



# BIDR News

SPRING 2021



**Prof. Nurit Agam**  
French Associates  
Institute for Agriculture  
and Biotechnology of  
Drylands



**Yoni Teitelbaum**  
Zuckerberg Institute for  
Water Research



**Dr. Muhammad  
Bashouti**  
Swiss Institute for  
Dryland Environmental  
and Energy Research



**The 7<sup>th</sup> International  
Conference on  
Drylands, Deserts, and  
Desertification**



**Awards BIDR  
2020**



Dear Reader,

In this inaugural newsletter, you will learn about some of the scientific activities currently underway at the Jacob Blaustein Institutes for Desert Research.

Although offering just a glimpse, the people, research, prizes, conferences, and activities highlighted in the following pages stand as a powerful testament to the BIDR's established status as a center of international excellence.

Over the past year, BIDR scientists have produced numerous peer-reviewed articles, with an average impact factor of 7.97. They have received many lucrative research grants, including the funding for a large-scale water technologies consortium led by BIDR researchers with colleagues from Northwestern University, Yale University, the Technion, and several industrial partners.

One notable example of our dynamic international collaborations is the newly established agricultural research institute to be built in Tamil Nadu, India, jointly coordinated by the BIDR and ABAN, India's largest offshore drilling entity. While ABAN will oversee the campus's construction, BIDR researchers will determine the new institute's curriculum. Through this institute, a new generation of Indian researchers will receive the tools necessary to address some of the modern world's most pressing issues, including developing effective agricultural methods and technological innovations to enhance food production, while simultaneously minimizing negative environmental impacts.

At the BIDR, we also undertook several groundbreaking studies related to the COVID-19 pandemic, including one that rethinks wastewater risks and monitoring in light of coronaviruses' persistence in this water and another that examines the development of effective filters and masks covered with graphene LIG to remove airborne virus particles.

In the past year, the Albert Katz International School for Desert Studies hosted 213 students from 25 countries, with an additional 68 postdoctoral fellows. The institutes recruited two new faculty members in the last year: Dr. Nina Kamennaya, who studies the molecular mechanism of carbon dioxide toxicity and the physiological strategies to manage it, and Dr. Avner Ronen, who is working on developing a new generation of membranes, with the ability to adjust surface properties actively or to release materials that can mitigate bacterial attachment.

This newsletter offers examples of the scientific and educational endeavors being pursued at the BIDR by spotlighting two outstanding researchers and one excellent graduate student, focusing on their groundbreaking work.

You will also find entries about the BIDR's recent prize winners and a short description of the Seventh International Conference on Drylands, Deserts, and Desertification, which was adapted to an online format and drew an impressively wide-ranging global audience.

Finally, I would like to take this opportunity to wish the BIDR's entire community a Happy Passover, a Blessed Ramadan, and a Happy Easter. May these holidays usher in a more hopeful spring season.

*Noam Weisbrod*

Noam Weisbrod, BIDR Director

## Prof. Nurit Agam

French Associates Institute for Agriculture and Biotechnology of Drylands



*Prof. Nurit Agam and students setting up the CRNS.*

Prof. Agam studies micrometeorology, examining exchange processes of water, heat, and momentum across the soil-plant-atmosphere continuum, particularly evaporation and transpiration. Prof. Agam received her Ph.D. from Ben-Gurion University and then held two postdoctoral positions—one at the Weizmann Institute and another at the US Department of Agriculture—after which she was a research associate at the Gilat Research Center ARO.

She conducts her research in both agricultural and natural environments. One particular topic Prof. Agam focuses on is the Negev Desert's water cycle during the dry period. Yes, you read correctly. She explores water when there is no water, or so one would think. Prof. Agam has found a regular exchange of water between the bare loess soil and the Negev's atmosphere throughout the entire dry period (from ~May to ~October), due to the intrusion of the sea breeze causing the formation of water vapor gradients. This unexpected and essential finding has led to the expansion of this research in multiple fascinating directions. To address the many challenging questions brought

forth, Prof. Agam has established a state-of-the-art micrometeorological station at the BIDR's Mashash Experimental Farm, located half-way between Beer-Sheva and the Sde Boker Campus, at the fringe of the Negev Desert.

