VOICE FROM THE DESERT

NEWSLETTER OF THE
JACOB BLAUSTEIN
INSTITUTES FOR
DESERT RESEARCH
המכונים לחקר המדבר
ע"ש יעקב בלאושטיין

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JACOB BLAUSTEIN INSTITUTES
FOR DESERT RESEARCH

Director's Message

Dear Reader,
I am happy to present you with the new issue of VOICE from the DESERT, the newsletter featuring recent developments, events and accomplishments at the Jacob Blaustein Institutes for Desert Research (BIDR). I am especially pleased to introduce myself to you in my very first Director's Message. Having commenced my tenure as BIDR Director in August 2014, I am eager to share with you my vision for the future of the Institutes. I have stepped into the position of BIDR Director in the midst of an enormous generational shift. Many of the founding scientists who established these Institutes are currently retiring, and the next generation is coming to the fore. One of my most important missions as new Director is recruiting excellent up and coming researchers.

Fittingly, this issue is dedicated to highlighting the BIDR's newest researchers. Inside, you will find profiles of nine of our most recent hires in a variety of disciplines, including ecology, solar energy, water treatment, dryland agriculture, hydrology, and environmental physics. Though their fields may differ, one common theme they all express is their appreciation of the strong multidisciplinary and collaborative atmosphere of the BIDR. In addition to voicing their excitement about the BIDR's new facilities, most notably the Ben-Gurion National Solar Energy Center Building that was dedicated last spring, our young researchers also remark on their gratitude to be working in a physical location of such stunning natural beauty.

The BIDR also hosted two important international conferences in the fall of 2014—the Fifth International Conference on Drylands, Deserts and Desertification (DDD) and the inaugural Israel-Italy Grapevine Symposium—which you can read more about in these pages. The DDD Conference, held biennially at the BIDR, brought together nearly 500 scientists, policymakers and practitioners from around the world working to promote sustainable living in the drylands. The GRAcious Symposium convened scientists from Italy and Israel who are studying the physiology and biotechnology of grapevine and wine grapes. Both conferences testify to the BIDR's important position in the international scientific community.

Thus, the content of this newsletter fits well with my vision for the BIDR—continuing to build an excellent multidisciplinary academic institution with a vital role to play on the global stage. However, I also hope to simultaneously deepen the BIDR's connection with our local community. The village that houses our institutes is one of the fastest growing in southern Israel. Our mission is to study the desert, and we must also sharpen our focus on this particular desert, the Negev, and the people who live here, especially the young people. It is crucially important to educate the next generation of scholars. With this in mind, I intend to strengthen the BIDR's outreach to the local high school. Additionally, we hope to continue increasing our graduate student enrollment. Phases 3 and 4 of our new dormitories are due to be completed this year, which will provide quality housing for our growing student body.

As we begin together a new chapter in the ongoing story of the BIDR, I welcome you to read this latest issue of VOICE from the DESERT and discover more about our next generation of scholars.

Yours in friendship,
Prof. Boris Zaltzman

Analysis Beneath the Surface - Dr. Anat Bernstein

Dr. Anat Bernstein is a recent and valued addition to the Department of Environmental Hydrology and Microbiology in the Zuckerberg Institute for Water Research (ZIWR). Her work focuses on tracking the degradation processes of organic pollutants in the subsurface, using compound-specific isotope analysis techniques.

Dr. Bernstein received her B.Sc. in the Department of Soil and Water Sciences at The Hebrew University, and went on to earn her M.Sc. and Ph.D. from the Department of Geological and Environmental Sciences at Ben-Gurion University (BGU). She was already connected to the BIDR, however, since her Ph.D. advisors were BIDR researchers and the laboratory for her doctoral work was located here, as she focused on the biodegradation of the explosive RDX in the Israeli Coastal Aquifer. After a two-year postdoctoral position in Germany, a one-year postdoc at BGU, and a stint at the Volcani Center, Dr. Bernstein returned to the ZIWR one year ago as a researcher. Here, she analyzes the ways that organic pollutants, such as industrial waste, explosives, and pesticides, among others, biodegrade below the ground surface of contaminated sites, looking specifically at the rates of degradation and the effects of environmental factors on their degradation.

