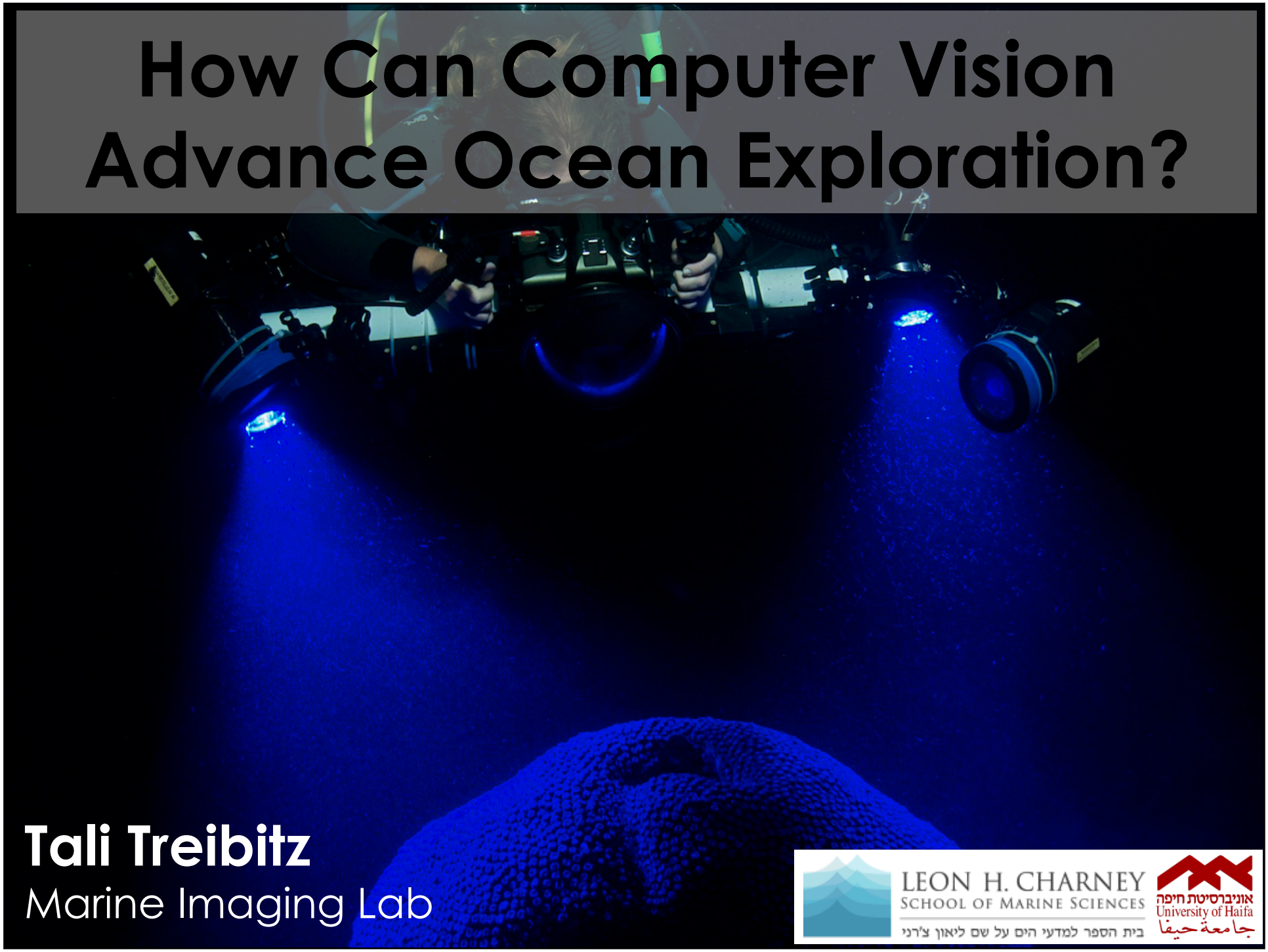
How Can Computer Vision Advance Ocean Exploration?



