum are normalized to an internal standard in the acceptor phase for quantitation and the relative abundance of the peaks in the mass spectrum are employed to monitor compositional changes in the naphthenic acid mixture using principle component analysis. We demonstrate the direct analysis of a synthetic oil sands process-affected water for classical naphthenic acids ( $C_nH_{2n+2}O_2$ ) as they are attenuated through constructed wetlands containing sedge (*Carex aquatilis*), cattail (*Typha latifolia*), or bulrush (*Schoenoplectus acutus*). Quantitative results for on-line membrane sampling compare favourably to those obtained by solid-phase extraction high-resolution mass spectrometry. Additionally, chemometric analysis of the mass spectra indicates a clear discrimination between naphthenic acid-influenced and natural background waters. Furthermore, the compositional changes within complex naphthenic acid mixtures track closely with the degree of attenuation. Overall, the technique is successful in following changes in both the concentration and composition of naphthenic acids from synthetic oil sands process-affected waters, with the potential for high throughput screening and environmental forensics.



Reprinted from *Science of The Total Environment*, vol 765, Duncan, K.D., Richards, L.C., Monaghan, J., Simair, M.C., Ajaero, C., Peru, K.M., Friesen, V., McMartin, D., Headley, J.V., Gill, C.G. & Krogh, E.T. Direct analysis of naphthenic acids in constructed wetland samples by condensed phase membrane introduction mass spectrometry, 137063, Copyright (2021), with permission from Elsevier.

Zeng, G., You, H., Du, M., Zhang, Y., Ding, Y., Xu, C., Liu, B., Chen, B. & Pan, X. (2021). Enhancement of photocatalytic activity of TiO<sub>2</sub> by immobilization on activated carbon for degradation of aquatic naphthalene under sunlight irradiation. *Chemical Engineering Journal*, 128498.

<https://doi.org/10.1016/j.cej.2021.128498>

**Abstract** Remediating and controlling PAHs (Polycyclic Aromatic Hydrocarbons) contamination in the environment is essential all over the world. Nano-TiO<sub>2</sub> immobilized on large surface area adsorbent is a kind of emerging endeavor to enhance the photo-catalysis performance. In this paper, activated carbon samples (ACs) were synthesized by using a kind of subtropical macroalgae, i.e., *Sargassum Horneri* (*S.H.*) as raw material. ACs activated by FeCl<sub>3</sub>, ZnCl<sub>2</sub>, a composite activators mixture of FeCl<sub>3</sub> and ZnCl<sub>2</sub> (CA) were selected to immobilize nano-TiO<sub>2</sub> in aquatic environment, and naphthalene degradation performance of these materials was systematically assessed. The results showed that ACs could provide more activated space for naphthalene photocatalytic reaction, in which Zn<sup>2+</sup> helped to hold relative high specific surface area, Fe<sup>3+</sup> helped to extend the valid light responsive wavelength, and CA could take advantage of both metal ions, with the largest whole volume and surface functional groups. The highest naphthalene degradation efficiency of TiO<sub>2</sub>/AC-CA under simulated sunlight could arrive to 77.5%, while those of TiO<sub>2</sub>/AC-FeCl<sub>3</sub> and TiO<sub>2</sub>/AC-ZnCl<sub>2</sub> were 65.0%, 54.5%, respectively. Meanwhile, the pH-resistance and reusing capability of TiO<sub>2</sub>/AC-CA are better than those of other TiO<sub>2</sub>/ACs. The results helped to clarify the synergistic mechanism of AC and TiO<sub>2</sub> in photocatalysis, especially the metal ions' role in combining the two materials, and showed the industrial potential of *S.H.* in PAHs contamination.

Reprinted from *Chemical Engineering Journal*, Vol 412, Zeng et al., Enhancement of photocatalytic activity of TiO<sub>2</sub> by immobilization on activated carbon for degradation of aquatic naphthalene under sunlight irradiation, 128498, Copyright (2021), with permission from Elsevier.

Oliveira, G., Khan, F., & James, L. (2020). Ecological Risk Assessment of Oil Spills in Ice-Covered Waters: A

Surface Slick Model Coupled with a Food-Web Bioaccumulation Model. *Integrated environmental assessment and management*, 16(5), 729-744.

