

IUPAC CHEMISTRY AND THE ENVIRONMENT DIVISION VI

Reports to Council July 2021

(Division President: Prof Hemda Garelick)



I. Executive Summary/Highlights:

Division VI: [Chemistry and the Environment Division](#) and its related sub-committees has members from over 20 different countries, Members are drawn from government, regulators, academia, industry and private consultancies, thus ensuring a wide range of expertise and experience, essential for solving complex problems. The Division membership and the members of its associated projects aim to offer learned and expert insight into the biophysico-chemical processes in environmental systems, including environmental and human health aspects related to the different environmental compartments, to food and agriculture and crop protection.

The Division regularly collaborates with other IUPAC Divisions and Standing Committees and these collaborations are listed in the projects sections (e.g. Div III, IV, V, VI, COCI, CCE, CHEMRAWN, ICGCSD and others). Projects in 2020-21: A detailed list is in Sections III and IV; highlights are below

Our projects have brought together industry, regulatory agencies, academia and researchers and provided global leadership on complex science issues (e.g. Nanomaterials/Nanopesticides, e-waste, risk assessment, microplastics, PFAS – section III. A number of completed projects have been submitted or published and presented in international conferences (Sections III & IV). These include:

- IUPAC leadership on Nanopesticides project has been recognized by the top-ranking journal Nature, and the IUPAC task group leader was invited by Nature Nanotechnology to contribute to a review, now published (Section IV). A new paper has been submitted to Nature Nanotechnology and is now under revision
- PAC- 2014-031-3-600 : (Purchase): Environmental and health challenges of e-waste and its management: an emerging 21st century global concern. (Published)
- PAC- 2016-015-2-600: (Perminova) "Intercalibration experiment on compositional space humic substances as measured by Fourier Transform Ion Cyclotron Resonance Mass Spectrometry" (accepted)
- PAC- 2015-056-3-600: (Kalderis) Glossary of terms used in biochar research. (Under review).
- H. Garelick has been invited to give a Keynote lecture on the IUPAC 'Environmental and health challenges of e-waste and its management' project in the conference "Physics and Radioelectronics in Medicine and Ecology Phreme'2020" Vladimir Russia, 07/2020
- E-waste in Africa: Through collaboration with CHEMRAWN and a number of Nigerian Young observers under the leadership of Division VI members (i.e. Sean Poopoola, Diane Purchase, Hemda Garelick, Nadia Kandle) a joint conference on "E-Waste Recovery and Management in Africa
- We have developed a long term collaboration with the Organisation for prohibition of Chemical Weapons and currently have two joint projects .
- We have participated in the 'IUPAC Global Women's Breakfast' event co-chaired and organised by a Division member: Dr Laura McConnell . Special participation reports have been submitted by Division members, Dr Bipul Saha who was very active in the organisation of the event in India , Prof Nadia Kandile who was one of the organisers in Egypt and Prof Hemda Garelick who was one of the organiser of a cross UK event. The involvement in GWB surprisingly was made easier through the virtual meeting facilities and many more women were able to participate in many countries.
- Due to the COVID19 effect, a slower progress of projects which are in place and many of the project had to extend their final deadlines. This particularly affected dissemination as it was more difficult to organised conferences and workshops. **Despite that Div VI has developed 4 symposia and a poster prize , for the IUPAC World Chemistry Congress 2021 Montreal, all of which have nominated keynote speakers**

II. Plans and priorities for this biennium, and beyond:

Through its two subcommittees activities, the Division aims to reflect the multidisciplinary nature of our work and the core principles developed under the above direction

- Evaluation of current knowledge
- Development of guidance and recommendations
- Collaboration with stakeholders (academia, industry and public bodies)
- Inclusive communication across the world
- Dissemination and raising the profile of IUPAC

The Division membership continues to develop the principles above which underpin the project activities. It encourages early career scientists and Young Observers to join the activities, become members of the

Continuing Projects

These include major new review projects which involve cross-collaboration across divisions and committees. Two of the latest projects which reflects this direction are;

- The Environment, Health and Food Safety Impact of Microplastics (Chaired by Dr Wu Div VI and involving Div II, IV, V, VII)
- Per and Polyfluoroalkyl Substances (PFAS) in the Environment: Information for Emerging Economies on PFAS Analyses in Environmental Media and their Impacts on Human Health (chaired by Dr Bradley Miller Div VI and involving Div V, CCE and COCI)
- Projects are being developed following the collaboration between IUPAC and OPCW.
 - Enhancing capabilities for the mitigation of chemical risk: the dissemination of the Emergency Response Guidebook in Russian-speaking countries. Collaboration with Div VII, CCE, OPCW and an EU project, (Led by Matteo Guidotti and Roberto Terzano Div VI)
- Bioavailability of endocrine substances in aquatic ecosystems (Led by Yehuda Shevah Div VI)

Further projects details are in sections III and VI

Projects in development

- In collaboration with CHEMRAWN: International Equipment Sharing Networks – Current Status and The Future
- In collaboration with Green Chemistry: Green Chemistry in Sub-Saharan Africa
- PPE Disposal or Waste for yr 2050: This project is led by Div IV with full participation from Div VI and OPCW (Led by Marloes Peeters and Michal Walters Div IV)

