

Wetsus Congress 2021

The world needs Wetsus innovations

Call for structural financing of Wetsus

At the annual Wetsus Congress, keynote speakers from government, industry and science made an appeal to the relevant authorities to organize structural financing for Wetsus. Based upon Wetsus' added value for science, innovation and sustainability, they pointed out the urgency to come to a permanent financing solution.

The Wetsus Congress, last Monday and Tuesday, was the first in-person water technology congress in a long time. This was very much appreciated by the 700 visitors of the 2-day event. In a great ambiance, they followed the 16 sessions with over 50 speakers. Keynotes were delivered by Peter ter Kulve, President Homecare Unilever, Ingrid Thijssen, President VNO-NCW, prof.dr. Marcel Levi, Chairman NWO, Jaap Slootmaker, Director-General for Water and Soil Affairs, Ministry of Infrastructure and Water Management, prof.dr. William Martin, professor of Molecular Evolution Heinrich-Heine-Universität, Düsseldorf and prof.dr.ir. Katja Philippart, Director Wadden Academy.

Emad al-Dhubhani wins Marcel Mulder prize

Emad al-Dhubhani has won the Marcel Mulder prize for his contributions to a water-splitting membrane for water-based batteries. Emad's newly developed technique to make membranes split water into its acidic and basic components has proven to outcompete the commercially available ones. For this major achievement the young scientist received the prize of €5000.



President of the supervisory board of Wetsus, Ed Nijpels, awarded Emad al-Dhubhani the prize for most innovative water technology research in the past year. Emad worked on making membranes by using a technique called electrospinning. "Such membranes can be used in water-splicing, wastewater cleaning, desalination, food industry, metal recovery, and CO₂ capturing," the scientist explains.

Usually, in such set-ups, the positive and negative membranes must be as close to one another as possible. "Conventionally, cationic and anionic membranes are cast on top of each other," Emad says, "but that is not efficient enough." Even though the distance between the layers is microscopic.

Best research poster winners

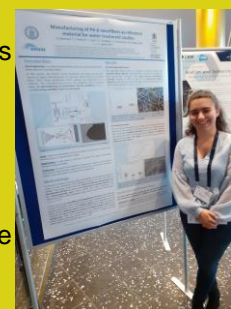
The best scientific research poster is awarded to one of the Wetsus researchers presenting their Ph.D. poster at the congress every year. This year, in addition, the best applied science poster was praised too. The 2021 winners are Bárbara Vital, in the category Ph.D. poster, and Danilo Damiano & Sofia Pereira, in applied science.



Bárbara's poster was commended for the excellent balance of accessible text and figures. On the print, she explained her research on developing a method to clean reverse-electro-dialysis membranes used to harvest energy from fresh and seawater.

Presenting her first poster, she was in awe of the favorable judgment of the jury. Bárbara thinks the combination of well-designed figures and schemes, contributed to the achievement. And "the less text, the better," she tips.

Danilo and Sofia's poster on the synthesis of nanofibers as a model for water treatment studies, was also praised for its excellent layout and understandable scientific wording. Supervisor Martijn Wagterveld explained that the authors had a different approach than Bárbara's. In contrast to their research, they put together the poster last-minute and changed up the given format.



All the creative and innovative winners were awarded a small gift and a great appreciation by the hundreds of congress visitors.

So, Emad took his research to a new dimension. By intertwining the cationic material with the anionic, he increased the efficiency of the system massively.

"We generated cationic and anionic nanofibers with high voltage while closely controlling the temperature and humidity," Emad explains, "these electrospun fibers were then shot at each other under an angle, interweaving the fibers." Like entangled wires, the positive and negative materials are knotted.

"Electrospinning has many advantages," Emad says, "you create a single sheet with a large contact area, which is robust yet flexible." A major advantage over the double sheeted, less efficient and more expensive membranes of now.

Being competitive and curious from a young age, it was only logical such research comes from his creative mind. Teen Emad already had an affinity for engineering projects. "I would stare at images of space shuttles, airplanes, and jets, wondering how they worked, how they were put together," he says. It shaped an engineering mind, and with a competitive attitude, it was only logical Emad got into science. Yet the secret recipe for winning such a prestigious prize requires more than that, according to Emad. "I think imagination, hard work, and especially teamwork paid off."

Day 2: on the origin of life and the conservation of it in the Wadden Sea

In addition to the ten parallel sessions on topics ranging from vortices to DNA data collection in wastewater, the visitors of the congress were enlightened by prof.dr. William Martin's theory on the origin of life, and prof.dr.ir. Katja Philippart's presentation on the effects of climate change on the Wadden Sea.