<https://setac.onlinelibrary.wiley.com/doi/full/10.1002/ieam.4273>

**Abstract** The limited knowledge on oil-ice interactions and on the ecological outcomes of oil spills in the Arctic represent sources of uncertainties for shipping and oil and gas activities in polar regions. The present work aims at the definition of the ecological risk posed by oil spills in the Arctic by the integration of an improved surface slick model to a fugacity-based food-web bioaccumulation model for icy waters. The model's outcomes are the representation of transport and weathering processes and the concentrations of a toxic component of oil, namely naphthalene, in the environmental media as a function of ice conditions. Given those concentrations, the associated ecological risk is defined in terms of the bioconcentration factor (BCF). Overall, the model predicted low bioaccumulation and biomagnification potential for naphthalene to a hypothetical Arctic food web, regardless of the ice concentration.

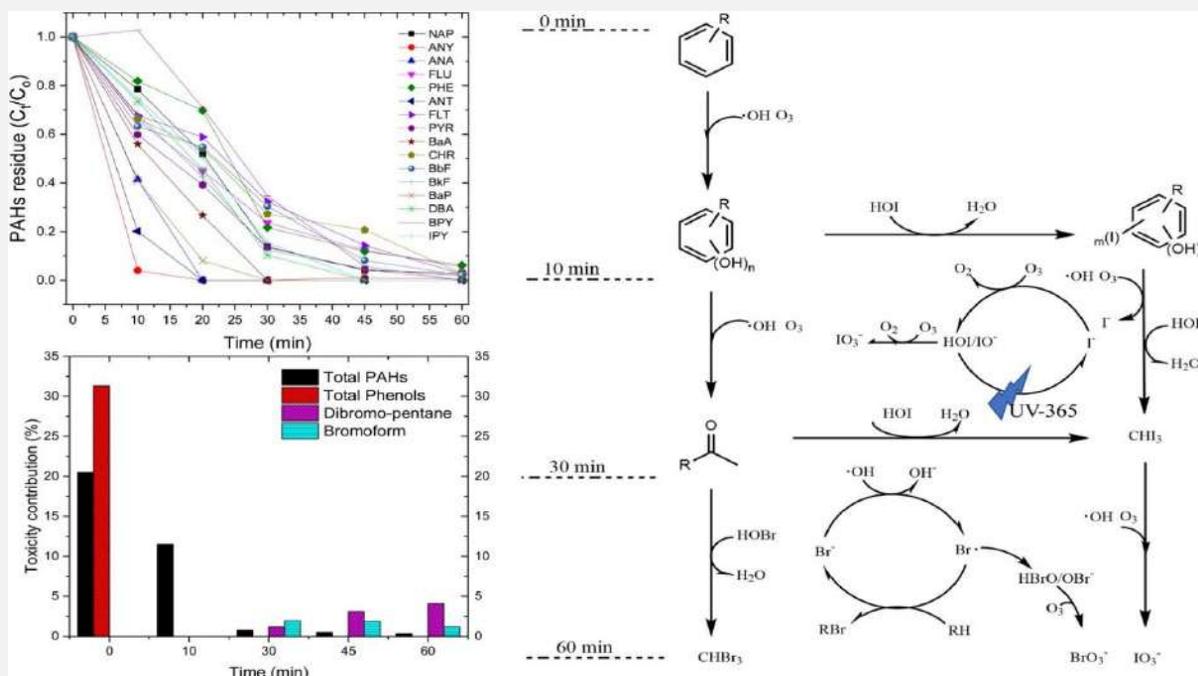
Reprinted from *Integrated environmental assessment and management*, vol 16, Oliveira, G., Khan, F., & James, L., Ecological Risk Assessment of Oil Spills in Ice-Covered Waters: A Surface Slick Model Coupled with a Food-Web Bioaccumulation Model, 729-744, Copyright © 2020, with permission from John Wiley and Sons.

Liu, B., Chen, B., Zhang, B., Song, X., Zeng, G., & Lee, K. (2021). Photocatalytic ozonation of offshore produced water by TiO<sub>2</sub> nanotube arrays coupled with UV-LED irradiation. *Journal of Hazardous Materials*, 402, 123456.