Dissemination

The dissemination is evident through previous conferences organised by the Division and also through a number of upcoming conferences planned for the next biennium

- **IUPAC World Chemistry Congress 2021 Montreal**, The integrated approach to the theme of chemistry and the environment has been raised in discussion with the organisers of the IUPAC World Chemistry Congress 2021. Following communications with colleagues from the Chemical Institute of Canada (CIC) we are working together to create a space in the conference where the focus of the contributions on the role of chemistry in studying and enhancing the environment will be presented. Three symposia will be presented at the 'IUPAC World Chemistry Congress 2021 Montreal' under the theme of Sustainability, sub-theme: 'Environmental Chemistry and Sustainability':
 - 'The environmental impact of fires': to be chaired by Prof Roberto Terzano (Italy) and Prof Fani Sakellariadou (Greece)
 - 'Emerging technologies and conservation practices for sustainable agriculture and public health': to be chaired by Prof Annemieke Farenhorst (Canada), Prof Diane Purchase (UK) and Dr Laura McConnell (US) – intra sub-committee collaboration.
 - 'Sustainable Polymers': to be chaired by Dr Weiping Wu (UK), Prof Bulent Mertoglu (Turkey), Prof Nadia Kandile (Egypt) and Prof Christine Luscombe (President of IUPAC Division IV, Polymer Division, US) – inter divisional collaboration.

- The Chemistry and the Environment Division Award 2021 (organised by Dr Bradley Miller) has again been proposed for the congress in Montreal
- 3 other symposia have been suggested by members of the CIC and we are expecting more to collaborate.
- **E-waste in Africa:** Through collaboration with CHEMRAWN and a number of Nigerian Young observers under the leadership of Division VI members (i.e. Sean Poopoola, Diane Purchase, Hemda Garelick, Nadia Kandle) a joint conference on “E-Waste Recovery and Management in Africa”, Nov 2021
- **APCE & CECE & ITP 2022 Angkor Wat, Nov. 2022.**
Sokha Siem Reap Resort & Convention Center, Siem Reap, Cambodia
IUPAC Special Sessions (iupac.org/event/apce-cece-2020-2)
Organized by the Chemistry and the Environment Division, IUPAC “The Environment, Health and Food Safety Impact of Microplastics “Per and Polyfluoroalkyl Substances (in the Environment”

III. **An overall report of Division/Committee activities and achievements during the 2019-2020 biennium through subcommittees report**

There are two subcommittees whose activities are summarized in section III.

These demonstrate the Division's drive to address the provision of scientific expertise and raise IUPAC profile among the various stakeholder through project work, publication and symposia organisation. This is all underpinned by the activity of the two Division sub-committees

1. Advisory Committee on Crop Protection Chemistry
https://iupac.org/who-we-are/divisions/division-details/?body_code=604
2. Subcommittee on Chemical and Biophysical Processes in the Environment
https://iupac.org/who-we-are/divisions/division-details/?body_code=605

The membership of the subcommittees and particularly of the project teams is very diverse in terms of nationalities, involvements of other Divisions/committees and gender/age areas of expertise (we often invite scientists from other discipline to provide additional insights to our projects.) This is reflected in the activities of the 2 sub-committees reports as presented below. These address through their activities the Union Goals

- Provide scientific expertise to address critical world needs.
- Increase the value of our products and services.
- Improve the vitality, effectiveness and efficiency of our Union.

i. **Advisory Committee on Crop Protection Chemistry**

Membership on this committee is highly diverse with representatives from academia, government, and industry. Members represent 14 countries from North and South America, Europe, Asia, and Oceania and 40% of members are women. Since the beginning of 2020 this committee has met virtually approximately quarterly.

Our committee has launched a new newsletter blog "CropChem News" which will be published on the IUPAC website 3 to 4 times per year. A link to the first issue is at: <https://iupac.org/cropchem-news-feb-2021/>

On-going projects

2013-029-2-600 – Kleter

The IUPAC Project "Inventory of Developments in the Field of RNAi-Based Pesticides and Potential Needs for International Harmonization of Regulatory Safety Requirements", is led by Dr. Gijs Kleter of Wageningen Food Safety Research in Netherlands. He has recently published a mini-review paper in Pest Management Science.

Kleter, G. A. 2020. Food safety assessment of crops engineered with RNA interference and other methods to modulate expression of endogenous and plant pest genes. Pest Management Sci. <https://doi.org/10.1002/ps.5957>

Abstract: Genetically modified crops have been grown commercially for more than two decades. Some of these crops have been modified with genetic constructs that induce gene silencing through RNA interference (RNAi). The targets for this silencing action are genes, either specific endogenous ones of the host plant or those of particular pests or pathogens infesting these plants. Recently emerging new genetic tools enable precise DNA edits with the same silencing effect and have also increased our knowledge and insights into the mechanisms of RNAi. For the assessment of the safety

of foodstuffs from crops modified with RNAi, internationally harmonized principles for risk assessment of foods derived from genetically modified crops can be followed. Special considerations may apply to the newly expressed silencing RNA molecules, such as their possible uptake by consumers and interference with expression of host genes, which, however, would need to overcome many barriers. Bioinformatics tools aid the prediction of possible interference by a given RNA molecule with the expression of genes with homologous sequences in the host crop and in other organisms, or possible off-target edits in gene-edited crops.

