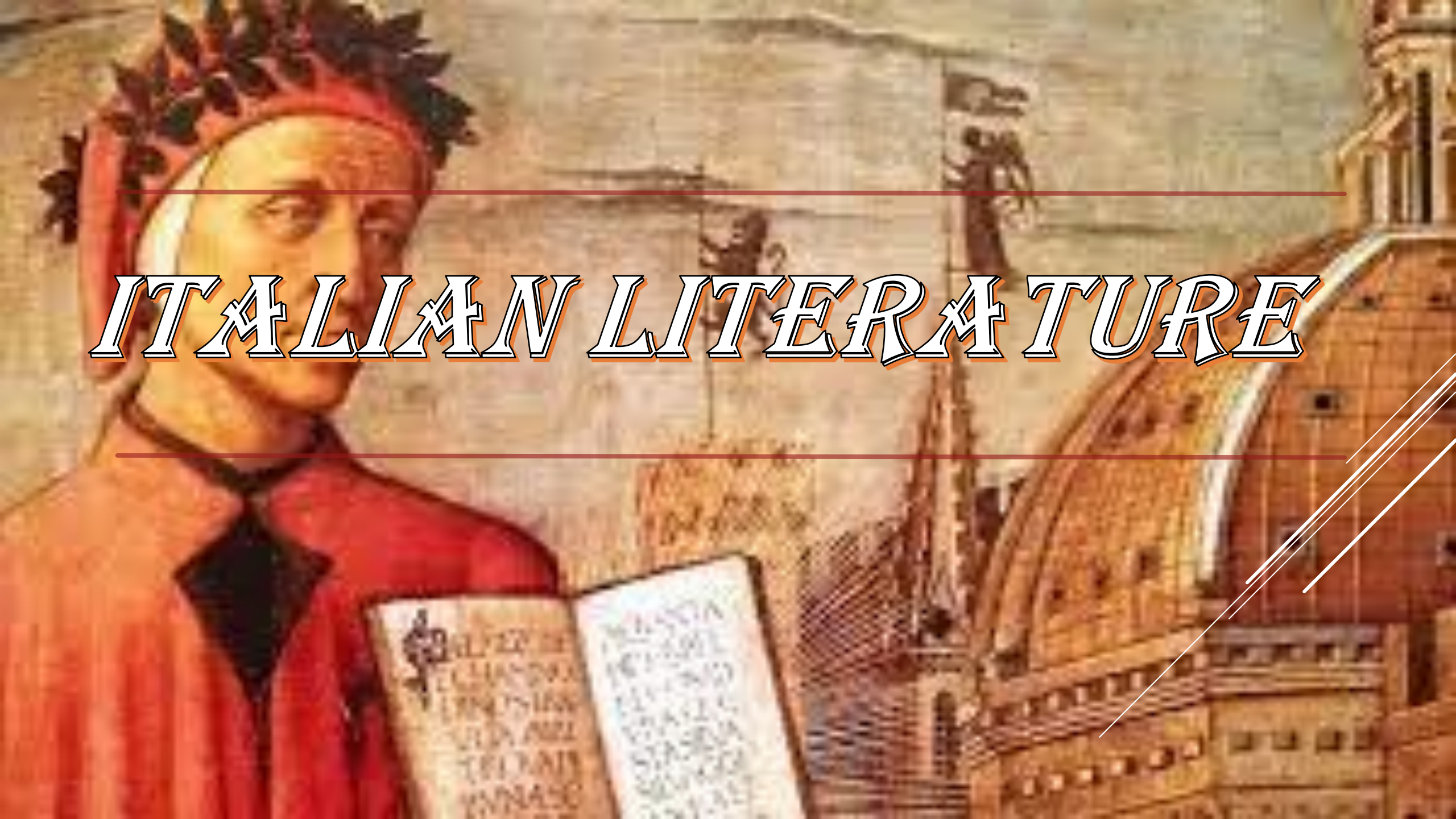
ERASMUS PROJECT: AQUAMARIS

Acquiring Marine Ecology Insight for Sustainability

Co-funded by the Erasmus+ Programme of the European Union

THE SEA IS OUR LIFE

HISTORY, ITALIAN LITERATURE, PHILOSOPHY, MATHEMATHICS, BIOLOGY, PHYSICS, PHYSICAL EDUCATION, ENGLISH, HISTORY OF ART…AND THE SEA!



ITALIAN LITERATURE

IL MARE

by Giovanni Pascoli,
1891

“M’affaccio, e vedo il mare:
vanno le stelle, tremolano l’onde.
Vedo stelle passare, onde passare;
Un guizzo chiama, un palpito risponde.
Ecco, sospira l’acqua, alita
Il vento:
sul mare è apparso un bel ponte d’argento.
ponte gettato sui laghi sereni,
per chi dunque sei fatto e dove meni?”

In this poem the natural elements seem to respond to each other in a superior harmony, then the tranquility is interrupted by the image of the bridge that suddenly enters, breaks the head of the sky and the sea and raises questions, since one knows neither where it leads nor for whom has been created, the conclusion of the poem shrouded in mystery without a key to reading.

THE SEA

"I look out, and I see the sea:
the stars go, the waves flicker.
I see stars passing by, waves passing by;
A flicker calls, a heartbeat responds.
Here, sighs the water, breaths
the wind:
a beautiful silver bridge appeared on the sea.
bridge thrown over the quite lakes,
So who are you made for and where are you going?

GOLDEN WAVES

"Golden waves, and the waves were hair,
a ship of ivory one day cracked;
a hand, even of ivory lead it through those messy hair,

And while the trembling and beautiful waves with a very straight furrow split,
the gold of the broken ones Love seized, to form chains to those to it rebel.

For the golden sea, which rippling shows its stormy blond treasure, shaken my heart to death already.

Rich shipwreck, in which submerged I die, since at least in my storm the rock was diamond and the gulf gold.

"Onde dorate" is a sonnet taken from the Lira, in which the poet describes a woman who combs her blond and golden hair.
A part of the female body is then celebrated. In the sonnet, whose dominant theme is that of love seen as torment and death, the poet says that his heart breaks against a rock as hard as a diamond.

ONDE DORATE

by Gianbattista Marino, 1931

Onde dorate, e l'onde eran capelli,
navicela d'avorio un dì fendea;
una man pur d'avorio la reggea
per quaasi errori preziosi e quelli;

E mentre i flutti tremolanti e belli
con drittissimo solco dividea,
l'or de le rotte fila Amor cogliea,
per formarne catene à suoi ribelli.

Per l'aureo mar, che rincrespando apria
il procelloso suo biondo tesoro,
agitato il mio core a morte gia.

Ricco naufragio, in cui sommerso ì moro,
poich'almen fur ne la tempesta mia
di diamante lo scoglio e 'l golfo d'oro.

CIVIC EDUCATION

THE LEGISLATION FOR SAFEGUARDING THE SEA

- It is incredible to think that the first express mention of the environment in the text of the Italian Constitution was only introduced in 2001

- The study of the environmental impact and sustainable development strategies have become "priorities" at an intercontinental level in recent years, accompanied by the search for new production technologies and new sources of energy production.

THE SUSTAINABLE DEVELOPMENT AGENDA

The Sustainable Development Agenda is a universal call to action to end poverty, protect the planet and improve the lives and prospects of everyone, everywhere. The 17 Goals were adopted by all UN Member States in 2015, as part of the 2030 Agenda for Sustainable Development which set out a 15-year plan to achieve the Goals.

The 17 Sustainable Development Goals (SDGs), with their 169 targets, form the core of the 2030 Agenda. They balance the economic, social and ecological dimensions of sustainable development, and place the fight against poverty and sustainable development on the same agenda for the first time.

Healthy oceans and seas are essential to our EXISTENCE. They cover 70 percent of our planet and we rely on them for food, energy and water. Yet, we have managed to do tremendous damage to these precious resources. We must protect them by eliminating pollution and overfishing and immediately start to manage and protect all marine life around the world responsibly.

THE TARGETS

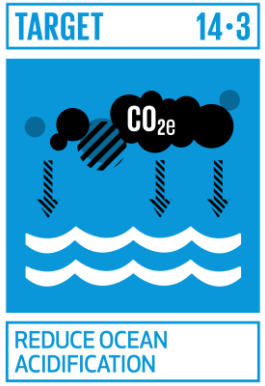
Everyone can help to make sure that we meet the Global Goals. These are the unforgettable ten targets to create action to conserve and sustainably use the oceans.

REDUCE MARINE POLLUTION

By 2025, prevent and significantly reduce marine pollution of all kinds, in particular from land-based activities, including marine debris and nutrient pollution.

PROTECT AND RESTORE ECOSYSTEMS

By 2020, sustainably manage and protect marine and coastal ecosystems to avoid significant adverse impacts, including by strengthening their resilience, and take action for their restoration in order to achieve healthy and productive oceans.



REDUCE OCEAN ACIDIFICATION

Minimize and address the impacts of ocean acidification, including through enhanced scientific cooperation at all levels.

SUSTAINABLE FISHING
By 2020, effectively regulate harvesting and end overfishing, illegal, unreported and unregulated fishing and destructive fishing practices and implement science-based management plans, in order to restore fish stocks in the shortest time feasible, at least to levels that can produce maximum sustainable yield as determined by their biological characteristics.

CONSERVE COASTAL AND MARINE AREAS
By 2020, conserve at least 10 per cent of coastal and marine areas, consistent with national and international law and based on the best available scientific information.

END SUBSIDIES CONTRIBUTING TO OVERFISHING
By 2020, prohibit certain forms of fisheries subsidies which contribute to overcapacity and overfishing, eliminate subsidies that contribute to illegal, unreported and unregulated fishing and refrain from introducing new such subsidies, recognizing that appropriate and effective special and differential treatment for developing and least developed countries should be an integral part of the World Trade Organization fisheries subsidies negotiation.

INCREASE THE ECONOMIC BENEFITS FROM SUSTAINABLE USE OF MARINE RESOURCES

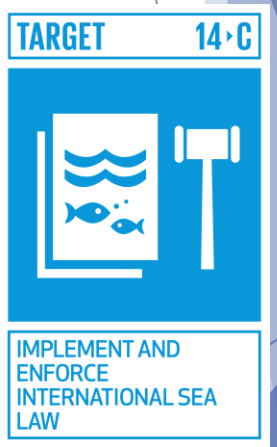
By 2030, increase the economic benefits to small island developing States and least developed countries from the sustainable use of marine resources, including through sustainable management of fisheries, aquaculture and tourism.