<https://doi.org/10.1016/j.jhazmat.2020.123456>

**Abstract** Offshore produced water (OPW) containing hazardous substances such as polycyclic aromatic hydrocarbons (PAHs) needs to be treated prior to discharge. This study integrated a photocatalytic ozonation system with TiO<sub>2</sub> nanotube arrays (TNA) and UV-light-emitted diode (UV-LED) irradiation and applied to treat OPW. Experimental and modeling efforts were made to evaluate the degradation efficiencies of PAHs, examine the behaviors of the OPW composition (e.g., phenols, iodide, and bromide), and investigate the oxidation intermediates and the associated toxicity and

biodegradability. The results indicated that ozone significantly enhanced the oxidation rates and removed the PAHs within 30 min, while the TNA showed strong photocatalytic capability. In the early stage, iodide was a strong ozone competitor, accelerating phenol degradation but inhibiting PAH oxidation, whereas UV-LED fortified the effect. The degradation of aromatics was altered by iodide and bromide at different stages. The contributions of four toxicants to the acute toxicity of OPW were quantified and ranked (PAHs > bromoform > phenols > dibromopentane). The  $EC_{50}$  value increased from 3 % to 57 %, and the biodegradability was doubled with less footprint in 28-day biodegradation tests. Overall, it is recommended to sequentially oxidize the matrix of OPW by ozonation and PAHs by the UV-LED/TNA/ozone system.



Reprinted from *Journal of Hazardous Materials*, vol 402, Liu, B., Chen, B., Zhang, B., Song, X., Zeng, G., & Lee, K., Photocatalytic ozonation of offshore produced water by  $TiO_2$  nanotube arrays coupled with UV-LED irradiation, 123456, Copyright (2021), with permission from Elsevier.

## HQP Publication

Azizi A, Shahhoseini F, Modir-Rousta A & Bottaro CS. (2019). High throughput direct analysis of water using solvothermal headspace desorption with porous thin films. *Analytica chimica acta*. 1087: 51-61. <https://doi.org/10.1016/j.aca.2019.08.022>

Azizi A, Shahhoseini F & Bottaro CS (2020). Magnetic molecularly imprinted polymers prepared by reversible addition fragmentation chain transfer polymerization for dispersive solid phase extraction of polycyclic aromatic hydrocarbons in water. *Journal of*

*Chromatography A*. 1610: 460534. <https://doi.org/10.1016/j.chroma.2019.460534>

Cao YQ, Zhang BY, Dong GH, Cai QH, Song X, Ye XD, Zhu ZW & Chen B. (2020). Microbial eco-physiological strategies for salinity-mediated crude oil biodegradation. *Science of the Total Environment*. 727(20): 138723. <https://doi.org/10.1016/j.scitotenv.2020.138723>

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- Yang M, Chen B, Xin XY, Song X, Liu JB, Dong GH, Lee K & Zhang BY (2020). Interactions between microplastics and oil dispersion in the marine environment. *Journal of Hazardous Materials*, 403 (2021): 123944. <https://doi.org/10.1016/j.jhazmat.2020.123944>
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Incomplete summary of PEOPLE CREATE HQP publications (April 2019 to January 2021) – we encourage PEOPLE members and HQP to share recent publications.



## Featured Research Group

# The Northern Region Persistent Organic Pollution Control (NRPOP) Laboratory

The Northern Region Persistent Organic Pollution Control ([NRPOP](#)) Laboratory is funded by the Canada Foundation for Innovation (CFI) and the Industrial Research and Innovation Funds (IRIF) of Newfoundland and Labrador Government. It is a first of its kind in Canada hosting pioneering research on quantitative understanding of persistent and toxic organic pollution and their effects in harsh marine and freshwater environments and development of innovative engineering and managerial solutions by integrating environmental engineering with nano/biological technologies and risk-simulation-optimization methods. The lab is equipped with a multi-scale experimental system which can be used to support model development through simulating the transport processes of persistent organic pollutants and their degradation products, testing the effects of pollution control and remediation practices, and gathering data for driving and validating models. Its associated research aims to enhance the understanding of the pollution mechanisms and help governments and industries improve their practices for mitigation of the POPs-related pollution problems, leading to short-/long-term environmental, economic and social benefits. (Note: Memorial websites have been under server upgrade recently. NRPOP website may be temporarily inaccessible to certain browsers.)