2014-032-1-600 - Karpouzas

Advances on the Assessment of Pesticides' Soil Microbial toxicity: New research and regulatory aspects in light of the recent methodological advances

A review paper on regulatory aspects of soil microbial toxicity is in development.

ii. Subcommittee on Chemical and Biophysical Processes in the Environment

The subcommittee focuses on topics regarding the distribution and environmental fate of chemicals (inorganic and organic compounds, nanomaterials), chemical and biophysical processes in environmental compartments (e.g., in soil and aquatic ecosystems) and interactions with organisms (bioavailability).

Although many of the members of the Subcommittee on Chemical and Biophysical Processes in the Environment are elected members of the IUPAC Division of Chemistry and the Environment (Division VI), the subcommittee is open to all scientists that are interested in questions regarding the topics of the subcommittee.

Recent activities

1. Membership update

The list has been updated to reflect the current membership. The group comprises 29 international scientists.

The subcommittee secretary also reached out to former IUPAC YO network to recruit new members, especially from developing nations that are currently under-presented in the subcommittee.

Project update

The subcommittee has received updates from all project chairs that are listed on IUPAC's project webpage with DVI assignments. <https://iupac.org/projects/>. A summary is provided in the table below.

Project	Updates
2014-026-3-600 Obare	Completing a book to be published by DeGruyeter.
2014-031-3-600 Purchase	Article published by PAC. collaboration with CHEMRAWN - E-waste in Africa meeting was to be held in May 2021. Levi Sydnes confirmed the conference is postponed.
2015-056-3-600 Kalderis	Manuscript submitted to PAC.
2016-045-2-700 Xing	manuscript is accepted by NanoImpact
2016-016-2-600 Xing	Update needed
2016-047-1-600 Xing	Update needed
2018-035-1-600 Xing	Book project with Wiley. Awaiting proof.
2018-013-2-600 Shevah	Progressing well. Progress report attached.
2018-039-3-600 Sakellariadou	Progressing and requested for extension.
2019-026-2-600 Wu	Progressing. A workshop to be held at the meeting in Angkor Wat.
2019-029-2-600 Miller	Progressing. A workshop to be held at the meeting in Angkor Wat.
Workshop and Divisional Meeting in Angkor Wat	DSC confirms the meeting will take place in November 2022

2. Website update

The content of the subcommittee website has been significantly revised and updated. https://iupac.org/who-we-are/divisions/division-details/?body_code=605

3. LinkedIn webpage

Dr Walter Waldman is currently working on getting member profile stories created to have quarterly updates to the LinkedIn page and drive traffic to our page.

4. World Chemistry Congress – Montreal

Members of the subcommittee has been involved with organizing four symposia in Montreal congress:

- The Environmental Impact of Fires. Organizers (in alphabetical order by last name): Fani Sakellariadou, Roberto Terzano
- Emerging Technologies and Conservation Practices for Sustainable Agriculture and Public Health. Organizers (in alphabetical order by last name): Annemieke Farenhorst, Laura McConnell, Diane Purchase
- A Healthy Intake: Environmental Pollutants in Air, Water, Food and their Removal. Organizers (in alphabetical order by last name): Hind Al-Abadleh, Patrick Hayes, Bradley Miller, Kevin Wilkinson

- Sustainable Polymers Organizers (in alphabetical order by last name): Nadia G Kandile, Christine Luscombe, Bulent Mertoglu, Weiping Wu

5. New projects

A number of new projects have been approved.

- 2020-020-2-600 - [Enhancing capabilities for the mitigation of chemical risk: the dissemination of the Emergency Response Guidebook in Russian-speaking countries](#)
- 2020-019-4-050 - [Examples of the introduction of sustainable development as well as green industrial processes for Secondary School Chemistry and Introductory Chemistry](#)
- 2020-016-3-020 - [The Gender Gap in Chemistry – Building on the ISC Gender Gap Project](#)

A number of new projects have been developed.

- Development of three Environmental Chemistry and Sustainability symposia for the 'Chemistry for Sustainability' thematic programme in 51st IUPAC General Assembly & 48th World Chemistry Congress, Montreal, 2021
- In collaboration with CHEMRAWN: International Equipment Sharing Networks – Current Status and The Future
- In collaboration with Green Chemistry: Green Chemistry in Sub-Saharan Africa
- In collaboration with Division VI: Recommendations for bio-contaminated material waste for yr 2050

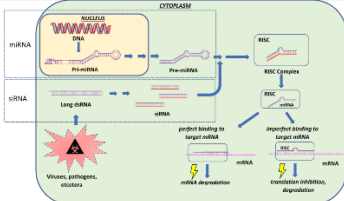
Publications from the subcommittee's projects in 2020