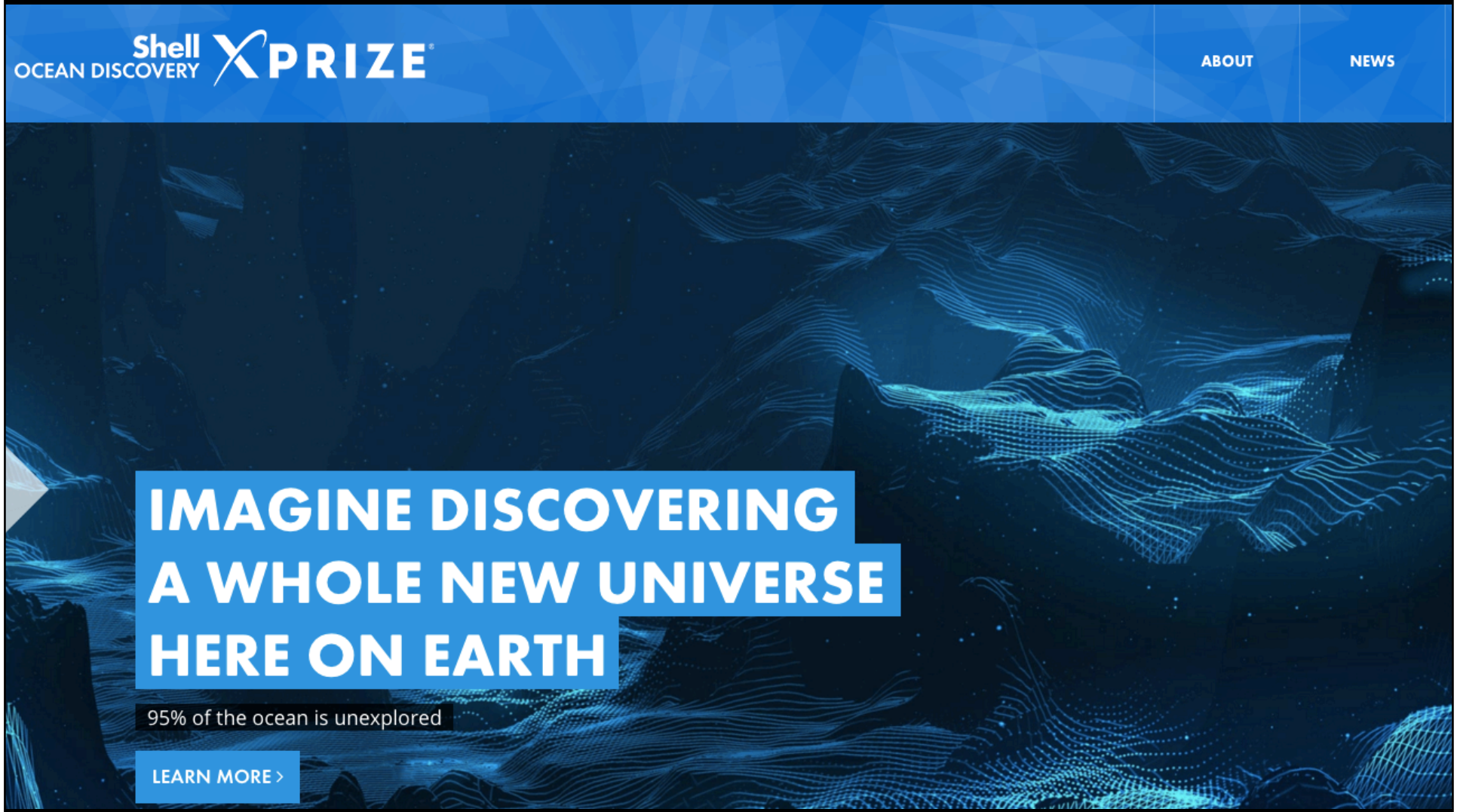
Tali Treibitz
Marine Imaging Lab

LEON H. CHARNEY
SCHOOL OF MARINE SCIENCES
בית הספר למדעי הים על שם ליאון צ'רני
אוניברסיטת חיפה
University of Haifa
جامعة حيفا

2 Take Home Messages about Computer Vision in the Ocean

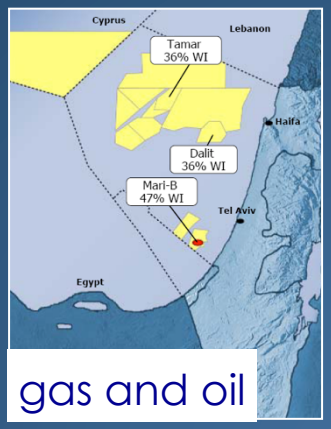
Very Interesting and Challenging

It is also Extremely Important!



http://oceandiscovery.xprize.org/

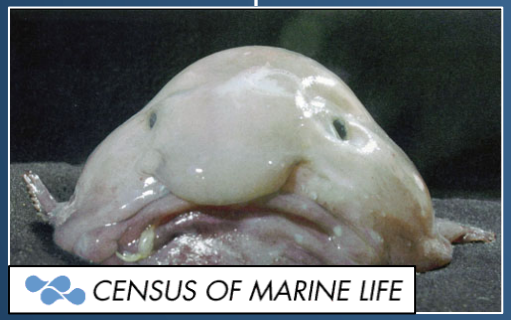
What's Out There?



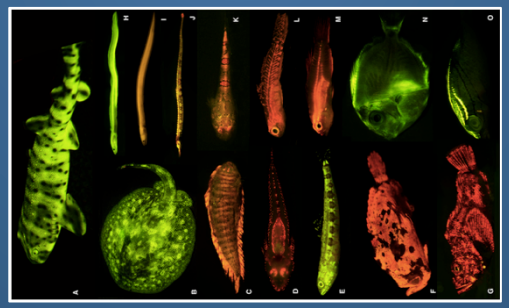
gas and oil

water via desalinization

New Species



Biotechnology:
source for new proteins



food supply

Only 5% the Ocean Floor has been Seen
~50% of the species undiscovered

Deep Sea Research in Israel

The Israel Center for Mediterranean Sea Research

A Proposed National Scientific Consortium

In cooperation with Israel's Council for Higher Education

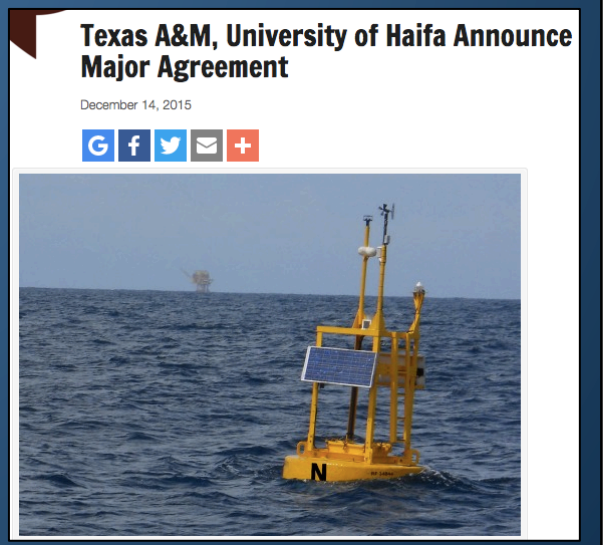
Discovery of gas →
No research facilities and experience
Needed: deep ocean science