### Research Team

- Professors: 3 core professors (Drs. Bing Chen, Baiyu Zhang, and Tahir Husain), 2 adjunct professors (Drs. Kenneth Lee @DFO and Rune Storesund @UC Berkeley), 10+ associated professors, and 30+ collaborators globally
- Postdocs and students: about 20-30 trainees at any time including 4+ postdocs/RAs, 10+ PhD, 10+

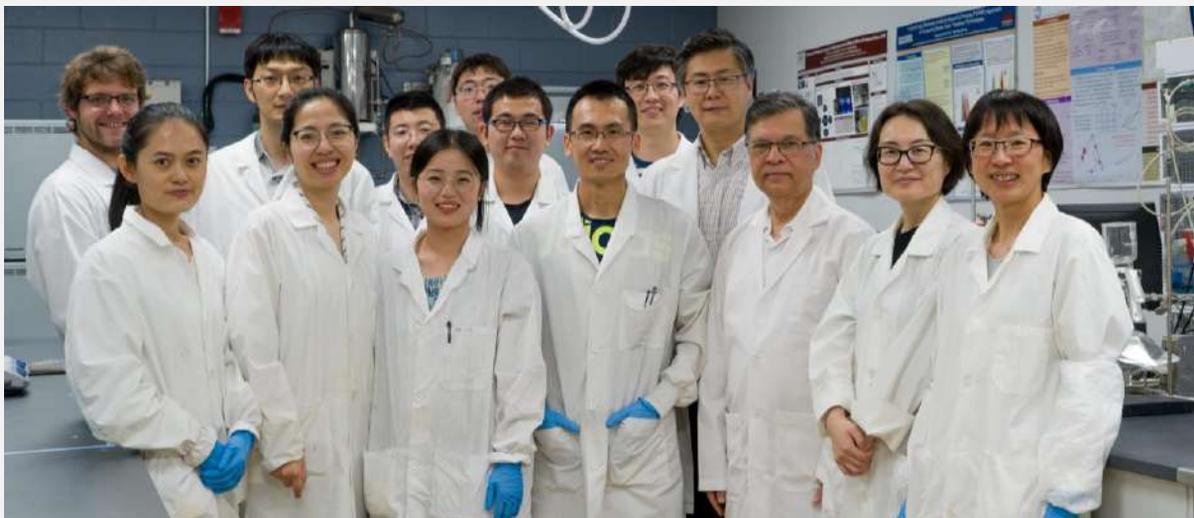
masters students, and some work-term undergraduate students; hosted 40+ visiting scholars worldwide; graduated students well placed in academia, industry and government

### Major research expertise

Marine/inland oil spill response and cleanup, contaminant fate, transport and effects, marine/coastal pollution prevention & mitigation, advanced water/wastewater treatment, environmental nanotech, environmental biotech, site remediation, process simulation & control, system optimization, risk/impact assessment, AI-aided decision making, etc.

### Featured Facilities

- Advanced analytical instruments (GC/GC-MS, GC-FID/ECD, HPLC-MS/MS, IC, AAS, TPH, TOC, spectrometers, AES, viscometer, contact angle goniometer, etc.)
- Biological and nanomaterial devices (PCR, fermentor, Microtox, respirometer, bio-safety cabinet, glovebox, freeze-dryer, NanoSight, LISST, microreactors, etc.)
- Physical simulation chambers/models (e.g., batch-/bench-/pilot-scale reactors/tanks incl. cohosting a 3.6m soil tank and 12m wave/spill tank)
- Data/image processing tools and modeling software - GNORM, OSCAR, MEDSLIK, LINGO/LINDO, ArcGIS, AutoCAD, Matlab, Worldviz VR, Hololens, etc.
- Faculty of Engineering - towing/wave tank, deep-water tank, ice tank (w wind tunnel), cold rooms (-20°C; x3), AUV and gliders, etc. (NRC – 200m ice/wave tanks, large-scale 3-D printers, etc.)