INCREASE SCIENTIFIC KNOWLEDGE, RESEARCH AND TECHNOLOGY FOR OCEAN HEALTH

Increase scientific knowledge, develop research capacity and transfer marine technology, taking into account the Intergovernmental Oceanographic Commission Criteria and Guidelines on the Transfer of Marine Technology, in order to improve ocean health and to enhance the contribution of marine biodiversity to the development of developing countries, in particular small island developing States and least developed countries.

Provide access for small-scale artisanal fishers to marine resources and markets

Enhance the conservation and sustainable use of oceans and their resources by implementing international law as reflected in the United Nations Convention on the Law of the Sea, which provides the legal framework for the conservation and sustainable use of oceans and their resources, as recalled in paragraph 158 of “The future we want”

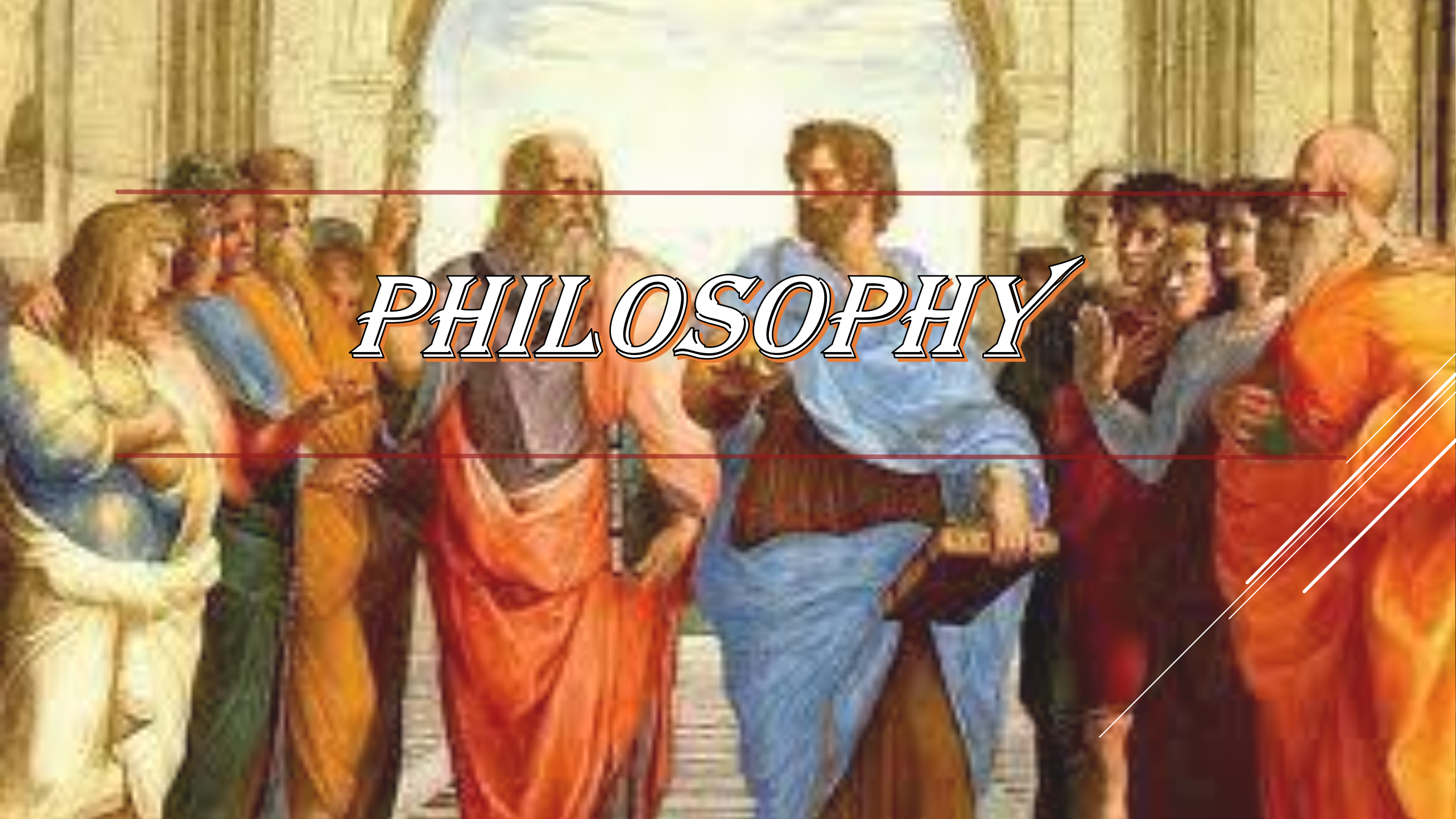


THE AGENDA 2030 AND THE COVID-19

There is no doubt that the current pandemic constitutes an unprecedented challenge, but in this moment of crisis it is even more important to work together, with determination to recover, following the path traced by the Sustainable Development Goals.

Each of them can become a resource for increasing the resilience and security of our hard-hit communities.

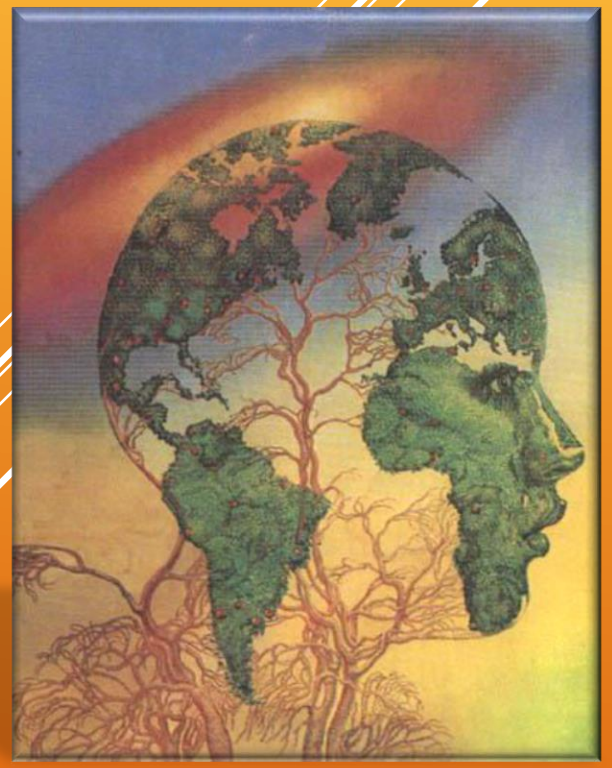
The future of humanity and the recovery from this pandemic depend on our will and our commitment to pursue and achieve the Sustainable Development Goals.



PHILOSOPHY

GREEN PHILOSOPHY

Philosophy has always dealt with the problem of the relationship between man and nature, but in the last decades of the twentieth century the sensitivity towards this theme has increased so much that a new field has opened up for philosophical reflection: environmental philosophy. It is a sector in which scientific, ethical, economic and political questions are intertwined.



IS MAN THE MASTER OF NATURE?

Over time…

... Some philosophers have proposed a re-evaluation of the mythical thought, such as that in which an attitude of interpenetration with nature is expressed ...

.. Other philosophers give man, who was created in God's image, a special status, which allows him to dominate nature and to dispose of it at will ...

.. Still others have pointed out that in the Bible there is not only the idea of man as master, but also that of man as guardian of nature.

NATURE:LIVING SUBJECT OR MECHANICAL OBJECT?

Giordano Bruno: Man: guest of nature

According to Bruno, the only difference between other animals and man is not the greater intelligence of the latter, but the possession of the most important organ: the prehensile hand. Only thanks to it does man triumph over other species. Bruno considers nature as a living being in which everything has a soul. Man is nature himself and cannot overpower it.

Francesco Bacone: Man: the master of Nature

Bacon sees nature as a kind of huge quarry from which to take useful materials. Nature is no longer considered sacred, and it is legitimate to carry out any kind of manipulation on it. Man must not consider it for its beauty, but only for the material and intellectual advantages it can offer.

The problem of the relationship between man and nature will then be developed in recent environmental philosophies. A real 'ethics of animals' has also been developed, in which the idea of man is opposed to that of animal.

BIOLOGY

MARINE BIOLOGY

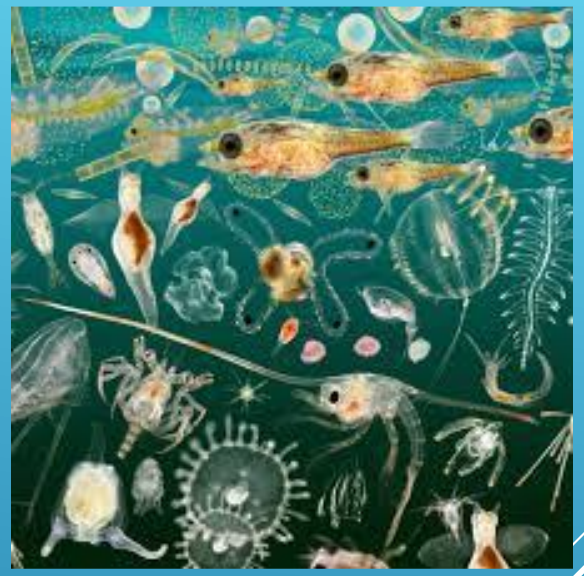
Marine biology is the study of **marine** organisms, their behaviors and interactions with the environment. **Marine biologists** study **biological** oceanography and the associated fields of chemical, physical, and geological oceanography to understand **marine** organisms.

An **ecosystem** consists of a community of organisms together with their physical environment.

The **categories** in which marine biology inscribes these organisms are **ecological categories**: *plankton*, *benthos*, *necton*, *neustone* include all the kingdoms of living beings: *monere*, *protists*, *animalia*, *plants*, *fungi*.

ECOLOGICAL CATEGORIES

The plankton is an **ecological category**. The word "plankton" comes from the Greek for "drifter" or "wanderer." An organism is considered plankton if it is carried by tides and currents, and cannot swim well enough to move against these forces. Some plankton drift this way for their entire life cycle. Others are only classified as plankton when they are young, but they eventually grow large enough to swim against the currents. Plankton are usually microscopic, often less than **one inch** in length, but they also include larger species like some crustaceans and jellyfish.



Benthos, in an **ecological cathegory** and consists of the assemblage of organisms inhabiting the seafloor. **Benthic** epifauna live upon the seafloor or upon bottom objects; the so-called infauna live within the sediments of the seafloor. The layer that the benthos occupy is called the *benthic zone*, which is the lowest layer of a lake, sea, stream, or river. This zone, of course, ranges from the shallow depths where water meets land, to extreme depths that humans have not yet been able to explore.

