



# Alioli ROV Submarine Drone



Juanmi Taboada

OpenSouthCode'23

Málaga, 10 june 2023



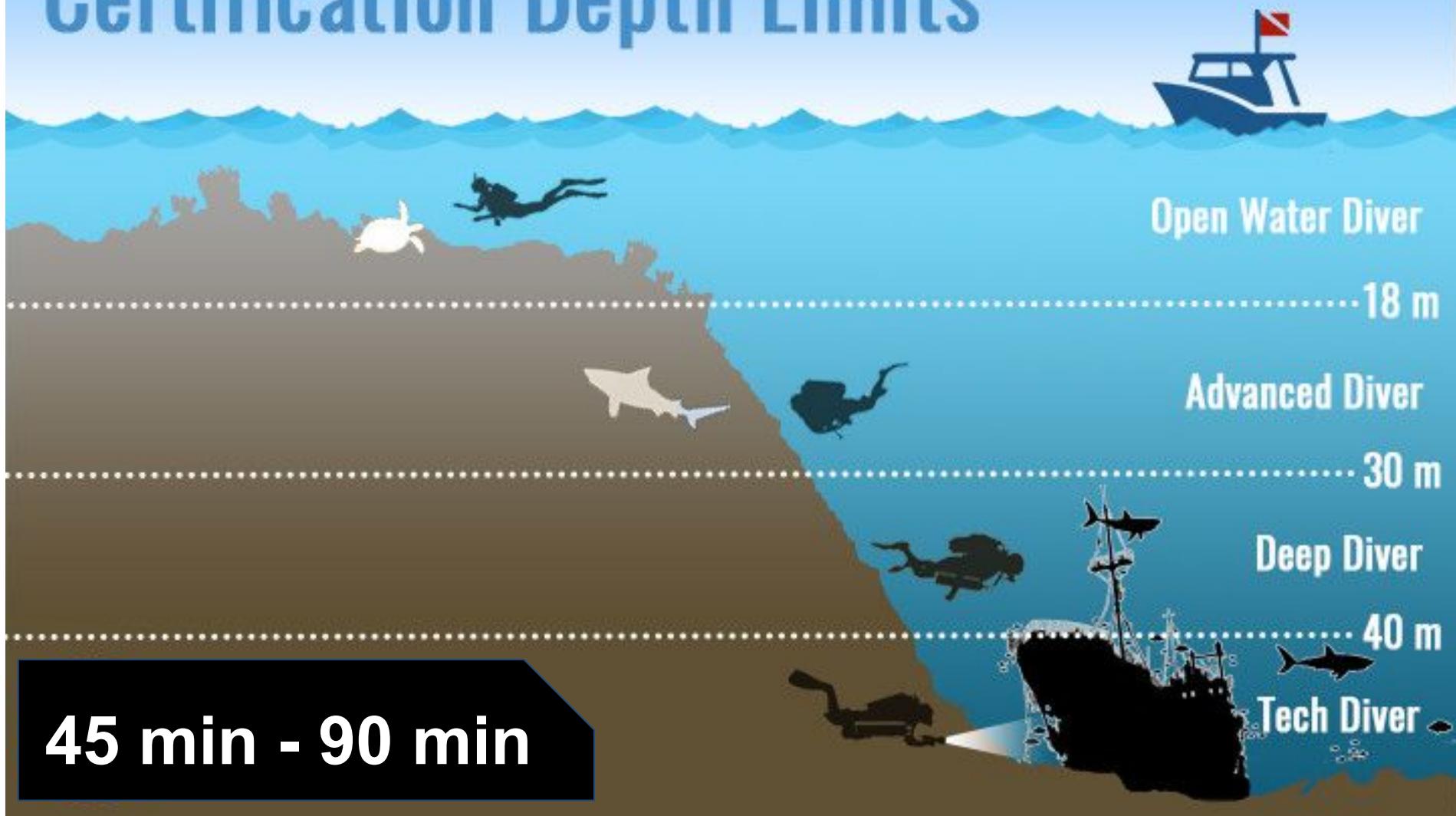
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Passion for water



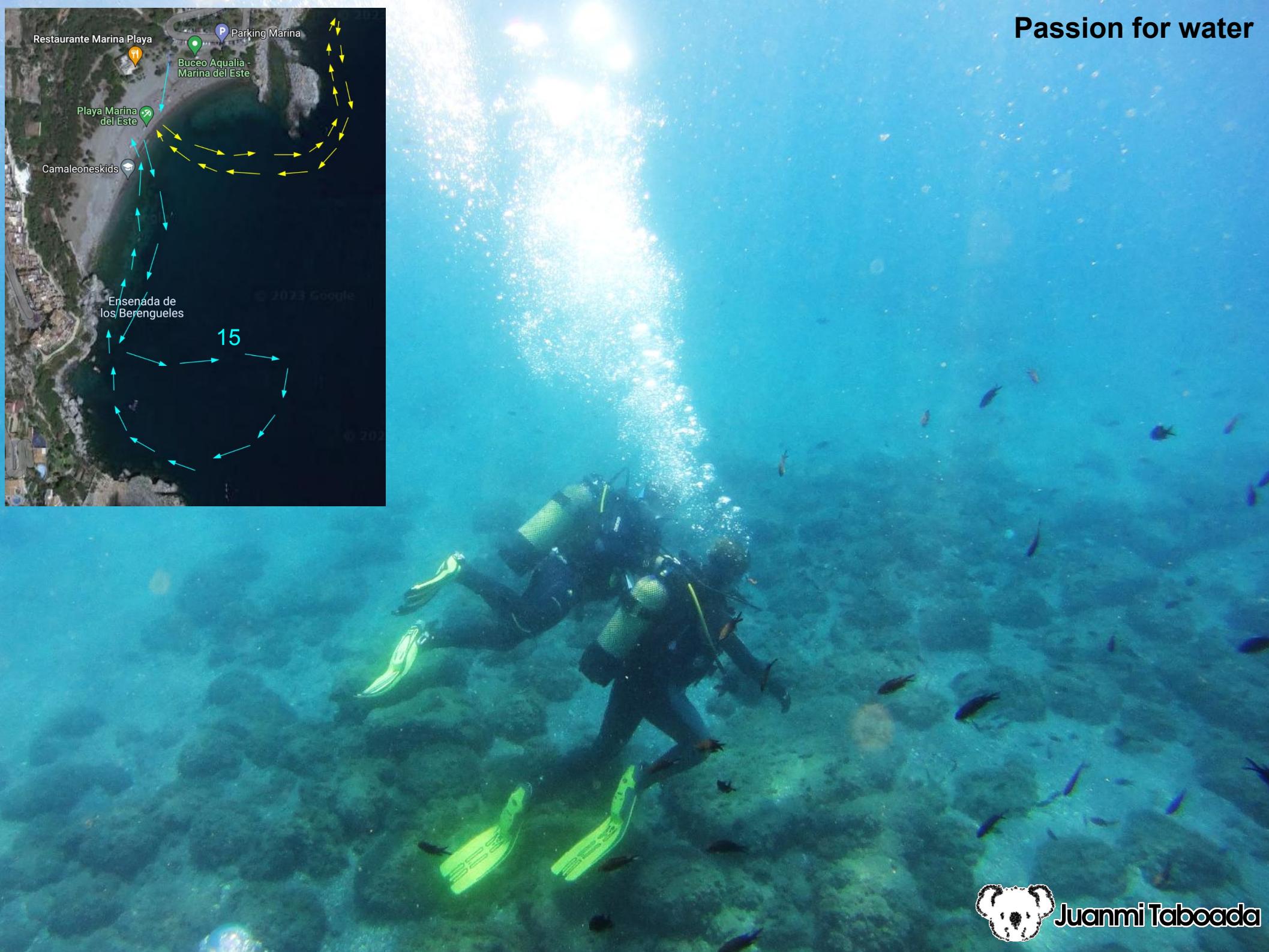
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# Certification Depth Limits





# Passion for water



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Passion for water



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## openMosix Computation Cluster

