

ENVIRONMENTAL SYSTEMS DIVISION NEWSLETTER

The ESD Newsletter is a monthly newsletter involving ALL members of ESD. Members are encouraged to forward materials, authored papers on Environmental and Environmental Systems topics, and comments on newsletter topics or current events to the Editor. Your participation is greatly appreciated.

ESD SURVEY – Fill out by Monday, March 6, 2023

Please participate in the ESD survey and help the ESD Executive Committee better serve the division. As a small token of our appreciation, by completing the survey and sharing your email address voluntarily, you will be entered into a drawing for a \$100 voucher that can be used for purchases from the ASME Store. <https://asme.store.merchorders.com>

Take the survey NOW at <https://forms.gle/fh9ePKCcZkivF7vj7>

The ESD newsletter features **Five** Sections:

(Please use the [blue](#) links below to navigate within the newsletter)

[Webinars \(Live or recorded\) / Conferences \(Web-access/in-person\)](#)

1. ESD DIVISION NEWS

[ICEM 2023 Call for Abstracts and Session Chairs](#)

2. ENVIRONMENTAL TECHNOLOGIES

[Solar powered' cells: Light-activated proton pumps generate cellular energy, extend life](#)

[Gene-edited hens may end the culling of day-old male chicks](#)

3. ENVIRONMENTAL REGULATIONS

[EPA Doubles Down in Long-Awaited Supplemental Proposed Oil and Gas Methane Rule](#)

[EPA Adopts Updated Phase I Environmental Site Assessment Standard that Addresses PFAS and Other Emerging Contaminants](#)

4. EDITORIAL BOARD SELECTIONS

[How micro plastics are infiltrating the food you eat](#)

[Global South countries showcase how GMOs are transforming their agriculture at UN Biodiversity Conference](#)

ENVIRONMENTAL SYSTEMS DIVISION NEWSLETTER

[The interior design of our cells: Database of 200,000 cell images yields new mathematical framework to understand our cellular building blocks](#)
[U.S.D.A. Approves First Vaccine for Honeybees](#)
[Sustainable solutions using biocontrol and IPM strategies](#)

5. READER COMMENTS TO THE EDITOR

1. ESD DIVISION NEWS

ICEM 2023 Call for Abstracts and Session Chairs

Nuclear Engineering and ESD, are pleased to announce Call for Abstracts. ICEM promotes a broad global exchange of information on technologies, operations, management, economics, and public policies in environmental remediation and radioactive waste management. This is a unique opportunity to foster cooperation among specialists from mature environmental management programs and those with emerging programs. The program Tracks and Topics are on the ICEM website (<https://event.asme.org/ICEM/Program>).

Abstracts for articles, papers and presentations are due **Feb 15, 2023**. Abstracts should be submitted on-line at <https://icem.secure-platform.com/a/organizations/main/home>, or additional information on submitting Abstracts please send an email to ASME at toolboxhelp@asme.org.

The ICEM Program Chairs, Martin Edelson and Jovica Riznic, request your help as Session Chairs or Co-Chairs. You can either volunteer for a specific Session/Topic or just in general. "Roles of the Session Chairs" is available to review duties.



ENVIRONMENTAL SYSTEMS DIVISION NEWSLETTER

For additional information please contact either Martin Edelson (mcedelson@gmail.com) or Jovica Riznic (Jovica.Riznic@cnsccsn.gc.ca).

2. ENVIRONMENTAL TECHNOLOGIES**Solar powered' cells: Light-activated proton pumps generate cellular energy, extend life**

New research in the journal Nature Aging takes a page from the field of renewable energy and shows that genetically engineered mitochondria can convert light energy into chemical energy that cells can use, ultimately extending the life of the roundworm *C. elegans*. While the prospect of sunlight-charged cells in humans is more science fiction than science, the findings shed light on important mechanisms in the aging process. This study found that simply boosting metabolism using light-powered mitochondria gave laboratory worms longer, healthier lives. These findings and new research tools will enable us to further study mitochondria and identify new ways to treat age-related diseases and age healthier." Mitochondria are organelles found in most cells in the body. Often referred to as cellular power plants, mitochondria use glucose to produce adenosine triphosphate (ATP), the compound that provides energy for key functions in the cell, such as muscle contraction and the electrical impulses that help nerve cells communicate with each other. Production of ATP is the result of a number of reactions made possible by the exchange of protons across a membrane that separates different compartments in mitochondria, ultimately forming a process called membrane potential. It has been shown that membrane potential declines with age, potentially playing a role in a number of age-related diseases, such as neurodegenerative disorders.