Right to left: NRPOP lab instructor, Lidan Tao; Core Professors: Dr. Baiyu (Helen) Zhang, Dr. Tahir Husain, Dr. Bing Chen (NRPOP director); and NRPOP students. Photo credit: NRPOP Laboratory.

## Research Area

### Area 1: Biosurfactant producers and production

- Biosurfactant producer screening and genetic engineering
- Waste based biosurfactant production
- Cultivation system design and advancement

### Area 2: Bio-aided oil pollution mitigation

- Bio-dispersion for marine oil spill response and cleanup
- Bio-enhanced coastal washing and bioremediation
- Bio-demulsification and bio-herding for oil spill response

### Area 3: Enhanced monitoring and analysis

- Advancement of oil analysis
- Phospholipid fatty acid (PLFA) based microbial community analysis

### Area 4: Oily wastewater treatment

- Enhanced oxidation processes and nano-microbial enhancement for wastewater treatment and reuse
- Integrated decanting system for marine oil spill response and on-site treatment of decanted water
- Hydrophilic Mesh and Activated Carbon for Oil Water Separation (Decanting)

### Area 5: Dynamic simulation, integrated assessment and intelligent decision making

- Integrated decision support systems for environmental emergency management
- AI aided optimization and human factor analysis
- AR/VR aided response training and decision making

Around 100 refereed journal articles, over 150 conference presentations, and 6 patents/disclosures in the past 5 years



Photo credit: NRPOP Laboratory

## Featured Research Group

# Research collaborative at UBC: Environment & Development: Gender, Equity, and Sustainability (EDGES)



[EDGES](#) is a research collaborative based at the University of British Columbia in Vancouver. The acronym EDGES identifies the major themes of our research: Environment & Development: Gender, Equity, and Sustainability. The use of the term EDGE is also meant to invoke several of its meanings—highlighting the goal of cutting-edge research, signaling the focus of research on marginal and vulnerable populations (women, impoverished, etc.), and also referencing the aim for sharp analysis that will serve to advance knowledge of key issues of contemporary social and environmental concern. In addition to regular research meetings, the collaborative also sponsors occasional lectures and events related to our research themes.

### Current Research

#### Beyond Access: Comparative Analysis of Non-material Dimensions of Water Insecurities

Awarded a SSHRC Insight Grant, this research project has three goals. First, it advances conceptualization and empirical evidence for non-material elements of water insecurity. Second, it examines theoretical and empirical linkages between household water (in)security and citizen engagement and participation across case study sites (e.g. South Africa, Brazil, Canada). Third, it develops and extends narrative, visual, and comparative methods for water insecurity studies. This project will contribute to our understanding of meanings and experiences of water insecurity and how these impinge on engagement and other key features of water governance.

#### EDGES Comparative Water Governance in Urban Sites in Africa Research Project (CWGAR)

The Africa Research Project is a comparative and collaborative project based at UBC with partners at the University of Ghana in Legon and at the University of Western Cape, South Africa. The project compares the effects of neoliberal policies and market instruments in the water realm (such as privatization, marketization, devolution, full-cost recovery measures, etc.) for water access and participatory governance, with particular focus on informal and underserved settlements

#### First Nations and the Shifting Water Governance Landscape of British Columbia

As part of the SSHRC-funded WEPGN: Water Economics Policy and Governance Network, the Program on Water Governance began a new project in 2013: First Nations and the shifting water governance landscape of British Columbia. This research explores some of the interactions between First Nations and water governance in the context of British Columbia. The project is guided by an environmental justice framework, and involves a commitment by the researchers and PoWG to engage collaboratively with communities. First Nations have articulated their strong ties to water and recognize it as a vital and sacred resource for sustaining health and culture. Working towards these issues in the context of water justice begins first with acknowledgment of First Nations' inherent right to govern their water resources in accordance with cultural preferences and practices, and also that these issues cannot be abstracted from broader governance challenges important for these communities.

#### International WaTERS

The network will advance the understanding of water resilience and security in the face of increasing climatic and hydrologic variability including the governance, socio-institutional, and equity dimensions of this challenge while maintaining a focus on urban dynamics, and urban-rural linkages.