16 computers  
@GEB University of Málaga

# Passion for researching and learning





Málaga Wireless 2003 @ La Térmica  
Research, Learn & Share

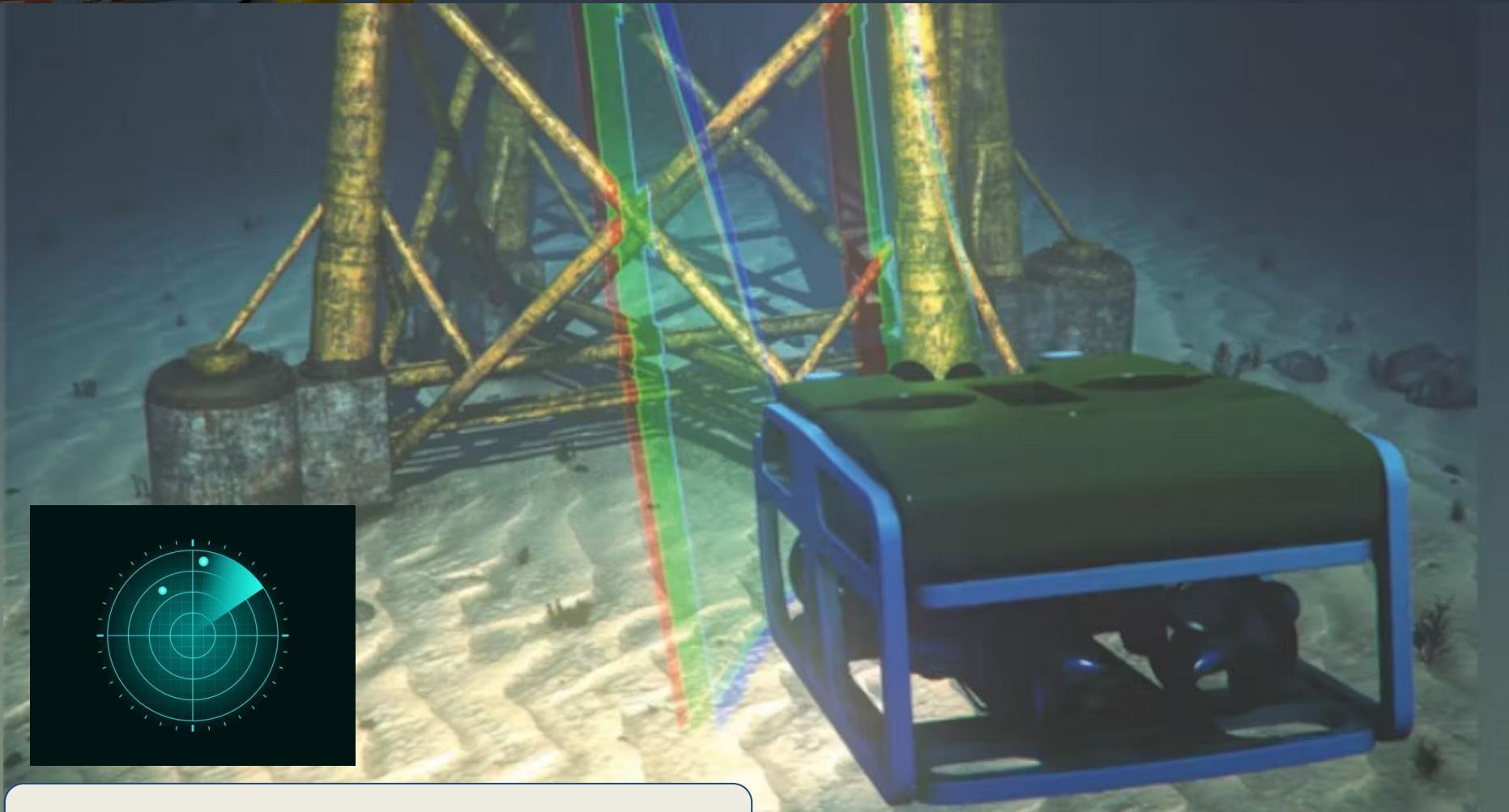
Scan the coast for scuba divers

The main concept



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Scan the coast for scuba divers



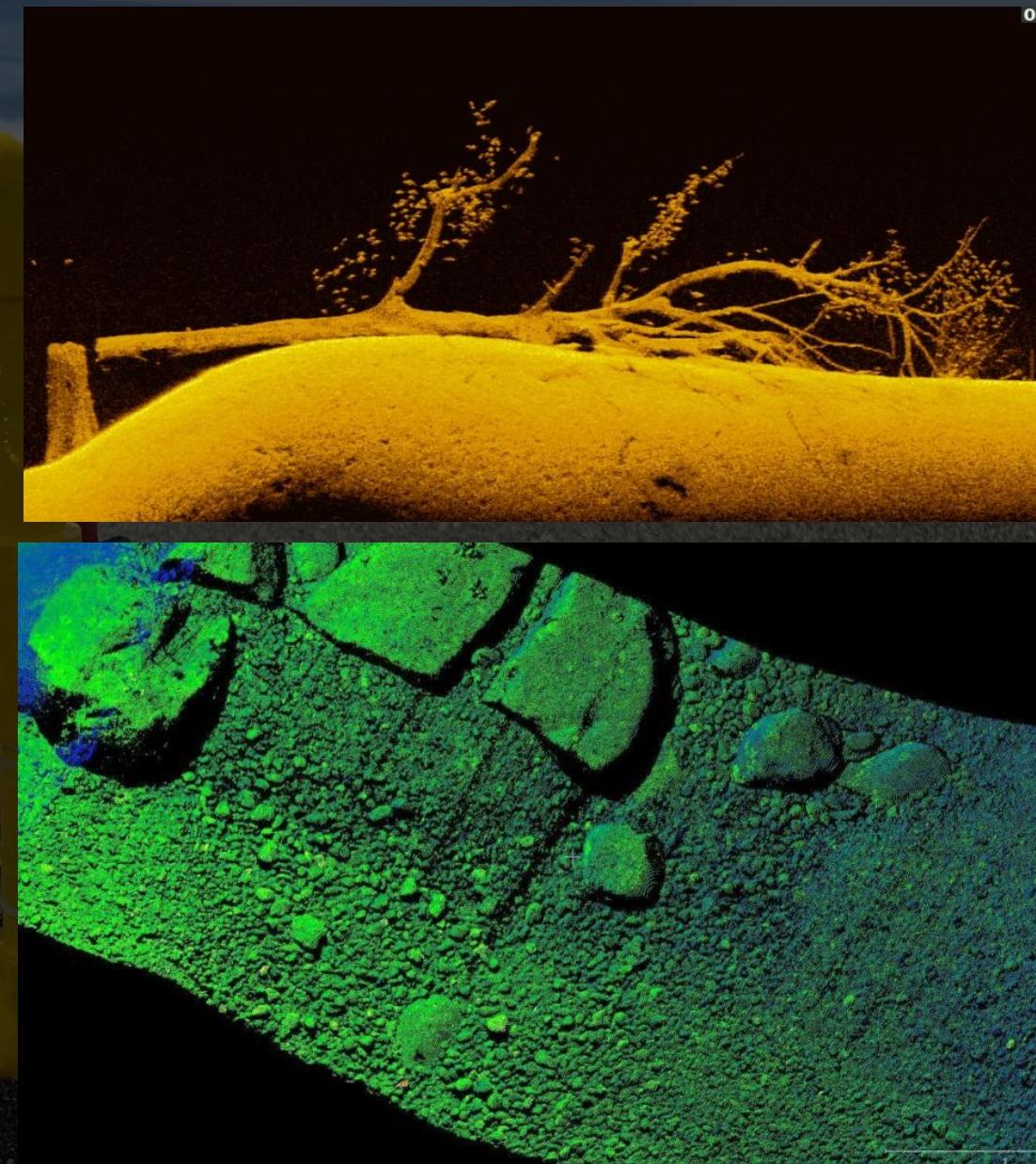
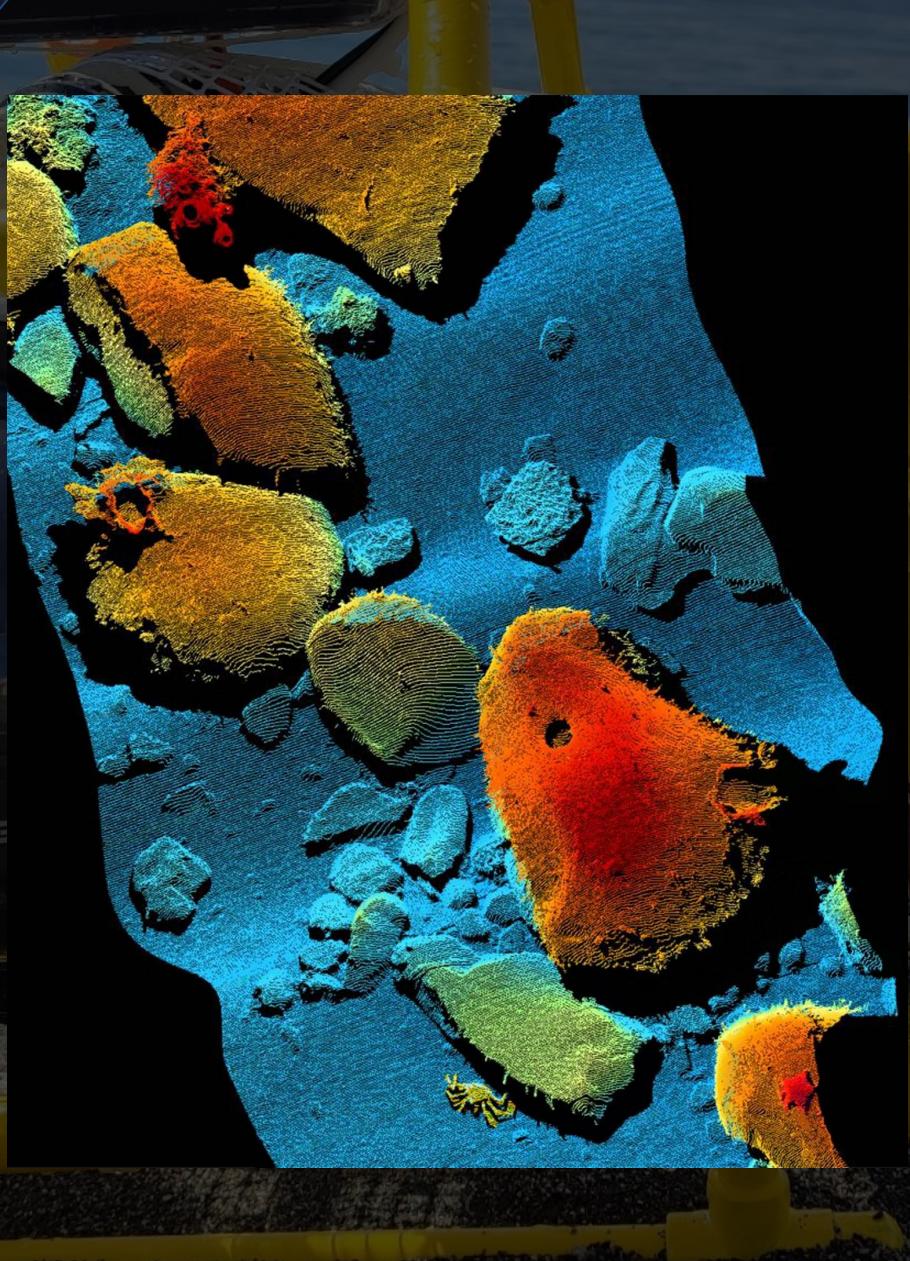
Scan structures, rocks and hills