- Global occurrence, chemical properties, and ecological impacts of e-wastes (IUPAC Technical Report), 2020, *Pure and Applied Chemistry*, in press. [IUPAC Project 2014-031-3-600](#) (Task Group Chair **D. Purchase**) – [Link](#) – [PDF](#)
- Interlaboratory comparison of humic substances compositional space as measured by Fourier transform ion cyclotron resonance mass spectrometry (IUPAC Technical Report), 2020, *Pure and Applied Chemistry*, Vol. 92, pp. 1447-1467. IUPAC [Project 2016-015-2-600](#) (Task Group Chair **I. Perminova**) – [Link](#) – [PDF](#)
- Guidelines for unequivocal structural identification of compounds with biological activity of significance in food chemistry (IUPAC Technical Report), 2019, *Pure and Applied Chemistry*, Vol. 91, pp. 1417-1437. IUPAC [Project 2013-024-2-600](#) (Task Group Chair **R.J. Molyneux**) – [PDF](#)
- **Hemda Garelick**, Khadijah Isimekhai, Alejandra Gonzalez Baez, Leonardo Pantoja-Munoz and **Diane Purchase** (2020). *E-Waste : What Is It ? Where Is It and Who Is Effected?*. Keynote Lecture at the International Scientific Conference. **"Physics and Radioelectronics in Medicine and Ecology Phreme'2020" Vladimir Russia, 2-3/07/2020**

IV. Tabular material.

a. Projects

Project Number (Task Chair)	Title	Status and report
2011-023-2-600 (Harris)	Critical review of approaches to dietary risk assessment for pesticides	Completed 14/8/2019 There are many approaches to calculating human exposure to pesticide residues via the diet. However, whilst the risk assessment paradigm used is the same, it is applied in widely varying ways around the world leading to different conclusions for similar data sets. The objective is to capture these and bring together a definitive set of models and overviews in a single publication.
2011-060-1-600 (Rüdel) -	Consideration of bioavailability of metals/metal compounds in the aquatic environment:	Completed 30/9/2017 The project has provided information on metal and metalloid bioavailability and the application of Biotic Ligand Model and bioavailability-based software tools for freshwater risk assessment. A first outcome of the project is a review on the current state of the application of bioavailability-based approaches in risk assessment approaches. The findings from this project is being disseminated via a websites http://www.metal-bioavailability.org/ on the bioavailability of metals. Similar websites for other projects (e.g. on e-waste is currently under development. Finding from this project have been presented in the special IUPAC symposium during the SETAC 2018 conference in Rome and published in Environmental Science and Pollution Research.
2012-019-1-600 (Unsworth)	The Importance of Chemistry in Maintaining a Secure Food Supply	Completed 12/8/2019 The book published by Springer Nature is available as ebook https://doi.org/10.1007/978-3-030-17891-8 ; the chapter (first online 29 May 2019), titled <i>The Battle for a Sustainable Food Supply</i> (pp. 13-84) by John Unsworth, Yoshiaki Nakagawa, Caroline Harris, Gijs Kleter is an outcome is this project.
2013-024-2-600 (Molyneux)	Recommended Methods for the Structural Identification of Biologically Active Compounds in Food and Flavor Chemistry	Completed 12/8/2019 A Technical Report prepared by Molyneux, R., Beck, J., Colegate, S., et al., titled "Guidelines for unequivocal structural identification of compounds with biological activity of significance in food chemistry" is published in <i>Pure and Applied Chemistry</i> 2019, 91(8), pp. 1417-1437; https://doi.org/10.1515/pac-2017-1204
2013-029-2-600 (Kleter)	Inventory of developments in the field of RNAi-based pesticides and potential needs for international harmonization of regulatory safety requirements	Near completion The IUPAC Project " Inventory of Developments in the Field of RNAi-Based Pesticides and Potential Needs for International Harmonization of Regulatory Safety Requirements ", is led by Dr. Gijs Kleter of Wageningen Food Safety Research in Netherlands. He has recently published a mini-review paper in Pest Management Science. Kleter, G. A. 2020. Food safety assessment of crops engineered with RNA interference and other methods to modulate expression of endogenous and plant pest genes. <i>Pest Management Sci.</i> https://doi.org/10.1002/ps.5957 Abstract: Genetically modified crops have been grown commercially for more than two decades. Some of these crops have been modified with genetic constructs that