Professor Zvi Ben-Avraham
Head of the Mediterranean Sea Research Center of Israel and Founding Director of the Leon H. Charney School of Marine Sciences

Dept. for Marine Technologies
School of Marine Sciences, U. Haifa

Labs:

- Marine Imaging
- Subsea Engineering
- Underwater Acoustics
- Applied Marine Exploration
- Fluid Dynamics

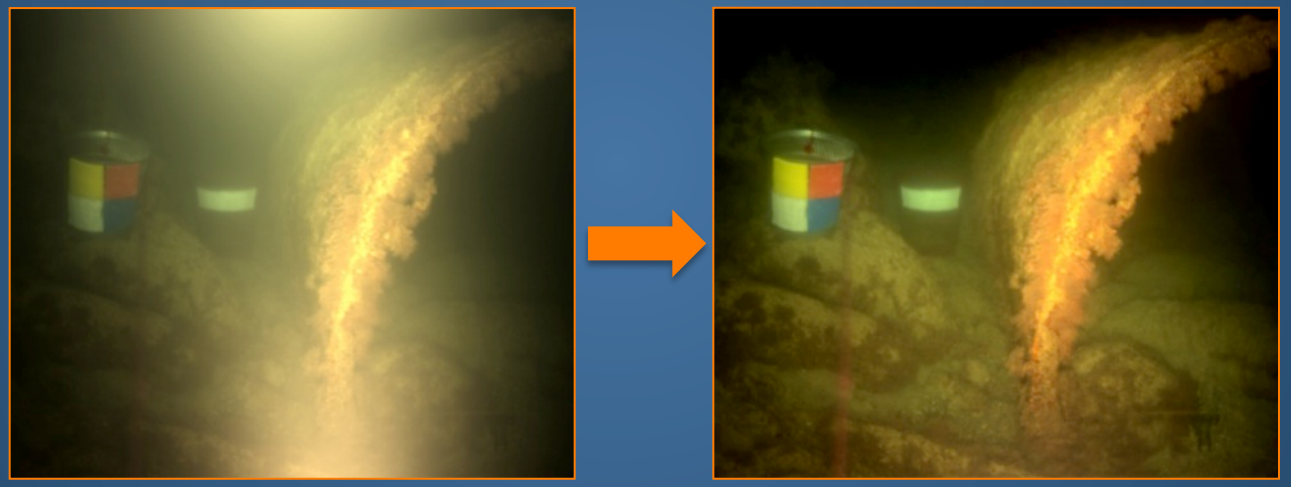


Texas A&M, University of Haifa Announce Major Agreement

December 14, 2015

Challenges:

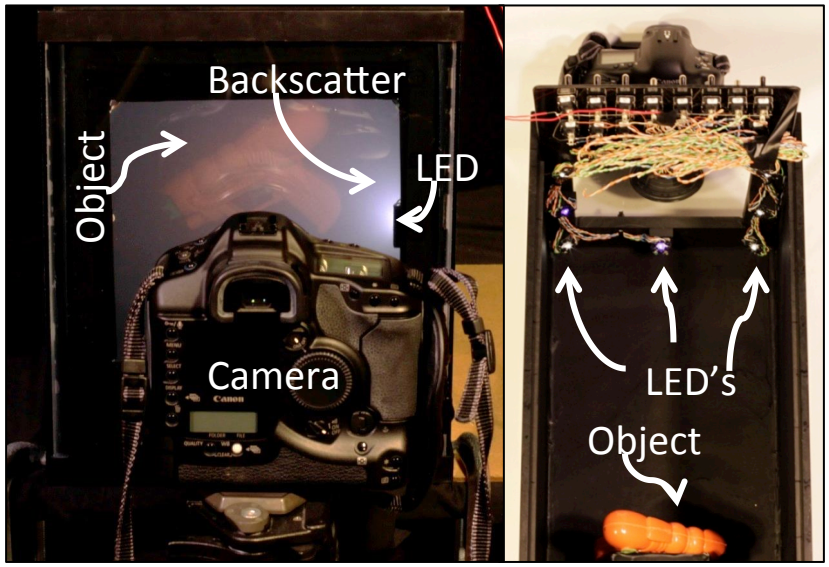
1. Visibility, Color and 3D



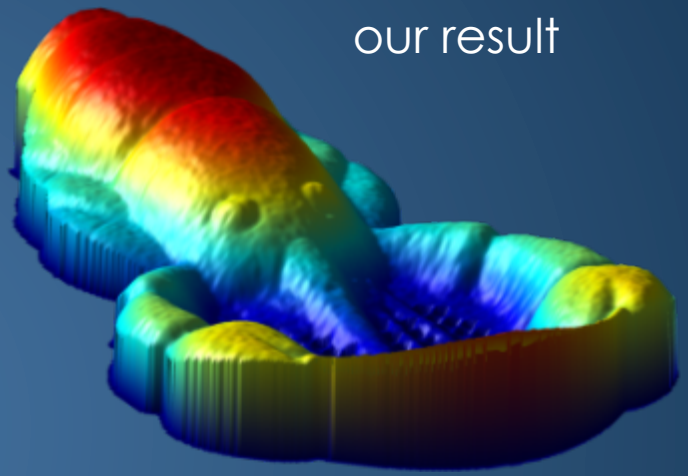
Treibitz & Schechner PAMI 2009

Photometric Stereo in a Scattering Medium

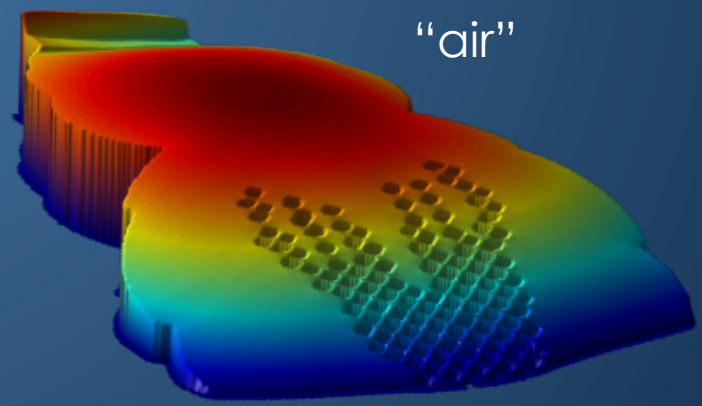
object in turbid medium



our result

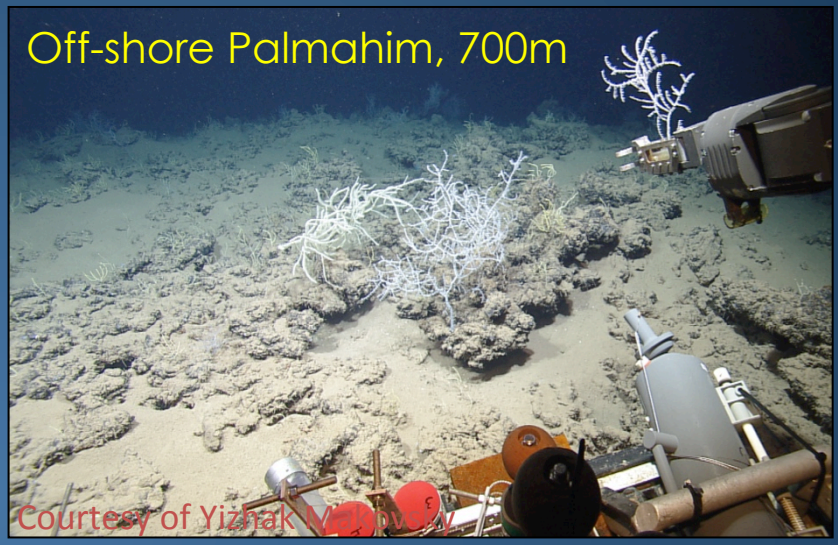


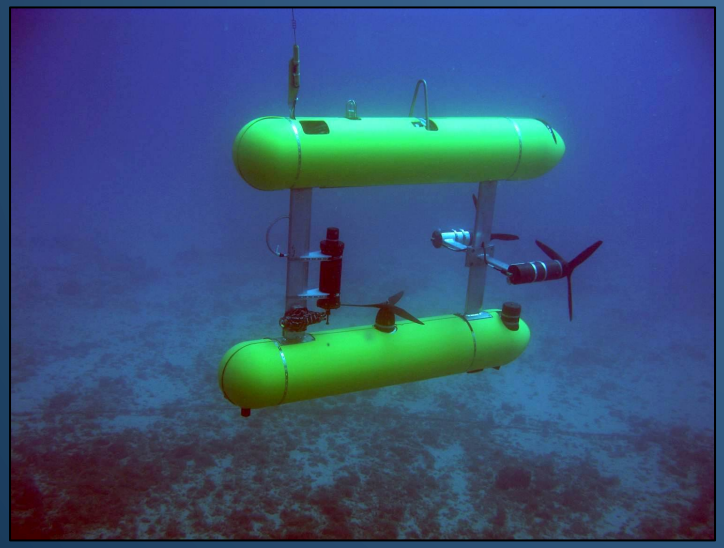
"air"

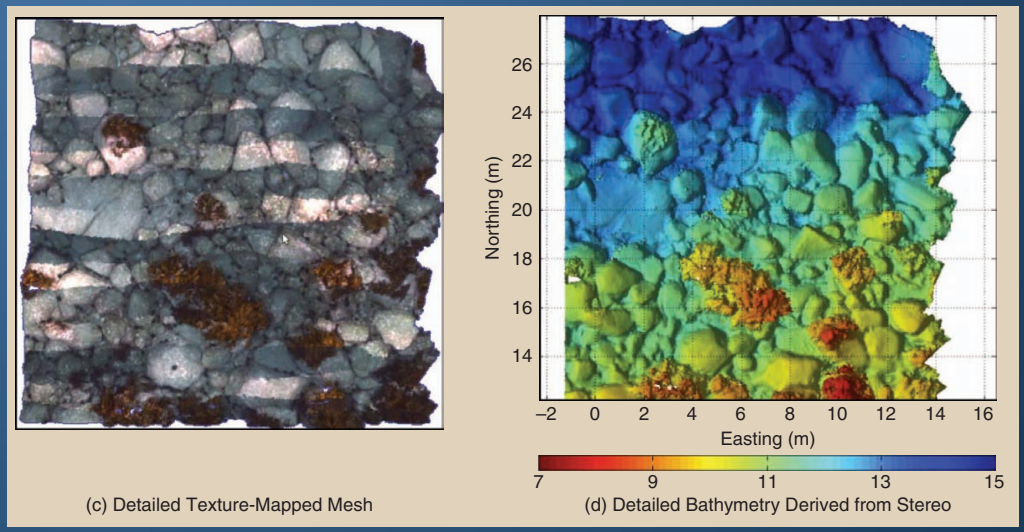


Photometric Stereo in a Scattering Medium, Murez, Treibitz, Ramamoorthi and Kriegman, ICCV 2015

AUV for Visual Surveys of the Seabed
New project funded by MOST







With Morel Groper, Subsea engineering lab

Challenges:

2. Identification and New Modalities

Automatic Identification of the Sea Bottom

Beijbom et al, Improving Automated Annotation of Benthic Survey Images Using Wide-band Fluorescence, Scientific Reports 2016

