



Newsletter SUMMER 2023

The Leon H. Charney School of Marine Sciences

GREETINGS FROM THE HEAD OF THE SCHOOL

These last few months have been hectic, trying to move the School forwards and developing both our research and teaching capacities. An international advisory committee visited the School in late fall and provided us with a comprehensive evaluation of our strengths and challenges. As we are a graduate school with no Bachelor of Science degree, one of our greatest challenges is recruiting and maintaining excellent research students that come from other institutions. This complex endeavor includes implementing focused marketing and advertising to reach potential students, offering competitive scholarships, updating our teaching programs to include "marketable tools and skills," providing practical experience, as well as ensuring a comprehensive scientific foundation. Our faculty and staff are working diligently to advertise our programs to both Israeli and international students. We are also hard at work developing a new program in sustainable mariculture and blue-tech as well as a non-thesis MSc program in marine sciences. These should be opening up by fall 2024. An important part of my job is making sure that the Leon H. Charney School of Marine Sciences and the University of Haifa's commitment to developing marine sciences is recognized in different venues around the world, as well as promoting our research achievements, initiating collaborations, and gaining support and partnerships for our many projects. In this capacity, I was part of a University of Haifa delegation, including President Ron Robin and VP for Research Mouna Maroun, that was invited to Berlin in March for a remarkable reception hosted by the Federal President of Germany Frank Walter Steinmeier at his Bellevue Palace to pay tribute to the University of Haifa and the German Sponsors' Association on the occasion of the 50th anniversary of its founding (link to event and speeches (link to event and speeches). The event was followed by a festive lunch hosted by the Hamburg State representative in Berlin. Here,

the University of Haifa delegation joined a group of distinguished guests, including the German Sponsors' group, alumni,

foundation, Bundestag representatives, media and film personnel, and members of important foundations. I also had the pleasure of meeting Prof. Katja Matthes - Director of GEOMAR with whom we partner on a large German-Israeli project on the Mediterranean Sea. During lunch, I had the opportunity to say <u>a few words</u> about the School of Marine Sciences and to highlight some of our projects It was indeed a very moving and exciting day – and I was honored to represent the Charney School of Marine Sciences. As we are nearing the end of the second semester and the School year, I would like to wish all our students good luck with their exams, theses, and reports – and congratulations to those who will be graduating and moving on.

Sincerely, Prof. Ilana Berman-Frank

Ilan Berman Frank



Reception in Bellvue Palace (Berlin) for the University of Haifa and the German Sponsors; Association by the President of Germany Frank Walter Steinmeier.

NEWS FROM DEPARTMENT HEADS Dr. Moses Strauss Department of Marine Geosciences

Dr. Revital Bookman

It is that time of the year when students and researchers in the Department of Marine Geosciences are very busy with research and courses after the long Spring holiday vacation.

A new course called "Dating Methods for Quaternary and Environmental Research" addresses an important subject in Geosciences - the need to determine time and change. The course, led by Dr. Revital Bookman, is multidisciplinary and also attracts students from other departments, such as Archaeology and Maritime Civilizations, where dating is crucial for their studies. The course starts with an overview of the geological timetable, dating materials, and different dating approaches, and explores the concept of radiometric dating. Although emphasis is given to Quaternary dating methods such as radiocarbon, the use of dendrochronology, tephrochronology, paleomagnetism, and laminated records will also be explored, and the use of Lead-210 dating and nuclear experiments and disasters as chronological markers for environmental reconstructions will be discussed. In our studies, we use marine technology such as Remotely Operated underwater Vehicles (ROV) for collecting data from the deep seabed. For the shallow coastal environment, Dr. Michael Lazar and his collaborator from the industry (and Research Affiliate in the Department) Dr. Uri Basson, are developing Frequency Domain electromagnetic methods to reveal changes in past sea level rise and to discover ancient coastal communities that were forced to abandon their settlements and move inland.

In the last European Geoscience Union (EGU) meeting that took place in Vienna this April, Dr. Michael Lazar presented their new technological approach that will serve underwater subsurface studies.