**Dr. Leila Harris**, PEOPLE Network member, is a current EDGES Member.

Leila Harris, Professor at IRES Institute on Resources Environment and Sustainability and Institute for Gender, Race, Sexuality and Social Justice. Faculty Associate at UBC Department of Geography, Faculty Associate at Peter Wall Institute for Advanced Studies, Co-Director of the Program on Water Governance, The University of British Columbia.  
[Full biography](#)

## Career Center

# Doctoral and Postdoctoral Positions

### Ph.D. Position in a DFF Research Leader Project on Environmental Toxicology, University of Southern Denmark (SDU), Denmark

We invite enthusiastic applicants for a full Ph.D. scholarship in Environmental Toxicology. The three-year scholarship is funded by a Sapere Aude Research Leader programme, a prestigious national programme by the [Independent Research Fund Denmark \(DFF\)](#) to support the most talented younger researchers in Denmark to establish high international-level research groups. The project will be carried out at the Department of Biology, University of Southern Denmark (SDU), Denmark. The starting date of the Ph.D. position is **1 August 2021**. Application deadline: **15 May 2021**.

#### Project background

The emission and accumulation of micro- and nanoplastics in the environment are invisible but inevitable, however, we don't know their actual impacts on wildlife and the environment, particularly nanoplastics. The primary goal of this project is to understand the intricate details of the cellular uptake mechanisms, developmental effects, and toxicity mechanisms of nanoplastics in organisms of different vertebrate classes under environmentally realistic conditions. This project on **Revealing "hidden" plastics using Trinal Oviparous Omics Model (TriOOL)** builds on strong interdisciplinary technologies and international expertise to explore frontiers of nanoplastic pollution issues, by integrating comparative model embryos, cutting-edge bioimaging, omics, and hazard modelling. The project will provide unprecedented insights into understanding the potential hazards posed by nanoplastics and corresponding mechanisms and launch a new chapter in the toxicological assessment

of nanopollutant mixtures.

The project is led by Sapere Aude Research Leader **Dr. Elvis Genbo Xu** (Assistant Professor). The successful applicant will be co-supervised by Associate Professor **Henrik Holbech**. The project team includes top-level collaborators Professor Gray Hardiman (UK), Professor Knut Erik Tollefsen (Norway), and Associate Professor Jonathan Brewer (Denmark), as well as a world-class international advisory board: Professor Richard Thompson (UK), Professor Martin Grosell (USA), Professor Daniel Schlenk (USA), Professor Daoji Li (China), and Professor Xiangrong Xu (China).

#### Qualifications

We are looking for an enthusiastic, ambitious, and independent candidate with an MSc degree in environmental sciences, biology, or related fields. The candidate should have laboratory and/or field experience in environmental toxicology. Experience with animal embryonic models, RNA sequencing and transcriptome analyses, or micro(nano)plastic is preferable. Proficiency in spoken and written English is mandatory.

See [more details](#) of the application. For further information, please contact [Elvis Genbo Xu](#), Email: [elvis@biology.sdu.dk](mailto:elvis@biology.sdu.dk).

### Ph.D. positions in NRPOP Laboratory, Memorial University, Canada

The Northern Region Persistent Organic Pollution Control (NRPOP) Laboratory was founded in 2007 by the Canada Foundation for Innovation (CFI) at Memorial University in Canada. This world-class lab is dedicated

to innovative research on the persistent and emerging contaminants in northern regions and marine environments and their mitigation methodologies and technologies. By integrating advanced nano/-bio-tech and AI techniques, coupled experimental and modeling approaches are used to study transport, fate and effect of these contaminants and develop monitoring, analysis, simulation, control and remediation technologies. The lab hosts the first-class analytical and simulation facilities especially including the indoor pilot-scale systems, a first of its kind in Canada, for simulating pollutant transport and mitigation process in subsurface and ocean environments. The NRPOP Lab is seeking enthusiastic and motivated Ph.D. students, **preferably starting 2021 Spring (May) or Fall (September) semester**. Later enrollment is also acceptable. The students will be fully funded and conduct modeling and/or experimental research on emerging contaminants. We welcome students who enjoy research to join NRPOP!