The new research involved *C. elegans*, a microscopic roundworm that -- like the fruit fly *Drosophila* -- has long been a research tool used by scientists to understand basic biological principles that, in many cases, apply throughout the animal kingdom. To carry out the experiments, a team of researchers from the U.S. and Germany adapted an existing research tool that allowed them to manipulate activity in mitochondria. The technique, called optogenetics, has been traditionally used to target and activate specific neurons, thus enabling researchers to more precisely study patterns of brain activity. The researchers genetically engineered *C. elegans* mitochondria to include a light-activated proton pump obtained from a fungus, an achievement the team first described in a 2020 paper in the journal EMBO Reports. In the new study, when exposed to light, the proton pumps would move charged ions across the membrane, using the energy from the light to charge the mitochondria. This process, which the researchers dubbed mitochondria-ON (mtON),

ENVIRONMENTAL SYSTEMS DIVISION NEWSLETTER

increased membrane potential and ATP production, and resulted in a 30-40 percent increase in lifespan of the roundworms. The study is important because it provides researchers with more insight into the complex biological roles that mitochondria play in the human body, a topic that the scientific community is only now beginning to understand. The study also creates a new method to manipulate and study mitochondria in the environment of a living cell. This could serve as an important platform to study mitochondria and identify ways to intervene and support function. (Ref.1)

Gene-edited hens may end the culling of day-old male chicks

Researchers from Israel believe they can end the controversial culling of a superfluous 7-billion-day-old male chicks through gene-edited hens that lay eggs from which only female birds hatch. A team from the Israeli Agricultural Research Organisation, Volcani Centre, has used gene editing to develop hens that only give birth to females. This comes following 7 years of research with Huminn, the American Israeli firm specialising in commercially viable sustainable food production. The technology involves genetically modifying egg-laying hens so that, when carrying male embryos, those do not progress and hatch. Scientists had gene-edited DNA into the hens that can stop the development of any male embryos in the eggs they lay. The DNA is activated when the eggs are exposed to blue light for several hours. Female chick embryos are unaffected by blue light and develop normally. The chicks have no additional genetic material inside them, nor do the eggs they lay. The practice of male chick culling has been banned in some European countries. Germany prohibited the method earlier this year, and French farmers have until 1 January 2023 to comply with new restrictions. At a meeting in October, EU agriculture ministers said they would consider a bloc-wide ban on culling male chicks from egg-laying hens, pending the results of an impact assessment. (Ref. 2)

3. ENVIRONMENTAL REGULATIONS**EPA Doubles Down in Long-Awaited Supplemental Proposed Oil and Gas Methane Rule**

On November 11, 2022, the U.S. Environmental Protection Agency (EPA) released a pre-publication version of its supplemental proposal for Standards of Performance for New, Reconstructed, and Modified Sources and Emissions Guidelines for Existing Sources: Oil and Natural Gas Sector Climate Review (Supplemental Proposal). The Supplemental Proposal has been highly anticipated since EPA published its initial proposal on November 15, 2021. EPA, Standards of Performance for New, Reconstructed, and Modified Sources and