One crucial direction she is currently exploring is using various methods to monitor these tiny fluxes over scales more considerable than just a soil sample. A recent project she has been conducting, together with German colleagues, explores the ability of Cosmic-Ray Neutron Sensing (CRNS) to detect the small fluxes involved in the formation and evaporation of these non-rainfall water inputs (NRWIs). The CRNS is a novel technology that quantifies the average soil water content over a larger than 100-m radius. If proved successful, this will be a novel and relevant tool for monitoring the water balance of arid and semi-arid regions, critical for understanding ecosystem dynamics, especially where water is a limiting resource.

Another intriguing direction is based on the assumption that where there is water, there is life. And if this is true, does this

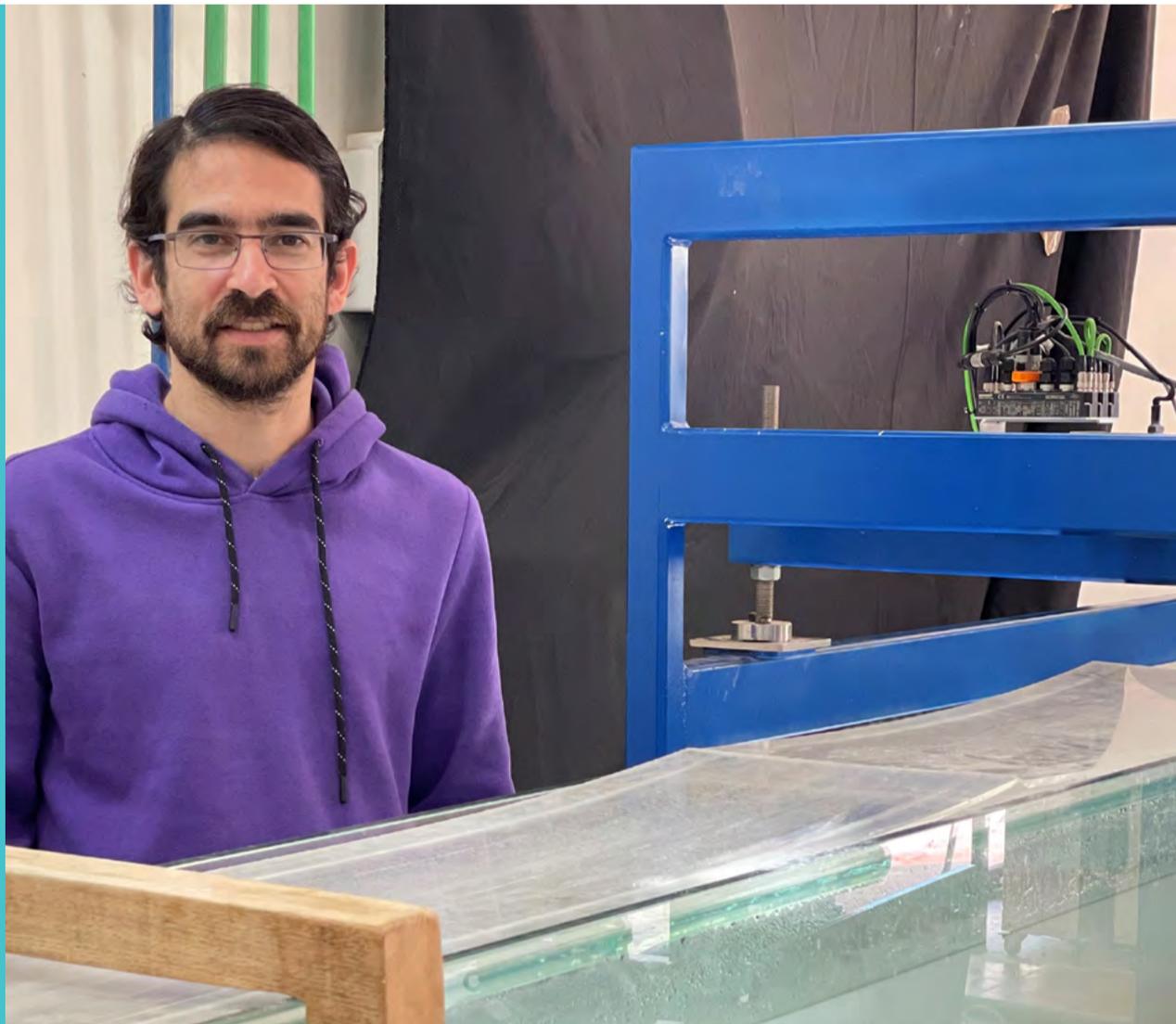
tiny, but very consistent and reliable, amount of water support or initiate any biological activity? Soil is globally one of the most significant contributors of CO<sub>2</sub> to the atmosphere, ten times higher than the emissions caused by the burning of fossil fuels. But is CO<sub>2</sub> flux initiated by the NRWIs? This is yet to be determined. The increasing recognition of the importance of hydrological and biogeochemical processes in arid environments makes a better quantitative understanding of the relations between NRWIs and CO<sub>2</sub> exchange one of the most pertinent issues in dryland research. Stay tuned...