### Requirements

- Master's degree in environmental engineering/science, chemical engineering, chemistry, microbiology, nanomaterial, AI, or related areas
- Ability to work independently and collaboratively
- Strong written and oral communication skills
- Past research experience in modeling and/or experiment related to emerging contaminants and/or nanomaterial, biotech and AI technologies will be an asset

Before applying through [Memorial's website](#), candidates are highly encouraged to contact [nrpop@mun.ca](mailto:nrpop@mun.ca) with the email subject "2021 NRPOP PhD application" including a curriculum vitae, transcripts and samples of publications if available.



### Postdoctoral Fellow position in AEON-Lab, Memorial University, Canada

The AEON-Lab (Anthropogenic Effects on the Oceanography of Newfoundland) is looking for a post-doc to join our project investigating interactive effects between oil, chemical dispersants, marine particles and dissolved organic matter. This project is part of the Multi Partner Research Initiative of the Canadian Government, which aims to enhance Canada's preparedness and to develop strong oil spill response plans grounded in science based decision-making.

The candidate should have basic knowledge of biological oceanographic concepts and oil spill research. The candidate should also have some experience in (a) the design and execution of a laboratory experiment, (b) supervising students involved in the project, (c) as well as be familiar with data analysis, interpretation and writing of scientific publications. An interest in learning transcriptomic approaches, to test for responses of algae to oil-dispersant application, is a plus. The successful candidate will be part of a great team of people working on this project led by Prof. Uta Passow, Canada Research Chair-1 (CRC), at the Ocean Sciences Centre, Memorial University Newfoundland, Canada. The transcriptomic work will be conducted in collaboration with Prof. Zoe Finkel, CRC-1, at Dalhousie University, and the successful candidate may also spend time in Halifax.

The Department of Ocean Sciences of MUN is located at the Ocean Sciences Centre (OSC) in Logy Bay. The OSC is a major facility for marine research on the Atlantic coast and Memorial University is Atlantic Canada's largest university. By offering diverse undergraduate and graduate programs to 18,000 students (<http://www.mun.ca/>), it provides a distinctive stimulating environment for learning in the Province's capital city, St. John's which is a safe, friendly city with great historic charm, a vibrant cultural life and easy access to a wide range of outdoor activities. NL has strong cultural, social and economic linkages to the oceans and fisheries. Therefore, there is great interest, support and engagement in marine research by the public, industry, NGOs and government departments across the province.

Applicants must possess a Ph.D. in oceanography or equivalent field. The applicant should have an understanding of the functioning of marine pelagic

systems and of petroleum chemistry and oil fate in marine environments. The initial appointment is for 15 months, with reappointment based on performance and funding. Applications are invited asap until the position is filled. The University strives to ensure its workforce is diverse and that it fulfills its commitment to an inclusive community dedicated to innovation and excellence in teaching and learning, research, scholarship, creative activity, service and public engagement. All qualified candidates are encouraged to apply; preference will be given to applicants who are legally entitled to work in Canada. Memorial University is committed to employment equity and diversity and encourages applications from all qualified candidates, including women, people of any sexual orientation, gender identity, or gender expression; Indigenous peoples; visible minorities and racialized people; and people with disabilities. The personal information requested in your application is collected under the authority of the Memorial University Act (RSNL 1990 c M-7) for the purpose of identifying and recruiting candidates; assessing applicant qualifications; and maintaining records pertaining to the administration of employment with Memorial University of Newfoundland.

Applicants should submit a CV, a short (1-2 page) statement of research experience and interests, and the names, affiliations and e-mail addresses of three references to: Uta Passow, [uta.passow@mun.ca](mailto:uta.passow@mun.ca)

Uta Passow, Canada Research Chair-1. Ocean Sciences. Memorial University of Newfoundland

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We look forward to PEOPLE Members and HQP sharing news, recent publication, awards, funding opportunities, graduate student/postdoc hiring, job openings, research group/lab highlights, upcoming events, or any information related to PEOPLE, HQP training, and professional skill development.

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Contact us: [peoplenetwork@mun.ca](mailto:peoplenetwork@mun.ca)

Website: [www.people-network.ca](http://www.people-network.ca)