Nekton or **necton**, from the Greek **nekton** meaning "to swim", refers to the actively swimming aquatic organisms in a body of water.

Neuston, group of organisms found on top of or attached to the underside of the surface film of water. The **neuston** includes insects such as whirligig beetles and water striders, some spiders and protozoans, and occasional worms, snails, insect larvae, and hydras.

Mussels farming

"**Mussels** are one of the most significant filter-feeders in the marine environment," said Brian Beal, a marine ecologist at the University of Maine at Machias. "They are responsible not only for efficiently producing high-quality protein but for cleaning the waters around them through their feeding activities."

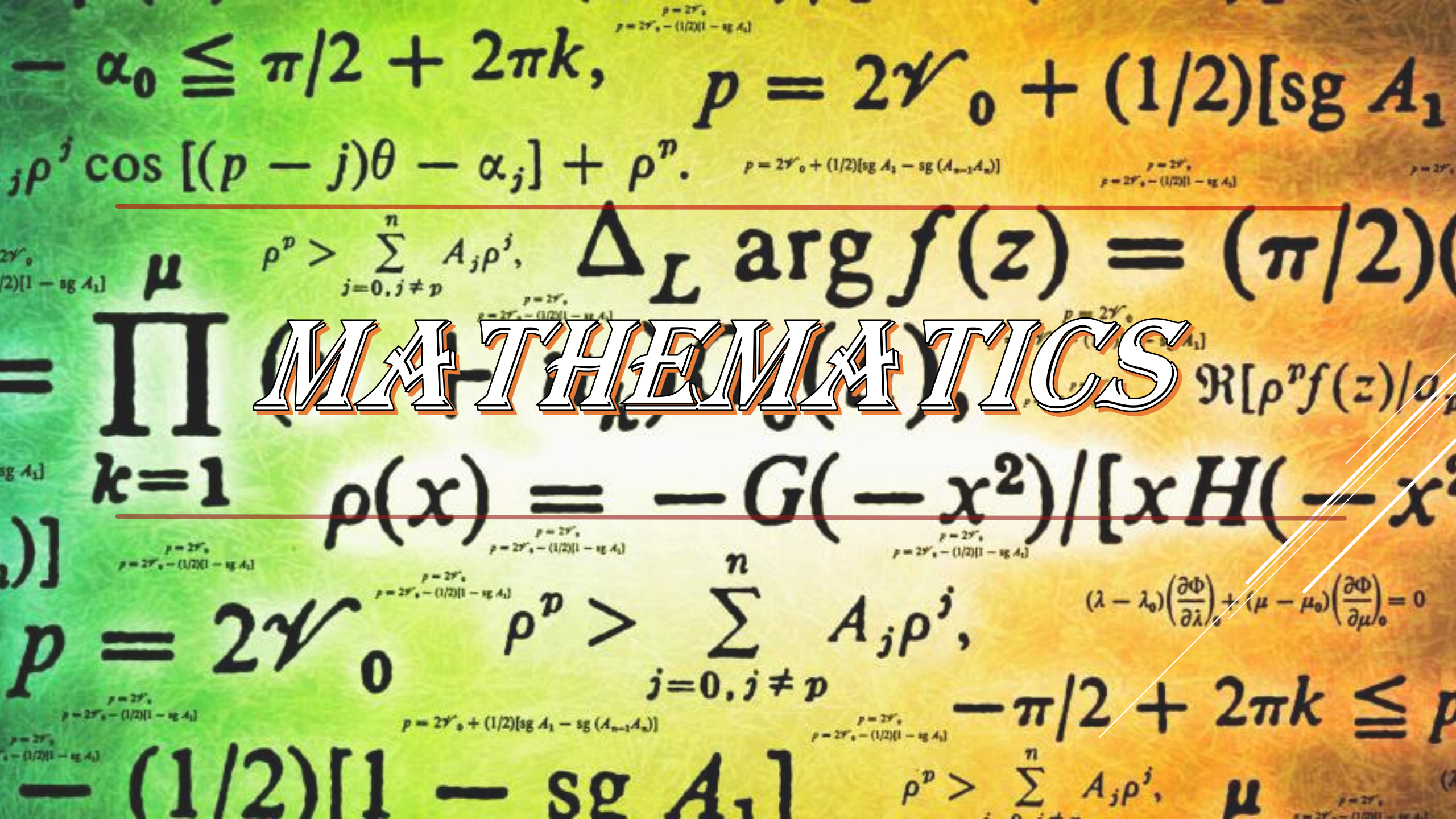
Mussels farming is developed mostly in marine breasts protected from storms, with contributions from some source of fresh water.

The plant consists of rows of poles (fusoli) that support festooned ropes (pergolari) from which other plant ropes (libani) hang on which the mussel larvae fix and evolve which, in ten months, the large bunches ready for the sale.

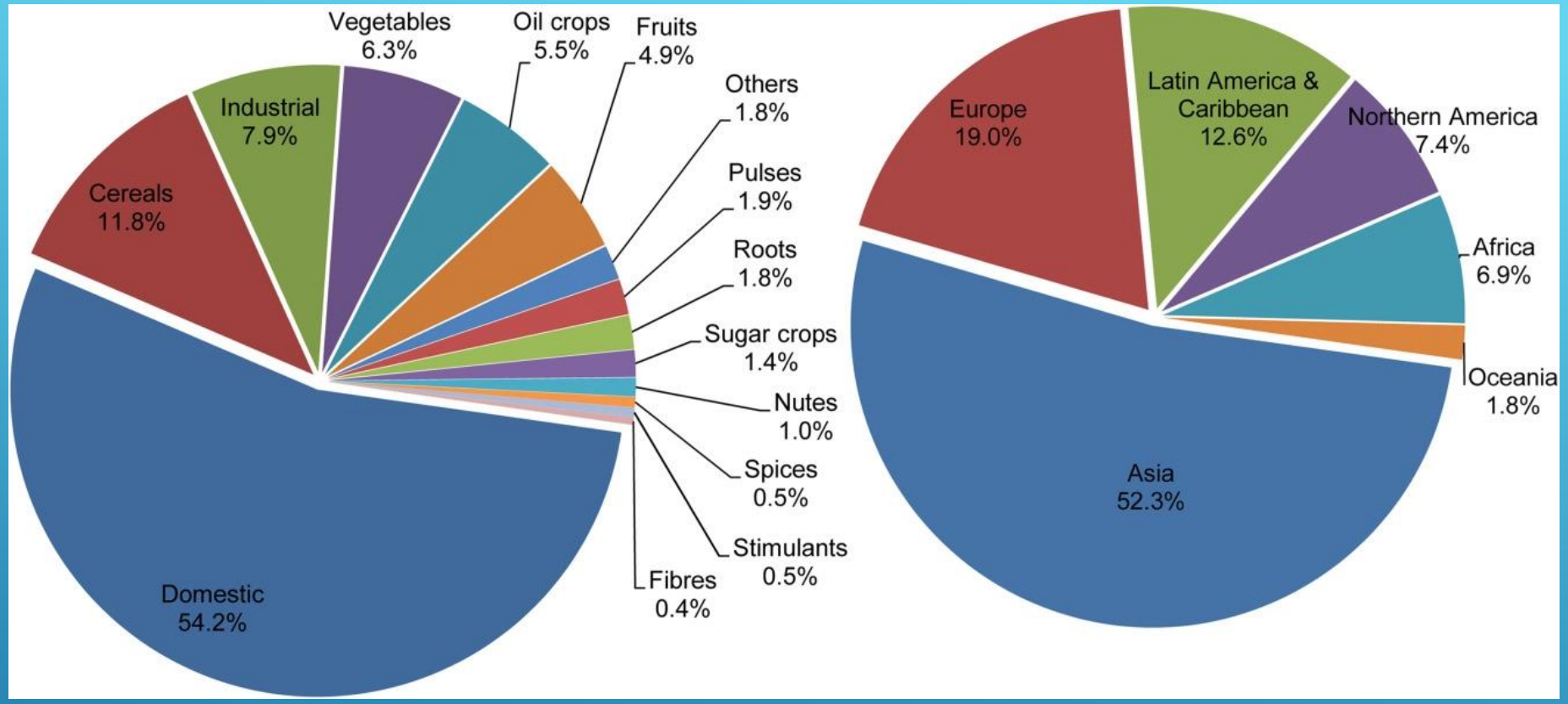
This breeding is practiced in our town Taranto, in Mar Piccolo.

In natural conditions the **mussel** (mollusc, commonly called mussel) tends to monopolize all the available sea surface, building one of the main components of the benthos.
Its abundance varies according to the depth (greater on the surface) and the season (maximum in the colder months) and usually the technique with floats is added to the cultivation on poles.

Mussel farming is one of the main productive activities of the city of Taranto. The importance of this activity is evidenced by the turnover of production, estimated at around 20 billion per year, and also plays a fundamental role for the workforce, creating employment for the youth groups most at risk. Production is divided between the Mar Grande (Great Sea) and the Mar Piccolo (Little Sea), even if the production capacity of the latter is ten times higher.