Fluorescence increased accuracy of Automatic Annotations in 22%

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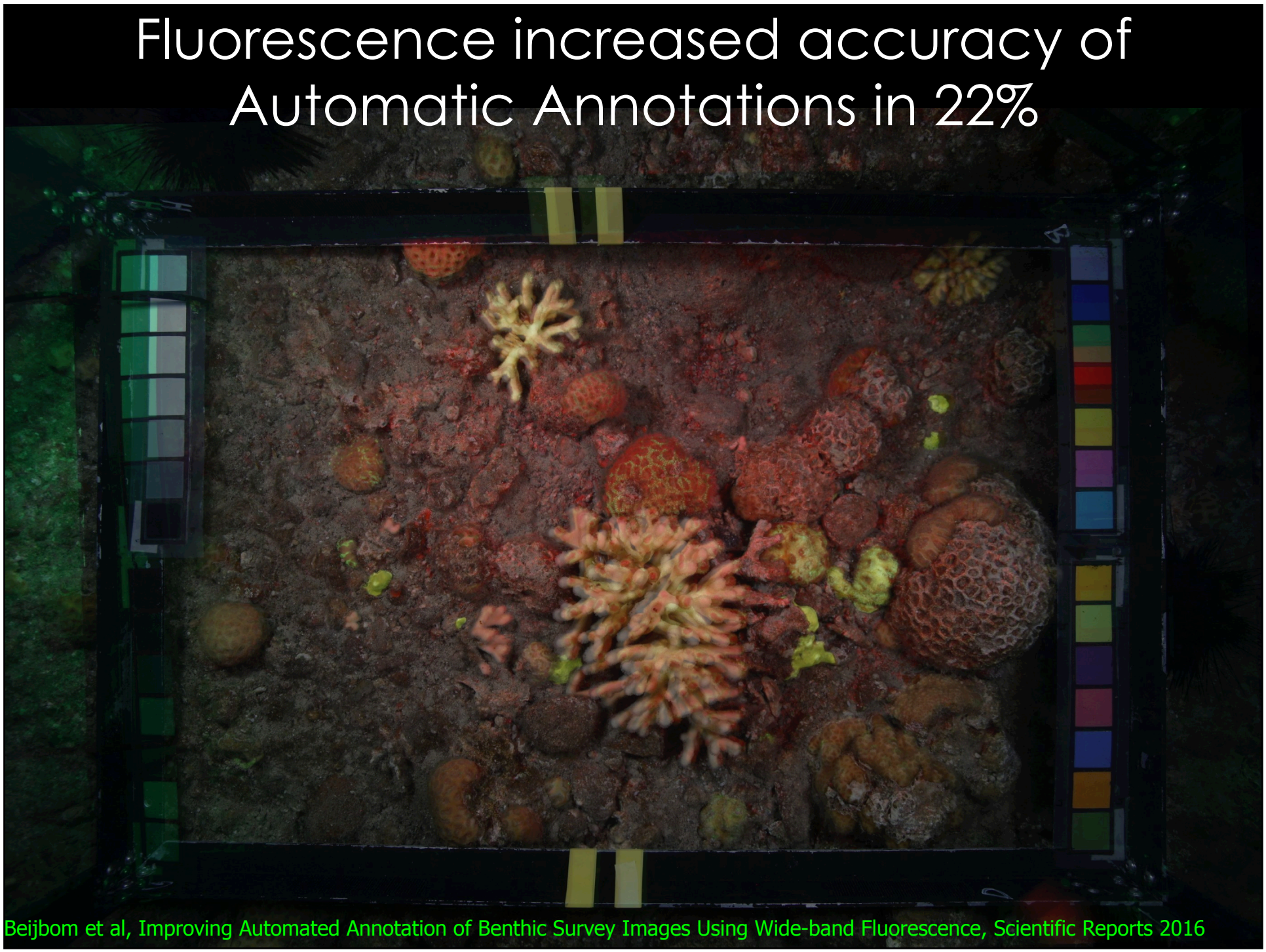
Fluorescence increased accuracy of Automatic Annotations in 22%



Beijbom et al, Improving Automated Annotation of Benthic Survey Images Using Wide-band Fluorescence, Scientific Reports 2016