DATING METHODS FOR QUATERNARY AND ENVIRONMENTAL RESEARCH

For Earth Science, Maritime Civilization, Geography and Archeology graduate and 3rd year undergraduate students

Basic concepts in relative dating and radiometric methods.

¹⁴C, OSL, U-series and more

 $\delta^{18}O$ curves, dendrochronology, tephrochronology and varve records

Nuclear experiments and disasters as chronological markers for environmental reconstructions.

Applications from Archeology, Geology and environmental Sciences.

For more information on time, syllabus and credits contact: Dr. Revital Bookman, rbookman@univ.haifa.ac.il



At the department of Marine Geosciences, our research is wide and we also study terrestrial aquatic environments. A good example is the research done in the PetroLab, headed by Prof. Nicolas Waldman and funded by the ISF. A multi-proxy approach is applied to lacustrine Pliocene and Early Pleistocene formations exposed in the Near East, which indicates major fluctuations in the lake levels that represent a response to changing climatic conditions in the past. This February, Prof. Nicolas Waldman gave a special seminar at the Monsoon Seminar series, presenting evidence for northward migrations of monsoon fronts in the past.



PetroLab postdocs addressing a lacustrine outcrop (Erk el Ahmar Formation) at the Jordan Valley that was used to reconstruct past climate change (Photograph by Sonja Rigterink)



Field work at near the Jordan River where past lakes flooded the valley (Photograph by Sonja Rigterink). Imagine, parts of the Jordan Valley were under the water in the geological past!

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Dr. Michael Lazar's students working in the shallow coast revealing subsurface archeological evidence for past coastal communities (photographs by Michael Lazar)

Xiongjie Zhou, a talented MSc student that graduated recently under the Dean List, published a paper with his advisor, Dr. Regina Katzman, on methane bubble solute exchange within muddy aquatic sediments and its growth. The theoretical model shows the substantial role of the mechanical muddy sediment characteristics in the CH4 bubble growth dynamics comparable to the role of biogeochemical controls. This is a significant understanding of gas-rich sediments that are under permanent concern due to their contribution to sediment destabilization and global warming.



Xiongjie Zhou presenting his study in a conference meeting (photograph by Regina Katzman)



Gas bubbles in aquatic sediments extracted from the seabed (photograph by Revital Bookman)

We are getting ready for our annual educational cruise in the Mediterranean that is led by Dr. Mor Kanari. This year, the cruise will be devoted to the collection of piston cores from the Dor Disturbance to study and date catastrophic sub-marine landslides on the continental slope. In the cruise, occurring this July, students will get to practice and coring methods for solving research questions related to marine geo-hazards.



The Department of Marine Biology

Prof. Smadar Ben Tabou de Leon



The 9th annual retreat of the Department of Marine Biology took place on May 1, 2023, in the Student's building at the University of Haifa, and it was a spectacular event! It was attended by about 100 participants, including PhD and MSc students, post-doc scholars, principal investigators, lab managers, research associates, and representatives of five sponsoring companies. The retreat began with a musical tribute to the efforts of the organizing team and the participants who made this awesome event possible. Following that, Dr. Rotem Kadir from the food-tech company, Mermade Seafoods, gave a talk about the foodtech industry in Israel and the opportunities for culture-based seafood development. During the retreat, students and researchers presented their scientific works in oral presentations and posters, demonstrating the multidisciplinary research in the department that advances the understanding of life in the oceans, from genes and proteins to organisms and ecosystems.



Best talk awards were given to: First prize: Noga Barak, Second Prize: Merav Gilboa, Third Prize: Cláudia Ferreira. Best Poster awards were given to: First prize: Itai Kolsky, Second prize: Tamar Shemesh, Third Prize: Alhan Abu Hamoud. Cláudia Ferreira designed the beautiful logo that decorated the giftmugs and the program; Prashant Tewari, Lior Shimoni and Alhan Abu Hamoud organized a fun activity including a Departmental quiz, a pantomime competition and dances; Hagai Nativ photographed the event, and Mermade Seafoods, Getter Group, Vectro Builder, Aquazone and Tivan Biotech sponsored the event.