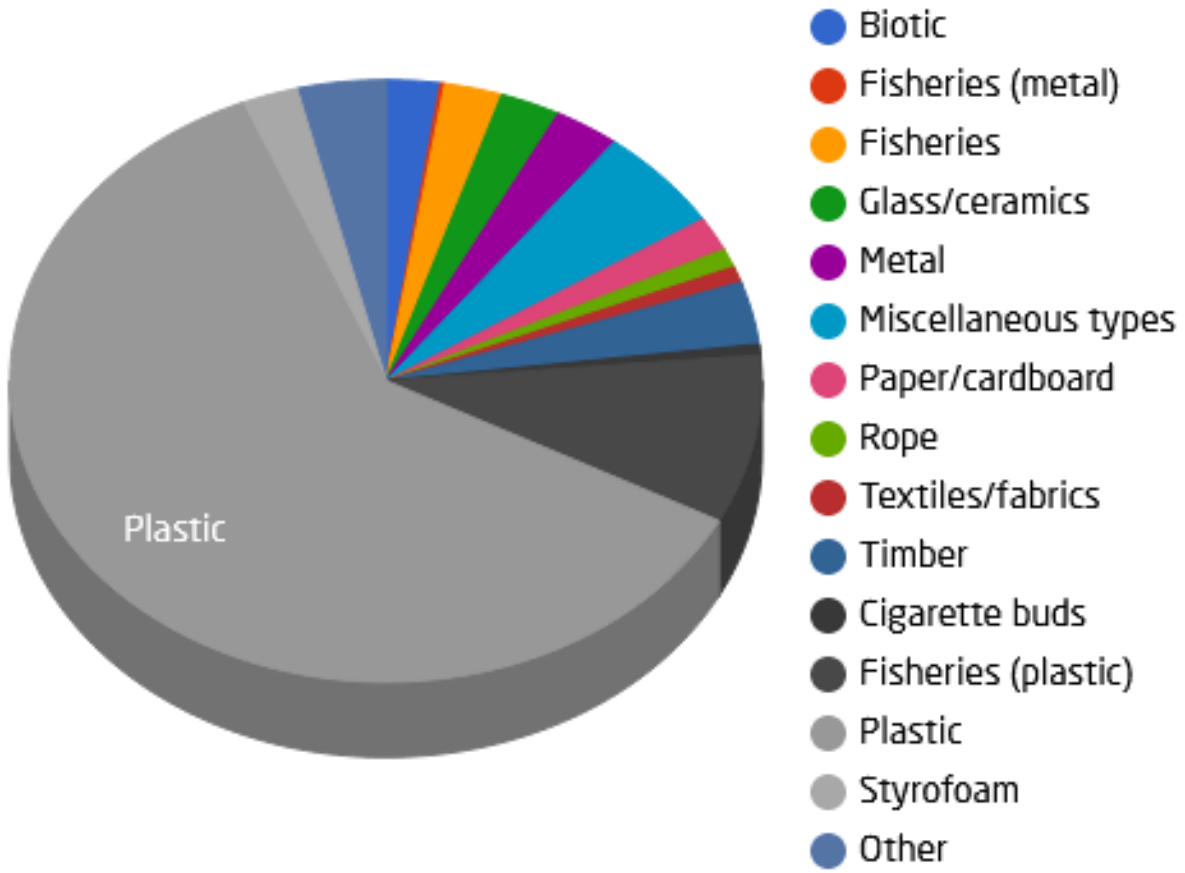

MATHEMATICS

Statistics on the marine ecosystem and Water pollution

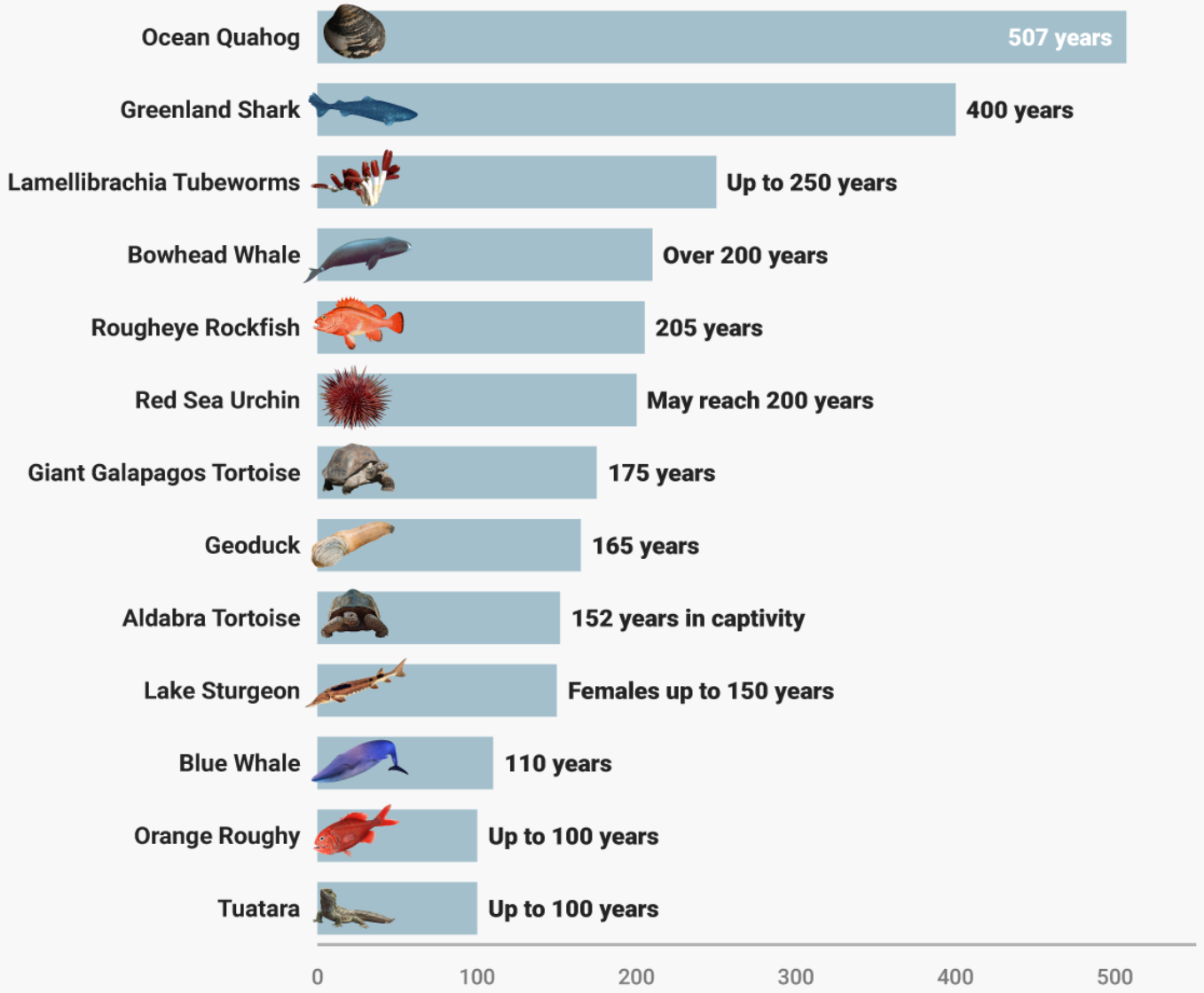


The figure shows the contribution of major products and regions to the total global human-induced P load to freshwater. The largest contribution to the global P load (54%) comes from the domestic sector, then agriculture (38%) and finally industry (8%). About 12% of the global P load is due to cereal production (4.3% wheat and 4.4% rice), vegetable production (6.3%), and production of oil crops (5.5%, of which 1.9% related to soybean and 1.1% to rapeseed). About 52% of the global anthropogenic P load occurs in Asia (30% China). The second polluter is Europe, contributing about 19%, followed by Latin America and the Caribbean (13%) and North America (7%).

