



ENVIRONMENTAL SYSTEMS DIVISION NEWSLETTER

01 MAY 2020

This ESD Newsletter is a monthly enterprise involving ALL members of ESD. ESD Members are encouraged to forward materials, authored papers for publishing on Environmental Engineering topics, and comments on newsletter topics or current events to the Editor. Your participation in submitting materials for the newsletter is greatly appreciated.

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1. ENVIRONMENTAL TECHNOLOGIES

Digital agriculture paves the road to agricultural sustainability

An ecosystem scientist and an agricultural economist, in one of their studies, outlined the development of a more sustainable land management system, through data collection and stakeholder buy-in. Published in Nature Sustainability, Bruno Basso, a professor in the College of Natural Science at Michigan State University, and John Antle, professor of Applied Economics at Oregon State University, believe the path begins with digital agriculture - or, the integration of big data into crop and farmland usage. Digital agriculture, Professor Basso says, is where agriculture, science, policy and education intersect. Putting that data to use requires an effective balancing of competing for economic and social interests while minimizing trade-offs. Technologies like genetic modification and crop production



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automation help produce more food than we need to survive. Agriculture's contributions to greenhouse gas emissions, water pollution and biodiversity loss show that major agricultural systems are on a largely unsustainable trajectory. And as the population increases, energy demands and pollution will scale accordingly. To meet this challenge, the researchers proposed a two-step process. The initial step focuses on the design of a sustainable framework - with goals and objectives - guided and quantified by digital agriculture technologies. Implementation, the second step, involves increased public-private investment in technologies like digital agriculture, and a focus on applicable, effective policy.

This paper links advancements in agronomic sciences to the critical role policymakers must play in the implementation and setting the agenda for sustainability in agriculture. "It does no good to design a policy that the farmer will ignore". "Policymakers must make use of digital agriculture to help drive policy. They recommend targeted tax incentives and subsidies to support farmers working toward a more sustainable system. If the objective is to increase biodiversity, to reduce nitrogen fertilizer use or to grow less resource-intensive bioenergy perennials, incentivization is key. The researchers' analysis showed that if nitrogen fertilizer applications were based on demand and yield stability instead of uniform application, usage in the Midwest could be reduced by 36 percent with significant reductions in groundwater contamination and carbon dioxide emissions. "Making use of digital agriculture is about breaking bread and creating a sustainable agricultural system. (Ref. 1)

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Engineers develop precision injection system for plants

While the human world is reeling from one pandemic, several ongoing epidemics affect crops and put global food production at risk. Oranges, olives, and bananas are already under threat in many areas due to diseases that affect plants' circulatory systems and that cannot be treated by applying pesticides. A new method developed by engineers at MIT may offer a starting point for delivering life-saving treatments to plants ravaged by such diseases. These diseases are difficult to detect early and to treat, given the lack of precision tools to access plant vasculature to treat pathogens and to sample biomarkers. The MIT team decided to take some of the principles involved in precision medicine for humans and adapt them to develop plant-specific biomaterials and drug-delivery devices. The method uses an array of microneedles made of a silk-based biomaterial to deliver nutrients, drugs, or other molecules to specific parts of the plant. The microneedles, which the researchers call phytoinjectors, can be made in a variety of sizes and shapes and can deliver material specifically to a plant's roots, stems, or leaves, or into its xylem (the vascular tissue involved in water transportation from roots to canopy) or phloem (the vascular tissue that circulates metabolites throughout the plant). In lab tests, the team used tomato and tobacco plants, but the system could be adapted to almost any crop, they say. The microneedles can not only deliver targeted payloads of molecules into the plant, but they can also be used to take samples from the plants for lab analysis. (Ref. 2) **[Back to Newsletter's Page 1](#)**



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2. ENVIRONMENTAL REGULATIONS

Germany bets on green hydrogen in quest for climate neutrality

In the fight against climate change, hydrogen made with renewable electricity is increasingly seen as a silver bullet for sectors with particularly stubborn emissions, such as heavy industry and aviation. As a result, the emission-free gas has become a big energy-policy talking point in a growing number of countries. As one of the key drivers behind a pan-European effort, Germany has set out to become a global leader in "tomorrow's oil" by beating Asian countries – not only to launch the next stages of its landmark energy transition but also to secure a promising growth market for its internationally reputed industry. The country will flesh out its ambitions in a highly anticipated National Hydrogen Strategy expected in the coming weeks, which might become part of a "green stimulus" program to restart the economy after the coronavirus crisis. A rapidly growing number of countries striving for climate-neutrality have placed large bets on hydrogen made with renewable electricity to reduce emissions in industries where it is most difficult. But producing the extremely energy-rich gas requires huge amounts of electricity, making it more expensive than conventional fuels. This is why decisive government action is needed to kick-start an international "hydrogen economy". But, despite the high hopes of many, experts warn that hydrogen is not a cure-all in the fight against climate change, and call for doubling down on other steps to slash emissions. A lion's share of current greenhouse gas emissions can be avoided by increasing efficiency, and by replacing fossil fuels with clean electricity directly – for example, using electric cars instead of combustion-engine models. But there are a number of activities where this approach doesn't work. For example, there is no technology on the horizon that could enable to power large planes and ships with batteries, because they are much too heavy. This strategy will also fail in many industrial sectors – for example, chemicals or steelmaking, where entirely new production methods are required because current processes cause unavoidable CO₂ emissions. Here green hydrogen made in electrolyzers has emerged as the leading candidate to deliver the deep emission cuts needed to achieve carbon-neutrality. (Ref. 3) [Back to Newsletter's Page 1](#)