Congratulations to Prof. Laura Steindler for the publication of her paper: "Bacterial aerobic methane cycling by the marine spongeassociated microbiome" in the prestigious journal Microbiome and for the super cool video abstract (i.e., sponge movie) that you can see here: <u>https://microbiomejournal.</u> <u>biomedcentral.com/articles/10.1186/s40168-</u> 023-01467-4_

Congratulations to Prof. Tali Mass and Dr. Tal Luzzatto Knaan for receiving the BSF Climate Change Grant entitled: "Biological and geochemical enhancement of coral recruitment and calcification for future reefs."

The Hatter Department of Marine Technologies

Prof. Morel Groper



We are thrilled to share with you the latest news and events from our department. Over the past few months, we have been dedicated to promoting marine technologies through various conferences and workshops. We are excited to announce that our Dr. Itzik Klein will be organizing the 10th conference on marine sciences, with a special focus on artificial intelligence and the sea. This conference is a fantastic opportunity to learn and network with other researchers from academia and industry sharing similar interests. We invite you to visit the conference website https://marsci.

haifa.ac.il/en/seaai-conference2/ for more information and to register. We are also proud to announce the

establishment of a new event, the 3 Minute Thesis Competition, organized by Professor Roee Diamant. This exciting competition challenges Ph.D. and Master's students to present several years of technical research in just three minutes using only a single slide. The competition will be held between departments within our school, followed by a challenging competition against the Faculty of Social Welfare & Health Sciences. We wish our representatives good luck!

Finally, we are delighted to share that Professor Morel Groper is organizing the 2023 conference on Naval Architecture, Marine Engineering, and Technology. This event will be held in person on July 13, 2023, in collaboration with the Technion and the Israel Navy. The conference aims to provide a platform for researchers and engineers to present their research works and projects in the fields of naval architecture, marine and offshore engineering, and marine technologies. Moreover, the event will facilitate interactions between academia, industry, and the navy, promoting discussions on shared interests and initiating potential collaborations. We look forward to your participation and support in these events. For more information, please visit our website.



CONGRATULATIONS

Congratulations to our faculty for newly funded grants:

Project name	Principal investigator
T. Treibitz	EyeSeas: Computer Vision as a Pilot for Underwater Vehicles010
T. Luzzatto Knaan, T. Mass	Biological and geochemical enhancement of coral recruitment and calcification for future reefs
I. Klein	Working dogs tracking and navigation
R. Diamant	SOUND: low-cost floaters to acoustically perform in-situ fish stock assessment
R. Diamant	Authentication for secure underwater acoustic
R. Diamant	Communicating novel schemes for shipping noise pollution monitoring to legislation authorities
R. Diamant	Impacts of shipping noise on sea bream fish

Congratulations on faculty promotions and hires

Michael Lazar - Associate Professor

Congratulations to our 2022-23 graduates!

The Department of Marine Biology

M.Sc. Hagai nativ Irina Irit Shaim Barbara Muller - Cum laude Goni Bregman – honorary citation - Dean of graduate studies Alex Wajnerman Vanessa Maria Bachmann Caller - Cum laude

Phd

Martina Mulas Tal Eli Zaquin Eyal Bigal Federica Scucchia Rami Tsadok

Dr. Moses Strauss Department of Marine Geosciences: M.Sc. Gal Goldstein

Michael Soukhanov Charles john Everhardt IV Yael Harmon

Phd Anat Ash-Mor Tal Ozer Ernst Uzhansky

The Hatter Department of Marine Technologies M.Sc.

Congratulation

Sharon farber Artur Shurin – honorary citation - Dean of graduate studies Naama Pearl - Summa Cum laude Itamar Davidesco Yaakov Libero - honorary citation - Dean of graduate studies Deborah Steinberger Levy - honorary citation - Dean of graduate studies Yelena Randall

Phd

Omri Gadol Allaka Hima Bindu Barak Or Talmon Alexandri Dror Kipnis



RESEARCH HIGHLIGHTS

VISEAON Marine Imaging Lab and Subsea Lab

Prof. Tali Treibitz, Prof. Morel Groper

During December 2022, members of VISEAON Lab and Subsea Lab convened in Eilat for a sequence of work meetings and subaquatic experiments, as an integral component of the DeeperSense project (www.deepersense. eu). We were delighted to welcome our collaborators from the DFKI German Research Center for Artificial Intelligence and were honored to host them.