Project Number (Task Chair)	Title	Status and report
		<p>induce gene silencing through RNA interference (RNAi). The targets for this silencing action are genes, either specific endogenous ones of the host plant or those of particular pests or pathogens infesting these plants. Recently emerging new genetic tools enable precise DNA edits with the same silencing effect and have also increased our knowledge and insights into the mechanisms of RNAi. For the assessment of the safety of foodstuffs from crops modified with RNAi, internationally harmonized principles for risk assessment of foods derived from genetically modified crops can be followed. Special considerations may apply to the newly expressed silencing RNA molecules, such as their possible uptake by consumers and interference with expression of host genes, which, however, would need to overcome many barriers. Bioinformatics tools aid the prediction of possible interference by a given RNA molecule with the expression of genes with homologous sequences in the host crop and in other organisms, or possible off-target edits in gene-edited crops.</p>  <p>Graphical summary of the RNAi mechanism (reproduced with permission from G. Kleter) For more information, see an earlier paper published by Dr. Kleter: Kleter, G. A., Kuiper, H.A., Kok, E.J. 2019. Gene-edited crops: towards a harmonized safety assessment, Trends in Biotechnol. https://doi.org/10.1016/j.tibtech.2018.11.014</p>
2014-026-3-600 (Obare)	<u>Chemical speciation of anthropogenic nanoparticles.</u>	<p>On-going Due Dec. 2021 To develop guidelines and provide a framework for understanding the chemical speciation of nanoparticles and the associated environmental health and safety issues.</p>
2014-031-3-600 (Purchase)	Environmental and health challenges of e-waste and its management: an emerging 21 st century global concern	<p>On-going 2014-031-3-600 (Purchase) - <i>The environmental and health challenges of e-waste and its management: an emerging 21st century global concern</i>: This project aims to bring together global expertise to a) examine current research on the chemical nature of e-waste and its global distribution; b) evaluate its environmental and health impact of e-waste and related risk management tools and models; c) identify shortcomings in present regulations and management strategies as well as future challenges; and d) develop a set of specific recommendations for management approaches that are science-based and globally informed. A manuscript entitled "A critical review on the chemical properties and ecological impacts of e-wastes" Pure and Applied Chemistry. In Press. ISSN 0033-4545.</p>
2014-032-1-600 (Karpouzias)	Advances on the Assessment of Pesticides' Soil Microbial toxicity: New research and regulatory aspects in light of the recent methodological advances	<p>On-going The conclusions drawn from this project and a proposal for the regulatory framework regarding the assessment of the soil microbial ecotoxicity of pesticides will be summarized in a paper which will be published in a relevant journal as open access to increase visibility. Data was presented in the 14th IUPAC International Congress of Pesticide Chemistry in Ghent, May 2019. A draft review paper is in preparation. Preparation of final deliverables.</p>

Project Number (Task Chair)	Title	Status and report
2015-010-3-600 (Keen)	Standardization of electrical energy per order (EEO) reporting for UV/H ₂ O ₂ reactors	Completed 30/6/2020 Extended till end of March 2020, in order to present the project results in an International Conference.
2015-056-3-600 (Kalderis)	Glossary of terms used in biochar research	On-going Final manuscript under review
2016-015-2-600 (Perminova)	Database on molecular compositions of natural organic matter and humic substances as measured by high resolution mass spectrometry	Completed 31/8/2020 A Final technical report on the project has been prepared and was approved by the Division for publishing in PAC. The first version was submitted in July 2019, the revision was submitted on December 23. Unfortunately, it is still under review, The manuscript is entitled "Intercalibration experiment on compositional space humic substances as measured by Fourier Transform Ion Cyclotron Resonance Mass Spectrometry" Author(s): A. Zhrebker, S. Kim, Ph. Schmitt-Kopplin, R.G.M. Spencer, O. Lechtenfeld, D.C. Podgorskii, N. Hertkorn, M. Harir, N. Nurfajin, B. Koch, E.N. Nikolaev, E.A. Shirshin, S.A. Berezin, D.S. Kats, G.D. Rukhovich, I.V. Perminova*
2016-016-2-600 (Kookana)	Guidance for Industry and Regulators on Assessment of the Environmental Fate and Risks of Nano-enabled Pesticides	On-going Based on the Nantes workshop and subsequent work by the project team, an article entitled "Ecological risk assessment of nano enabled pesticides: A perspective on problem formulation" has been developed that has now been published by Journal of Agricultural and Food Chemistry, 2018, 66, 6480-6486, in the special issue "Nanotechnology applications and implications of agrochemicals toward sustainable agriculture and food systems' under the "Perspectives" category. In this paper, a group drawn from regulatory agencies, academia, research and the agrochemicals industry offered a perspective on relevant considerations pertaining to the problem formulation phase of the ecological risk assessment of nano-enabled pesticides.
2016-019-2-600 (Terzano)	Trace elements analysis of environmental samples with X-rays: from synchrotron to lab and from lab to synchrotron	Completed 3/6/2019 A one-day special Symposium entitled "TRACE ELEMENTS ANALYSIS OF ENVIRONMENTAL SAMPLES WITH X-RAYS" was organized during the ICOBTE 2017 Conference, which took place in Zurich (Switzerland) from 16 to 20 July 2017. An IUPAC Technical Report has been published by Pure & Applied Chemistry.
2016-047-1-600 (Xing) Extended to 2018-035-1-600 (Xing)	Multi-scale Biogeochemical Processes in Soil Ecosystems: Critical Reactions and Resilience to Climate Changes	On-going Submissions of 14 chapters to Wiley by end of April. Expected to be completed by 6/2021