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Scan the coast for scuba divers

## SONAR and fish finders

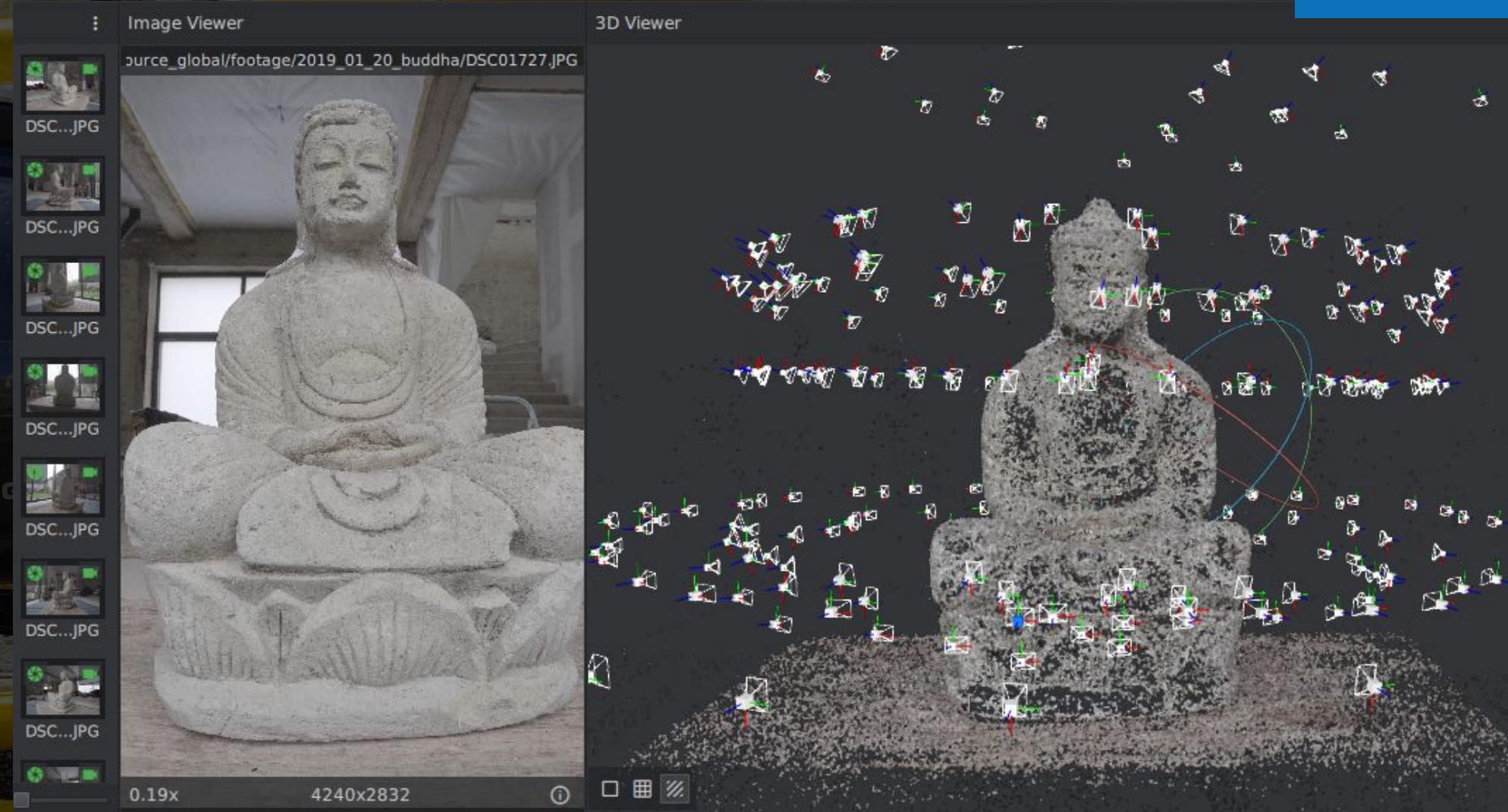


## Meshroom

Meshroom is a free, open-source 3D Reconstruction Software based on the **AliceVision** Photogrammetric Computer Vision framework



**MESHROOM**  
Open Source Photogrammetry Software



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Scan the coast for scuba divers

## Photogrammetry



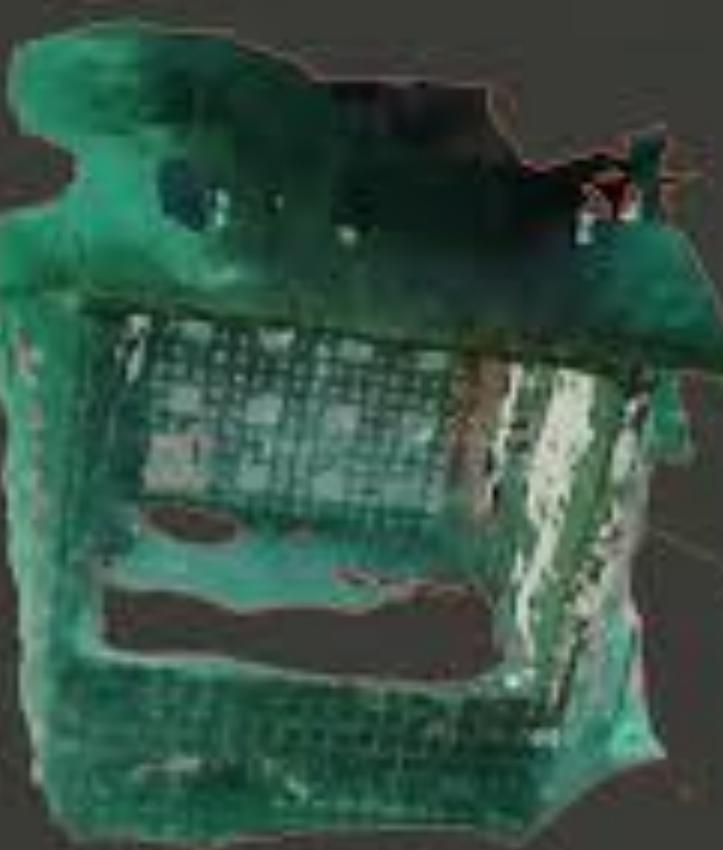
(Click on the image to watch the video)



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Scan the coast for scuba divers

Photogrammetry 



(Click on the image to watch the video)



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Scan the coast for scuba divers

Photogrammetry 



(Click on the image to watch the video)



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Scan the coast for scuba divers

Photogrammetry 



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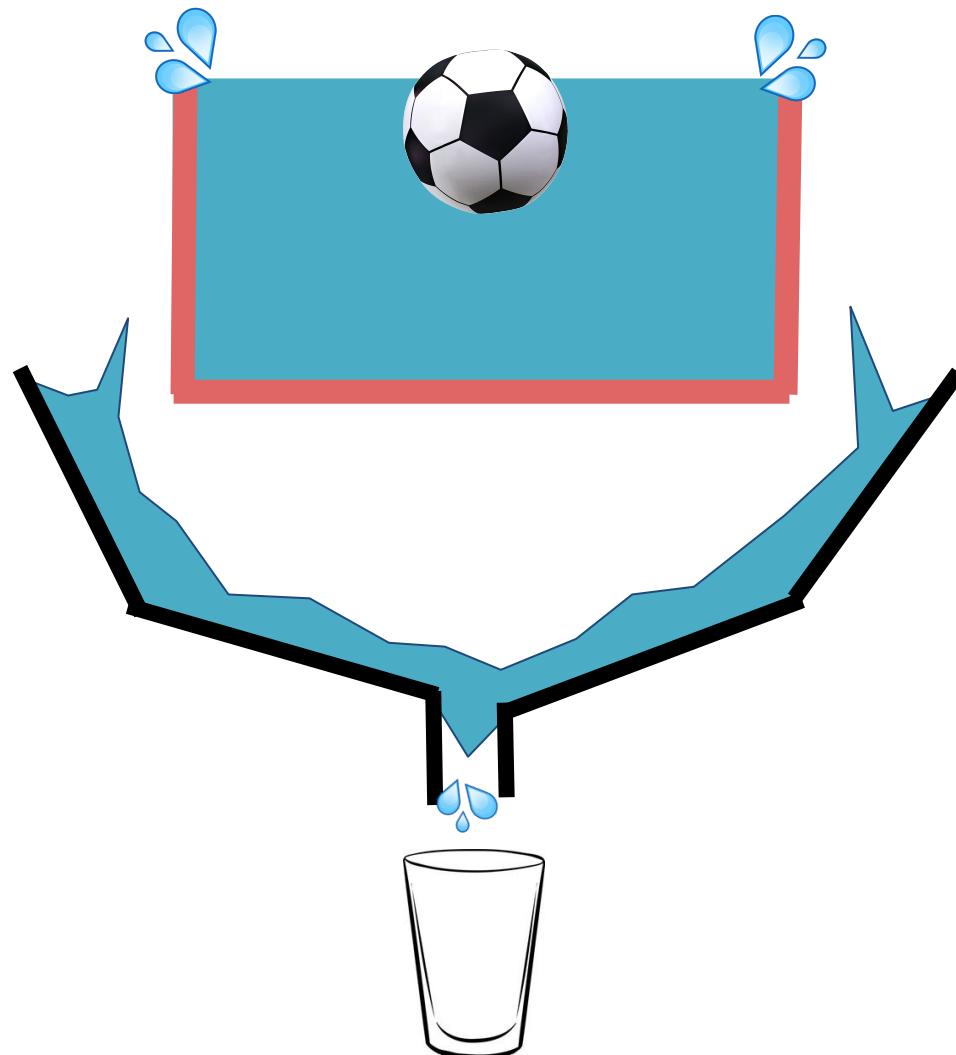
Any object, totally or partially immersed in a fluid or liquid, is buoyed up by a force equal to the weight of the fluid displaced by the object.