ENVIRONMENTAL SYSTEMS DIVISION NEWSLETTER

Emissions Guidelines for Existing Sources: Oil and Natural Gas Sector Climate Review, 86 Fed. Reg. 63110 (Nov. 15, 2021) (Initial Proposal). EPA currently regulates emissions from oil and natural gas facilities under 40 C.F.R Part 60 Subparts 0000[1] and 0000a.[2] As part of the Initial and Supplemental Proposals, EPA would regulate oil and natural gas facilities constructed, modified, or reconstructed after November 15, 2021, under a new Subpart 0000b. With the Supplemental Proposal, EPA has released proposed regulatory language for Subpart 0000b. In addition, EPA released proposed regulatory text for emissions guidelines in a new Subpart 0000c. These emissions guidelines are intended to inform states in the development, submittal, and implementation of state plans to establish standards of performance for greenhouse gases (in the form of limitations on methane) from sources existing on or before November 15, 2021. Under the Supplemental Proposal, states and tribes would be required to submit plans to EPA for review within 18 months of the publication of a final rule, with a compliance deadline for existing sources that is no later than 36 months after the deadline to submit the plan to EPA. The Supplemental Proposal also includes an updated proposed “Appendix K,” which is a protocol for determining leaks using optical gas imaging that EPA is now proposing to limit to natural gas processing plants. The Supplemental Proposal includes several significant changes or updates, which EPA describes as improvements, and additional proposed requirements for sources that were not covered in the Initial Proposal. Several consequential aspects of the Supplemental Proposal include: Super-Emitter Response Program, Abandoned and Unplugged Well Monitoring, and, Fugitive Emissions Monitoring for All Wells.

These are only some of the numerous additional requirements that EPA is proposing in the Supplemental Proposal. Due to the breadth and complexity of the Supplemental Proposal and the long-awaited release of proposed regulatory text, EPA has also published a memorandum and accompanying chart that summarizes where, throughout the proposal, the agency is soliciting public comment (Summary of Comment Solicitations). In the Summary of Comment Solicitations, EPA has organized the agency’s 142 solicitations for comment by topic, preamble section, and issue to assist the public in understanding on which aspects of the proposal the agency specifically seeks input and guidance. Examples of the topics on which EPA solicits comment include: the potential of advanced methane detection technologies; the “equivalence determination” now required by Clean Air Act Section 136(f)(6)(A)(ii), a provision added to the per the Biden Administration’s Inflation Reduction Act of 2022; and the proposed Super-Emitter Response Program. Although the Supplemental Proposal has not been published in the Federal Register, EPA has established a public comment deadline of February 13, 2023, and will hold virtual public hearings on January 10 and 11, 2023. Comments can be submitted to EPA by registering to speak at the public meeting or in writing on the Federal e-rulemaking portal (www.regulations.gov). The agency plans to issue a final rule in 2023.

ENVIRONMENTAL SYSTEMS DIVISION NEWSLETTER

EPA's efforts to advance CAA regulations to reduce methane emissions from the oil and gas industry sector are separate from the inspections and anticipated rulemaking by the Pipeline and Hazardous Materials Safety Administration (PHMSA) under Sections 113 and 114 of the PIPES Act of 2020. While PHMSA has stated that EPA's regulations may satisfy some Section 114 PIPES Act requirements, it has provided little guidance on this issue. (Ref. 3) [Back to Newsletter's Page 1](#)

EPA Adopts Updated Phase I Environmental Site Assessment Standard that Addresses PFAS and Other Emerging Contaminants

On December 15, 2022, the U.S. Environmental Protection Agency (EPA) published a final rule amending its All Appropriate Inquiries (AAI) Rule to incorporate ASTM International's E1527-21 "Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process" (Final Rule).¹ The Final Rule – effective February 13, 2023 – allows parties conducting due diligence to utilize the E1527-21 standard to satisfy the AAI requirements under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), for the purpose of obtaining liability protections when acquiring potentially contaminated properties. Specifically, "bona fide prospective purchasers," "contiguous property owners," and "innocent landowners" can potentially obtain CERCLA liability protection by complying with the AAI Rule. More broadly, however, other regulating bodies, such as states, often require or recommend using the E1527 standard for evaluating potentially contaminated properties prior to purchase. The Final Rule's publication ends months of speculation and confusion about when and how EPA would address E1527-21 and its prior version, E1527-13. After ASTM issued E1527-21 in November 2021, EPA published an applicable direct final rule (and accompanying proposed rule, requesting comments on the direct final rule) in March 2022 incorporating E1527-21 into the AAI Rule, but also allowing parties to continue to use E1527-13 to satisfy AAI requirements. Many commenters opposed this approach, predicting confusion about which standard to use and pointing out that ASTM would eventually do away with E1527-13. In response to these comments, EPA withdrew the direct final rule in May 2022. The Final Rule addresses these concerns by removing the AAI Rule's reference to the E1527-13 standard one year from the Final Rule's publication in the Federal Register, i.e., December 15, 2023. Until then, any Phase I Environmental Site Assessment (ESA) conducted using E1527-13 will be considered compliant under the AAI Rule.