On the origin of life

William Martin, professor at the Heinrich Heine University in Düsseldorf, Germany, discussed his theory on how life could have started in the tens of meters high porous structures that can form at the bottom of oceans. Famous examples of which are active chimneys that spray out water of about 70 to 90 °C, that were discovered at "Lost City" in the 1990s. In an in-depth, but ever-humorous manner, Martin showed the spontaneous processes that could occur in such environments, driven by the supply of CO₂ and hydrogen.

To reproduce what might have occurred about 4 billion years ago, his group experimentally determined whether organic molecules could have arisen from Lost-City-like structures and concluded they can indeed.

Assuming that these large structures on the ocean bottom contained an iron-nickel mineral called *Awaruite*, these could support methanogenic and acetogenic pathways. Astonishingly, with just the catalytic metal, hydrogen, and CO₂ in the mix. Though crucially depending on compartmentalization by the porous structure, it becomes a real possibility that molecules were kept together and could increase in concentration.

Further evidence of what might have happened at the origin of the tree of life is that the cofactors responsible for modern methanogens and acetogens still are shared now 4 billion years later.

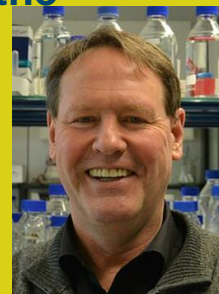
Later steps towards the recreation of the last universal common ancestor are still dazzlingly unknown, but that won't stop Martin's group from finding out the details of those last pieces – or actually first – pieces of the puzzle.

The effects of climate change on the Wadden Sea

Professor doctor engineer Katja Philippart depicted the effects of drought, a rising sea level, and global warming on the UNESCO World Heritage site – the Wadden Sea. How it looked like in the past, and how it will in the future. She described how ecosystems would be disrupted based on various scenarios of the most recent IPCC report.

As the sea levels rise, the balance between high and low tide will be drastically disturbed. With the seabed being above the waterline for smaller amounts of time, an effective longer-lasting high tide is created, while low tide lasts shorter and shorter. As the seafloor is a flourishing nursery for sea life and feeding ground for several birds, they will have to survive on ever-shortening feeding periods.

Philippart also explained that the changing temperatures could further disrupt Wadden ecosystems. Fish hatch sooner than their food source – phytoplankton – bloom, resulting in less food high up in the food chain and thus a disbalance.



Furthermore, due to increasing droughts, we as humans will store more and more freshwater from rivers, reducing their discharge to the Waddensea. The lacking freshwater feed will also have severe effects on the Wadden ecosystem. Therefore, Philippart pleaded to seek out solutions together with the water sector.

Though the effects of climate change on the Wadden cannot be prevented, they can be minimized. Philippart called out for engineering knowledge. As only knowledge and innovation can aid in the persistence and protection of this World Heritage site.

Keynotes Wetsus Congress on YouTube

Due to the COVID situation, not all people who wanted to attend our congress, were able to come to Leeuwarden. For this reason, but also for the congress guests who wish to revisit a lecture, we recorded the keynotes and put them on YouTube.

You can find them on our [Wetsus Congress playlist](#).

Wetsus Congress/EWTW 2022



On September 19 - 22, 2022, the global water technology sector will get together during the second European Water Technology Week (EWTW 2022) in WTC Leeuwarden. Business and innovation leaders from companies, universities and governments will meet and inspire each other in the innovative climate of WaterCampus Leeuwarden. The first edition of EWTW attracted over 1000 participants from 38 countries. EWTW 2022 will feature the Wetsus Congress 2022, an international business

program initiated by Water Alliance, the assembly of the Global Water Tech Hub Alliance and a new dedicated trade show: [Water Tech Europe](#). Science, valorization, scale up, business development, export, entrepreneurship, policy and education: all aspects of water technology innovation will be integrated in the congress program and the trade show. Please follow all at the dedicated [website](#).

Aquatech

Before this, we hope to meet you at Aquatech/AIWW in November. Wetsus will be present at The Netherlands pavilion, with the rest of the WaterCampus partners. You can also get acquainted with some Wetsus innovations at the [Innovation Lab](#), or enjoy the program of the [Industrial Users Hub](#), powered by Wetsus. Finally, the [Aquatech Innovation Award](#) is chaired by Wetsus Executive Board member prof.dr.ir. Cees Buisman. See you there!