This biodegradation is primarily caused by bacteria already present in the site. One might naively assume that people must immediately intervene to clean up a contaminated site, but as Dr. Bernstein points out, “it is important to first understand about naturally occurring processes” at the site, since in some cases, contamination can be remediated by these existing bacteria. But first, scientists, like Dr. Bernstein, must thoroughly understand the complexities of these processes.

The specific tool she uses is the compound-specific isotope analysis method, which measures the ratios of naturally occurring stable isotopes, providing insight into the extent of degradation and the origins of chemicals. A new Stable Isotope Laboratory is currently being constructed at the Zuckerberg Institute, and is set to be fully running in a matter of months. This lab will allow Dr. Bernstein and her colleagues to advance their research and develop methods that can then be applied in the field, including actual contaminated sites throughout Israel.

In addition to her excitement about the new lab, Dr. Bernstein also points to the extraordinary encouragement offered by her more senior colleagues, noting a valuable “will to support,” which makes her department an environment especially conducive for carrying out research.

Bridging between Mathematics, Physics and Chemistry: The Dynamical Systems Approach to Energy and Biological Systems - Dr. Arik Yochelis

In the summer of 2012, Dr. Arik Yochelis joined the Alexandre Yersin Department of Solar Energy and Environmental Physics in the Swiss Institute for Dryland Environmental and Energy Research, where he implements nonlinear physics methods and seeks novel mechanisms that are related to renewable energy and biological systems, such as organic solar cells, ionic liquid supercapacitors, photo-electrochemical water splitting, auditory systems, and excitable media. Dr. Yochelis’ approach combines theoretical methods and close collaborations with experimentalists to produce new frameworks that are realistic enough to allow empirical predictions.

Dr. Yochelis received his undergraduate degree and master’s degree in physics from Ben-Gurion University and Tel Aviv University, respectively. He then returned to BGU to complete his Ph.D. in the Physics Department. After completing several postdoctoral positions, at the Technion, UC Berkeley and UCLA, Dr. Yochelis returned to Israel, where he initially began working in industry, for the Landa Corporation, in a research division doing modeling and computations for energy-related projects. When he realized that the experimentalists couldn’t provide answers to many of his questions, he refashioned himself from a theorist to an experimentalist and gained hands-on experience with running experiments and taking measurements. This proved to be an extremely valuable experience in learning how to bridge the gap between theory and experimentation. It also shined light on what knowledge gaps exist in the energy field, in general. This awareness, along with a shift away from Landa’s focus on research, led Dr. Yochelis to return to academia.

An example of Dr. Yochelis’ multidisciplinary approach can be found in his work modeling the mechanisms of organic solar cells, a joint project with Dr. Visoly-Fisher (BIDR) and Dr. Gavish (Technion). Although not as commonly used as inorganic solar cells, organic solar cells are much thinner and lighter than their inorganic counterparts, making them more mobile. Among other applications, Dr. Yochelis notes that “potentially, they can be worn on one’s clothing, can be rolled up and easily transported, can be cheaply printed to cover large-scale areas, for example, to cover windows to quickly produce electricity. In addition, they are nontoxic and do not create environmental hazards. While they won’t produce enough electricity to power a car, they may suffice to charge a cellular phone.” However, they also have a notorious stability problem, in that they degrade relatively quickly, both because the organic material itself degrades and the mechanistic structure degrades due to its delicate nano-scale construction. Dr. Yochelis is working on a novel model that combines both the organic cells’ electrostatic properties and their chemical composition properties—that is, unlike other models that only consider one property or the other, this model takes into account both the solar cell’s efficiency in producing electricity and its durability against degradation.

He is using a similar approach to tackle the challenging photo-electrochemical water splitting project, a joint initiative with Dr. Visoly-Fisher (BIDR) and Dr. Rothschild (Technion), which recently received funding of nearly 1M NIS for a three-year period from the Ministry of National Infrastructures, Energy and Water Resources. In these projects and others, Dr. Yochelis brings his previous experience of bridging the gap between theory and experimentation to bear.

Dr. Yochelis believes that the atmosphere in his department aids in this project of bridging gaps. As he says, “the environment of the department is very open-minded. Here, there is a true multidisciplinary approach to science. Multidisciplinary methodology drives the research. Unlike in some other places, the physicists here are not ‘self-involved.’ They reach out to learn the languages of other disciplines, such as biology and chemistry. Most importantly, theorists are learning the language of experimentalists. This environment encourages productive discussions and meaningful collaborations.”