Among its many updates, E1527-21 adds definitions for certain terms (e.g., "significant data gap") and updates other definitions for clarity and consistency (e.g., "recognized

ENVIRONMENTAL SYSTEMS DIVISION NEWSLETTER

environmental condition”); it explains how long a Phase I ESA remains viable (no more than 180 days prior to property acquisition, or up to one year if certain components are updated); and expands the scope of the subject property’s historical review to include adjoining properties. One of the most notable and potentially significant updates is E1527-21’s discussion of “emerging contaminants,” or “substances not defined as hazardous substances under CERCLA,” which includes discussion of how and whether to address per- and polyfluoroalkyl substances (PFAS).

With respect to PFAS, the timing of the Final Rule’s publication is particularly relevant to parallel rulemaking. In September 2022, EPA published a proposed rule designating PFOA and PFOS – the most common and well-studied PFAS – as CERCLA hazardous substances. The comment period for that proposed rule ended on November 7, 2022, and the final version is expected to be published in 2023. If EPA designates PFOA and PFOS as CERCLA hazardous substances as expected, they will fall within the scope of E1527-21. The same will apply to any other PFAS that EPA designates as CERCLA hazardous substances, which the agency has indicated it is considering via a future rulemaking. Although many states have been regulating PFAS for years under various regulatory programs, similar efforts by the federal government are more recent. In addition to the Final Rule and the anticipated PFOA and PFOS CERCLA hazardous substance rule, EPA is also in the process of developing a proposed national drinking water regulation for PFOA and PFOS and is considering regulatory actions to address other PFAS. These changes and others likely to occur in the coming months and years underscore the importance of understanding the various risks associated with PFAS contamination and how to comply with current and forthcoming requirements. (Ref. 4)

4. EDITORIAL BOARD SELECTIONS

How micro plastics are infiltrating the food you eat

Plastic pollution is one of the defining legacies of our modern way of life, but it is now so widespread it is even finding its way into fruit and vegetables as they grow. Micro plastics have infiltrated every part of the planet. They have been found buried in Antarctic Sea ice, within the guts of marine animals inhabiting the deepest ocean trenches, and in drinking water around the world. Plastic pollution has been found on beaches of remote, uninhabited islands and it shows up in seawater samples across the planet. One study estimated that there are around 24.4 trillion fragments of microplastics in the upper regions of the world’s oceans. However, they are not just ubiquitous in water – they are spread widely in soils on land too and can even end up in the food we eat. Unwittingly, we may be consuming tiny fragments of plastic with almost every bite we take.

ENVIRONMENTAL SYSTEMS DIVISION NEWSLETTER

In 2022, analysis by the Environmental Working Group, an environmental non-profit, found that sewage sludge has contaminated almost 20 million acres (80,937sq km) of US cropland with per- and polyfluoroalkyl substances (PFAS), often called "forever chemicals", which are commonly found in plastic products and do not break down under normal environmental conditions. Sewage sludge is the byproduct left behind after municipal wastewater is cleaned. As it is expensive to dispose of and rich in nutrients, sludge is commonly used as organic fertilizer in the US and Europe. In the latter, this is in part due to EU directives promoting a circular waste economy. An estimated 8-10 million tons of sewage sludge is produced in Europe each year, and roughly, 40% of this is spread on farmland. Due to this practice, European farmland could be the biggest global reservoir of micro plastics, according to a study by researchers at Cardiff University. This means between 31,000 and 42,000 tons of micro plastics, or 86 trillion to 710 trillion micro plastic particles, contaminate European farmland each year.