'Corona change' is an economic force with environmental consequences

Climate change issues are intimately tied to the coronavirus (CV) pandemic, but how? The recent announcement that the Environmental Protection Agency (EPA) has suspended regulations requires reflection on the pandemic's climate change politics. There are countless speculations as to the virus' origins, and all are anthropogenic. This means human practices disrupt ecological balance resulting in huge social impacts, like pandemics. Climate change is itself a result of cumulative human practices throwing off ecological cycles: this is the most general way to connect CV to ongoing climate change issues.

"Corona change" is the sum of all socio-economic impacts on the environment during this pandemic. Extreme market competition pressures labor and ecological systems to perform beyond their limits. Workers are always pressured to elide health and safety codes — such as



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we have seen with Boeing leadership's complicity in recent plane crashes. In nature, for example, fewer forests are pressured and fail at adequate carbon capture, which creates a domino effect leading to greenhouse gas pollution accumulations. During this crisis, there are many pressure points and contradictions; it's unclear what the future holds. Corona change is economic, as revealed by oil price declines at their lowest level since 2002. Oil prices for the U.S. and global crude benchmarks suffered the largest quarterly percentage declines on record and lost more than half their value for the month amid a demand slump caused by the coronavirus pandemic and a glut of supply thanks to a Russia-Saudi oil-price war. To compensate for this profit loss, oil companies have added another layer. They have successfully lobbied the EPA to suspend rule implementations, like reporting fracking wastewater, so the American Petroleum Institute can facilitate profits. The fallout from this move, intended to create a trickle-down economic effect to boost supply and demand chains, is manifold. It compounds to air and water pollution in an already pollution-intensive industry, adding to the radically compromised unhealthy pandemic atmosphere that can continue for years. EPA regulation suspension also encourages the wrong kind of employment. This may sound arbitrary, but work performed by those who create and process EPA paperwork is the kind of labor encouraged by the new normal of social distancing/remote work. (Ref. 4) [Back to Newsletter's Page 1](#)

3. ESD CHAIRMAN/DIVISION NEWS

ESD Technical Representative to WIE Planning Committee

Why: The Environmental Systems Division (ESD), in conjunction with the ASME Materials and Energy Recovery Division, the ASME Research Committee on Energy, Environment and Waste, and the Air and Waste Management Association (A&WMA) are planning a Waste Information Exchange (WIE) in the Washington, DC area. The WIE will be based on the [Air] Information Exchange held annually in North Carolina. The main presentations will be by EPA personnel.

How: ESD is looking for a volunteer to be the ESD Technical Representative to the Planning Committee. The individual should be familiar with the RCRA/HSWA regulatory program (including guidance and compliance/enforcement issues) on both solid and hazardous waste. Contacts in the Office of Resource Conservation and Recovery (ORCR) in DC would be a plus. Most of the work will be by telephone or electronic mail.

Submit Nominations: please contact Arnie Feldman at jjdsenv@att.net or Ryan Neil, ESD Chair, at ryanneil84@hotmail.com

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ICEM 2021 ANNOUNCEMENT

ASME, the Nuclear Engineering and the Environmental Systems Divisions, are pleased to announce the return of the International Conference on Radioactive Waste Management and Environmental Remediation (ICEM). The Conference is set for Oct 10-13, 2021, in Stuttgart, Germany. As with past, ICEM's the Conference will feature Plenary and Luncheon speakers, breakout sessions, and a large exhibit hall suitable for equipment displays for radioactive D/D&D tasks. The breakout sessions will feature panel discussions, invited speakers, articles, and presentations, as well as peer-reviewed papers.