The Optics of Solar Cells - Dr. Avi Niv

The Alexandre Yersin Department of Solar Energy and Environmental Physics, in the Swiss Institute for Dryland Environmental and Energy Research, is pleased to welcome Dr. Avi Niv into its ranks. Dr. Niv studies the energy-related aspects of light-matter interactions on the nanoscale, particularly in their application to the production of solar fuels.

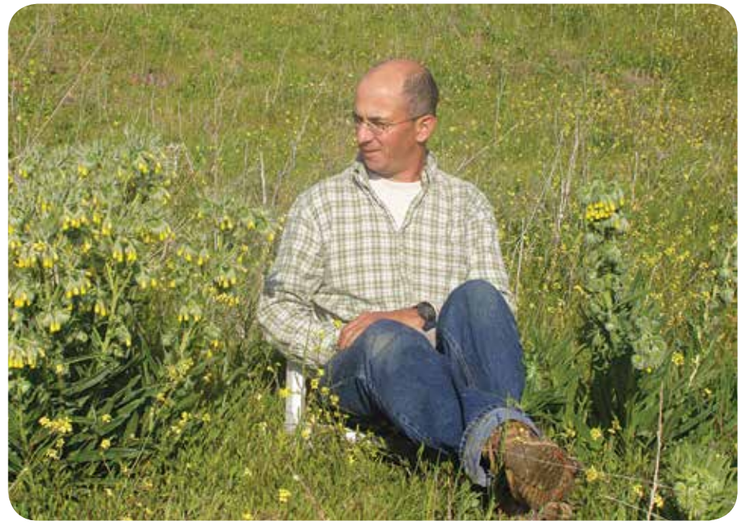
Dr. Niv was raised in northern Israel and did both his undergraduate and graduate work at the Technion, focusing on optics. After a three-year postdoctoral position at the University of California, Berkeley, during which he honed in on his specialty of light-matter interactions, he was happy to return to Israel, specifically to the BIDR. Here for just over a year, Dr. Niv works on optics for solar cells. As many know, solar cells transform the sun's light energy into useful work. Optics refers to the specific technology of the cell that handles this light. Obviously, a good solar cell must have good optics. However, many of the recently proposed materials for solar cells have been selected for their beneficial material properties, such as availability and cost-effectiveness, rather than their optics. Indeed, their poor ability to usefully absorb light has stood in the way of their commercial utilization. Dr. Niv states, "What I am trying to do is use my optical skills to get around the optical limitations of key conceptual solar cell technologies such as organic and oxide-based solar cells."

For example, in collaboration with Prof. Rothchild's group from the Technion, Dr. Niv and his team have worked with hematite-based cells; hematite is a type of iron oxide which functions as a semiconductor, with the ability to absorb light and transform it into usable energy. Due to its large abundance and chemical stability, hematite is promising as a future solar cell technology. However, in order to operate, the hematite must be very thin, compromising its ability to absorb light. Using advanced optical manipulation to trap the light within the cell, Dr. Niv has been able to demonstrate a more than 30% enhancement in efficiency. As Dr. Niv indicates, scientists' research can be applied to any number of technologies, but he prefers "working on technologies that are meant to do good."

He also points out that his work is greatly assisted by being carried out in the beautiful new Ben-Gurion National Solar Energy Center Building that was dedicated last spring. While previously the labs were located so far out into the desert that "you needed a camel to get there," as Niv humorously notes, now he can just pop across the hall to his laboratory and easily interact with his students and experiments. As he puts it, "this is a very nice environment for conducting research." He makes the same claim about the campus itself, especially with its proximity to the seemingly limitless horizon of the desert. After growing up in the mountain-enclosed Hula Valley, Dr. Niv remarks that "the desert has some infinity, like the ocean, which broadens your mind and gives you a clarity of thought that you bring to your work." Dr. Niv's research will certainly continue to shine light onto the issues of our pressing energy needs.