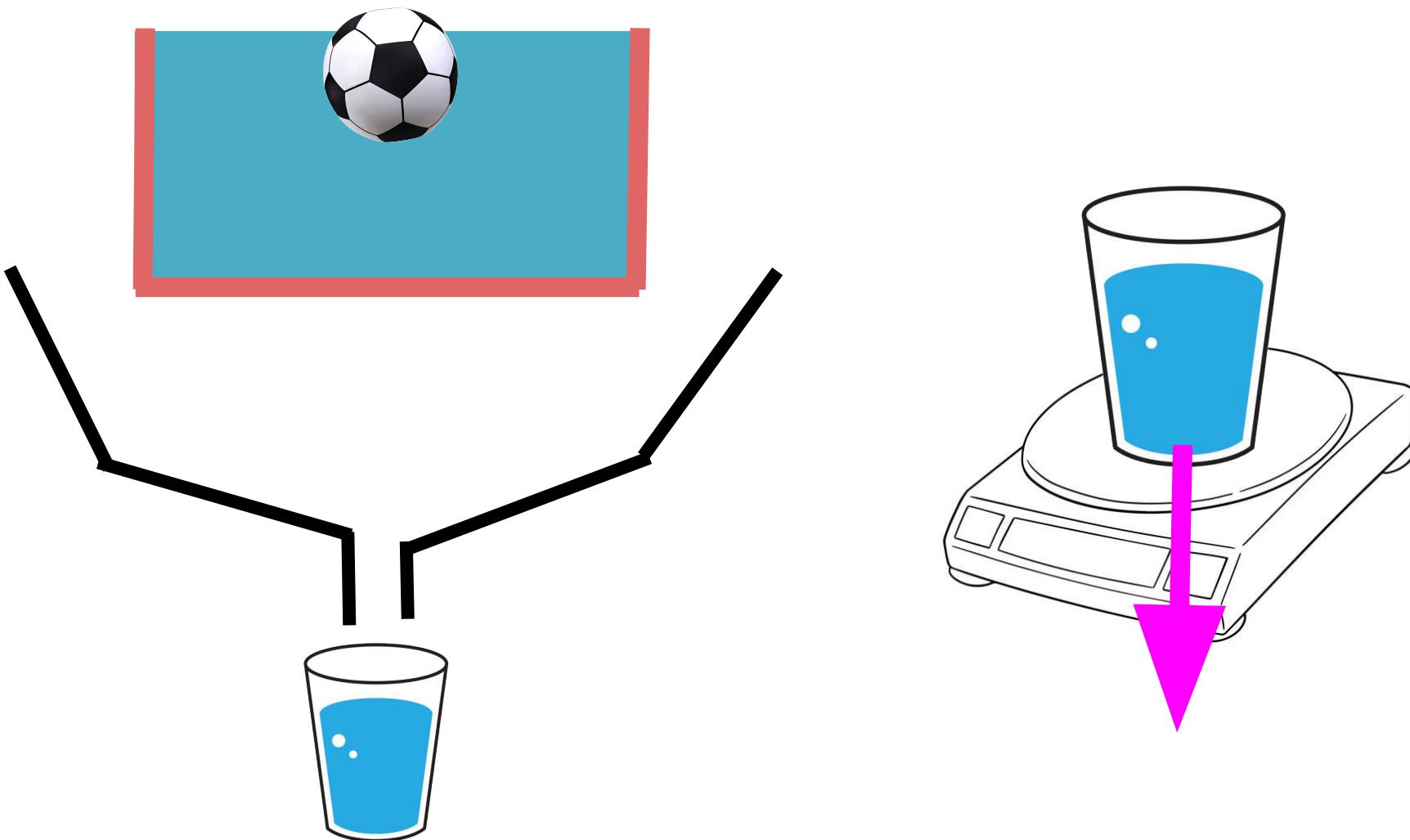
Todo cuerpo sumergido en un líquido experimenta una fuerza hacia arriba equivalente al peso del volumen desalojado



Die Auftriebskraft eines Objekts in einem Medium entspricht exakt der Gewichtskraft des Mediums, das durch das Objekt verdrängt wird.

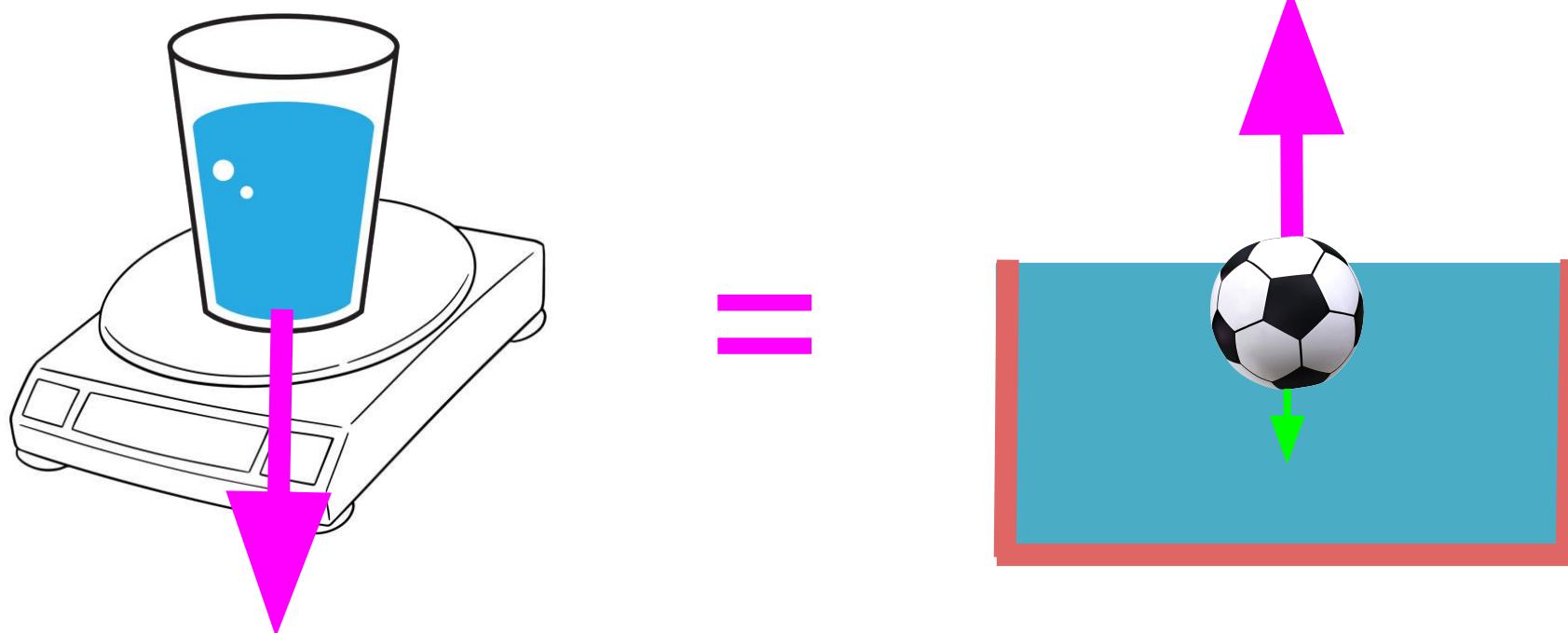


# Archimedes Principle



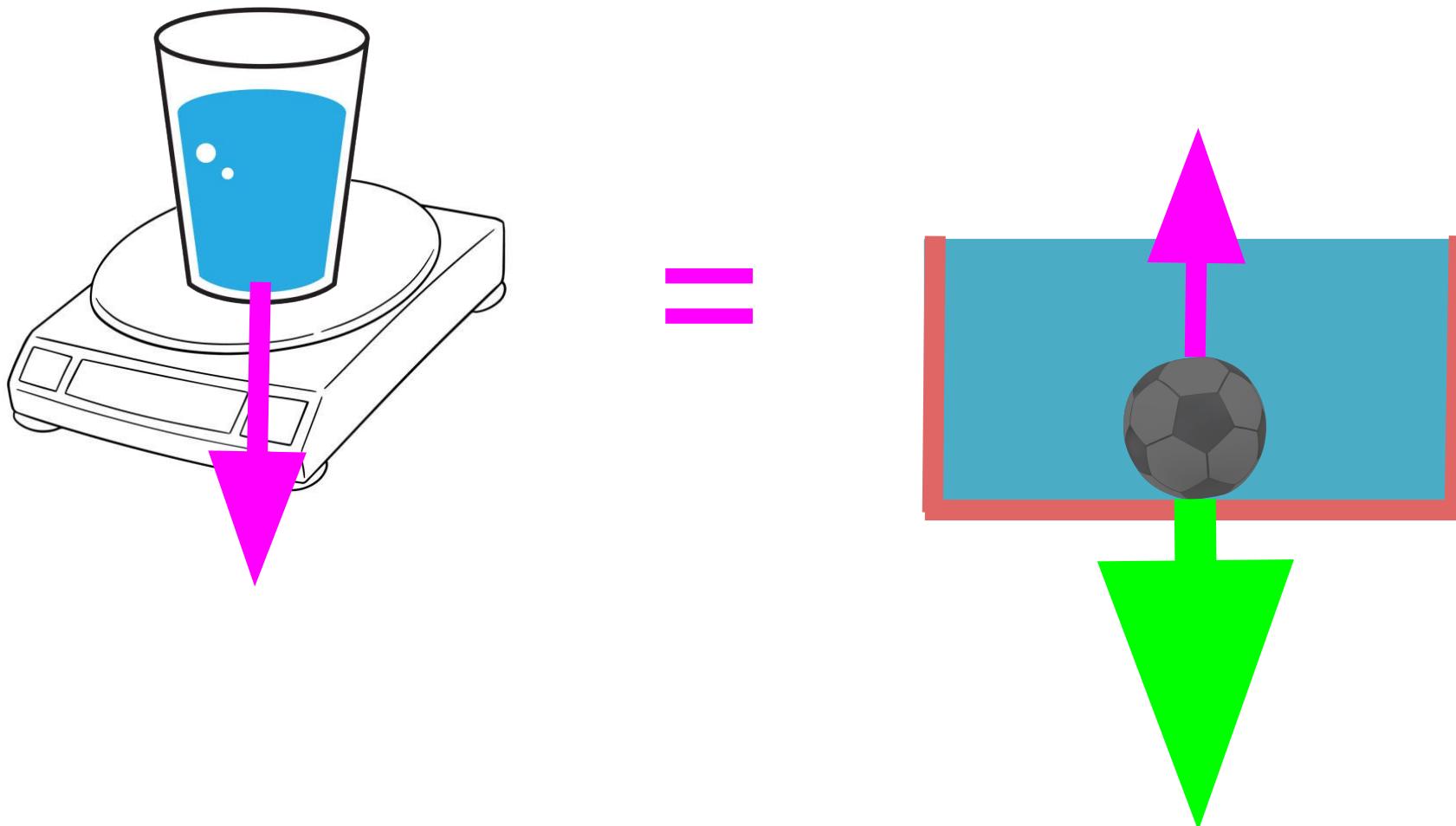
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# Archimedes Principle