The researchers found that up to 650 million micro plastic particles, measuring between 1mm and 5mm (0.04in-0.2in), entered one wastewater treatment plant in south Wales, in the UK, every day. All these particles ended up in the sewage sludge, making up roughly 1% of the total weight, rather than being released with the clean water. A report by the UK's Environment Agency, which was subsequently revealed by the environmental campaign group Greenpeace, found that sewage waste destined for English farmland was contaminated with pollutants including dioxins and polycyclic aromatic hydrocarbons at "levels that may present a risk to human health". A 2020 experiment by Kansas University found that plastic serves as a vector for plant uptake of toxic chemicals such as cadmium. "In the plants where cadmium was in the soil with plastic, the wheat leaves had much, much more cadmium than in the plants that grew without plastic in the soil," Research also shows that micro plastics can stunt the growth of earthworms and cause them to lose weight. The reasons for this weight loss are not fully understood, but one theory is that micro plastics may obstructs earthworms' digestive tracts, limiting their ability to absorb nutrients and so limiting their growth. This has a negative impact on the wider environment, too, the researchers say, as earthworms play a vital role in maintaining soil health. Their burrowing activity aerates the soil, prevents erosion, improves water drainage and recycles nutrients. (Ref. 5)

Global South countries showcase how GMOs are transforming their agriculture at UN Biodiversity Conference

Countries in the Global South have been showcasing how genetically modified organisms (GMOs) are transforming their agriculture at the United Nations (UN) Biodiversity Conference in Montreal, Canada. At a side-event organised by some Global South countries

ENVIRONMENTAL SYSTEMS DIVISION NEWSLETTER

and the Alliance for Science, government representatives highlighted their countries' achievements in approving locally developed GMO products to address challenges in the agricultural sector and enhance sustainable food production. Argentina, Brazil, Colombia, Uruguay, Kenya, Paraguay, and Nigeria, which are all parties to the UN Convention on Biodiversity, co-hosted the event. The discussion was under the theme: "The contribution of locally developed safe living modified organisms (LMOs) or GMOs to the Sustainable Development Goals (SDGs)". Head of Planning, Research, and Statistics at Nigeria's National Biosafety Management Agency Scholastica Bello said Nigeria approved genetically modified (GM) cowpea or beans which is resistant to some pests in 2019, making it the first country in the world to approve GM cowpea for cultivation by farmers. She said GMO technology is helping her country meet SDG Goals 1 on no poverty, 2 on zero hunger, 3 on good health and well-being, 8 on decent work and economic growth, 9 on industry, innovation, and infrastructure, 12 on responsible consumption and production, and 13 on climate action. Farmers planting the GM variety are seeing a 51% reduction in the applications of pesticides, a 39% reduction in the quantity of pesticides applied every season, a 41% reduction in the toxicity of pesticides applied as measured using the Pesticide Use Toxicity Score, and a 47% reduction in the cost of pesticides. The GM eggplant farmers are also enjoying 42% higher net yields, a 27% increase in gross revenue per hectare, a 10% reduction in the likelihood of reporting symptoms consistent with pesticide poisoning, and a 31% reduction in the cost of growing the crop. Global Policy Lead at the Alliance for Science Pablo Orozco told the audience there is a need for the United Nations Convention on Biological Diversity to recognize biotechnology as a key tool that can help contribute to protecting biodiversity. (Ref. 6)

The interior design of our cells: Database of 200,000 cell images yields new mathematical framework to understand our cellular building blocks