Seeds on the Move - Dr. Itamar Giladi

Dr. Itamar Giladi, a plant ecologist, has joined the Marco and Louise Mitrani Department of Desert Ecology, in the Swiss Institute for Dryland Environmental and Energy Research. Here he studies the evolution and ecology of seed dispersal—as Dr. Giladi puts it, "the only stage in the lives of most plants during which they can move from one location to another." This dispersal process, whether carried out by wind, water or various types of animals, has an effect on the distribution of plants, on where they grow, who their neighbors are, and who they will compete with. Dr. Giladi notes that "where a seed arrives after dispersal determines what the rest of the plant's life will be like, including whether it will survive at all."



Dr. Giladi did his undergraduate work at The Hebrew University of Jerusalem and then completed his master's degree at Ben-Gurion University. After receiving his Ph.D. from the University of Georgia in the U.S. and holding postdoctoral positions at The Hebrew University and Ben-Gurion University, he began his position as a BIDR researcher two years ago.

Within the general field of seed dispersal, Dr. Giladi is currently specializing in the dispersal of seeds by ants. Particular species of ants carry seeds to their nests for food, while some seeds are dropped along the way or are discarded out of the nest, resulting in germination. Dr. Giladi has examined a specific relationship between seed and ant in which the seeds of certain species of plants develop an appendage that is rich in lipids. The ant carries the seed by its appendage, sort of like a handle, takes it to its nest, and feeds the fatty-acid rich appendage to its larvae. The seed itself is left unconsumed, and is then thrown out of the nest where it can germinate and develop. As Dr. Giladi puts it, he is "looking at what the potential benefits are for both partners in this interaction." The seed seems to benefit from the ant nest environment, where it is protected from predation and it is located far away from its parent plant, thus eliminating competition with its relatives. Evidence also exists that the consumption of the appendages increases the growth rates of the ants. Dr. Giladi is currently comparing the types and behaviors of the ant and plant partners across different countries, including the United States and Israel.

In addition, Dr. Giladi is interested in investigating the intersection of methodology and theory in the field of ecology. As he notes, "scientists construct theories based on what we observe. When observing natural phenomena, what we see depends on how we search, how we record, and from how close up or far away we look." All of these factors will be affected by methodological decisions. Specifically, in ecology, he indicates the prevailing preference for studying biotic interactions (e.g. plant competition) at the scale of a few meters, but inferring their outcomes at a much larger scale. He suggests that "maybe if we looked at the same process, but from farther away, we would start seeing other patterns." Along these lines, Dr. Giladi has experimented with studying a single property, but at different scales simultaneously. He claims that this process can "give you a more complete picture, as well as directing you to the most appropriate scale to study particular mechanisms."

By any measure, Dr. Giladi is quite happy to be working in the Mitrani Department –as he says, "it is a strong, friendly, and collaborative environment. In many ways, it is like one big research group." With this support, ideally the seeds of his research will be widely dispersed into the scientific field.

Cooperation in Plant Communities - Dr. Merav Seifan

The Marco and Louise Mitrani Department of Desert Ecology, in the Swiss Institute for Dryland Environmental and Energy Research, is happy to welcome Dr. Merav Seifan to its ranks, where she works as a plant ecologist. She specifically studies plant communities, including analyzing the factors that make different plant species grow together in certain places and not in others. In addition, she looks at how interactions with animals affect these factors.

Dr. Seifan earned both her undergraduate and graduate degrees from The Hebrew University of Jerusalem, receiving a Ph.D. from the Ecology Department. She then moved to Tübingen University in Germany where she completed a postdoctoral position and then stayed on as a researcher. After eight years in Germany, Dr. Seifan returned to Israel and to the BIDR, taking a position as a researcher here.

Unlike most research in this field, which focuses on the negative interactions between animals and plants (for example, animals eating plants and trampling on them while grazing) and between plants and other plants, Dr. Seifan's work also focuses on positive interactions, examining how these relationships can benefit both partners. It has been common in the past for ecologists to view plant-plant interactions and plant-animal interactions strictly in terms of competition for resources. However, in the two types of animal-plant interactions that Dr. Seifan has focused on—specifically, grazing and pollination ecology—mutually beneficial interactions can also be seen. She notes that, for example, "a grazing cow can also introduce more nutrients to an area, increasing plant growth. Also, a particularly large flower that attracts bees may, at the same time, assist its neighboring, less attractive, flowering plants since the bees that are drawn to the large flower may prefer, for energy reasons, to remain in the area and visit nearby plants."