Fluorescence increased accuracy of Automatic Annotations in 22%

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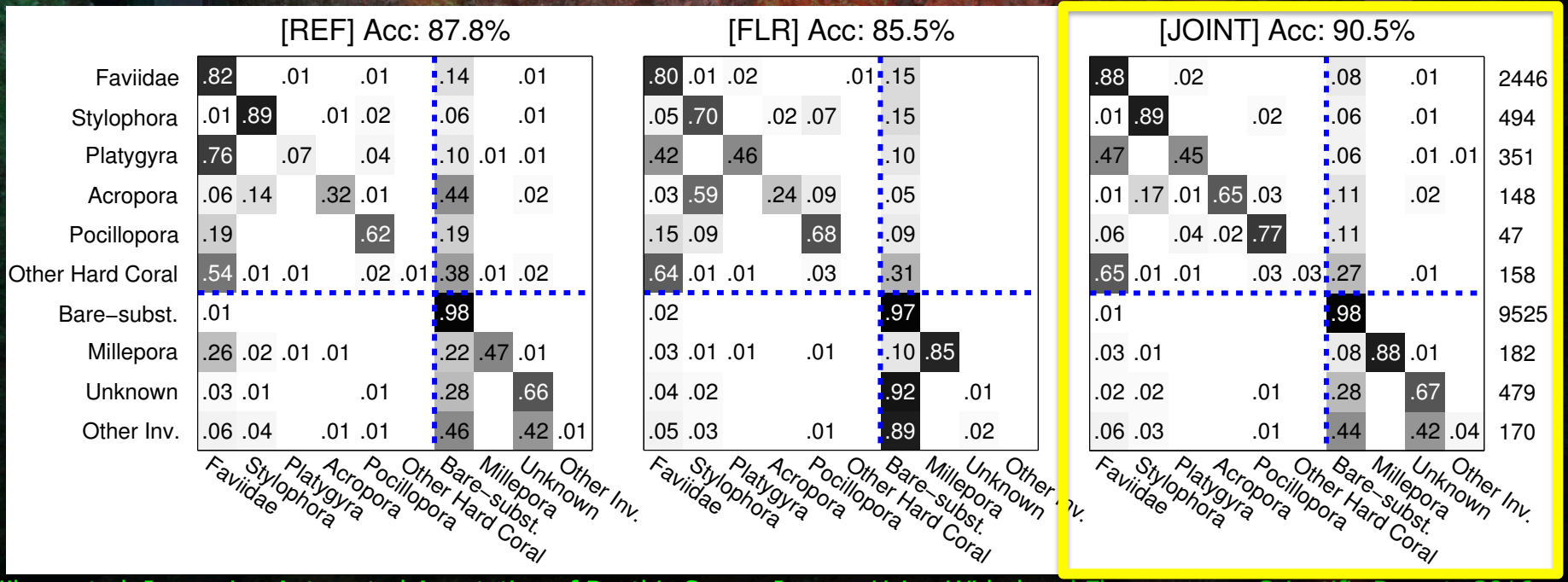
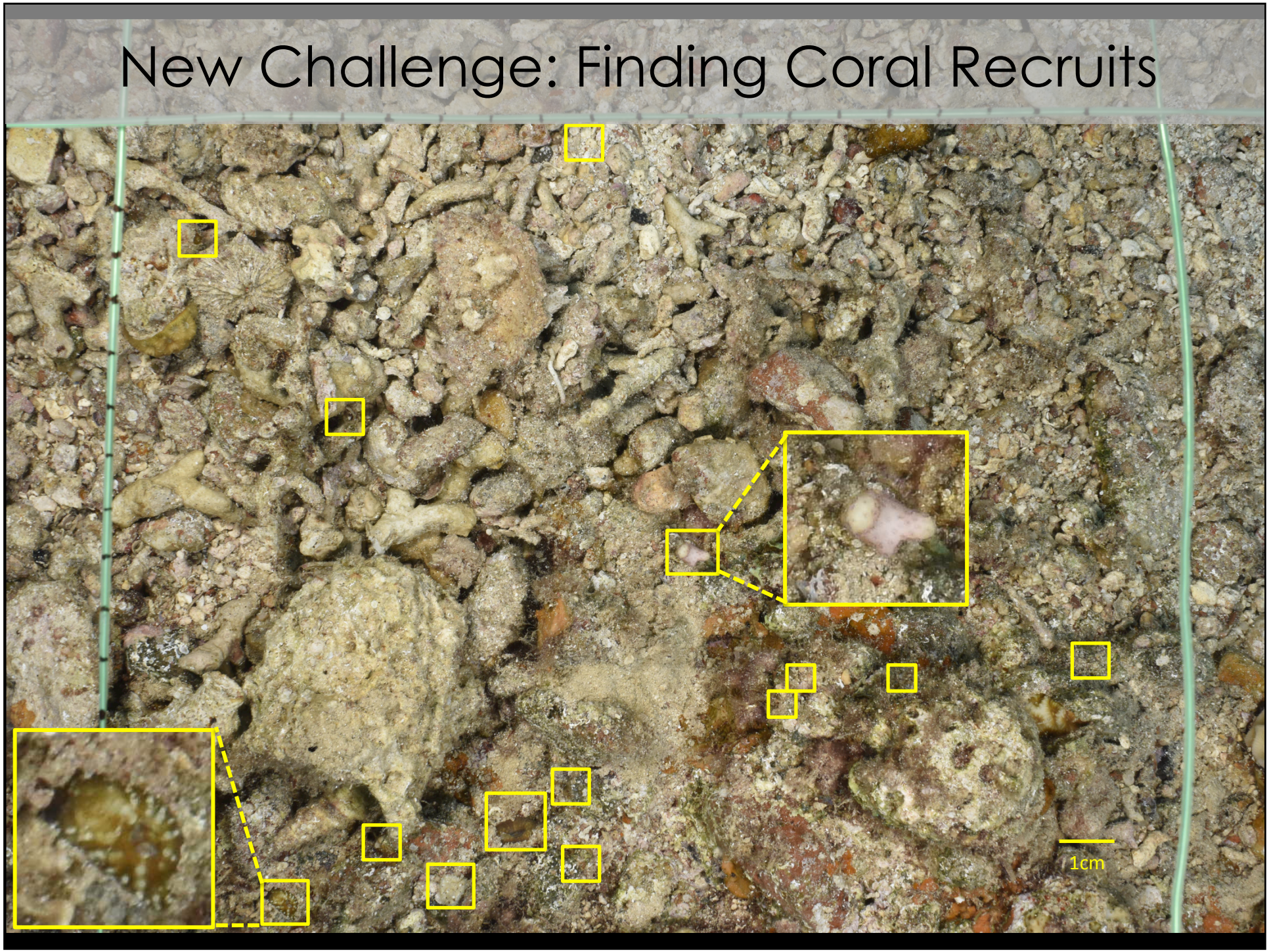


Beijbom et al, Improving Automated Annotation of Benthic Survey Images Using Wide-band Fluorescence, Scientific Reports 2016