Through that work, the scientists also captured details about the rich variation in cell shape even among genetically identical cells grown under identical conditions. The team described their work in a paper published in the journal *Nature* in 2022. This study provides a roadmap for biologists to understand organization of different kinds of cells in a measurable, quantitative way, Rafelski said. It also reveals some key organizational principles of the cells the Allen Institute team studies, which are known as human induced pluripotent stem cells. Understanding how cells organize themselves under healthy conditions -- and the full range of variability contained within "normal" -- can help scientists better understand what goes wrong in disease. The image dataset, genetically engineered stem cells, and code that went into this study are all publicly available for other scientists in the community to use." In a body of work launched more than seven years ago, the Allen Institute team first built a collection of stem cells genetically engineered to light up different internal structures under

ENVIRONMENTAL SYSTEMS DIVISION NEWSLETTER

a fluorescent microscope. With cell lines in hand that label 25 individual structures, the scientists then captured high-resolution, 3D images of more than 200,000 different cells.

All this to ask one seemingly straightforward question: How do our cells organize their interiors? Getting to the answer, it turned out, is really complex. Imagine setting up your office with hundreds of different pieces of furniture, all of which need to be readily accessed, and many of which need to move freely or interact depending on their task. Now imagine your office is a sac of liquid surrounded by a thin membrane, and many of those hundreds of pieces of furniture are even smaller bags of liquid. Talk about an interior design nightmare. The scientists wanted to know: How do all those tiny cellular structures arrange themselves compared to each other? Is "structure A" always in the same place, or is it random? The team ran into a challenge comparing the same structure between two different cells. Even though the cells under study were genetically identical and reared in the same laboratory environment, their shapes varied substantially. The scientists realized that it would be impossible to compare the position of structure A in two different cells if one cell was short and blobby and the other was long and pear-shaped. So they put numbers on those stubby blobs and elongated pears.

Using computational analyses, the team developed what they call a "shape space" that objectively describes each stem cell's external shape. That shape space includes eight different dimensions of shape variation, things like height, volume, elongation, and the aptly described "pear-ness" and "bean-ness." The scientists could then compare apples to apples (or beans to beans), looking at organization of cellular structures inside all similarly shaped cells. If you're looking at how thousands of white-collar workers arrange their furniture in a high-rise office building, it's as if every worker put their desk smack in the middle of their office and their filing cabinet precisely in the far-left corner, no matter the size or shape of the office. Now say you found one office with a filing cabinet thrown on the floor and papers strewn everywhere -- that might tell you something about the state of that particular office and its occupant. The same goes for cells. Finding deviations from the normal state of affairs could give scientists important information about how cells change when they transition from stationary to mobile, are getting ready to divide, or about what goes wrong at the microscopic level in disease. The researchers looked at two variations in their dataset -- cells at the edges of colonies of cells, and cells that were undergoing division to create new daughter cells, a process known as mitosis. In these two states, the scientists were able to find changes in internal organization correlating to the cells' different environments or activities. Ref. 7)

ENVIRONMENTAL SYSTEMS DIVISION NEWSLETTER

U.S.D.A. Approves First Vaccine for Honeybees

A biotech company in Georgia has received conditional approval from the U.S. Department of Agriculture for the first vaccine for honeybees; a move scientists say could help pave the way for controlling a range of viruses and pests that have decimated the global population. It is the first vaccine approved for any insect in the United States. The company, Dalan Animal Health, which is based in Athens, Ga., developed a prophylactic vaccine that protects honeybees from American foulbrood, an aggressive bacterium that can spread quickly from hive to hive. Previous treatments included burning infected colonies and all of the associated equipment, or using antibiotics. Diamond Animal Health, a manufacturer that is collaborating with Dalan, holds the conditional license. Dalail Freitak, an associate professor in honeybee research at the Karl-Franzens University of Graz in Austria and chief science officer for Dalan, said the vaccine could help change the way scientists approach animal health. Before you start imagining a tiny syringe being inserted into a bee, the vaccine, which contains dead versions of the bacterium *Paenibacillus larvae*, comes in the form of food. The vaccine is incorporated into royal jelly, a sugar feed given to queen bees. Once they ingest it, the vaccine is then deposited in their ovaries, giving developing larvae immunity as they hatch.