She indicates that plants can also cooperate, rather than only compete. For example, in desert areas, large woody plants offer shade to smaller plants, reducing their evaporation rate, and thus promoting growth. Dr. Seifan examines how these positive interactions affect the ways that plants are arranged together in particular locations. As mentioned, these positive, cooperative interactions have been greatly understudied and only in the past ten years have they become the focus of much new research.

Dr. Seifan finds the Mitrani Department to be a similarly cooperative environment. In fact, she says that the department is "a dream place to be. It is an extremely productive and lively department with a strong emphasis on cooperation and collaboration, including across the disciplines." She notes that this focus on collaboration "represents a great way of thinking about science." She also mentions that working in such a beautiful natural environment is "a blessing. When you are stressed, you can go outside and see the landscape and the ibex, and it relaxes your mind. Working in such a place is a privilege."

Studying Insect Reproduction in the Field - Dr. Michal Segoli

Dr. Michal Segoli is one of the newest researchers to join the BIDR, beginning work in the Mitrani Department of Desert Ecology, in the Swiss Institute for Dryland Environmental and Energy Research, just this past fall. She is a behavioral and evolutionary ecologist, specifically studying insects, primarily parasitoids, and the factors that limit their reproductive success in the field. Her work has direct applications in the biological control of both agricultural pests and the spread of disease.

Dr. Segoli received her undergraduate degree from The Hebrew University of Jerusalem, and her graduate degrees from Ben-Gurion University. In her first postdoctoral position at the University of California, Davis, she worked on insect ecology in both natural and agricultural environments. Specifically, in one study, she investigated tiny parasitoids that parasitize leafhopper insects in vineyards. Since the leafhoppers are detrimental to the growth of the wine grapes, Dr. Segoli worked on ways to improve the reproductive success of these parasitoids so that they can act as a control for the leafhoppers, thus improving the productivity of the vineyard.

Her second postdoctoral position was at James Cook University in Australia, where she focused on endosymbionts, which are microbes that live in insect bodies. Here, she was involved in a research project in which mosquitos were infected with a certain type of endosymbiont, after which they no longer transmitted dengue fever. While this sounds like a completely desirable outcome, Dr. Segoli was also charged with determining the other effects of these endosymbionts on the behavior and success of these mosquitos, in case they might be negative. Indeed, we humans want to improve the situation for our benefit, whether in agricultural production or disease control, but as Dr. Segoli points out, "you must test the effects of the different players on each other. We must be careful in these complex systems. And these effects must be studied either directly in the field or at least under field-like conditions."

Dr. Segoli's work is innovative in that most of it is done in the field, rather than in the laboratory, as is the common practice. As she notes, "the assumptions in the lab don't always hold in the field." For example, in laboratory modeling, it is always assumed that larger individuals survive better and reproduce better. While this is often true in the laboratory, in the field, individuals may die before even reaching the lifespans seen in the lab, making the differences observed in the lab between small and large individuals irrelevant under field conditions. Therefore, as Dr. Segoli indicates, it is crucial to carry out field studies.

There are many challenges to studying very small, mobile insects in field conditions since it is much more difficult to observe them continuously for a long period of time and to manipulate environmental conditions. Still, Dr. Segoli and her team have developed ways to address these challenges, such as using modified capture trays to collect the insects when they die naturally. Then, they can count the insect's eggs and estimate how many eggs a female can lay during her lifetime, thus getting a direct estimate of the insect's reproductive success in the field. This is, of course, very labor intensive work. Dr. Segoli and her team must place around 100 trays in the field on a daily basis and search them all, from which they may get roughly ten suitable insect samples per day. She notes that you "must have determination to study in the field because otherwise you will always return to the laboratory because it is easier." Dr. Segoli clearly has a large supply of determination!

Dr. Segoli also notes the plentiful benefits of working at the BIDR and living in Midreshet Ben-Gurion. She says that she feels "very connected to this place. It is beautiful and a great place to raise a family." Like many of her colleagues, she also draws attention to the extremely supportive atmosphere of the BIDR. She particularly appreciates the fact that "there are mentors everywhere, willing to help and to advise new researchers," contributing to a friendly and collaborative workplace.