*Detecting water and heat fluxes at the Mashash Farm.*

## Yoni Teitelbaum

Zuckerberg Institute for Water Research



*Yoni Teitelbaum in Prof. Shai Arnon's lab.*

Yoni Teitelbaum was born in Israel but grew up in the USA. He earned a B.S. in Mathematics from Stanford University and then worked as a data scientist at an internet startup for five years. Yoni then immigrated to Israel (made Aliyah). Soon after arriving in Israel, he started his studies at the Zuckerberg Institute for Water Research.

In 2018, he completed an M.Sc. in Hydrology under the supervision of Profs. Shaul Sorek, Alex Yakirevich, and Amit Gross. He then continued to a Ph.D., also in Hydrology, under Prof. Shai Arnon and Dr. Scott Hansen's supervision. He expects to complete his doctoral studies in March 2022.

Yoni's current research focuses on the flow of stream water into and out of streambed sediment. This flow, known as hyporheic

exchange flux, is ecologically important because it brings oxygen into the streambed, which is necessary to sustain the microbes that live in the sediment.

Simultaneously, water that flows from the sediment back out into the stream brings with it nutrients used by other organisms within the stream. Sometimes, fine-grained sediment (clay) gets washed into streams due to floods. Due to its small grain size, the clay gets trapped between the original streambed sediment particles, blocking the hyporheic exchange flux's flow paths.

Understanding exactly how this happens is the topic of Yoni's research. Impeding hyporheic exchange flux has a damaging effect on stream ecosystems.

Human activity, such as construction, agriculture, and mining, has increased the fine-grain sediment introduced into streams in recent years. Thus, environmental policymakers are interested in understanding these streambed clogging processes to enact policies to protect stream ecosystems.



*Teamwork during 48-hr sampling as part of the Worldwide Hydro biogeochemistry Observation Network for Dynamic River Systems (WHONDRS).*

## Dr. Muhammad Bashouti

Swiss Institute for Dryland Environmental and Energy Research



*Dr. Muhammad Bashouti and students.*

Dr. Bashouti is a member of the Alexandre Yersin Department of Solar Energy and Environmental Physics and the Director of the Ben-Gurion National Solar Energy Center. Dr. Bashouti studies the properties of molecular surfaces and their transformations. After completing his Ph.D. in Physical Chemistry at the Technion in Haifa, Israel, Dr. Bashouti held two postdoctoral positions—the first also at the Technion but in the Department of Chemical Engineering for 14 months, and the second in the Department of Physics at the Max Planck Institute for the Science of Light in Germany for two and a half years. He was then promoted to the position of independent researcher at Max Planck, which he held for three years before coming to the BIDR.