Global composition of marine litter

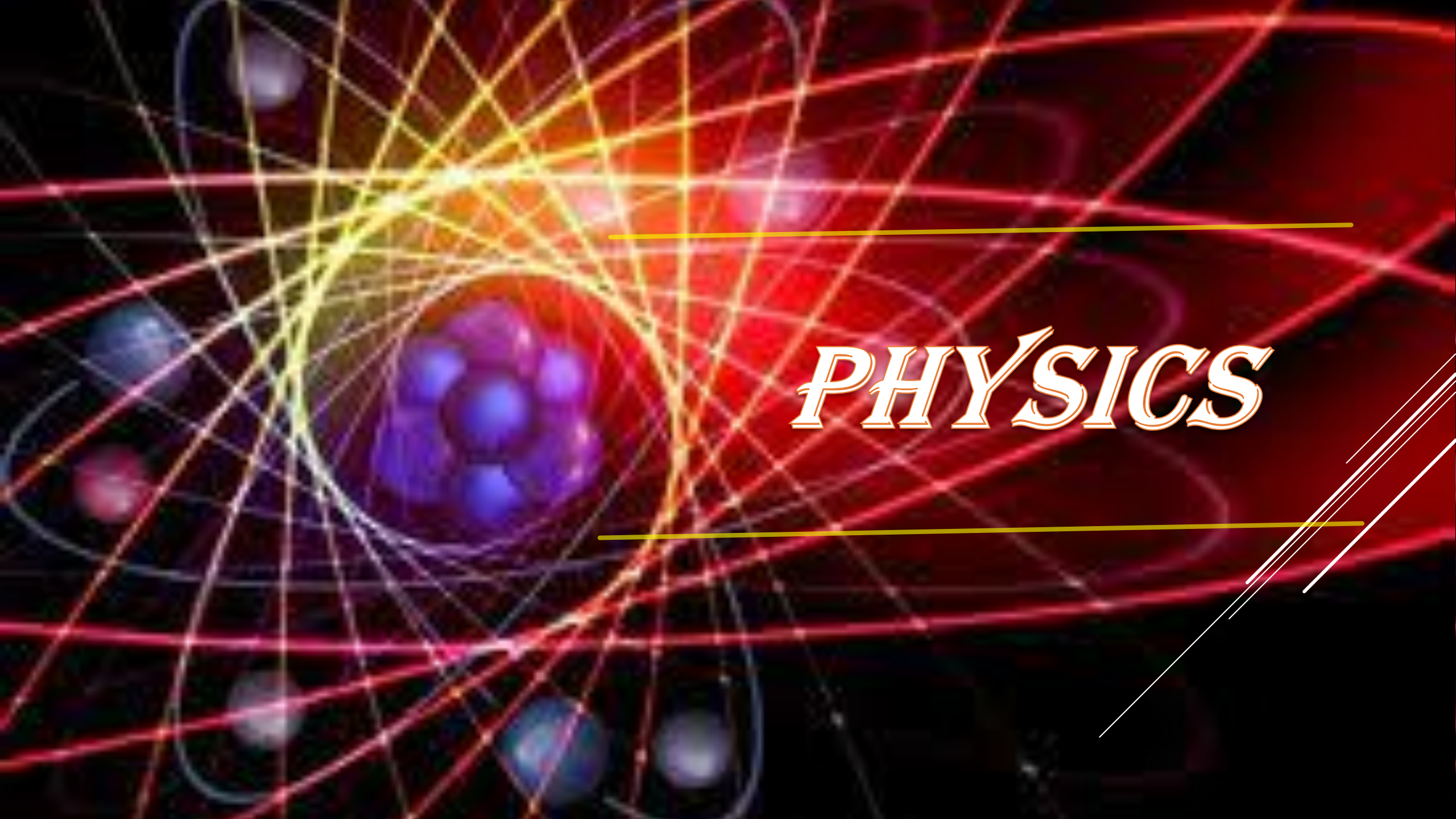


THE LONGEST-LIVING ANIMAL SPECIES

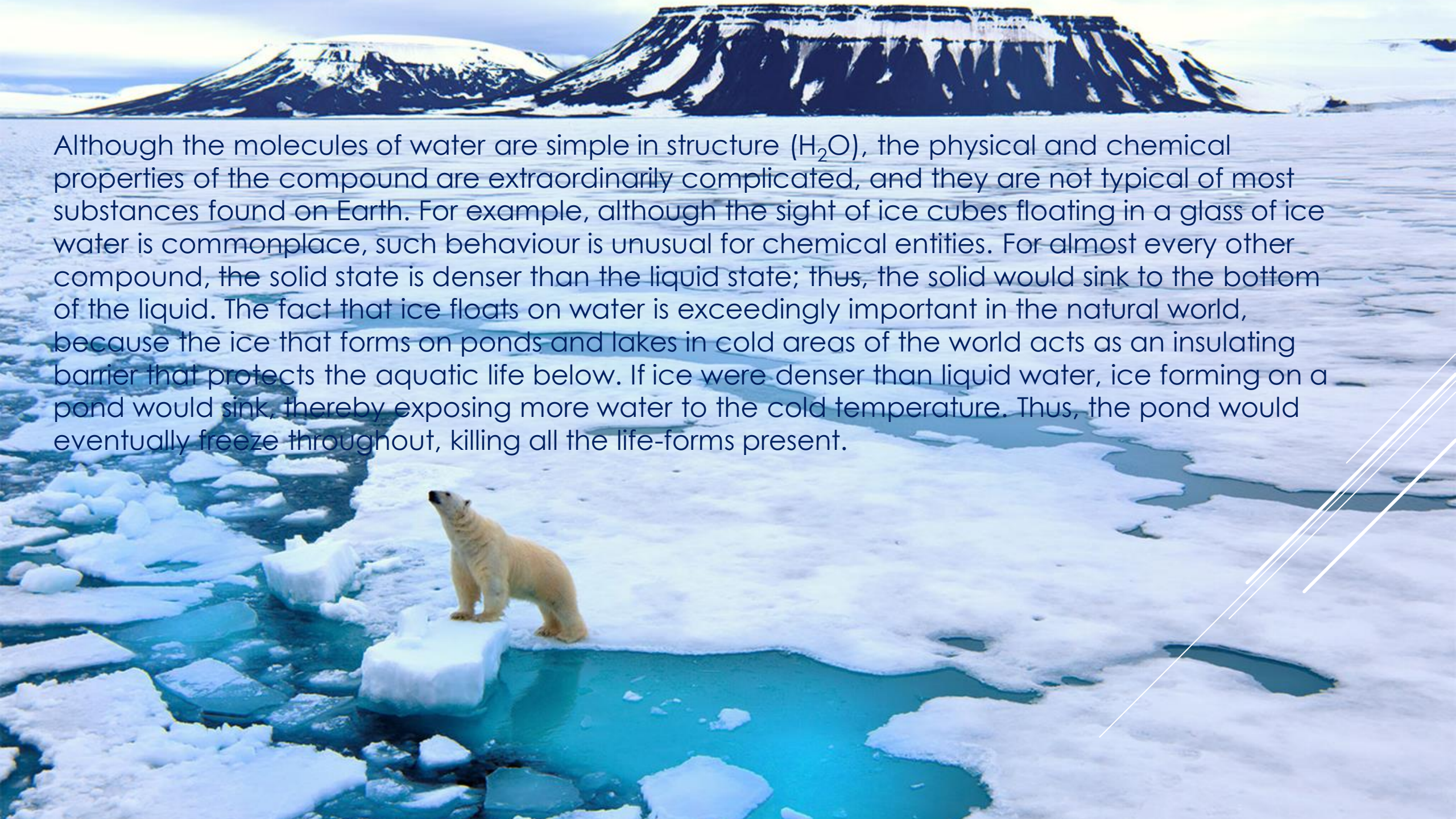


SOURCE: Alaska Fisheries Science Center, NOAA, CS Monitor, US Fishery Bulletin, National Geographic, Australian Zoo, University of Michigan, Oceana, Cosmos Magazine, Smithsonian National Zoo, Science News, Canadian Journal of Fisheries & Aquatic Sciences, WWF, New Zealand Department of Conservation, Wired, Penn State, Science, ScienceNordic

BUSINESS INSIDER

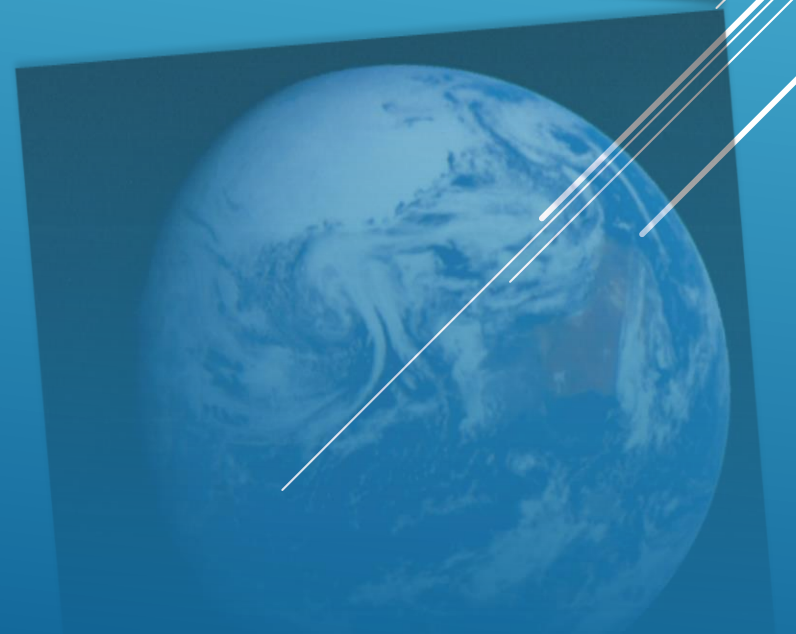

PHYSICS

Water, a substance composed of the chemical elements hydrogen and oxygen and existing in gaseous, liquid, and solid states. It is one of the most plentiful and essential of compounds. A tasteless and odourless liquid at room temperature, it has the important ability to dissolve many other substances. Indeed, the versatility of water as a solvent is essential to living organisms. Life is believed to have originated in the aqueous solutions of the world's oceans, and living organisms depend on aqueous solutions, such as blood and digestive juices, for biological processes. Water also exists on other planets and moons both within and beyond the solar system. In small quantities water appears colourless, but water actually has an intrinsic blue colour caused by slight absorption of light at red wavelengths.



Although the molecules of water are simple in structure (H_2O), the physical and chemical properties of the compound are extraordinarily complicated, and they are not typical of most substances found on Earth. For example, although the sight of ice cubes floating in a glass of ice water is commonplace, such behaviour is unusual for chemical entities. For almost every other compound, the solid state is denser than the liquid state; thus, the solid would sink to the bottom of the liquid. The fact that ice floats on water is exceedingly important in the natural world, because the ice that forms on ponds and lakes in cold areas of the world acts as an insulating barrier that protects the aquatic life below. If ice were denser than liquid water, ice forming on a pond would sink, thereby exposing more water to the cold temperature. Thus, the pond would eventually freeze throughout, killing all the life-forms present.

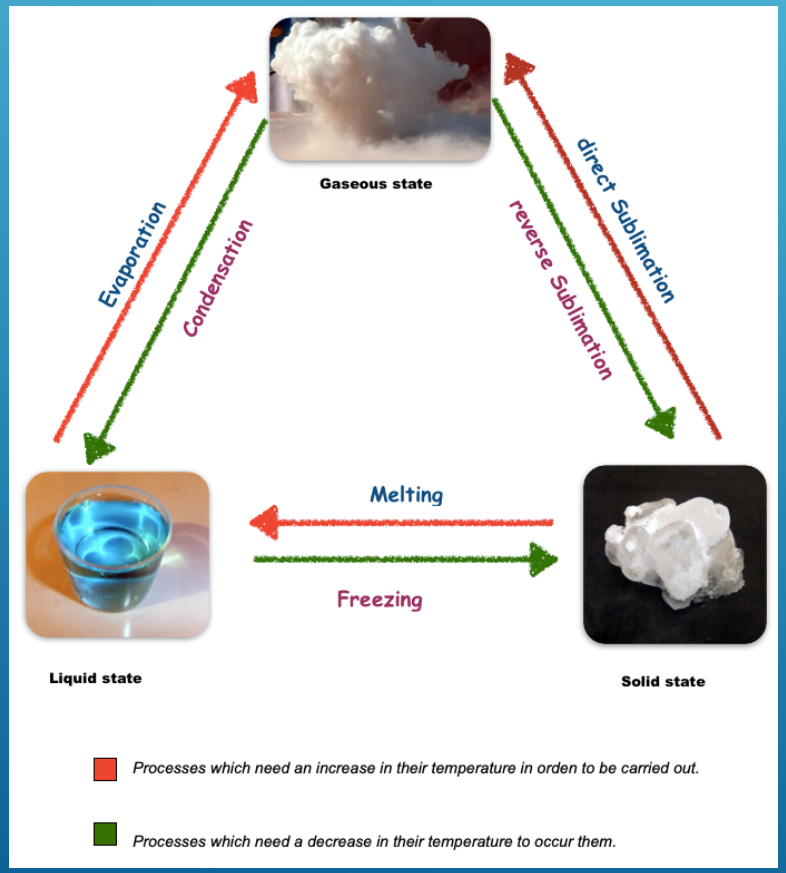
The water on the surface of Earth is found mainly in its oceans (97.25 percent) and polar ice caps and glaciers (2.05 percent), with the balance in freshwater lakes, rivers, and groundwater. As Earth's population grows and the demand for fresh water increases, water purification and recycling become increasingly important.



CHANGES OF STATES OF MATTER

In nature, we can observe changes of matter in a frequent way, like the well-known case of water, which can be found in solid, liquid and gaseous forms. Bodies can change from one state to another due to the effect that temperature and pressure produce on them, either increasing or decreasing said factors.

In a general and more visual way, we can understand the different changes of state through the subject can pass:



Progressive changes of state: They occur when we increase the temperature of their bodies through the application of heat, such as: melting, evaporation and direct sublimation.