DeeperSense Partner Meeting, Eilat 06.-08. December 2022

The main goal of DeeperSense (Deep Learning for Multimodal Sensor Fusion) is to develop advanced AI algorithms and technologies that can process and analyze multiple streams of data from various sensors (such as FLC & FLS) and fuse them into a single cohesive representation of the underwater (UW) environment, enabling better real time decisionmaking such as Obstacle Avoidance (OA), and navigating capabilities for UW vehicle. The workshop was conducted in a hybrid manner with partners from various organizations, including the University of Girona, University of Haifa, Federal Agency for Technical Relief, KRAKEN Robotic GmbH, and others. The meeting included presentations of the teams' progress and achievements, as well as the initiation of a new WP to focus on further algorithm development and machine learning. The goal is to achieve autonomous capabilities of spatial orientation and avoidance of underwater obstacles based on FLS and FLC by December. One of the Israeli team tasks is EagleEye, that uses Machine Learning and Deep Neural Networks to fuse data from long-range lowresolution acoustic sensors such as Forward-Looking Sonars (FLS), with short-range highresolution optical data from Forward-Looking Cameras (FLC). EagleEye will significantly enhance the capabilities of FLCs, and OA systems based on FLCs, in that it empowers them to perceive obstacles even under bad visibility conditions or when the obstacles are still far away.

The Israeli team led by Prof. Tali Treibitz presented our progress and achievements on the subject of EagleEye along with the presentation of the development and adjustments made to the Alice AUV, and a summary and explanation of extensive data collection in the Mediterranean and Red Seas. Together with Tali, the doctoral students Fabian Yitzhak and Yevgeny Gutnik presented significant achievements in machine learning that make it possible to move to the stage of AUV integration and experiments in autonomous navigation and in the avoidance of underwater obstacles.

The workshop was attended by several individuals, including Prof. Morel Groper, Dr.

Derya Akkaynak, Mr. Nir Zagdansky, Mr. Amir Dayan, and student Matan Yuval.

This project is carried out in collaboration with Dr. Assaf Zevuloni (Marine Ecologist at The Israel Nature & Parks Authority – INPA). INPA is defined as End User of the Project's products to carry out research activities while preserving nature and the reef.

After the workshop, the Israeli team continued their work with ALICE and BlueRov, successfully completing three days of sampling. During this period, they collected over 40 hours of data and effectively tested the autonomous obstacle identification capabilities of the underwater vehicles.



Alice AUV operating team(LtoR), Amir Dayan, Opher Barnatan and Yevgeny Gutnik, Photo by: Nir Zagdanski

AUTONOMOUS NAVIGATION AND SENSOR FUSION LAB (ANSFL) Dr. Itzik Klein

Our ANSFL team is presenting its artificial intelligence inertial sensing research around the world. At the underwater technology symposium UT23, held in Tokyo, we gave a special session on the theme of data-driven underwater navigation with four lectures. Hybrid learning and fusion was the title of the talk given at the Israeli conference on robotics (ICR23) held in Israel. In May, we will present our hybrid nonlinear Kalman filter at the European

Navigation Conference (ENC) and give two lectures at the International Conference on Robotics and Automation (ICRA23). Next, during Oceans23, in Limerick, we have a special workshop on models and learning methods for autonomous underwater vehicle navigation. We have open positions for MSc/PhD students (fully funded). For more details, visit the ANSFL website: marsci.haifa.ac.il/labs/ansfl



The thesis paper of M.Sc. student Deborah Levi from the Viseaon lab was accepted to the upcoming prestigious Computer Vision and Pattern Recognition Conference (CVPR) in Vancouver. This conference publishes full length papers with <25% acceptance rate and is rated #4 overall in Google journal h-index (right after Science).