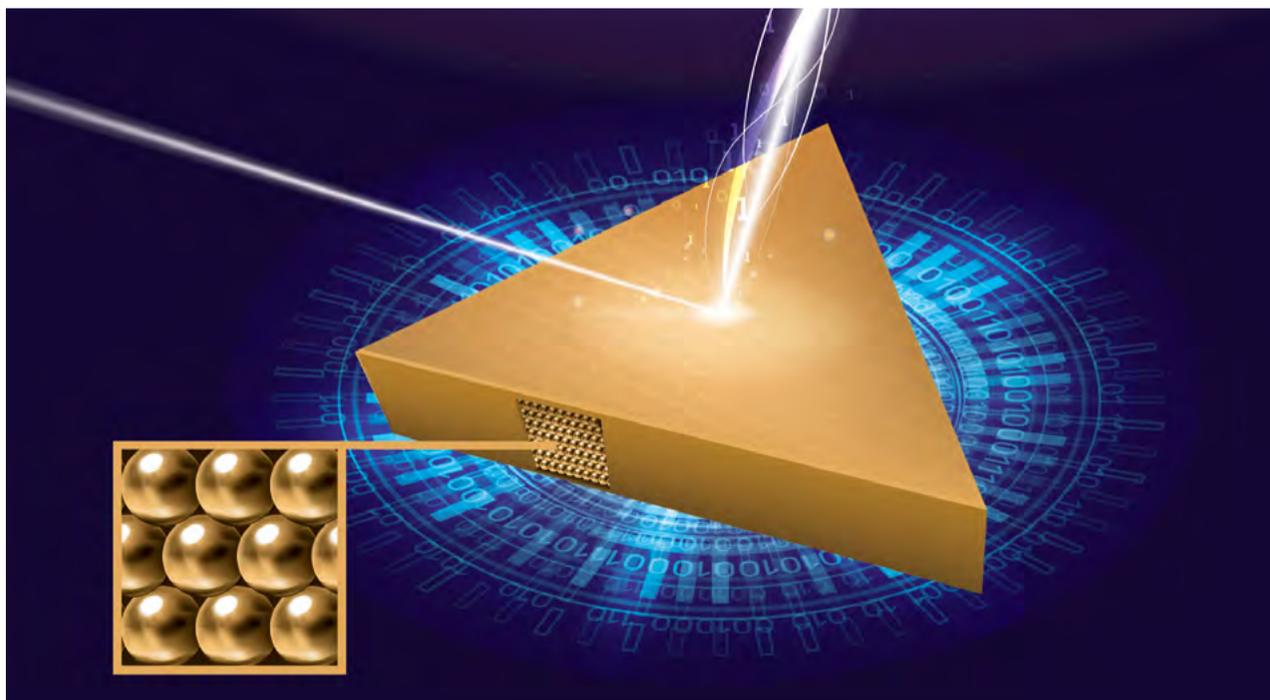
Dr. Bashouti's lab is multidisciplinary and uses advanced methods and technology to explore the interactions

between molecules and interfaces. Since molecular dimensions are well beyond the resolution of standard or even state-

of-the-art lithographic techniques, when fabricating actual nanoscale molecular electronics circuits, the molecules themselves represent just one part of the puzzle, posing the question, which molecules and materials are consistent with both chemical reactions and electronic circuitry? How can energy be transferred from the molecule to the nanomaterial? Dr. Bashouti's work focuses on this component of the molecular optoelectronic circuit, as it represents a serious and fundamental scientific challenge.

He collaborates with national and international experts in science (physics, mathematics, and chemistry) and engineering (material, electrical, and chemical), producing cutting-edge research that combines basic science and nanotechnological applications in molecular interfaces/molecular optoelectronics and at length scales ranging from the sub-micro to a single nanometer.

Dr. Bashouti's research fields include material engineering, surface functionalization, energy transfer at interfaces, and optoelectronic characterization and devices.