Project Number (Task Chair)	Title	Status and report
2017-013-1-600 (Racke)	Crop protection chemistry in Latin America: Harmonized approaches for environmental assessment and regulation	On-going
2017-035-2-600 (Kookana)	Human Health Risk Consideration of Nano-enabled Pesticides for Industry and Regulators	<p>On-going</p> <p>IUPAC project was jointly developed by IUPAC Divisions VI and VII with COCI on human Health Risk Consideration on Nano-enabled Pesticides to provide guidance to industry and regulators. The key objective of the project is to assist industry, contract research organizations and regulators in determining an acceptable and practical approach for identifying and generating the data relevant to human health risk assessment required for the registration of nano-enabled pesticides.</p> <p>The project made an excellent start in June 2018 with a project workshop in Boston to coincide with the Gordon Research Conference on Nanoscale Science and Engineering for Agriculture and Food Systems. The objective of the workshop was to identify questions that are specific to nano-enabled pesticides that must be addressed in addition to the questions normally asked for conventional pesticides. The workshop brought together a range of expertise from regulators, industry, researchers and academia. Regulatory agencies namely, US Environment Protection Agency (EPA), US Food and Drug Administration (FDA), Health Canada, Australian Pesticides and Veterinary Medicines Authority (APVMA), each provided an overview of their approach for regulating nano-enabled pesticides/nanomaterials. Vive Crop Protection represented industry.</p> <p>The second workshop in the project was held after IUPAC GA in Paris in July 2019, in London at Middlesex University and a framework for human health considerations for nanopesticides was considered. The workshop was attended by European Food Safety authority, OECD, Health Canada, BFR Germany and Vive Crop Protection among others. The framework is currently being reviewed by colleagues, e.g. in BFR Germany. A draft paper for publication is being developed.</p> <p>An article has been written for Chemistry International which is likely to be published soon.</p>
2018-013-2-600 (Shevah)	Bioavailability of endocrine substances in aquatic ecosystems	<p>On-going</p> <ol style="list-style-type: none"> 1. The number of the WG members was increased to 11 2. An extensive literature survey was prepared and circulated 3. The first Working Paper on EDCs residues monitoring in Israel was prepared and circulated, asking to prepare same in other countries by the WG members. 4. Review and comments by the WG members are pending. 5. A workshop on Dutch research and innovations on micro-pollutants removal from municipal wastewater (Amsterdam

Project Number (Task Chair)	Title	Status and report
		Nov, 7, 2019) was attended by the TL. Engineering and technology breakthrough attained by several Dutch research groups were presented, detailing design parameters, influent and effluent quality, CO2 footprint and costs. A summary report is being prepared and will be circulated shortly.
2018-026-2-600 (Purchase)	Development of a technical symposium on 'Innovative Chemistry for Environmental Enhancement' for Theme 3 'Chemistry for the Environment' at the 47th IUPAC World Chemistry Congress, Paris, 2019	Completed 8/11/2019 The aim of the symposium is to highlight the role of chemistry in providing innovative solutions to meet environmental challenges as well as enhance the environment. Excellent keynote and invited speakers around the world delivered their talks in the conference. An article on the symposium has been published in Chemistry International.
2018-039-3-600 (Sakellariadou)	Seabed Mining and Blue Growth: Exploring the Potential of the Marine Mineral Deposits as a Sustainable Source of Rare Earth Elements (Maree)	The task group had a face-to face meeting on Nov.2019 The extensive report is almost finished and it is expected to be sent to PAC for review and publication by April 2021.
2018-014-1-600 (Gubala)	CHEMISTRY IN THE CLASSROOM	On-going A joint project led by Div VII and CCE. Results were presented in Paris Congress in 2019. No reports since
2019-026-2-600 (Weiping Wu Yong-Chien Ling)	The Environment, Health and Food Safety Impact of Microplastics	On-going First task group meeting has taken place in March 2020. A number of virtual meetings have taken place since.
2019-029-1-600 (Mélanie Kah Bradley Miller)	Per and Polyfluroalkyl Substances (PFAS) in the Environment: Information for Emerging Economies on PFAS Analyses in Environmental Media and their Impacts on Human Health	On-going First task group meeting has taken place in March 2020
2020-020-2-600 (Guidotti)	<u>Enhancing capabilities for the mitigation of chemical risk: the dissemination of the Emergency Response Guidebook in Russian-speaking countries</u>	On-going The project is a collaborative with the OPCW and a related EU project. It is also a collaboration with Div VII and CCE. The first meeting took place on 17/03/21

a. Conference presentations

Hemda Garelick, Khadijah Isimekhai, Alejandra Gonzalez Baez, Leonardo Pantoja-Munoz and **Diane Purchase** (2020). *E-Waste : What Is It ? Where Is It and Who Is Effected?*. Keynote Lecture at the International Scientific Conference. "**Physics and Radioelectronics in Medicine and Ecology Phreme'2020**" Vladimir Russia, 2-3/07/2020

Keleter 2020. G. Kleter*, IUPAC Project team, H. Kuiper, "RNA interference-based crop protection: Food & feed safety, detectability, regulation, and efforts towards international harmonization IUPAC2019 international pesticides congress in Ghent, May 20th, 2019

B. Saha, Status of R&D and Manufacturing of Biopesticides and Biostimulants in India, 2019, IUPAC International Congress of Pesticide Chemistry, Ghent, Belgium

B. Saha and Kamlesh Dasgupta, Dissipation and residue analysis of Imidacloprid in Okra crop (Ladies' finger) under field conditions in different agro-climatic zones of India., 2019, IUPAC International Congress of Pesticide Chemistry, Ghent, Belgium

Prof Nadia Kandile. (2019). Kyenote: Overview and Difications on Climate change.