Scientists long assumed that insects could not acquire immunity because they lacked antibodies; the proteins that help many animals' immune systems recognize and fight bacteria and viruses. Once scientists understood that insects could indeed acquire immunity and pass it to their offspring, Dr. Freitak set about answering the question of how they did so. In 2015, she and two other researchers identified the specific protein that prompts an immune response in the offspring and realized they could cultivate immunity in a bee population with a single queen. Their first goal was tackling American foulbrood, a bacterial disease that turns larvae dark brown and makes the hive give off a rotting smell. The disease ran rampant during the 1800s and the early 1900s in bee colonies in parts of the United States. While American foulbrood is not as destructive as varroa mites, the bacterium can easily wipe out colonies of 60,000 bees. The conditional approval provides a mechanism that allows companies to accelerate approval for vaccines if they demonstrate there is a high, unmet need in the market. (Ref. 8)

Sustainable solutions using biocontrol and IPM strategies

The demands being placed by policymakers on European farmers and growers with the introduction of the European Green Deal (2019) and its associated strategies are well known, and the urgent need for action with more sustainable practices to address the challenges posed by climate change and environmental damage is widely accepted. The "Farm to Fork" strategy presented in 2020 by the European Commission aims to transform agricultural

ENVIRONMENTAL SYSTEMS DIVISION NEWSLETTER

production using sustainable practices such as increasing organic production to 25%, reducing the use of chemical pesticides by 50%, and improving production systems by reductions in fertilizer usage of at least 20% and nutrient losses by 50%. Certis Belchim has been working for many years on the development and registration of a range of Biorational products, all registered as Plant Protection Products and evaluated at the EU and country levels. These products of natural origin (including fungicides, bactericides, insecticides, acaricides, molluscicides, and nematicides) are effective in controlling pests and diseases, and the portfolio now includes more than 22 well-known registered brands with organic certification, available to farmers for use in organic as well as conventional crops. This enables the company to provide crop protection solutions in line with these aims with products that both growers and consumers can trust and whose use is safe for humans and the environment. An IPM combination of conventional and Biorational, using conventional plant protection products in early BBCH, followed by a Biorational range of insecticides and fungicides from flowering to harvest, provides a complete pest and disease control strategy. In addition, Biorationals are very compatible with beneficial insects, so they are ideal for IPM strategies looking for synergies.

Such an IPM strategy used in protected cucumber production in V́icar (Almería, Spain) in autumn 2021 illustrates the success of using Biorational products in a program to control the pests and diseases of this crop. Delfin/Turex, Neudosan, Majestik, Botanigard/Botanigard 22WP, and Breaker Max were the key bioinsecticides to control Lepidoptera, Aphids, Mites, Thrips, and White fly, respectively. At the same time, Valcure was the main fungicide against soil diseases, with Amylo-X and Armicarb against foliar disease (Botrytis and Powdery mildew). Chemical products such as Mospilan Max (Acetamiprid 20%), Teppeki (Flonicamid), Takumi (Cyflufenamid 10%), and Ranman Top (Cyazomid 16%) were only used in the earliest BBCH growth stages of the crop, from transplant to flowering. Environmental impact coefficient (EIQ value): the G4TF strategy reduced the EIQ value to 54% versus the conventional strategy. This coefficient measures the impact not only on the environment but also on the worker and consumers. It is a clear indicator of sustainability. Profitability: at the grower level, it is critical that the protocol provides profitability. In this case, with the IPM G4TF strategy, there is a 3% increase in economic benefit due to a higher yield. This higher yield was not only due to the excellent healthy state of the plant but also to the use of the Certis Belchim range of Biostimulants, based on yeast extract, used during the cycle.”(Ref. 9)

5. ESD NEWSLETTER READER COMMENTS

None received this month.

ENVIRONMENTAL SYSTEMS DIVISION NEWSLETTER

NB: Readers may request for “name withheld from printing” while submitting their comments/suggestions.