Building a Better Membrane - Dr. Roy Bernstein

Dr. Roy Bernstein is a new member of the Department of Desalination and Water Treatment in the Zuckerberg Institute for Water Research (ZIWR), where he focuses on water treatment technology, specifically membrane technology. Generally speaking, membranes are used to separate a wide variety of materials, including salts, pathogens, pharmaceuticals, organic solvents, and microorganisms, from water, with applications in desalination, the treatment of freshwater for drinking and the treatment of wastewater for reuse in agriculture.

Dr. Bernstein grew up in Israel and received both his B.Sc. and his M.Sc. from The Hebrew University of Jerusalem. He did his graduate work at Ben-Gurion University, studying under several esteemed water treatment experts. His Ph.D. study focused on new ways to apply polymer science to modify membranes used in desalination in order to reduce the boric acid concentrations in the desalinated water and to lower the membrane's biofouling propensities (biofouling refers to the blockage of membranes by organic particles, which reduces the membrane's functionality). This work resulted in a patent for the development method; the improved membrane was developed and upscaled in the Zuckerberg Institute's Pilot Plant for Desalination and Water Treatment.

After one postdoctoral position in Germany and another in Belgium, Dr. Bernstein returned to the ZIWR as a researcher to continue developing methods of improving membrane technology. Specifically, he and his group study the particular chemistry of membranes with an eye toward modifications that can make the membranes more effective. For example, they are experimenting with applying hydrogels to the membrane to reduce biofouling. Another research direction includes the development of "mixed matrix membranes," which are polymeric membranes that are embedded with nanoparticle fillers, for various applications. Dr. Bernstein notes that, "the benefit of such membranes is the synergy between the advantageous properties of inorganic fillers and polymers."

Dr. Bernstein points to the enormous advantage of being able to carry out his work at the ZIWR since he can manufacture these new membranes "in-house" and carry out upscaling experiments in the Pilot Plant. As he says, from a facilities point of view, the BIDR offers one of the "best places to study membrane technology." He also adds that the "knowledge base of the researchers in the Zuckerberg Institute is unparalleled since they have more than thirty years of experience in membrane research." As an avid runner, Dr. Bernstein also notes that the distinct advantages of living in Midreshet Ben-Gurion not only include being able to walk to work but also having the opportunity every day to run in the desert, which is, as he describes, "an amazing and intense experience." Dr. Bernstein, together with his colleagues in the ZIWR, will continue to move forward into the future of water treatment technology.

Investigating the Soil-Plant-Atmosphere Interface - Dr. Nurit Agam

Dr. Agam is the latest researcher to join the Wyler Department of Dryland Agriculture, in the French Associates Institute for Agriculture and Biotechnology of Drylands, where she studies micrometeorology, examining exchange processes of water, heat, and momentum across the soil-plant-atmosphere continuum, particularly evaporation and transpiration. She looks at these processes in both agricultural and natural ecosystems specifically examining the uniqueness of arid and semi-arid environments in both areas of study.

Dr. Agam received her Ph.D. from Ben-Gurion University, and then held two postdoctoral positions—one at the Weizmann Institute and another at the Agricultural Research Services of the US Department of Agriculture—after which she was a research associate at the Gilat Research Center, ARO. She joined the faculty here two years ago.

On the agricultural front, one of her current projects involves separating between the physical processes of transpiration and evaporation, i.e. distinguishing between water that is productively used by the plant and water that is lost from the soil to evaporation without going through the plant. As Dr. Agam says, "if we are able to quantify the amount of water lost to evaporation, we can see if it makes sense to apply certain agricultural techniques to enhance the water-use efficiency."

Along with her colleague, Prof. Aaron Fait, she is also working on manipulating the microclimate of wine grape bunches, through shading, to enhance their quality in arid environments. It has been proven that overexposure to solar radiation can be detrimental to wine grapes. Dr. Agam and Prof. Fait are using tube-shaped nets to cover the grape bunches along entire rows of vines to shade these berries from the sun, while experimenting with different levels of shading. This is a rather simple technique that farmers can implement and, due to the increasing demand worldwide for wine and the concomitant growth of the wine industry in sunny, arid areas, a potentially extremely helpful innovation.