Explanation:

Neural Radiance Fields (NeRFs) is a new technique in computer vision and graphics. Given a set of images of a certain scene, the NeRF aims to generate a novel view image of the same scene, i.e., to understand how the scene looks like from a viewpoint that we do not have in the original set of images. This results in the creation of highly detailed and realistic 3D scenes from 2D images.

However, thus far, NeRFs failed to correctly model scenes immersed in a scattering medium like haze, fog, or underwater. Deborah developed a novel formulation that inserts the effect of the water into the NeRF equations and modifies to deep network to take into account these changes.

This newly developed framework enables holistic modeling of the scene, and it has several outputs: First, it enables rendering novel views of underwater scenes. Second, the modeling allows "removing" the background water so that the images appear as if they were acquired without the water between the camera and the scene. Third, it allows estimating the 3D map of the scene and the water properties. Because the framework integrated information from multiple images, it is able to reconstruct further objects and create high fidelity, photorealistic 3D models of organisms on the ocean floor.

Full citation of the paper:

SeaThru NERF: Neural Radiance Fields in Scattering Media, Deborah Levy, Amit Peleg, Naama Pearl, Dan Rosenbaum, Derya Akkaynak, Simon Korman, Tali Treibitz, CVPR 2023

Movie showing result:

https://www.youtube.com/ watch?v=oRMvTBBARKE

More info on the paper's website: <u>http://sea-</u> <u>thru-nerf.github.io/</u>.



method, where SeaThru NeRF is the only one that can estimate depth of further

objects.



AUV SNAPIR – DEEP MAINTENANCE PROCEDURE

The big Autonomous Underwater Vehicle (AUV) of Haifa University is getting refreshed at the deepest level after five years of good work and dozens of dives in many countries (mainly Israel and France). In the past few years, we have learned a lot about the vehicle and how to use it. It is one of two currently in use around the world. Equipped with the latest underwater technologies, it is rated for up to 3000m deep and has a special compartment for dedicated payloads. So, as you can see on the top side of the picture, after Corona times [in which we kept diving] we disassembled the whole vehicle - as seen on the bottom side of the picture. We are checking it down to every screw, cable, and O-ring.

This procedure, which is conducted every few years for this vehicle, will be the first for this specific vehicle. For the few months of its duration, we will remain on land. We have already disassembled it to the lower level, as shown in the center pictures, and have washed it, as shown in the right picture. In the center picture on the left, all the cables are being checked. We hope to get back to sea to make sure everything is up and running around February 2023.



AUV Snapir during maintenance time, photographer – Samuel Cohen-Salmon



CAUSE AND EFFECT: FISHING GEAR AND SHARKS Dr. Ziv Zemah-Shamir

A new publication titled "Comparing Spatial Management Tools to Protect Highly Migratory Shark Species in Eastern Mediterranean Sea Hot Spots" has been released (JEMA, 2023). This marks the first collaboration between Reichman University, Technion, and the Department of Marine Biology at the University of Haifa. Dr. Ziv Zemah-Shamir and Ph.D. candidate Ole Sørensen discuss the biological conservation aspects that were integrated into an economic-biological model and combined with marine planning to derive efficient management tools and recommendations for decision-makers in marine environment conservation. Our paper compares various policy tools for ocean closure management around a unique shark aggregation site in Israel's nearshore coastal waters. We provide specific recommendations for an optimal management approach that allows for marine recreational activities like fishing while maintaining safe conditions for these apex predators, which are essential to the local marine ecosystem. Additionally, we used the benefit transfer method to understand the recreational fishers' derived benefits and incorporated them into the model. Our main conclusion is that dynamic time-area closures offer sustainable and effective management strategies that can successfully preserve specific species in limited areas (i.e., small areas) since they are based on near real-time data.

https://doi.org/10.1016/j.jenvman.2023.117691



Female dusky shark (Carcharhinus obscurus) caught in fishing gear (A) and dorsal fin damage (B + C) after releasing (Photos by Dr. Leigh Livne, and Dr. Aviad Scheinin from "Morris Kahn Marine Research Station" and Ran Golan "Out of the blue diving center").