MELTING

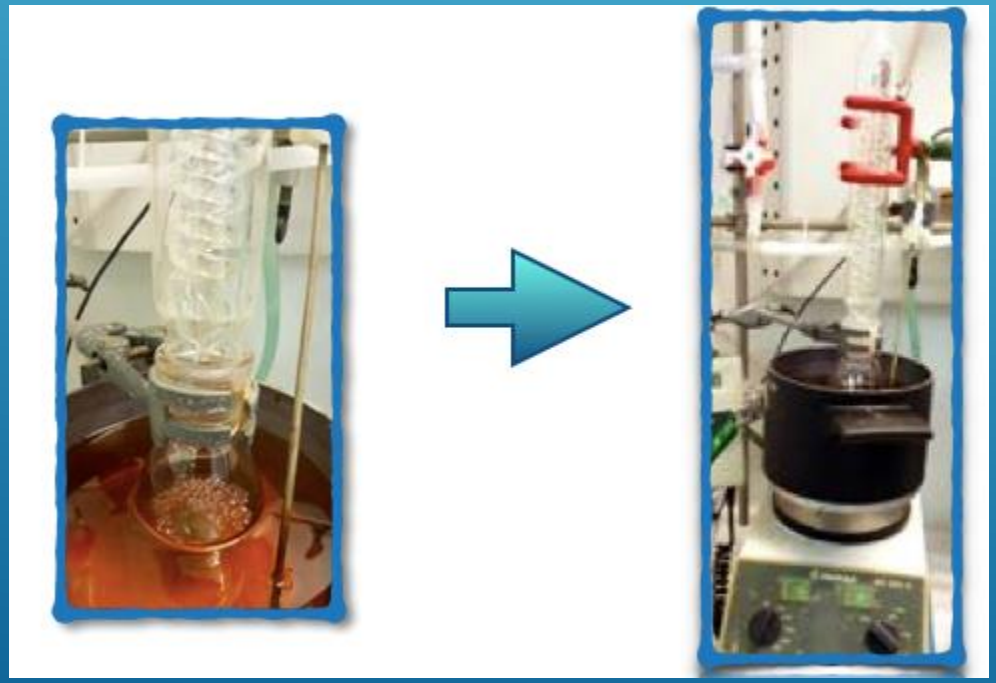
Melting: It is the change from the solid state to the liquid state through the application of heat. The temperature at which this process occurs depends on each substance, being called at said temperature "Fusion Point". In the case of gold, for example, it is 1064° C while in the case of ice it is 0° C.

EVAPORATION

Evaporation: It is the change form the liquid state to the gaseous state. This process can occur at room temperature, only passing the particles from the surface to the gaseous state. If heat is applied both the particles of the surface and those of the interior can go into the gaseous state. The temperature necessary to reach this point is called the "Boiling Point" and is characteristic of each substance. For the case of silver it is 2162 °C, while in the case of water it is only 100 °C.

REFLUX

In a properly adapted laboratory there are different ways to perform this process. One of them is through the REFLUX, where with a heating plate, we increase the temperature of the substance in liquid state, until reaching its boiling point. At this temperature steam starts to rise up the column and we can then condense it again to pick it up if we are interested on it.



DIRECT SUBLIMATION

Direct Sublimation: It is the change from the solid state to the gaseous state by an increase in the temperature. In nature there are some substances that can undergo such transformation as for example metal iodine, sulfur, dry ice or benzoic acid among others. If we study the case of dry ice (CO2) in the laboratory, we can see that the transformation is immediate when we add a few drops of ethanol.

LIOFILIZATION

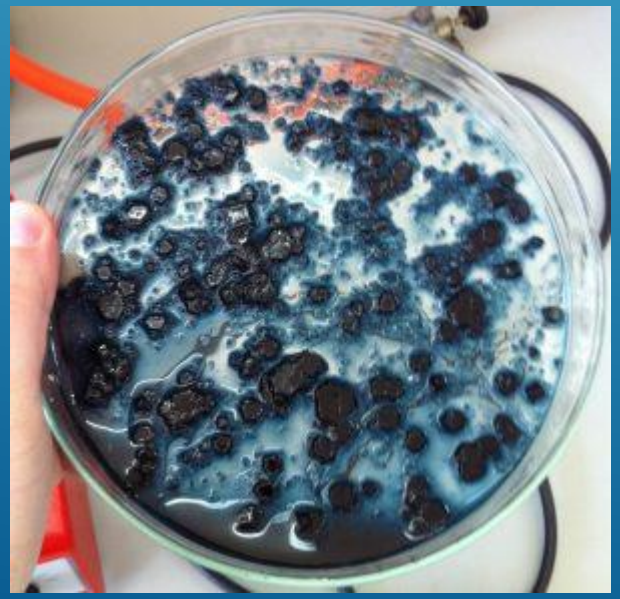
Industrially, this process can be carried out quickly and effectively, thanks to the “lyophilizer”.

With the LIOFILIZATION we can eliminate the water present in solutions due to the conditions of low pressure and low temperature that the equipment facilitates us. The present water is removed by freezing and subsequent sublimation of the ice. When the machine supplies heat, the ice passes from its solid phase to the gaseous one without reaching the boiling point of the water and therefore without passing through the liquid phase.

Regressive state changes: They are those which occur when the temperature of the bodies decreases, that is, they are colder, such as: solidification, condensation and regressive sublimation.

SOLIDIFICATION

It is the passage of a substance from the liquid state to the solid state. For this process to occur, the substance must reach a certain temperature known as the "Freezing Point" and, because of this process is the reverse of the melting point, it coincides with the temperature of the Melting Point. In our daily lives we see sometimes this process with the water, which forms ice when we lower its temperature. But in the laboratory we can perform many solidifications, the best known is CRYSTALLIZATION.



Crystallization is a technique widely used in the laboratory to purify substances that normally contain impurities. A substance that crystallizes easily is KH2PO4 (monopotassium phosphate) after making a saturated solution of said compound with hot water.

LET'S DO AN EXPERIMENT:

Crystallization of KH2PO4

A satured solution of approximately 3,5 g of mono potassium phosphate in 20 ml of hot water is made.

After the complete dissolution of the mixture and without waiting for it is cold, it is poured over the container.

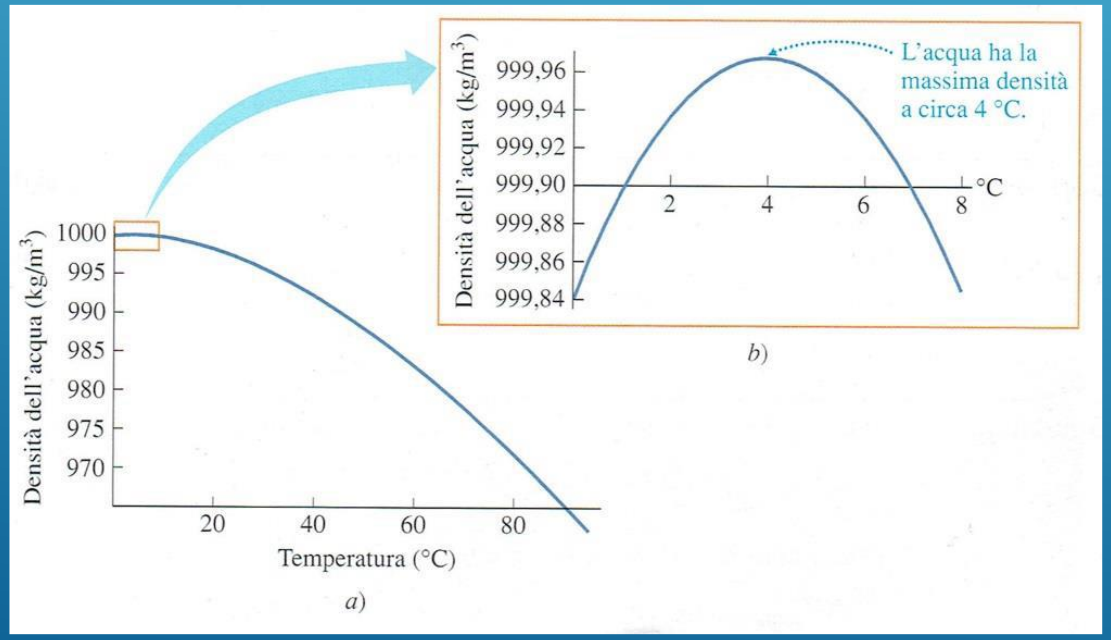
The saturated solution begins to ascend through absorption by the paper and as it cools, crystallization takes place acquiring the green hue due to the color previously used in the paper.

The crystallization ends when all the monopotassium phosphate solution has been consumed.

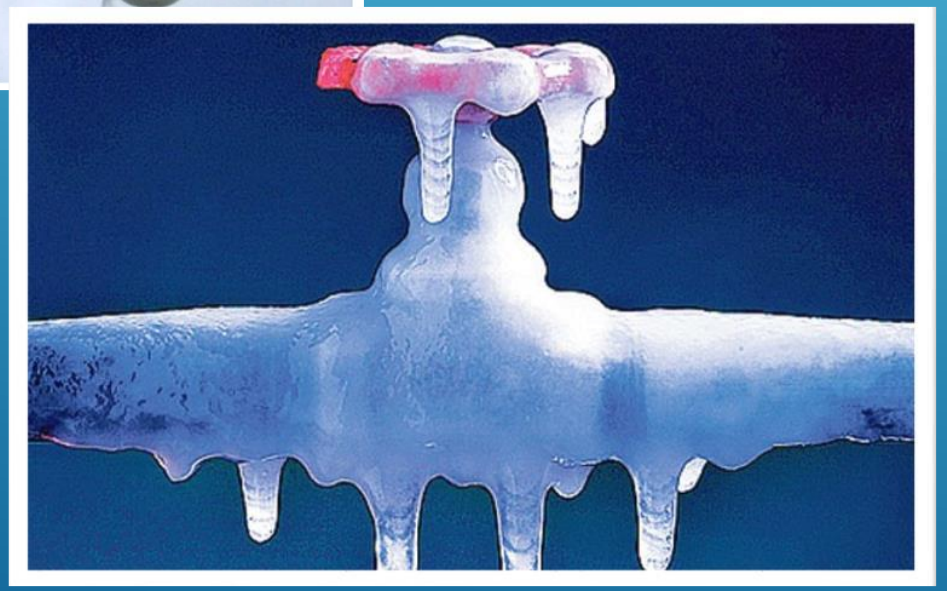
WATER DENSITY

The density of water is the weight of the water per its unit volume, which depends on the temperature of the water. The usual value used in calculations is 1 gram per milliliter (1 g/ml) or 1 gram per cubic centimeter (1 g/cm^3). While you can round the density to 1 gram per milliliter, there are more precise values for you to use.

The density of pure water actually is somewhat *less* than 1 g/cm^3. A standard table lists the values for the density of liquid water. Note that water can be supercooled and remain a liquid well below its normal freezing point. The maximum density of water occurs around 4 degrees Celsius. **Ice is less dense than liquid water, so it floats.**



This particular water behavior has significant consequences for the ecology of lakes in northern latitudes: when temperatures drop in winter, the surface waters of a lake cool more rapidly than those below and sink, allowing the hot water to rise to the surface to be cooled in turn.