She is also working with Prof. Pedro Berliner on optimizing a form of water harvesting systems, known as micro-catchments. Throughout history, in arid regions, humans have created ways to channel runoff water from a large area into a smaller catchment area to support the growth of trees. By replacing these traditional shallow, surface-area basins with deeper trenches, the surface area of the water exposed to evaporation decreases, and the trench walls shade the trench's bottom where water is collected, thus decreasing the amount of water loss. Currently, Dr. Agam and Prof. Berliner are investigating the optimal set up of these trenches to minimize water loss.

In the natural ecosystem field, Dr. Agam investigates dew formation and water vapor adsorption at the soil surface during the dry season in the arid Negev Desert. The amounts of water produced by these processes on the soil are extremely low, making it a challenge to accurately quantify them. Thus, Dr. Agam and her team are experimenting with a variety of cutting-edge measurement techniques to quantify these very small amounts over areas with a large footprint.

Dr. Agam is very happy to be at the BIDR with "many new researchers that represent a revitalizing atmosphere." Like many of her colleagues, she also draws particular attention to the supportive atmosphere of the BIDR, which, she says, "is not trivial, is much appreciated, and contributes tremendously to the researcher's productivity." She also loves the natural environment here, and takes the opportunity during breaks to clear her mind by gazing into the desert horizon, much as her work looks into the frontiers of dryland studies.

The Motions of Ice - Dr. Roiy Sayag

The newest addition to the Alexandre Yersin Department of Solar Energy and Environmental Physics, in the Swiss Institute for Dryland Environmental and Energy Research, is Dr. Roiy Sayag. Joining the department only one year ago, Dr. Sayag studies the dynamics of ice sheets, specifically focusing on the mechanisms and time scales of ice sheet instability.

Dr. Sayag grew up in Israel and received his undergraduate degree in math and physics from The Hebrew University of Jerusalem. After beginning his graduate work at the Weizmann Institute of Science, he moved to Harvard University, where he studied fluid mechanics and completed his Ph.D., focusing on ice sheet dynamics. He then moved to the University of Cambridge in the UK for a postdoctoral position in the Department of Applied Mathematics and Theoretical Physics, where he continued working on ice. Now, he is pursuing this field of study as a researcher at the BIDR.

The layperson might assume that melting is the only mechanism that can degrade ice sheets. In fact, there are other triggers of ice-sheet instability, in which the ice discharge into the ocean accelerates significantly and abruptly. One example is a flow instability that leads to the formation of ice streams, which are bands of rapid ice flow within ice sheets. In addition, ice sheets are composed of two distinct regions: the first is called grounded ice, which is connected to the bedrock, and the second is termed an ice shelf, which is supported by the ocean but still attached to the ice sheet. One question that Dr. Sayag's work investigates is whether and in what way the position of the interface between these two regions can become unstable. This potential interface shift has great implications—if the interface moves so that it creates a larger amount of floating ice, the sea level will rise; if more floating ice becomes grounded ice, the sea level will drop. Part of Dr. Sayag's work involves determining the time scales of these instabilities. As he notes, "if these occur over a short time period, and the sea levels were to suddenly rise, for example, the effect on humanity would be catastrophic. If they occur over a longer time scale, we may have a chance to make the necessary adjustments."

One quite unique aspect of Dr. Sayag's work is that he uses laboratory experiments, something very rare in the field of ice sheet dynamics. The challenge is one of scale. Though ice does indeed behave like a complex fluid, it is extremely viscous and therefore flows very slowly, especially on a small spatial scale. Thus, if he were to use actual ice in his experiments, Dr. Sayag would have to wait hundreds of thousands of years to get results. Since he will have retired long before then, he instead uses other substances that are less viscous than ice, yet share some of its complex properties—these substitute substances range from sugar syrup to polymer suspensions, depending on what property is being examined.

After his sojourn in the oft gray-skied UK, he is very happy to now be basking in the desert light. And if you think you are clever in pointing out the seeming irony of studying ice in the desert, you will be interested to learn that some ice sheets are, in fact, deserts. Indeed, as Dr. Sayag notes, the largest desert on Earth is a cold desert—Antarctica. In addition to the climate outside, Dr. Sayag also appreciates the intellectual climate of the BIDR and his department, in which, as he says, "the background of my colleagues is basic science. Thus, whatever the context of the various problems we work on, we all share a common language."