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# Archimedes Principle



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At constant temperature (and low pressure) the volume  $V$  of a gas mass  $M$  is inversely proportional to its pressure  $p$ , i.e.,  $pV = \text{const}$



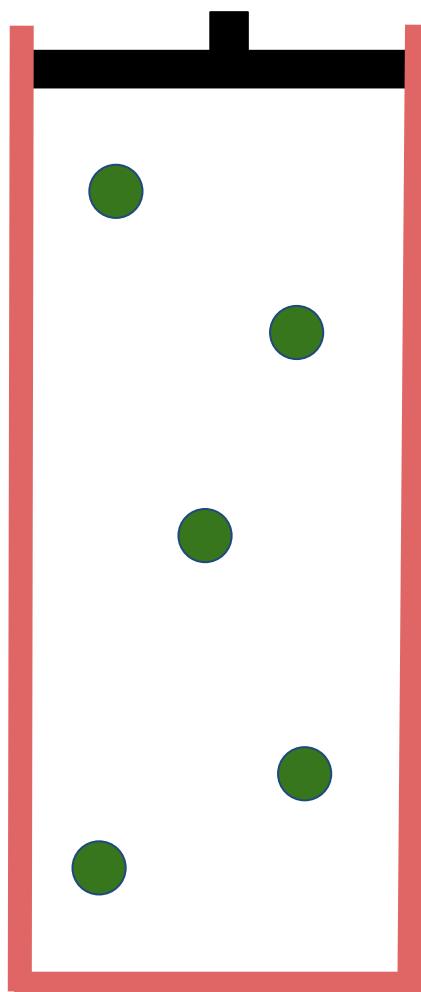
El volumen ocupado por un gas, a temperatura constante, es inversamente proporcional a su presión



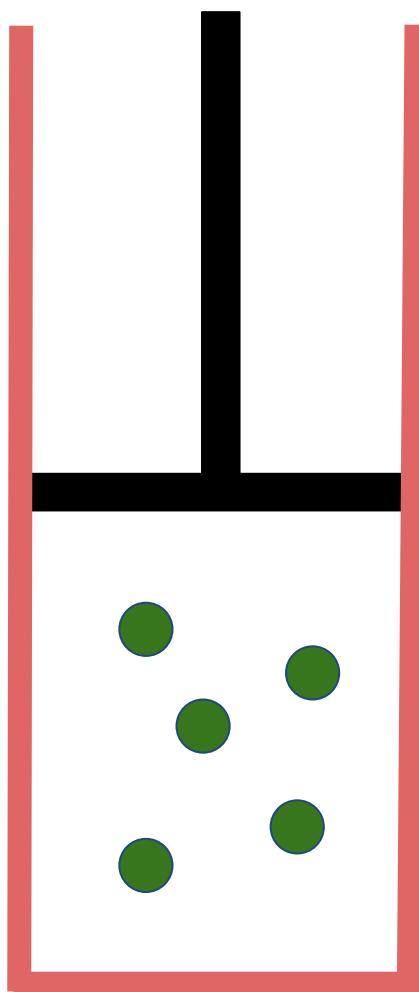
Der Druck idealer Gase bei gleichbleibender Temperatur und gleichbleibender Stoffmenge umgekehrt proportional zum Volumen ist



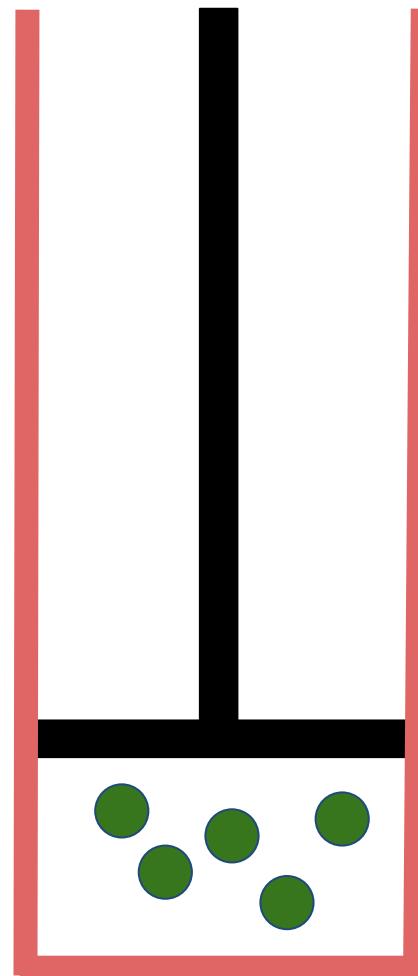
# Boyle-Mariotte law



$V = 60$  liters  
 $P = 0.5$  atm



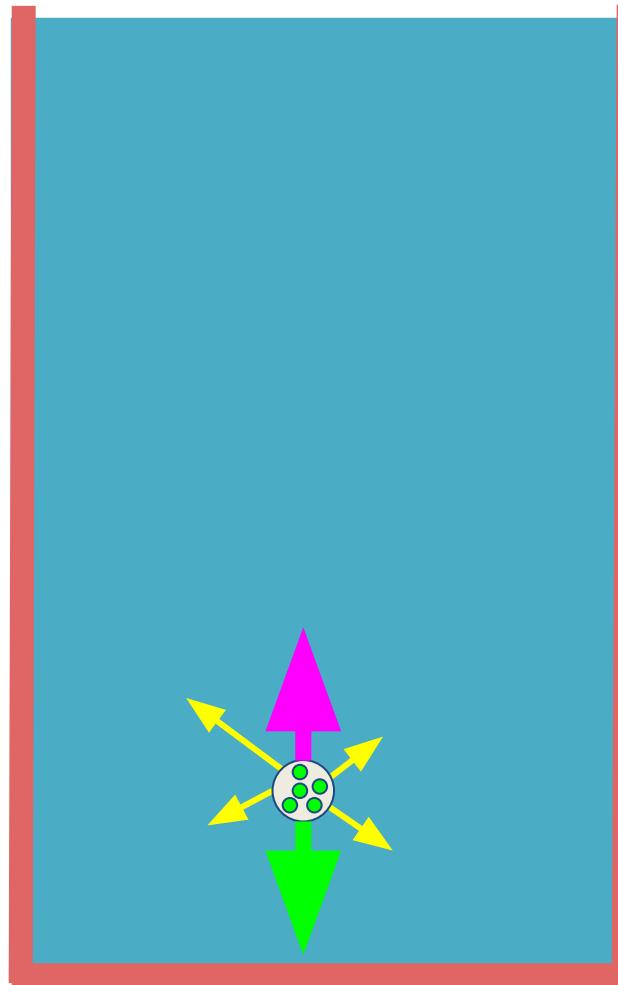
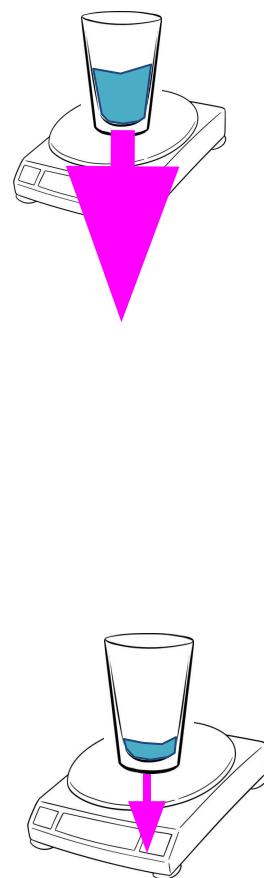
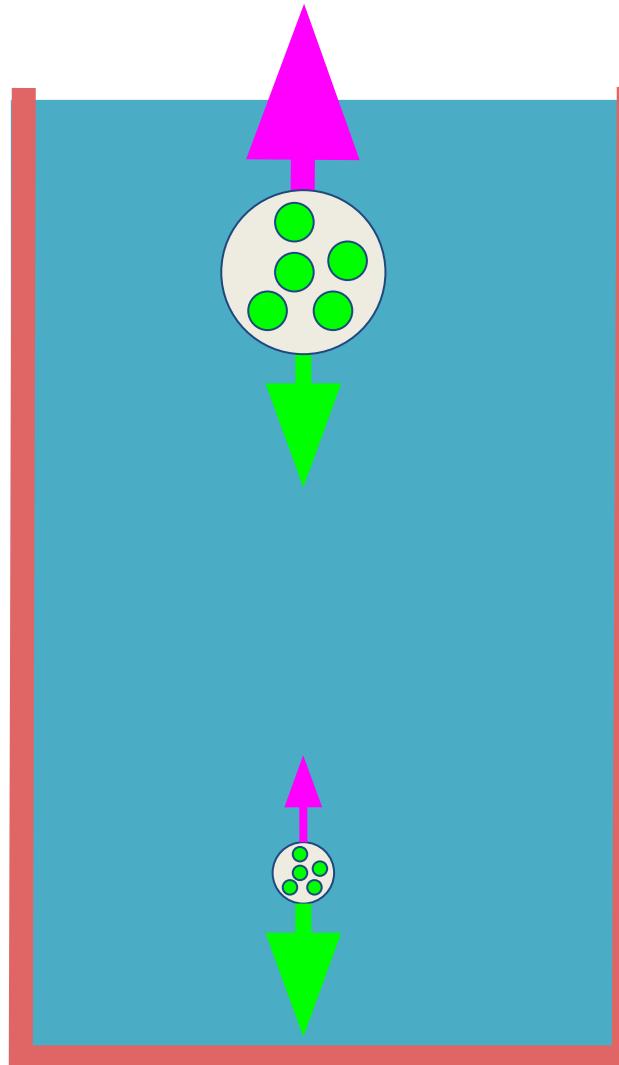
$V = 30$  liters  
 $P = 1$  atm