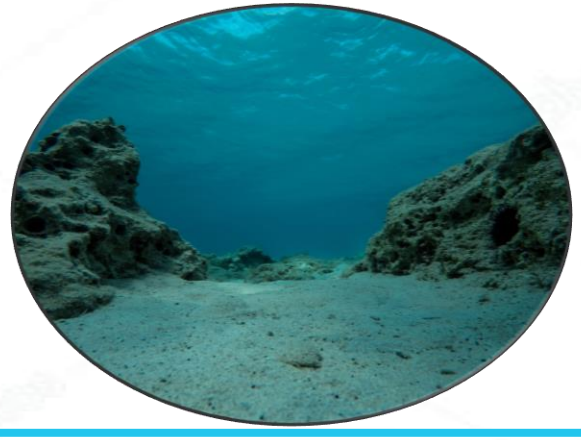


The same physical phenomenon is responsible for damage to water pipes in winter: even if a pipe is made of steel, it is often not strong enough to resist when the ice that forms inside it expands due to a strong lowering of the water. temperature.

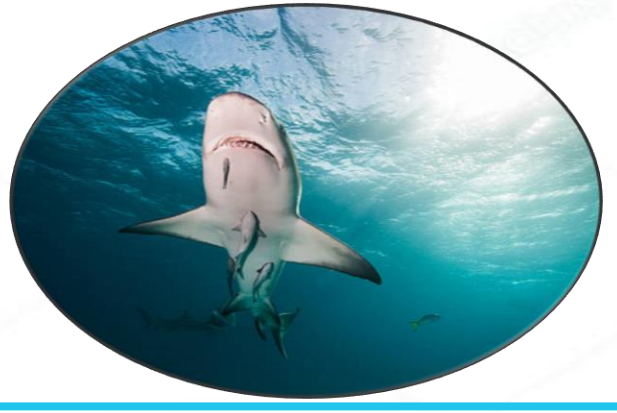
ENGLISH

MARINE ECOSYSTEM

Is made up of

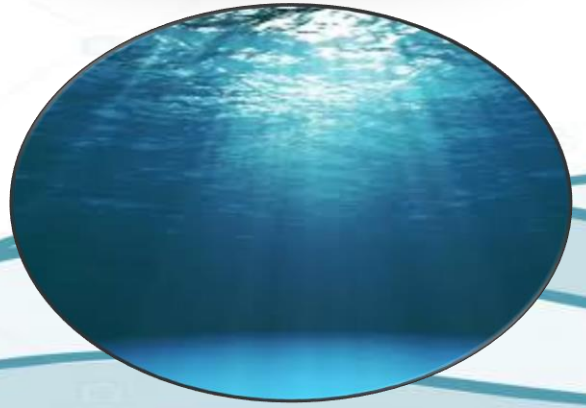


Non-living structures



Interaction with others

Living organigm



Habitat

Over 80% ofmarine pollutioncomes from land-basedactivities

POLLUTION:

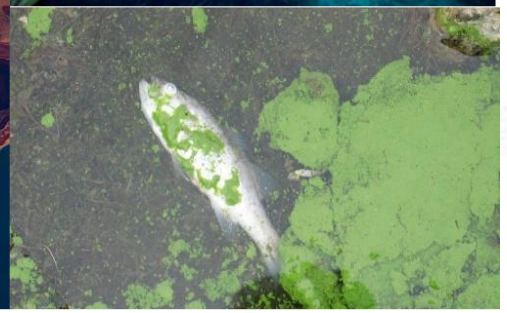
CAUSES



1. Industries and toxic chemicals
2. Land fills
3. Oil tankers
4. Fertilizers
5. Sewage disposals

EFFECTS



1. Toxic chemicals entering the food chain
2. Seas of plastic and garbage (trapped animals)
3. Oil spills
4. Eutrophication

https://www.youtube.com/watch?v=yaDx-WJAsaE trapped animals
https://youtu.be/Sp572udnPVg us commission 2015

SOLUTIONS:

What can we do? There are a few key steps that never hurt to repeat.

CLEAN UP YOURSELF

If you're on the beach or at the park, be mindful of a "leave with what you came with" policy.

RECYCLE

Recycle in your own home through separate collection of waste.

JUST SAY NO TO PLASTIC

Cut down on the amount of plastic you're consuming.

OUR STUDENTS AS POETS

WATER INSIDE US

Tears are the bitterest water I know,
But we all have tidal waves inside us.
The sea hates who is coward,
Facing the waves is an adventure,
We can create a paper boat
To navigate our heads.

The rain in our heart is a symphony,
And when it falls, it becomes music.
Stare the shape of the clouds,
And the summer hailstorms are sights.
We can smile without umbrellas
Dancing under the rain.

Because water is salt
If life were the ocean.

FILIPPO PAVONE 2L

Water is life

Water is peace and quiet at the same time
Water is honest
It gives us a lot of things
but, it doesn't ask anything
Water is indispensable
Water is a resource for us
We take advantages from it
But, it doesn't ask anything
We have a gift in our hands
But we are wasting it
And it doesn't keep anything from us
I don't know why, but
I'm sure that in the future, if we continue to waste it
We'll understand what is the world without it

Jacopo Odone 2 L

WATER ON EARTH

I will tell you something obvious:
Water is blue
Water is wet
And that is obvious too.
In water fish live
And whales and sharks,
In water dolphins live
And sun rays that spark.
Water is made
Of hydrogen and oxygen,
Kept together with the strongest bond.
Water bonds people
When they play on the shore
But water destroys and kills too
And there is nothing water cannot break.
Water does everything
And that is why it is obvious, but great.

Di Luzio Fabia
Patrono Giada

OUR INCREDIBLE PRESENT

Water is fresh
Water is like blue eyes
Water is life

We have to protect her
And then she loves us
And the Earth becomes better

Water is like the time
Water is like a diamond
Water is an incredible present

Andrea Schiavone 1^M

WATER IS LIFE

Water is the matter of life
There is no life without water

Clear and silky
Valid and precious

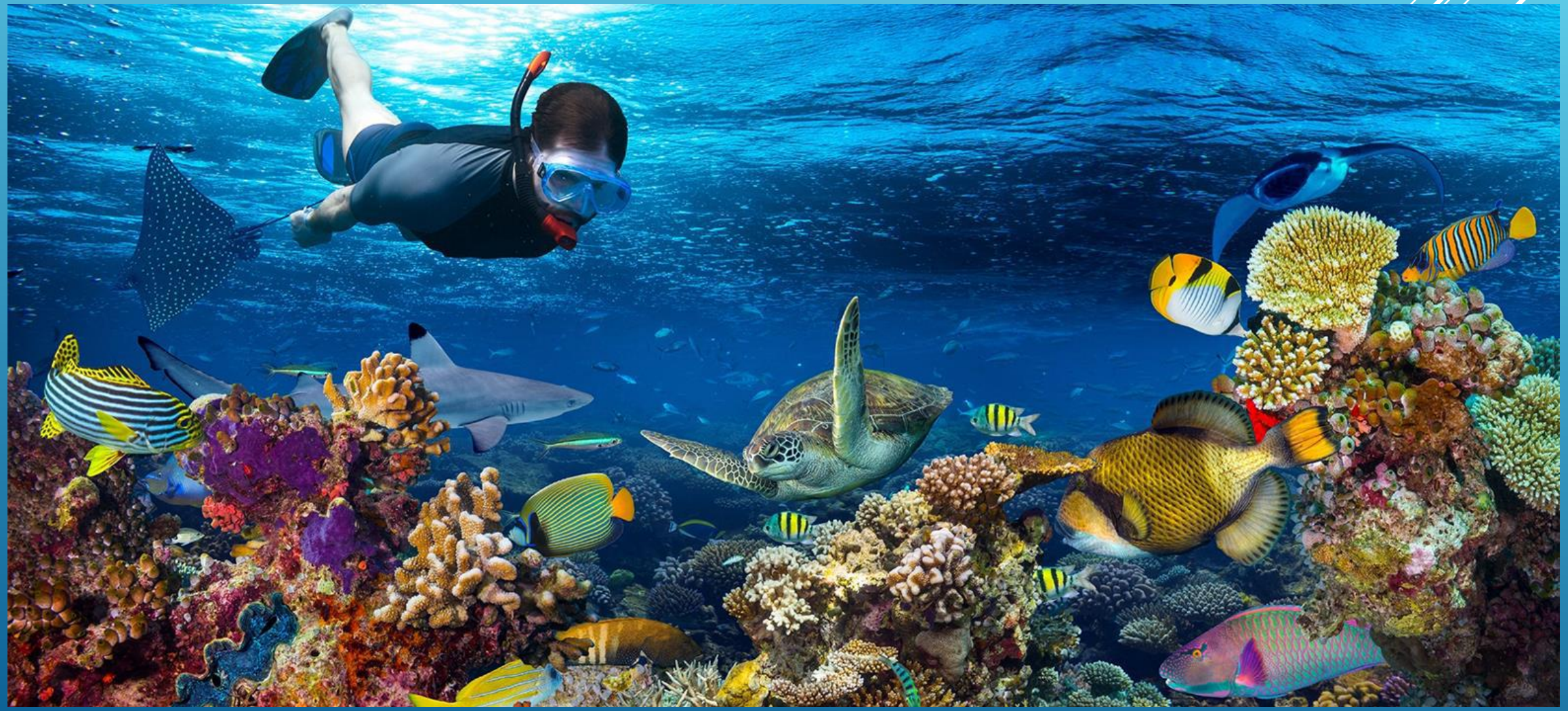
Fluent and noisy
Bright and joyful

Pure, fresh and clean
Useful to save your life

Emanuela Maria Mandurino 1M


PHYSICAL EDUCATION

SNORKELING



WHAT IS SNORKELING?