In: Climate Change in an African Context (Igniting the Power of Science

African Science Week, Science talks, workshop and expo . Organized by Prof. Ghada Bassioni

16 December 2019 Academy of Scientific Research and Technology, Cairo, Egypt

Green Chemistry for Sustainability. Symposium Chairman :, Prof. Dr. **Nadia Kandile** and Symposium Coordinator Prof. Dr. Ghada Bassioni. Under the Auspices of, Prof. Dr. Mahmoud Sakr, President of the Academy of Scientific Research and Technology, Organized By "National Committee for Pure and Applied Chemistry NAPAC, 7th December 2019 Academy of Scientific Research and Technology, Cairo, Egypt

L. Pantoja Munoz*, A. Gonzalez Baez, D. Mckinney, **H. Garelick*** (2019) Microplastics and Wet-Wipes: Should They Be Flushed into The Sewer System. IUPAC 47th World Chemistry Congress (in Paris 5-12 July, 2019 Theme: Chemistry and Society : Current Knowledge

D. Purchase*, G. Abbasi, L. Bisschop, D. Chatterjee, C. Ekberg, P. **Fedotov**, **H. Garelick**, **N. Kandile**, **M. Lundström**, A. Matharu, **B. Miller**, A. Pineda, O. Popoola, T. Retegan , H. Ruedel, A. Serpe, Y. Sheva, K. Surati, F. Walsh, B.P. Wilson, M.H. Wong (2019) E-Waste - An Emerging 21st Century Global Grand Challenge: Global Occurrence, Chemical Properties and Ecological Impacts. IUPAC 47th World Chemistry Congress (in Paris 5-12 July, 2019 Theme: Chemistry and Society : Current Knowledge

W. Wu, R. Bradley, F. Liu, Y. Lai, B. Zhao, Novel Materials and Devices for Sustainable Energy Applications, IUPAC 47th World Chemistry Congress in Paris 5-12 July, 2019 Theme: Chemistry for the Environment: Innovative Chemistry for Environmental Enhancement

R. Bradley, F. Liu, H. Yang, B. Zhao, **W. Wu**, A Novel Biomass Derived Low-Cost Mesoporous Carbon, CARBON 2019 World Carbon Conference, UKY Lexington KY, 14-19 July 2019.

Gonzalez Baez A.*, Pantoja Munoz L., **Garelick H.**, and **Purchase D.** (2019). Urban mines, recovering Rare Earth Elements from Waste Printed Circuit Boards (WPCBs) through bioleaching. CEST 2019. 16th International Conference on Environmental Science and Technology. Rhodes, Greece, 4 - 7 September 2019

Amabogha O. N., **Purchase D**, **Garelick H.** and Jones H. (2019) .Combining phytoremediation with bioenergy production: Developing a multi-criteria decision matrix for species selection. CEST 2019. 16th International Conference on Environmental Science and Technology. Rhodes, Greece, 4 - 7 September 2019

B. Saha, "Biofertilizers and Biopesticides: Development Trends and Market Overview in India", 3rd International Conference on Biofertilizers and Biopesticides, Taipei , Taiwan, 7th to 10th August, 2018

b. Presentations IYPT and IUPAC100 and GWB

Member of Div VI have participated in the 'IUPAC Global Women's Breakfast' event co-chaired and organised by a Division member: Dr **Laura McConnell** . Special participation report have been submitted by Division members, Dr **Bipul Saha** who was very active in the organisation of the event in India , Prof **Nadia Kandile** who was one of the organisers in Egypt and Prof Hemda Garelick who was one of the organiser of a cross UK event.

GWB2021: We had very successful GWB2021 program in India. Out of 324 global events, 61 events were held in India. There was very enthusiastic participation. In one webinar, I made a presentation on “Best Practices of Promoting Women Scientists in Indian Organizations”. It was attended by more than 1500 participants. **Bipul Saha**

IUPAC Global Women’s Breakfast
Global Network in Support of Empowering Women in Science(EGYPT)

The National Committee for Pure and Applied Chemistry at the Academy of Scientific Research and Technology was hold a breakfast on 12.02.2020 to empower women in science chaired by Prof. Dr. Nadia Kandile, Ass. Member of IUPAC and Prof. Dr. Ghada Bassioni, member of IUPAC executive bureau.

World Mycotoxin Forum 2019: **Prof Diane Purchase** of the subcommittee represented IUPAC to give a keynote in the World Mycotoxin Forum meet IUPAC100 in Belfast (14-16 October 2019). <https://www.worldmycotoxinforum.org/>

Symposium Chairman: **Prof.Nadia Kandile** - Symposium Coordinator:Prof. Dr. Ghada Bassioni
Celebrating the International Year of the Periodic Table of Chemical Eleme (Chemistry Education),Main Hall of the Academy of Scientific Research and Technology, 17 March 2019.

Keynote lecture by **Prof. Nadia Kandile** with the title : Introduction to the International Union of Pure and Applied Chemistry, conference of the Egyptian Committee of Pure and Applied Chemistry 20-22 Oct 2019, Hurghada, Egypt.