Fifth International DDD Conference Convened an Assembly to Address Desertification

The Fifth International Conference on Drylands, Deserts and Desertification (DDD) took place at the BIDR, November 17-20, 2014, bringing together nearly 500 scientists, policymakers, NGO members, students and interested members of the public from a wide range of disciplines and from nearly 60 countries around the world, including nine African countries, as well as Mongolia, Colombia, India, Germany, Australia, and China, just to name a few. The DDD Conference is held at the BIDR biennially, and the 2014 theme was "Healthy Lands-Healthy People," featuring collaborations with the United Nations Convention to Combat Desertification (UNCCD), Israel's Ministry of Foreign Affairs, the Japan International Cooperation Agency, the British Council, and many other institutions and organizations. As Prof. Isaac Meir, co-chair of the Conference Organizing Committee, notes, "in 2014, we opened the conference to new audiences—archaeologists, geologists, physicists, public health scientists, remote sensing scientists, water management experts and others--alongside an enlarged cooperation with organizations from abroad."

Indeed, the 2014 DDD Conference hosted a meeting of the UNCCD's Science-Policy Interface (SPI) group. Prof. Alon Tal, Special Advisor to the Conference's Scientific Committee, points out that "the SPI used our venue to produce a position paper regarding desertification and climate change, which indicates that the conference proceedings, in addition to their scientific merit, also inform the discourse of the international community as it seeks to do a better job in addressing this global scourge."

As in past years, the 2014 Conference provided a unique, multidisciplinary platform for participants from myriad fields and backgrounds to conduct a truly interdisciplinary conversation. Also, as in previous conferences, the special environment of the BIDR created a unique four-day community, with conference attendees participating in a variety of field trips, local folk dance lessons, and dinner in a Bedouin tent—just a sampling of the offered activities. As Prof. Meir points out, "the BIDR is one of the very few institutions in the world that instigate, foster and promote this kind of multi-level, multidisciplinary dialogue between science, policy and implementation." The DDD Conference has emerged as a global event in the common attempt to forge a more sustainable way of living in drylands.

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The Science of Winemaking - BIDR Hosts the First Israel-Italy Grapevine Symposium

From October 29 to 31, 2014, the BIDR hosted the inaugural Israel-Italy Grapevine Symposium, known as the GRAcious Symposium, bringing together Italian and Israeli scientists from different disciplines who work on grapevine to discuss its history, physiology, and biotechnology. Grapes have been grown and fermented into wine for thousands of years, constituting today one of the most widely cultivated fruit crops, with demand for wine increasing yearly. While many people know that Italy has a several-thousand-year history of winemaking that continues to the present, others are not aware that winemaking for export, as well as local consumption, also thrived in Israel's Negev Desert two thousand years ago and that winemaking activities have been recently renewed in this area. With both Israel and Italy sharing a similar Mediterranean climate, this conference, which was sponsored by the Italian Embassy in Israel, the Italian Ministry of Foreign Affairs, The Jacob Blaustein Center for Scientific Cooperation, and Haifa Chemicals, provided a unique opportunity for scientists from both countries to share their expertise and knowledge in a memorable setting. Adding to the conviviality of the gathering, participants were taken on tours of historical winemaking sites and contemporary vineyards, as well as hosted at a lovely wine tasting event with local music and many regional vineyards represented.

Conference Organizer and Co-Chair Prof. Aaron Fait, a researcher in the French Associates Institute for Agriculture and Biotechnology of Drylands, noted that the gathering "provided a joint discourse on grapevine and introduced the Italian scientists to the new frontiers of desert viticulture." He also indicated that the symposium has continued to bear fruit as "this discourse is currently being translated into joint applications to national and European grants and several international scientific collaborations."

Hopefully, these collaborations will continue through the vehicle of the GRAcious Symposium, with the next one possibly being held in Italy, so that the Israeli scientists can have the opportunity to observe the current directions in one of the most important winemaking countries in the world. Ideally, the conference would then return to Israel since, as Prof. Fait puts it, "nothing can support our institute and its activities better than to host international events so that the participants can see with their own eyes our contributions to desert agriculture and biotechnology."

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