$V = 15$  liters  
 $P = 2$  atm



# All together: Archimedes & Boyle-Mariotte



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Let's break the myth



(Click on the image to watch the video)



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**Let's break the myth**



(Click on the image to watch the video)

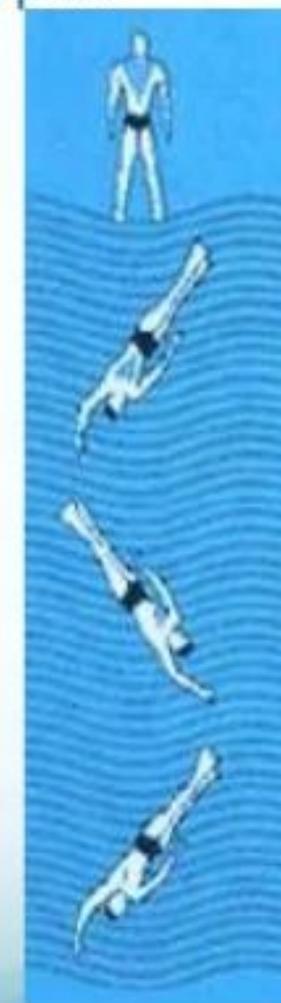


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## Boyles law

## (Volume and Pressure Changes) at Depth

Depth	Pressure	Relative Volume	Volume
Sea level	1 ATA	1 or 100%	20 l
10 M	2 ATA	1/2 or 50%	10 l <input checked="" type="checkbox"/>
20 M	3 ATA	1/3 or 33 %	6.7 l
30 M	4 ATA	1/4 or 25 %	5 l <input checked="" type="checkbox"/>
40 M	5 ATA	1/5 or 20%	4 l
90 M	10 ATA	1/10 or 10%	2 l



NB: Change in volume with pressure is the greatest nearer the surface





We are all set!



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What makes it novel?

Fully digital  
Wireless communication  
(wireless control & wireless video)

Satellite  
GPS / GPRS

GPS  
GPRS

Base Station 1  
Boat

GPRS  
Base Station 2

Alioli Buoy

Alioli ROV



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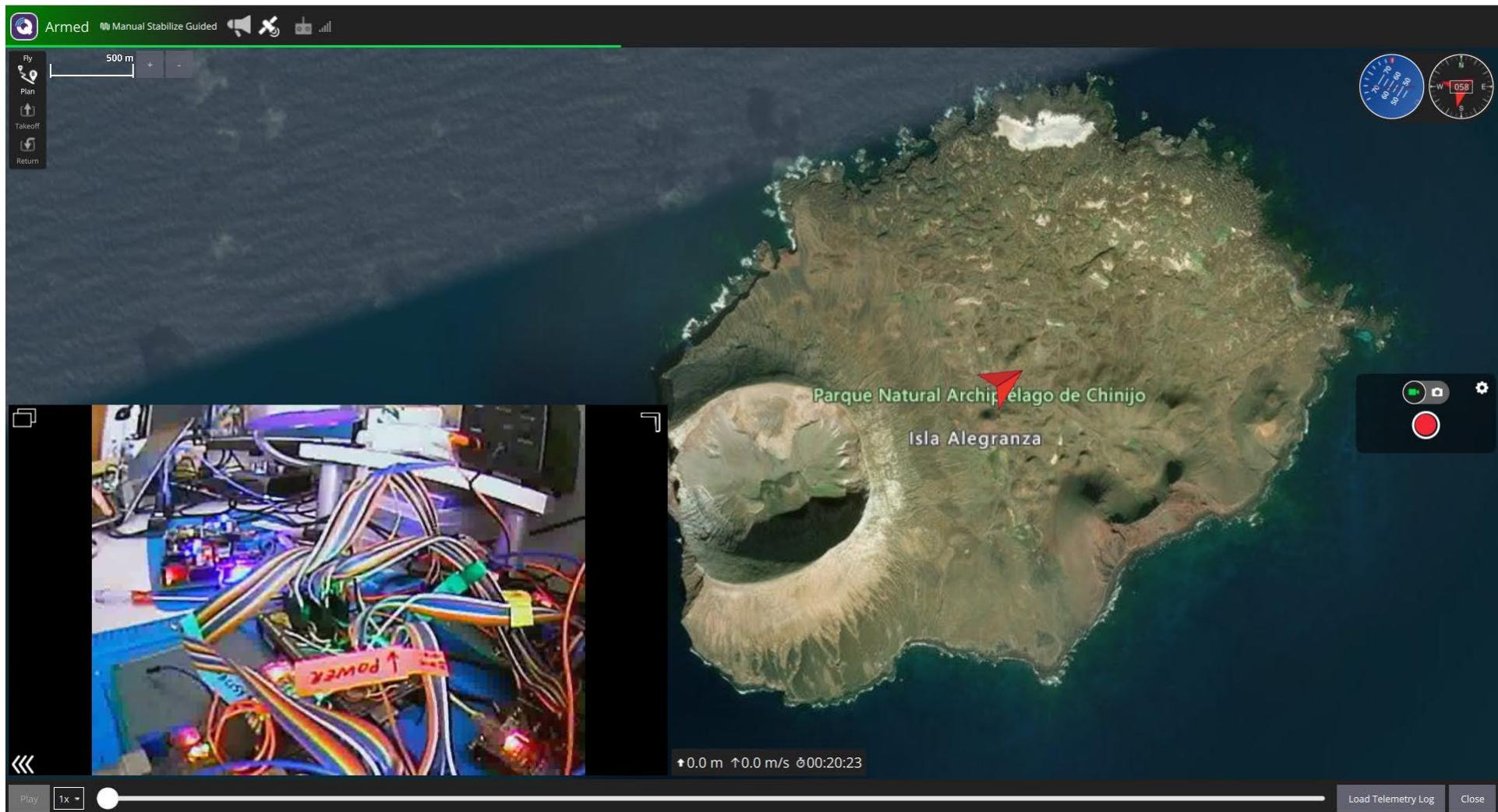
- Open Source
- Low cost
- **Low consumption**
- Fluid communication for adequate performance
- Real time telemetry and positioning
- Visualization on real time without bandwidth consumption
- Water cooling



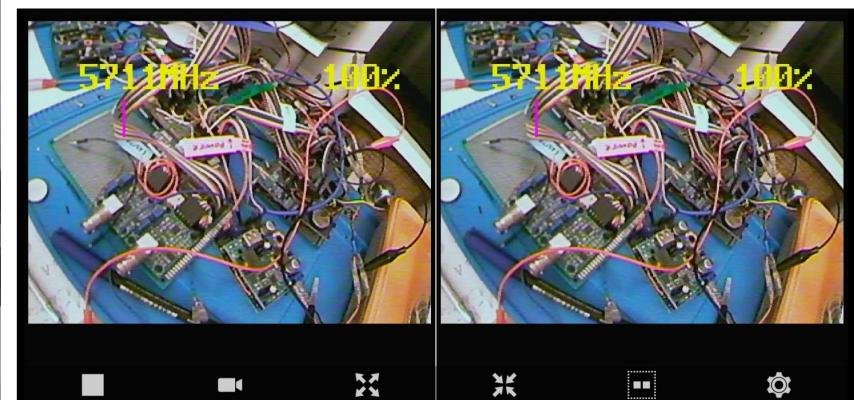
	<b>Buoy Millis:</b>	3013929	2963649	2913518	2863399	2813217	2763058	2712886
	<b>Buoy Latitude:</b>							
	<b>Buoy Longitude:</b>							
	<b>Buoy Main Amperage:</b>	1083.3	988.9	1180.3	954.2	1101	1184.6	1014.8
<b>06-12-2022 15:05:37</b> ( 1670335537 )	<b>Buoy Main Voltage:</b>	11.6	11.7	11.8	11.7	11.7	11.8	11.7
<b>2.140.120.239 : 3814</b> ( 2.140.120.239 )	<b>Buoy Temp Main Battery:</b>	25.2	25.3	25.2	25.3	25.3	25.2	25.1
<b>Buoy v1.1</b> ( 20220329100623CEST )	<b>Buoy Temp Sea Water:</b>	15.6	15.6	15.8	15.8	15.8	15.5	15.6
<b>11 seconds ago</b>	<b>Rov Altitude:</b>	21.5	20.8	19.2	16.4	14.1	10.9	12.3
<b>Online for:</b> 49 minutes	<b>Rov Engines Amperage:</b>	0	0	0	0	0	0	0
	<b>Rov Engines Voltage:</b>	8.6	8.6	8.6	8.6	8.6	8.6	8.6
	<b>Rov Main Amperage:</b>	183	192.3	188.5	189.3	182.8	190.3	183.9
	<b>Rov Main Voltage:</b>	11.8	11.8	11.8	11.8	11.8	11.8	11.8
	<b>Rov Pressure:</b>	-2.6	-2.5	-2.3	-2	-1.7	-1.3	-1.5
	<b>Rov Ready:</b>	1	1	1	1	1	1	1
	<b>Rov Temp BMP:</b>	23.8	23.9	24.1	24.2	24.3	24.4	24.5
	<b>Rov Temp Engines Battery:</b>	19.1	19.2	19.5	19.9	20.2	20.9	21.1
	<b>Rov Temp Gyro:</b>	28	28	28	28	28	28	28
	<b>Rov Temp Main Battery:</b>	23.9	23.9	23.9	23.9	23.9	24	24
	<b>Rov Temp Sea Water:</b>	15.6	15.7	15.7	15.6	15.8	15.8	17.1