B. Saha, Selection of IYPT 2019 Activities and Publicity in India, Invited speech delivered in the Closing Ceremony of IYPT, Tokyo, December 5, 2019

B. Saha, “History of Genesis of IUPAC and its current activities” and “Life and Works of Mendeleev”, In augural program of IUPAC Centenary and 150th Anniversary of Periodic Table , January 02, 2019, Hyderabad

B. Saha, “IUPAC Centenary” and “Life and Works of Mendeleev” and “IYPT”, Federation of Indian Chambers of Commerce and Industry, New Delhi, January 09, 2019

B. Saha, “IUPAC Centenary” and “International Year of Periodic Table of Chemical Elements 2019”, Annual General meeting of PMFAI, Mumbai, January 10, 2019

B. Saha, “Mendeleev and Periodic Table”, Indian Institute of Chemical Technology, Hyderabad, February 1, 2019

B. Saha, “History of IUPAC and Current Activities” and “Mendeleev’s Periodic Table”, Vivekananda College, Secunderabad, June 23, 2019

B. Saha, “Mendeleev’s Periodic Table” and “Fun with Elements”, Science Fair on Periodic Table jointly organized by the Royal Society of Chemistry (London) – India Chapter, Indian Institute of Chemical Technology and White Board Ventures.

B. Saha, “Life and Works of Mendeleev”, Tamil Nadu State Level IYPT Celebrations, Coimbatore, November 8, 2019

B. Saha, Review of IUPAC Centenary and IYPT activities in India, Closing ceremony in India, Hyderabad, Dec 18. 2019.

c. Selected Publications

MacMartin, T. L., Graham, C. I., **Farenhorst, A.**, & Brassinga, A. K. C. (2021). Complete Genome Sequences of Two Environmental Legionella Isolates Obtained from Potable Water Sourced in a First Nation Community. *Microbiology Resource Announcements*, 10(4).

Victor Castro Gutierrez, Francis Hassard, Rodrigo Leita, Beata Burczynska, _View
Dirk Wildeboer, Isobel Stanton, Shadi Rahimzadeh, Gianluca Baio, **Hemda** Garelick, Jan Hofman, Barbara Kasprzyk-Hordern, Rachel Kwiatkowska, Azeem Majeed, Sally Priest, Jasmine Grimsley, Lian Lundy, Andrew C Singer, Mariachiara Di Cesare (2021) Monitoring occurrence of SARS-CoV-2 in school populations: a wastewater-based approach.
doi: <https://doi.org/10.1101/2021.03.25.21254231>

Melanie Kah*, Linda J. Johnston, Rai Kookana, Wendy Bruce, Andrea Haase, Vera Ritz, Jordan Dinglasan, Shareen Doak, Hemda Garelick, Vladimir Gubala (2021) Comprehensive Framework for Human Health Risk Assessment of Nanopesticides. Submitted to Nature Nanotechnology.

Melanie Kah and **Rai Kookana**(2020) Emerging investigator series: nanotechnology to develop novel agrochemicals: critical issues to consider in the global agricultural context. *Environmental Science Nano*. DOI: 10.1039/d0en00271b. rsc.li/es-nano

Nadia G. Kandile, Mansoura I. Mohamed, Howida T. Zaky, Abir S. Nasr, Yassmin G. Ali, (2021) Quinoline anhydride derivatives cross linked chitosan hydrogels for potential use in biomedical and metal ions adsorption, *Polymer Bulletin* Published online: 12 March (2021)

YC Ling. Laundry pollutes the ocean! <https://www.youtube.com/watch?v=fgx7Jc8k-lw>. *New Deeper Once in SET News Channel Taiwan*. March 15, 2021.

YC Ling. Experience sharing of higher education institutions to help achieve sustainable development goals through green sustainable chemistry. Special Symposium on Green Chemistry. *2021 National Chemistry Meeting Taiwan*. March 12-14, 2021.

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L. Zhang, Y. Song, **W. Wu**, R. Bradley, Y. Hu, Y. Liu, S. Guo, Fe₂Mo₃O₈ nanoparticles self-assembling 3D mesoporous hollow spheres toward superior lithium storage properties, *Frontiers of Chemical Science and Engineering*, 15, 156–163, 2021.

W. Wu, X. Fan, Y. Li, R. Dong, Growing collaborations between Chinese and UK young scholars on chemical science and technology. *Frontiers of Chemical Science and Engineering*, 15, 1–3, 2021.

Purchase D, Chen, W., **Garelick H**, **Kandile N. G.**, **Kookana R.**, **Miller B.**, & **Terzano R.** (2020). Innovative Chemistry for Environmental Enhancement, *Chemistry International*, 42(1), 41-44. doi: <https://doi.org/10.1515/ci-2020-0130>

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Bipul B. Saha, Report of IUPAC Workshop on “Green Chemistry” held in Rome from 28th February to 1st March, 2019, *Pestology*, Vol. XLIII No. 3, March 2019, pp 18-20

B. Saha, Report on the Closing Ceremony of the International Year of the Periodic Table, *Chemical News*, January 2020, pp 70-72

B. Saha and Jaychandra Reddy N, 150th Anniversary of Periodic Table and Mendeleev, *Chemical Industry Digest Annual*, January 2019, pp 84-88

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Ken Racke, Pieter Spanoghe, Nathan De Geyter and Bipul Saha (2019) Summary of 14th IUPAC International Congress of Crop Protection Chemistry, and IUPAC Award Presentation (Published Online in *Chemistry International*: 2019-10-31 DOI: <https://doi.org/10.1515/ci-2019-0429>)

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