ESD NEWSLETTER BOARD

Editor: DR. K. J. SREEKANTH - (sreekanthkj@kisar.edu.kw)
Assoc: DR. JAMES ZUCCHETTO - (jimzuc@comcast.net)

NEWSLETTER ARTICLE SOURCES

1. <https://www.sciencedaily.com/releases/2022/12/221230142237.htm>
2. <https://www.poultryworld.net/poultry/genetics/gene-edited-hens-may-end-the-culling-of-day-old-male-chicks/>
3. <https://www.natlawreview.com/article/epa-doubles-down-long-awaited-supplemental-proposed-oil-and-gas-methane-rule>
4. <https://www.natlawreview.com/article/epa-adopts-updated-phase-i-environmental-site-assessment-standard-addresses-pfas-and>
5. <https://www.bbc.com/future/article/20230103-how-plastic-is-getting-into-our-food>
6. <https://www.myjoyonline.com/global-south-countries-showcase-how-gmos-are-transforming-their-agriculture-at-un-biodiversity-conference/>
7. <https://www.sciencedaily.com/releases/2023/01/230104115148.htm>
8. <https://www.nytimes.com/2023/01/07/science/honeybee-vaccine.html>
9. <https://www.hortidaily.com/article/9486058/sustainable-solutions-using-biocontrol-and-ipm-strategies/>

ABOUT NEWSLETTER

ENVIRONMENTAL ENGINEERING features the application of environmental technologies to engineering systems to attain optimal performance according to established standards. The Newsletter of the Environmental Systems Division (ESD) will attempt to highlight a variety of environmental technology applications aimed at enhancing engineering systems performances in accordance with the latest standards by presenting excerpts of and links to selected articles from a variety of websites.

DISCLAIMER

Disclaimer: This newsletter may contain articles that offer differing points of view. Any opinions expressed in this publication do not represent the positions of the ESD Executive Board members of the American Society of Mechanical Engineers (ASME).

ENVIRONMENTAL SYSTEMS DIVISION NEWSLETTER**Upcoming Webinars (Live or Recorded Access) /
Conferences****[Conference for Advanced Reactor Deployment](#)**

Annenberg Presidential Conference Center
College Station, Texas USA
February 22–24, 2023

[Joint Rail Conference](#)

Sheraton Inner Harbor Hotel, Baltimore, MD
April 11–13, 2023

[Waste Information Exchange](#)

April 11 – 12, 2023
Arlington, VA USA

[Offshore Technology Conference \(OTC\) Houston](#)

May 1 – 4, 2023
Houston, TX USA

[30th International Conference on Nuclear Engineering](#)

Kyoto International Conference Center, Kyoto, Japan
May 21–26, 2023

**[42nd International Conference on Ocean, Offshore & Arctic
Engineering](#)**

Melbourne Convention and Exhibition Centre, Melbourne, Australia
June 11–16, 2023

ENVIRONMENTAL SYSTEMS DIVISION NEWSLETTER

[1st Annual Aerospace Structures, Structural Dynamics, and Materials Conference \(SSDM\)](#)

June 19 – 21, 2023
San Diego, CA USA

[Turbo Expo 2023](#)

Hynes Convention Center, Boston, MA, USA
June 26–30, 2023

[Summer Heat Transfer Conference \(SHTC\)](#)

July 10 – 12, 2023
Washington, DC USA

[Power Applied R&D 2023](#)

August 6 – 9, 2023
Long Beach, CA USA

[International Design Engineering Technical Conferences & Computers and Information in Engineering Conference \(IDETC/CIE\)](#)

August 20 – 23, 2023
Boston, MA USA

[Smart Materials Adaptive Structures and Intelligent Systems \(SMASIS\)](#)

September 11 – 13, 2023
Austin, TX USA

ENVIRONMENTAL SYSTEMS DIVISION NEWSLETTER

[International Conference on Environmental Remediation and
Radioactive Waste Management \(ICEM\)](#)

October 3 – 6, 2023
Stuttgart, Germany

[The Internal Combustion Engine Forward Conference \(ICEF\)](#)

October 8 – 11
Pittsburgh, PA USA

[Offshore Technology Conference \(OTC\) Brazil](#)

October 24 – 26
Rio de Janeiro, Brazil