The Tracks for ICEM 2021 include:

Track 1 Robotics and Remote Handling and Viewing Technologies

Track 2: Facility Decommissioning, Decontamination & Demolition (D/D&D) Overall (Plan, Decommissioning, Demolition, R&D)

Track 3: Major facilities experience in handling accidents and D/D&D

Track 4. Spent Fuel, Fissile Material, TRU, and HLW Management:

Track 5. L/ILW Radioactive Waste Management:

Track 6. Environmental Remediation (ER) including Activities at NORM/TENORM Sites

Track 7. Special Topics 1 - Public Involvement/ Crosscutting Issues/Global Partnering/Human Resource Development

Track 8. Special Topics 2 - New Facility Planning/ Environmental Management (EM)/ Health & Safety

Track 9. Student/Young Engineers Program

Track 10. D/D&D Research & Development Activities

If you are interested in being a Track Chair, a Session Chair, or helping to develop the conference, please do not hesitate to contact Arnie Feldman (jjdsenv@att.net) or Bob Stakenboroghs (bob@evisive.com). **[Back to Newsletter's Page 1](#)**

4. EDITORIAL BOARD SELECTIONS

What's going to 'bug' you in 2020?

Insect pests never seem to get the respect they deserve. If they present a threat during a growing season, they move front and center, but more often, they are a much lower concern than fertility, weeds and diseases. Some of that is thanks to today's improved genetics and commercial varieties and hybrids that produce their hardier, more durable plant stands. Some, too, is thanks to the improved efficacy in available chemical products. Even so, certain pests are becoming consistent threats with an impact that stretches beyond isolated pockets in one part of the province or another. According to a crop input representative with Lakeside Feed and Grain Limited, Western bean cutworm (WBC) now leads that pack across



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much of southern Ontario, and it is showing signs of expanding its reach farther east. In the past couple of years, they have tried setting out more traps to monitor flight patterns and to time their arrival in Ontario fields. However, they concede it's difficult to find egg masses, and so is trying to determine the best timing to pull the trigger and spray for a pest. The good news on WBC is that grower awareness seems to be solid; adding that most farmers have sat through at least one presentation on the dangers it can pose. That includes the connection between cutworm and its ability to open a corn plant to infection from mould diseases like gibberella ear rot (GER). It is a point of frustration that in spite of doing the best job of fertilizing and managing weeds in a corn crop using the latest, most disease-resistant hybrid; it is still possible to have that crop affected by cutworm and an associated disease outbreak. (Ref. 5) [Back to Newsletter's Page 1](#)

Yanmar Leverages Agri-Robotics for a Sustainable Farming Future

It is hard to think of a more important economic sector than agriculture. This industry directly affects the lives of everyone the world over, despite being beset by challenges from all sides. Changes in temperature and precipitation are influencing crop yields; farmers and agricultural workers are directly exposed to the effects of weather extremes, while millions more in food-related jobs are already feeling the impact of our changing climate. Furthermore, consumers today are increasingly aware of the issue of chemicals used in producing their food and demand sustainable production of ever tastier, higher quality products. The focus is now on achieving desired yields in an environmentally sustainable way, with a continuous focus on reducing the amount and type of chemicals used. Drought, flooding and the appearance of new pests and diseases are, however, now a threat on all continents. With its European research facility nestled in the hills above Florence, Italy, Yanmar R&D Europe (YRE) is well placed to focus on a variety of field-based studies to bring added value to the agriculture industry – and possibly even attract a new generation of workers to the land. These include the two-year, four-million Euros 'SMASH' project being carried out in cooperation with 10 technology partners to develop a mobile agricultural 'eco-system' to monitor, analyze and manage agricultural crops. The acronym stands for 'Smart Machine for Agricultural Solutions Hightech', and this project was co-financed by the Tuscany local government. It consists of the development of a modular robotic platform that employs the latest information communications technology to examine crops and soils, analyzes gathered information and provides clear, actionable information to farmers to support crop management. One of Yanmar's many roles was to develop control systems for the multipurpose robotic arm for mobile manipulation (including precision spraying), sensor integration for positioning technologies, and autonomous navigation and software development for the control of the system's mobile base (in collaboration with other partners). (Ref. 6) [Back to Newsletter's Page 1](#)

AI Used to Monitor Health of Coral Reefs and Detect Ocean Trash Pollution

Intel has recently collaborated with Accenture and the Sulubaaï Environmental Foundation to create an AI-driven data collection platform aimed at analyzing and protecting vulnerable marine habitats, habitats like coral reefs. A combination of climate change, pollution, and overfishing have been damaging the world's oceans, particularly coral reefs. Coral reefs



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around the world are experiencing mass die-offs and problems like coral bleaching. Scientists and conservationists are looking for ways to protect coral reefs and help them recover. The purpose of CORaiL will be collecting information on coral reefs and other marine habitats, providing researchers with the data they need to determine what strategies could be effective at protecting vulnerable marine ecosystems. Artificial intelligence provides unprecedented opportunities to solve some of society's most vexing problems. Our ecosystem of corporate and social partners for this 'AI for social good' project proves that there is strength in numbers to make a positive environmental impact. (Ref. 7) [Back to Newsletter's Page 1](#)