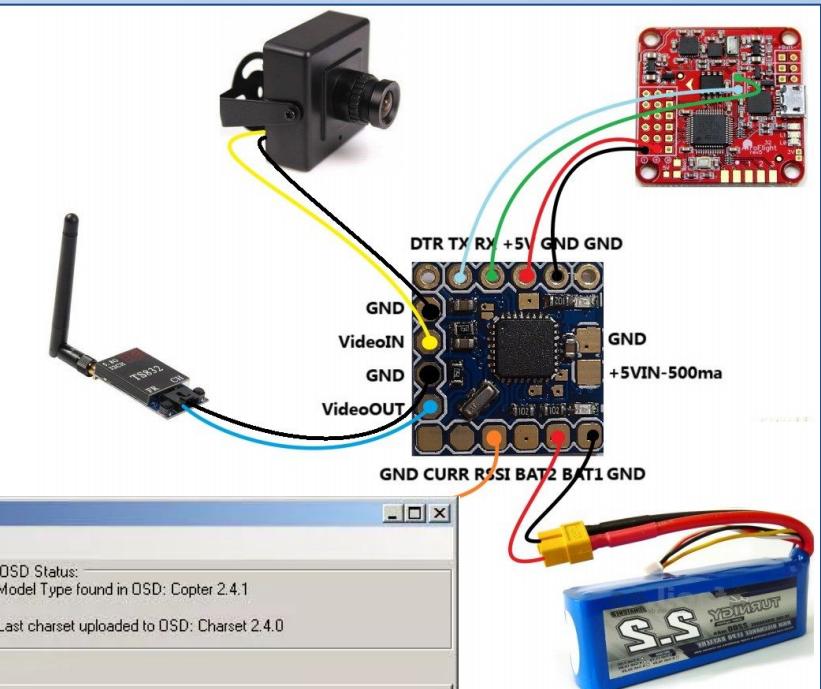
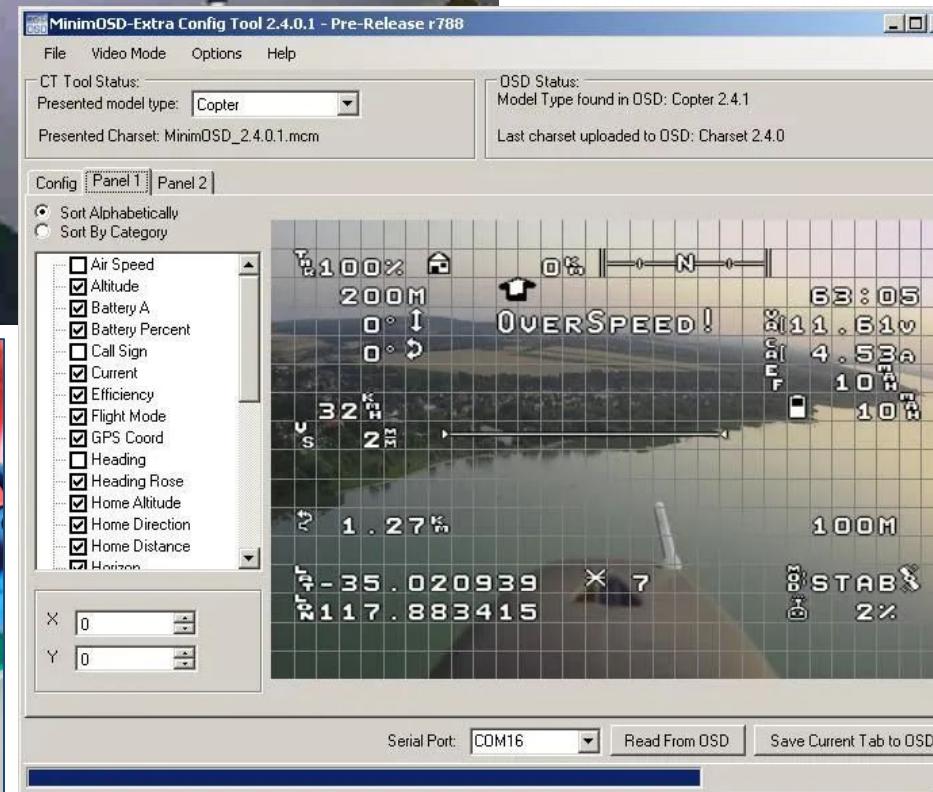
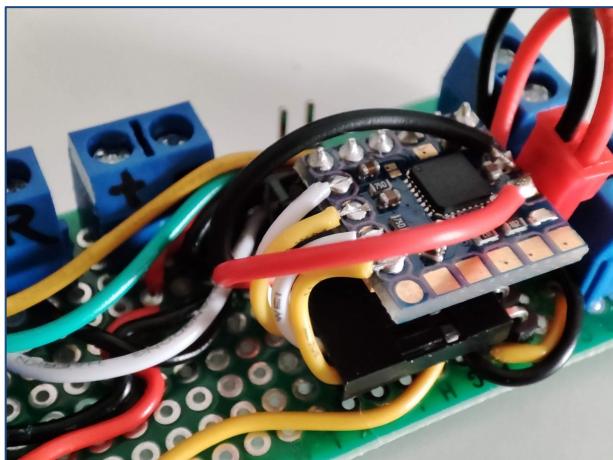
# QGround Control and Mavlink Protocol



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# Micro MinimOSD



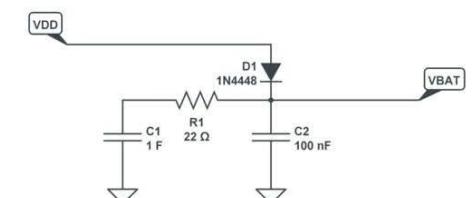
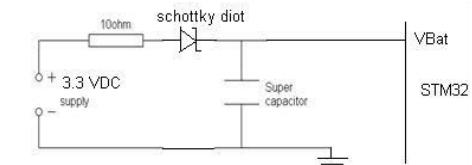
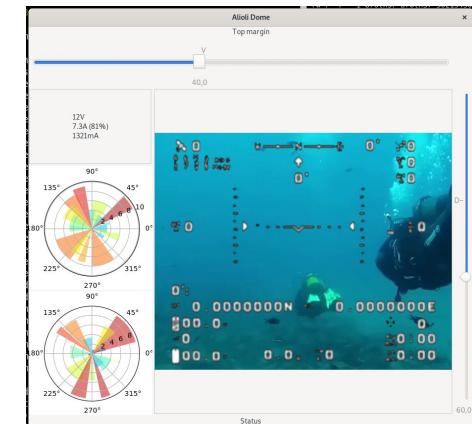
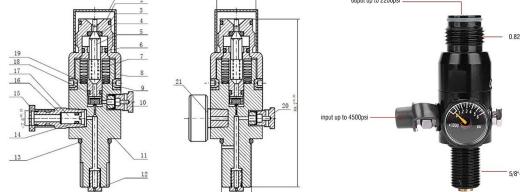
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Deprecated buoyancy system



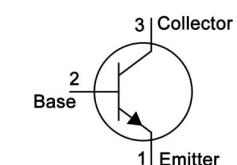
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- My own browser and visualization software (GTK)
- Automatic buoyancy system
- GSM/GPRS/GPS Module Power and supercapacitors
- Mass and volume distribution (Archimedes first law)
- Insulation
- Umbilical management system
- ROV dimensions
- Aerodynamics (edges)
- Propeller's size, engine's strength and produced thrust