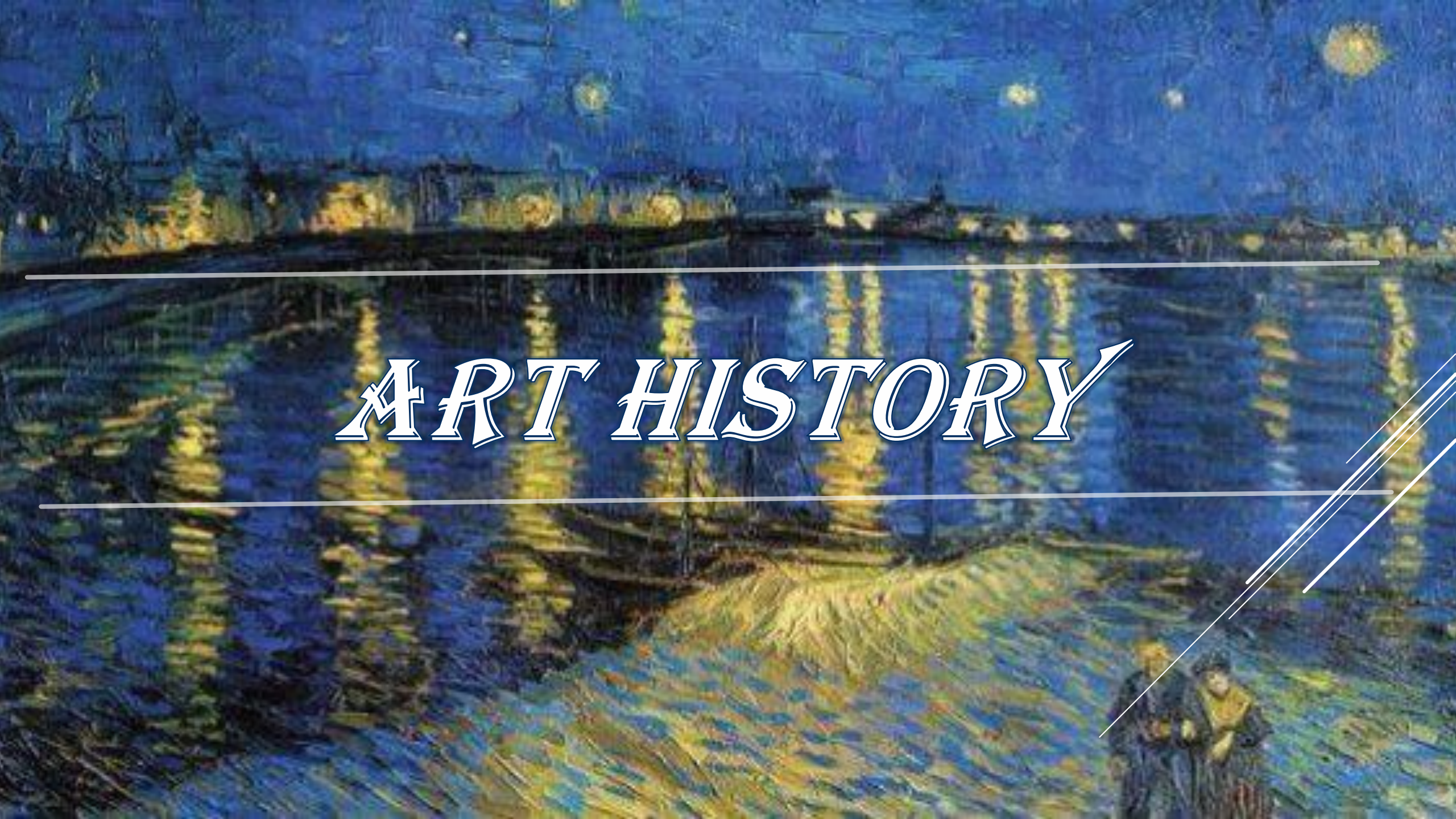
The term snorkeling means swimming on the surface (a few tens of centimeters) using the snorkel or aerator (in English: snorkel), with the sole purpose of **observing** the seabed with the respective fauna.

The **snorkeler** is a curved tube of plastic material, used in diving that has one of the two ends ergonomically molded and made of silicone, so that it can be inserted in the mouth in a more comfortable way. There are two variants of this tool, one without and one with a vent valve, which is a valve that removes residual water from the tube to allow the *snorkeler* to breathe better.

Generally it is used combined with a **diving mask** and a pair of short blade pinnea.

SNORKELING IN THE “MAR PICCOLO”

The Mar Piccolo of Taranto, an ideal place to snorkel, allows you to admire its small extraordinary inhabitants and give free rein to underwater photography.
Its underwater environment offers breathtaking scenery, old mussel farming poles are covered by an extraordinary, complex and colorful community, consisting of algae and filtering animals, including soft sponges, sea squirts, spirographs and showy filtering apparatuses that help purify the sea water.
And among the gigantic gatherings that surround the poles, tiny nudibranchs with exceptional liveries crawl and fish, multicolored blenny and magnificent marine valleys swim.


ART HISTORY

THE BEACH AND THE SEASIDE: A SOURCE OF ARTISTIC INSPIRATION

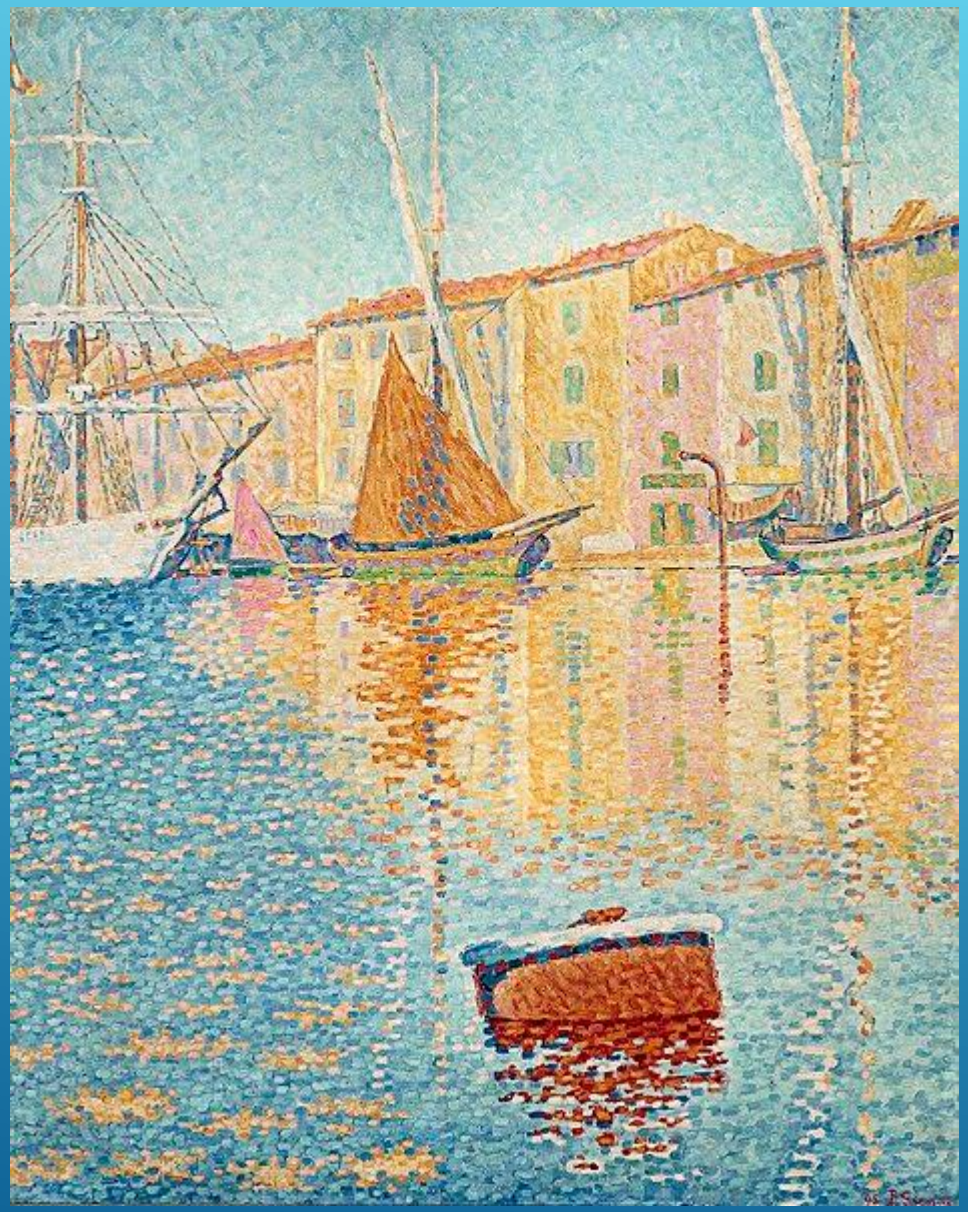
William Merritt Chase, *Au bord de la mer*, 1892

The possibilities are endless when attempting to depict the beach. The seaside is an ever-changing landscape; its consistent motion has made it a great source of inspiration for many artists. This particular theme is well-liked, especially for its artistic beauty and the duality between land and sea. By representing the beach, artists not only practice their art but also share their emotions.

THE SEA: AN ARTISTIC STUDY

In art history, the seaside is a popular destination of artists when studying color, light, and movement. Many painters have tried capturing the atypical lightening, which is often steady in the sky and shaky in the sea. Sea canvas art is a very relatable theme for those who seek to represent " true nature". In the second half of the 19th century, the impressionists and the post-impressionists dedicated much of their works to the study of this colorful and wavering light, easily found in seascapes. They aimed to capture nature's fugacity and believed that this fleeting moment could still be alive.

Claude Monet, *Mer agitée à Étretat, 1883*



Paul Signac, *La bouée rouge*, 1895

At the same time, the divisionists developed a particular technique to entrap beams of light in their canvas using individualized color separation. By juxtaposing side-by-side colors, they appear to merge in the eyes of the spectator, creating a unique visual experience.

THE BEACHE'S JOY

Beach often relates to heat, sand, and holidays and many artists had this same vision of leisure and summer fun! Within the endless styles and trends of art history, Edward Henry Potthast and Joost Wensveen have commonly attempted to immortalize this fleeting moment of happiness. In doing so, they've created something durable, and everlasting memory.

American impressionist, Edward Henry Potthast, portrays a close-up family portrait demonstrating lively movements in *The Bathers*.

The contemporary artist Joost Wensveen, from the Netherlands, uses a very particular technique for his beach photography. To have a natural and spontaneous effect, the artist used the combination of multiple shots in his photography. He shot a scene during 30-minute intervals and merged them into a single artwork. In doing so, he shows a simple pleasure for all.

Joost Wensveen, *Le grand saut*, 2017

THE SEASIDE IN DANGER?

With the reality of sea pollution, contemporary artists are confronted with environmental threats and have protested this environmental injustice through their works. Seaside and beaches may become an old souvenir once pollution consumes the spaces.
Artists like Mandy Barker, use old plastic garbage found in the sea or on the beach as her art's subject and medium. This photographer is well known for her environmental engagement. Her artwork is intriguing with its airy aesthetic exposing the pollution situation.

Mandy Barker, *Snowfall On Christmas Island, Commissions*, 2016