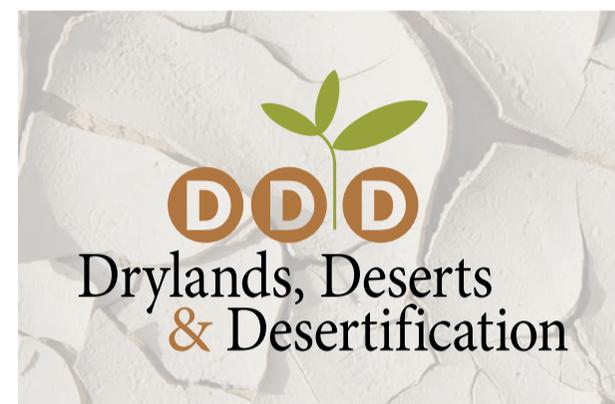
*Gold monocrystalline as a plasmonic raw material.*

## The Seventh International Conference on Drylands, Deserts, and Desertification

November 16–18, 2020

Due to the COVID-19 pandemic, the conference transitioned to an online event, with a diverse program of 31 sessions and virtual tours scheduled over three days during the afternoon and evening hours to accommodate participants from international time zones. Mr. Ibrahim Thiaw, the Executive Secretary of the UNCCD, offered greetings to the conference. Also welcoming the conference attendees were H.E. Martin Mwanble, the Zambian Ambassador to Israel and the Dean of the African Ambassadors to Israel; H.E. Gianluigi Benediti, the Italian Ambassador to Israel; Gila Gamliel, the Head of the Israel Ministry of Environmental Protection; Prof. Noam Weisbrod, the Director of the Blaustein Institutes for Desert Research; and Prof. Daniel Chamovitz, the President of Ben-Gurion University. This year's theme, Feeding the drylands: challenges in a changing environment, concerns every living organism on our planet. The sessions in the conference dealt with challenges facing

human health, food, water, and ecosystems. Altogether, there were 31 sessions, including 45 presentations within the food challenges theme led by the French Associates Institute for Agriculture and Biotechnology of Drylands and 35 presentations within the water challenges theme led by the Zuckerberg Institute for Water Research. There were three keynote talks, including the opening lecture on food security by BGU President Prof. Daniel Chamovitz. Also, Prof. Bernadette N. Kumar, President of the EUPHA Section for Migrant and Ethnic Minority Health and Co-Chair of Lancet Migration, gave a talk entitled *Migration and Climate Change: Defining Issues for Global Health*, and the 2019 Israel Prize recipient, Prof. Dan Yakir, gave a presentation entitled *Forests at the Dry Timberline as Important Testbeds for Probing Ecosystem Response to Change*. Prof. Rattan Lal, the 2020 Laureate of the World Food Prize Foundation, also gave a talk on what comes next in regard to feeding the drylands. DDD2020 was a



great success with over 2400 participants from over 109 countries worldwide that constitute approximately 95% of the population on earth. The conference also received wide attention from the national and international media, including radio, television, and print/internet articles. The diverse global participation in and the vast media exposure of this conference are testaments to the importance of the DDD issues and the conference's ongoing success.

## Awards BIDR 2020



The Albert Katz School of Desert Studies' teaching committee selected five exceptional students who will receive the **Merit Awards** as part of the annual "Rosh Hashanah Toast" ceremony. The outstanding students for the 2020 academic year are:

- **Erez Azulai** (Robert Equey Prize for Excellence in Hydrology and Water Quality)
- **Sherina Harilal** (The Daniel Falkner Prize for Excellence in Desert Studies)
- **Yuval Zukermank** (Frederick Siegmund Prize for Excellence in Ecology and Nature Conservation)
- **Bar Eshel** (Albert Katz Foundation for Excellence in Hydrology and Water Quality)
- **Nadezhda Stavtseva** (Albert Katz Foundation for Excellence in Desert Studies)

**The Yehiel Admoni Award** for research that brings life into the desert sponsored by the Admoni Family of Israel. This annual award recognizes exceptional research in the field of combating desertification and agricultural development in arid areas. The award honors Mr. Yehiel Admoni, who has devoted his life to promoting agriculture, settlement, and the development of the Negev in general, and the Sde Boker Campus of Ben-Gurion University, in particular. 2020 WINNERS:

- **Bar Eshel**
- **Jingbo Zhen**
- **Dr. Oded Berger-Tal**
- **Dr. Oded Nir**