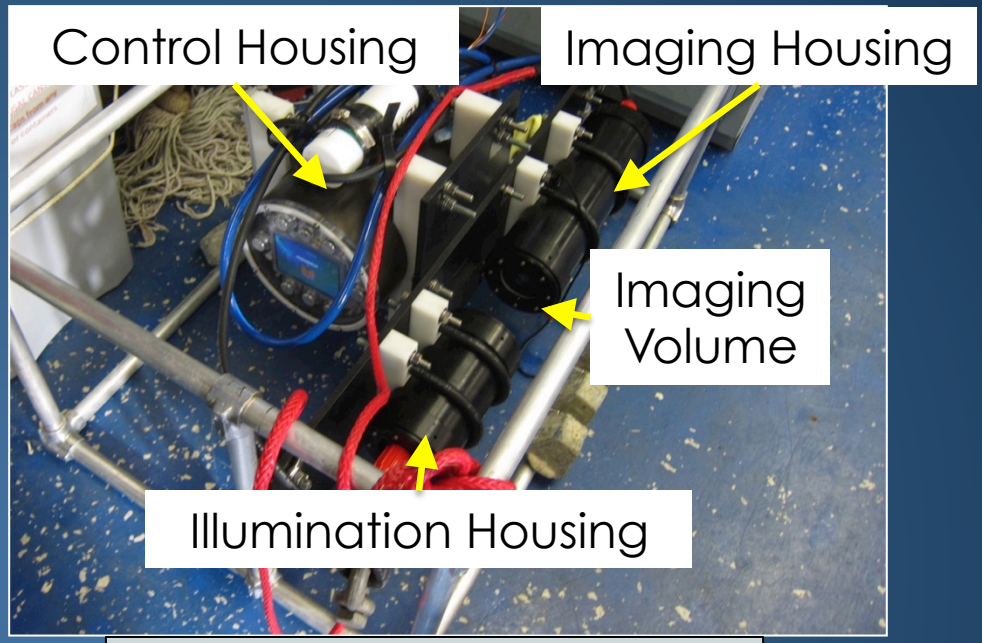
New Challenge: Finding Coral Recruits

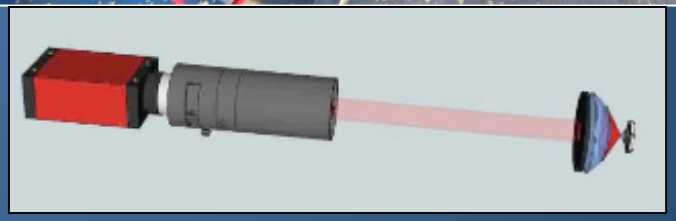


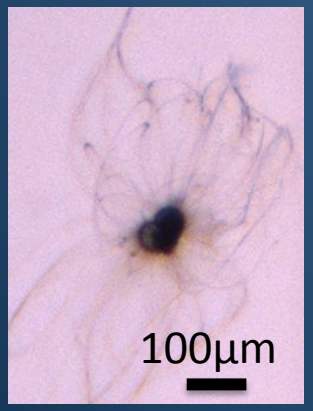
Challenges:

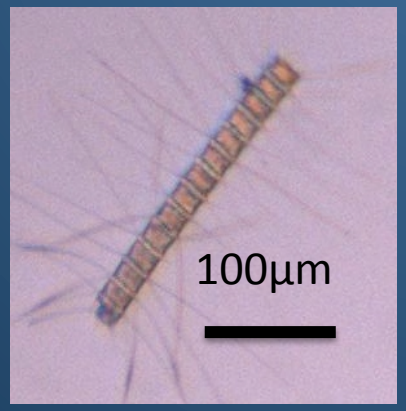
3. Medium and Scale

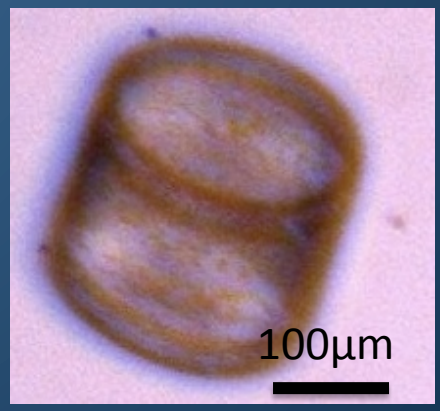
In Situ Bright Field Microscopy



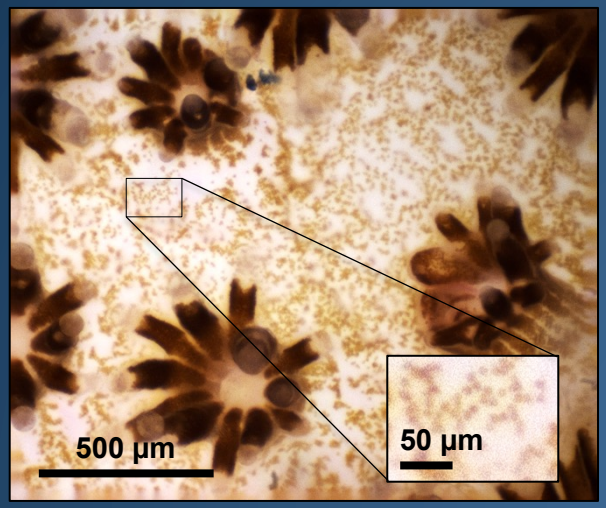


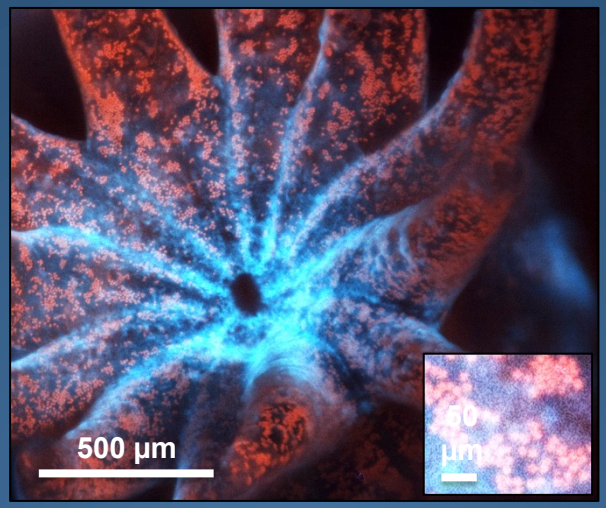


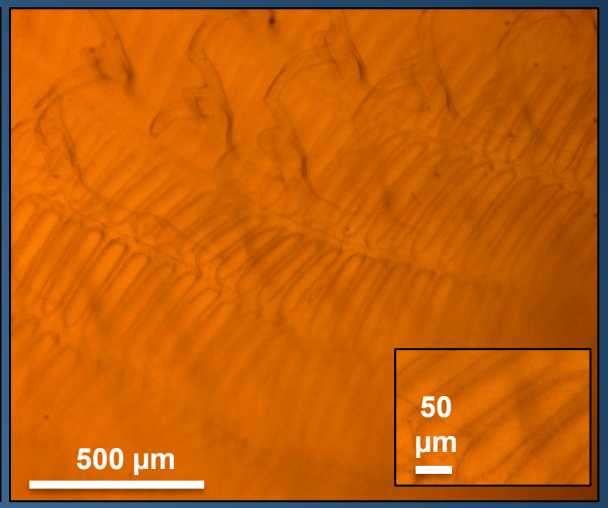


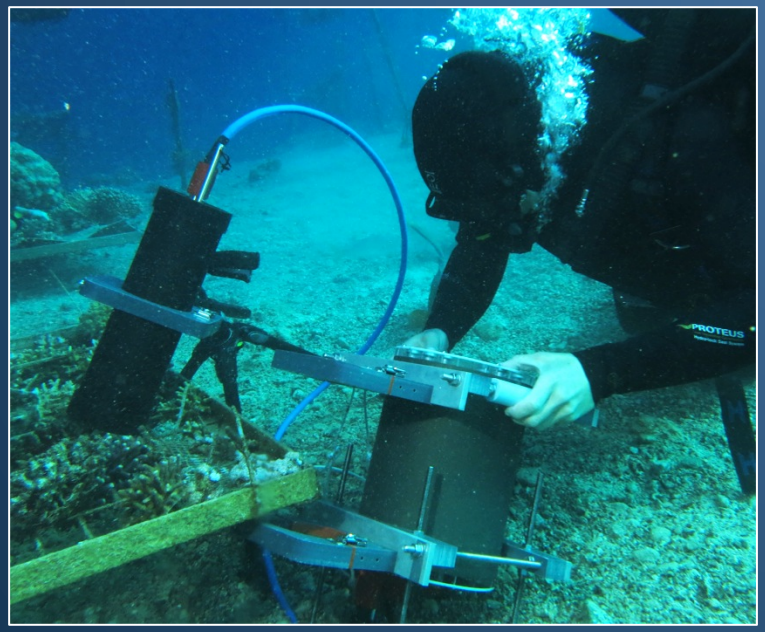


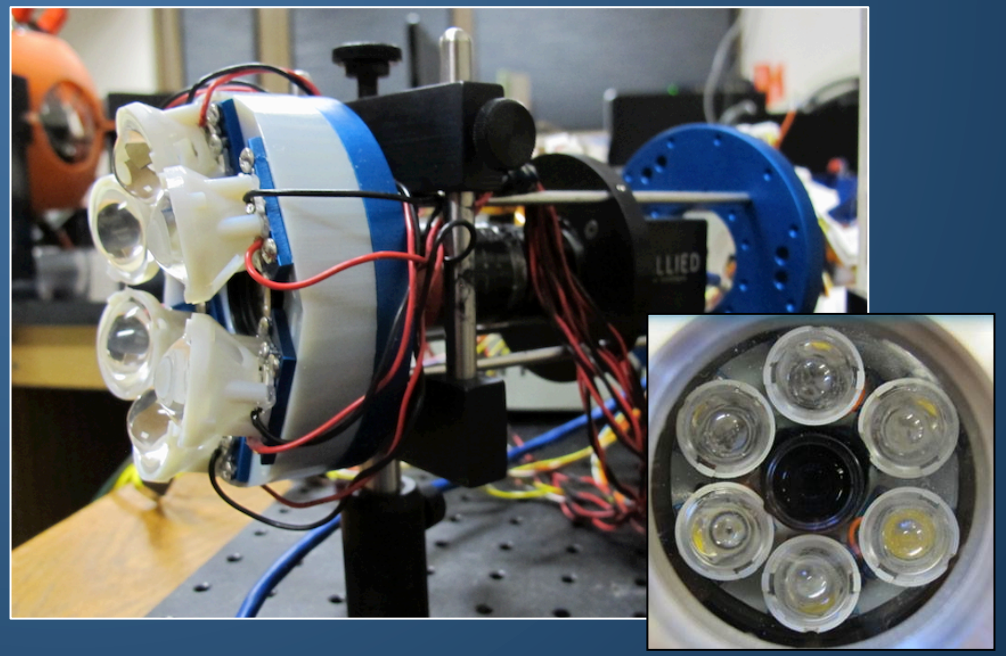
The BUM: Benthic Underwater Microscope











Mullen et al, Underwater Microscopy for *In Situ* Studies of Benthic Ecosystems , in review

Open Positions for Talented Graduate Students and Post-Docs

ttreibitz@univ.haifa.ac.il
marsci.haifa.ac.il/profiles/tTreibitz/