Tank farm waste cleanup helps pave 'path to glass

On behalf of the U.S. Department of Energy, Washington River Protection Solutions, WRPS has protected the environment and the public by safely managing 56 million gallons of highly radioactive nuclear waste in 177 underground tanks. Presently, WRPS is marching in lockstep with DOE and other Hanford contractors in paving the "path to glass" toward waste treatment and disposal in the glass form. For most of the contract, the tank farms team has focused on removing and transferring the waste from older single-shell tanks to more robust double-shell tanks. Removing waste from the single-shell tanks—, which have long, since passed their original design life—is one of the most complex challenges in the DOE complex. With tank retrieval as a cornerstone of the mission, their heightened focus is on building a waste delivery system to help achieve DOE's goal of beginning waste treatment by the end of 2023. Today, WRPS is constructing a system that will separate cesium and undissolved solids from radioactive tank waste, providing a low-activity waste stream to the Waste Treatment and Immobilization Plant (WTP) for making glass. For waste feed delivery and other tank farms projects to run smoothly, upgrading critical infrastructure is paramount. One of the major successes last year was improvements made at the Effluent Treatment Facility (ETF), where they processed 3.4 million gallons of wastewater. ETF will support WTP operations for years to come. (Ref. 8) [Back to Newsletter's Page 1](#)

Recycled SuperBreak : one with 100% Recycled Fabric

The Recycled SuperBreak, each containing the equivalent of 20 plastic water bottles* worth of recycled plastic, uses 900 Denier Polyester eco-fabrics, made of postconsumer waste such as plastic water and soda bottles. The sophisticated recycling technology that creates this eco-conscious fabric breaks down plastic through a manufacturing process and transforms it into high-quality spun polyester yarn. Utilizing these recycled fabrics in product development has a lower impact on climate change than the equivalent virgin polyester. Mindful processing and manufacturing of the Recycled SuperBreak is also a key driver of the sustainability efforts –All the machines used in the production of the Recycled SuperBreak use renewable energy from a solar power system and the eco-conscious fabric produced has a solvent-free PU coating, which reduces the number of hazardous chemicals used during processing. Not only is the Recycled SuperBreak helping to combat the ever-growing problem of plastic waste, but the pack is also incredibly stylish and functional. The traditional foam used in the back panel and straps of every pack was removed in order to make the Recycled SuperBreak fully packable into itself for simple and convenient storage. It



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also uses 60% recycled paper for its product hangtags, in addition to using eco-friendly vegetable ink and a water-based varnish on the hangtags. The Recycled SuperBreak will be available in five colors including Black, Red Tape, Yellow Card, New Olive and Oyster. (Ref. 9)

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“Earth School” launches to keep students connected to nature in the time of COVID-19

In response to the COVID-19 crisis, an unprecedented coalition has come together to launch “Earth School,” which provides free, high-quality educational content to help students, parents, and teachers around the world who are currently at home. Initiated by the United Nations Environment Programme (UNEP) and TED-Ed, Earth School takes students on a 30-day “Adventure” through the natural world. The curated Earth School content features videos, reading materials and activities —, which will be translated into 10 languages — to help students gain an understanding of the environment while considering their role within it. This is the biggest online learning initiative in UNEP’s history and is available free on TED-Ed’s website. According to the UN Educational, Scientific and Cultural Organization (UNESCO), more than 1.5 billion learners are affected by COVID-19 school closures. The pandemic has caused health, economic, and education crisis; in the age of physical and social constraints, there is a strong need for global science literacy. That is why UNEP and TED-Ed — in coordination with 30 collaborators, including National Geographic, WWF and UNESCO — came together to launch Earth School in just over two weeks. Built for children and youth ages 5-18, it spans 30 school days that run between Earth Day and World Environment Day on June 5, which this year will take place under the banner of Time for Nature. (Ref. 10)

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5. ESD NEWSLETTER READER COMMENTS

“The Blogger Rabble is so wrong in his observations about visibility improvement. His claim that it is a result of CO₂ reduction is laughable. CO₂ is a gas. It has no visible impact. I am amazed that this article was allowed to be published in a technical journal such as this. Shame on ASME”. - George Tracy (08 April 2020)

Expecting the reader's comments and views on the newsletter. [Back to Newsletter's Page 1](#)



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ESD NEWSLETTER BOARD

Editor: DR. K. J. SREEKANTH - (sreekanthkj@kisir.edu.kw)

Assoc: DR. JAMES ZUCCHETTO - (jimzuc@comcast.net)

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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.

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