CONFERENCES/WORKSHOPS

The 10th Haifa Conference on Marine Sciences: SeaAI - Artificial Intelligence and Sea, 20.6.2023



Join us at the SeaAl conference, which addresses Artificial Intelligence and the Sea: a one-day conference bringing together researchers working on AI (theory and practice) and the sea (marine science and technology). Oceanic data has a great deal of diversity and richness, prompting state-of-the-art artificial intelligence (AI) methods to be implemented in a variety of oceanic research domains. The conference provides an excellent opportunity for researchers, engineers, and practitioners to present their ideas, findings, and applications in the area of Artificial Intelligence and Sea. SeaAI will include keynote speeches and invited presentations by renowned scientists and engineers. Discover more on the <u>conference</u> website:

We are very pleased to announce that this year's conference has been officially endorsed as an Ocean Decade activity by the UN Decade of Ocean Science for Sustainable Development Conference Chair: Itzik Klein

Conference on Naval Architecture, Marine Engineering, and Technology: Promoting Collaboration and Advancement, 13.7.2023



Prof. Morel Groper of the University of Haifa, in collaboration with Prof. Nitai Drimer from the Technion and Commander Yaniv Wahrmann of the Israel Navy will be organizing an upcoming conference focused on Naval Architecture, Marine Engineering, and Technology. This event, set to take place in person, serves as a dedicated platform for researchers and engineers to present their latest findings and projects in the fields of naval architecture, marine and offshore engineering, and marine technologies. The conference aims to foster valuable interactions among academia, industry professionals, and the navy, encouraging discussions on shared interests and facilitating potential collaborations. By bringing together experts from diverse backgrounds, the event seeks to drive advancements in naval architecture, marine engineering, and technology to new horizons.

Participants can expect insightful presentations and engaging sessions that delve into the latest research and developments in the maritime industry. The conference will provide a comprehensive overview of emerging trends, challenges, and opportunities, offering attendees a chance to deepen their understanding of the field.

Discover more on the <u>conference</u> website

FROM THE MEDIA

Link to the full media coverage of CSMS activities: marsci.haifa.ac.il/en/school/news/



Selected articles:



Ha'aretz Article Features Dr. Tal Luzzatto-Knaan on Five Israeli Studies Destined for Breakthroughs

Dr. Tal Luzzatto-Knaan and her team at the Functional Metabolomics Lab are exploring the chemical substances produced by algae to defend itself. They believe that these substances may be applied to diverse applications – from drugs and antibiotics to eco-friendly fertilizers.



ISRAEL21c chose Dr. Beverly Goodman as one of 48 Israelis who are shaping Israel and the world 17.4.23

ISRAEL21 channel chose our marine geoarchaeologist Dr. Beverly Goodman as one of 48 Israelis who are uniquely shaping Israel and the world, today and into the future.



The heavy price that corals may pay because of climate change (in Hebrew) 23.2.2023

A new study by the School's researchers found that corals pay a significant price in coping with the decrease in the amount of oxygen in the water due to global warming. "Although the coral survives, it pays a heavy price for it, and the fear is that any further environmental change will harm its ability to survive." marine areas.



A joint study by the School of Marine Sciences and GEOMAR (Kiel, Germany) found that more greenhouse gases are emitted in the eastern Mediterranean basin than previously thought

(in Hebrew) 10.1.23

In a study conducted as part of a joint project of the School of Marine Sciences and the GEOMAR it was found that more greenhouse gases are emitted in the eastern Mediterranean basin than previously thought. The reason for this is not animal activity, but a chemical phenomenon. Oceans and seas are key factors in regulating carbon dioxide for balancing Earth's climate. Dr. Or Bialik, who led the study in collaboration with Israel Marine and Lakes Research, explains that this phenomenon should be viewed as part of a whole.

"This is a symptom of the crisis more than a disease in itself. Israel is a sample of what is happening around the world." The EMS FORE project, in which the study was conducted, was established to examine present or past changes occurring in the Mediterranean Sea as a model for studying the future ocean under climate change.