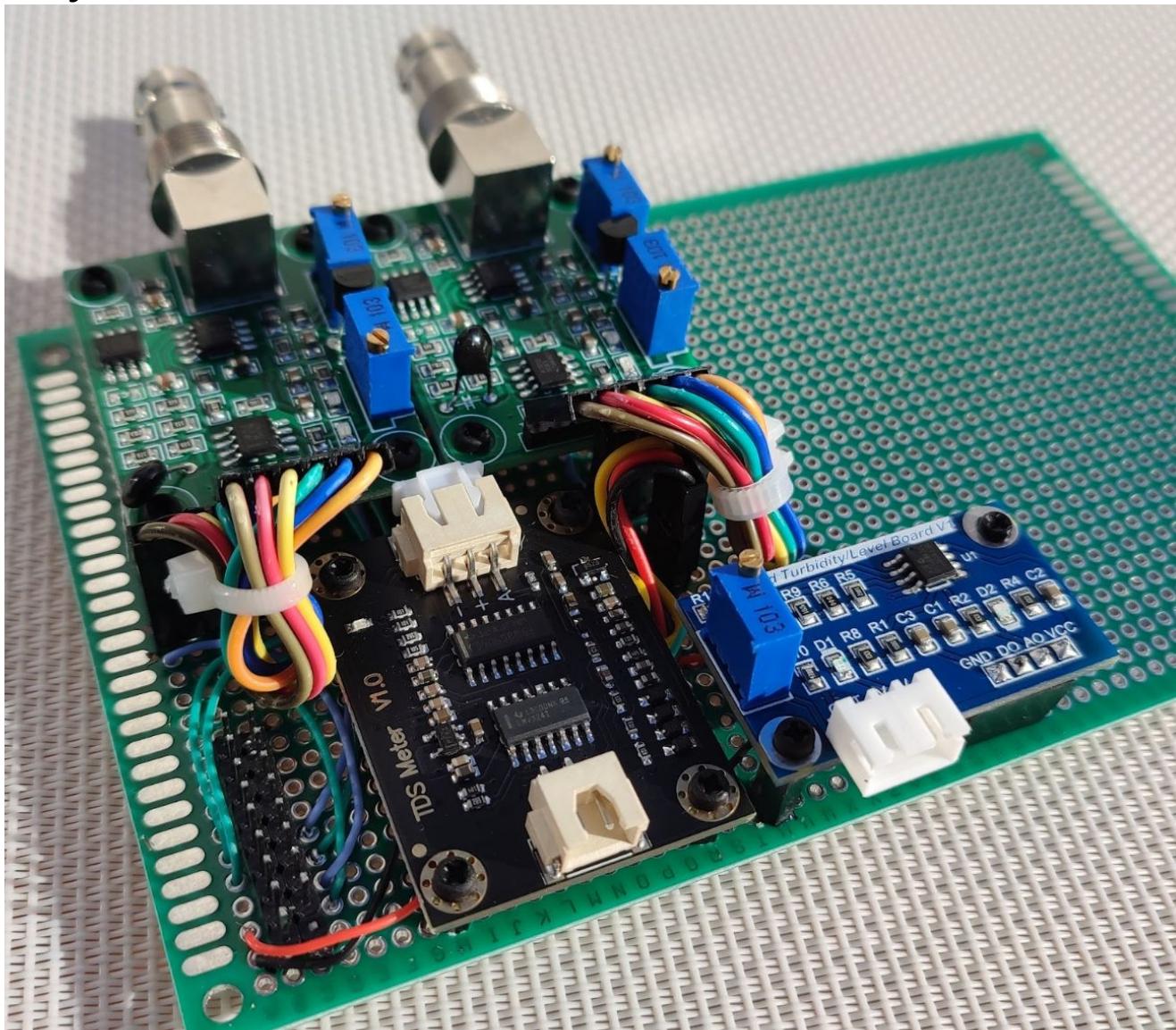


2N2222 Transistor Pinout

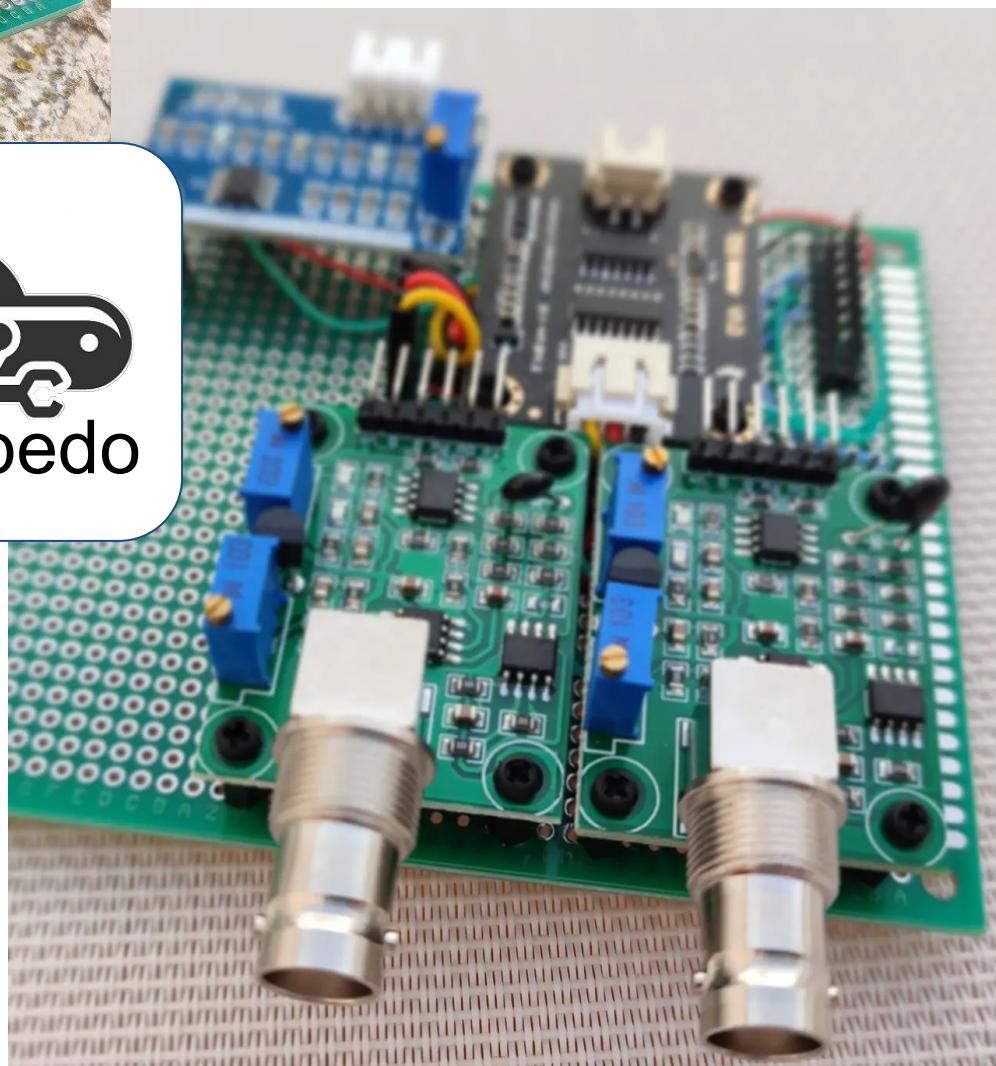
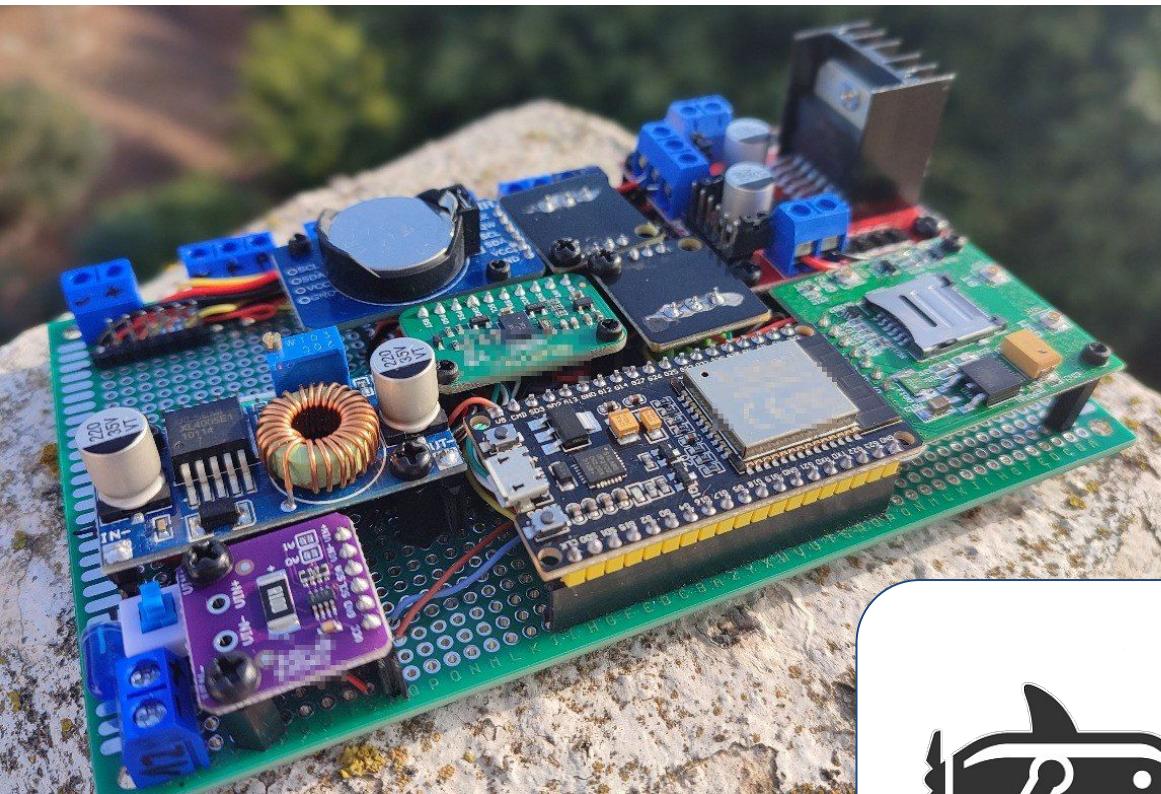
TO-92 Package



- Command and conquer 💥
- Water analytics board



- Torpedo (Micropython) - Fast and Furious! ⚡



- Underwater photography
- Body search
- Study and act on species invasions
- Archaeology
- Scuba diver companion
- Disabled people with underwater health conditions and diseases
- Game simulations (racing, wars and competitions)
- Cheap bathymetry



- Learning (electronics & microcontrollers)
- Yes I can
- Not abandon
- Using free hw and sw and share it with the world so that tomorrow we have a Google Maps of the seabed



# This is Alioli ROV

A photograph of the Alioli ROV, a yellow and black submarine drone. It has a large circular black camera lens on its front left side. The body is primarily yellow with black accents. It is resting on a sandy ocean floor. In the background, a boat is visible on the water under a clear blue sky.

Alioli ROV  
Submarine Drone



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(Click on the image to watch the video)

# Alioli ROV Submarine Drone



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Gracias - Thank you

OpenSouthCode'23

Málaga, 10 june 2023