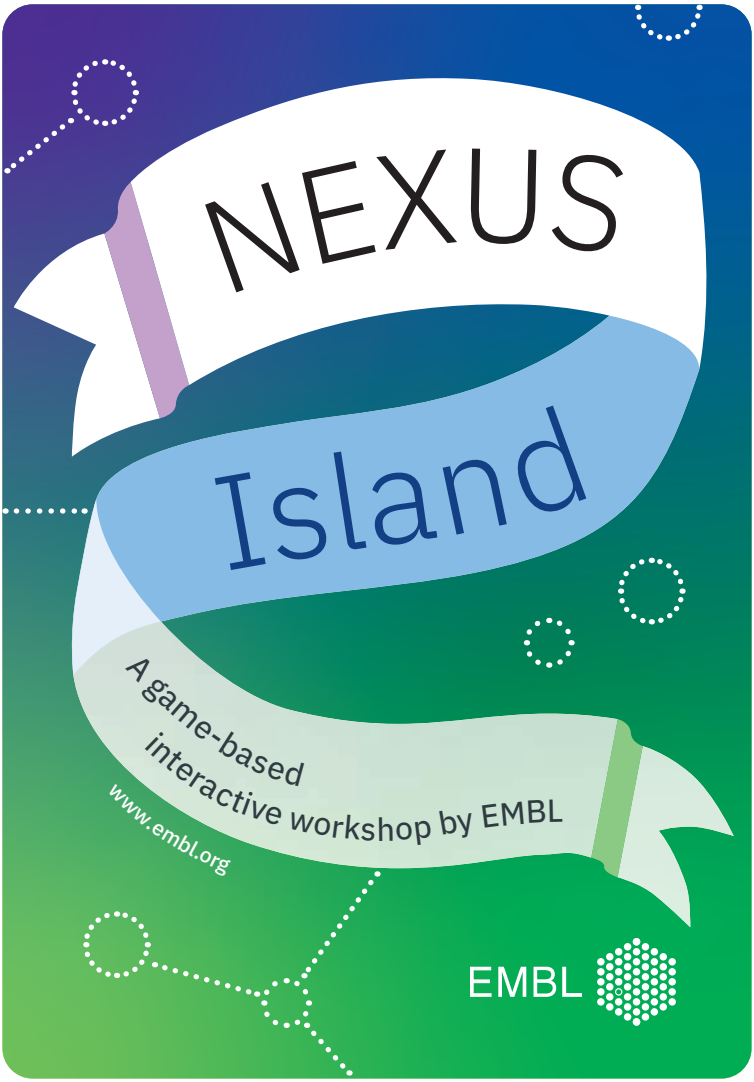
NEXUS
Island
A game-based
interactive workshop by EMBL
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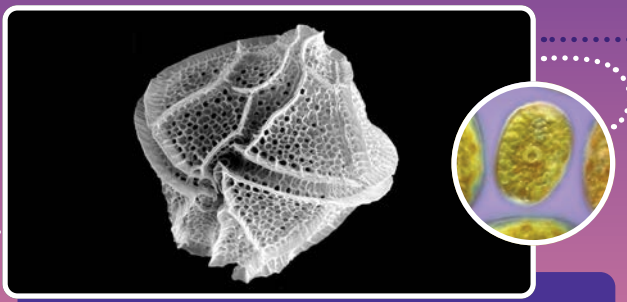
Ocean Glow

Latin name: Lingulodinium polyedra

Eukaryotes

Ocean Glow are algae that can cause red tides. To grow, they need vitamin B1 and B12, but they can't produce them themselves. One way of getting these vitamins is living together with bacteria who produce them.



Where do you find them?
Sea

Who do they live with?
Bacteria that produce vitamins like Dinoshiba

SUPERPOWER Glow in the dark

WEAKNESS Need vitamin B1 and B12 to grow

Visible to naked eye

Invisible — 50 µm — Visible

Tolerance to pollutants ?

Intolerant — Tolerant

Especially during the night, Ocean Glow can emit a blue-green light making the waves glow blue when they break.

EMBL

Speedies

Latin name: Obama nungara

Eukaryotes

Speedies are flatworms from South America. They have been extremely successful at making a life in Europe and are considered a danger for local worms and snails, because Speedies eat them.

Where do you find them?
Soil

Who do they live with?
They like their independency

SUPERPOWER Unstoppable travellers

WEAKNESS Don't like mountains

Visible to naked eye

Invisible — 7 cm — Visible

Tolerance to pollutants ?

Intolerant — Tolerant

Speedies have hundreds of eyes all over their bodies.

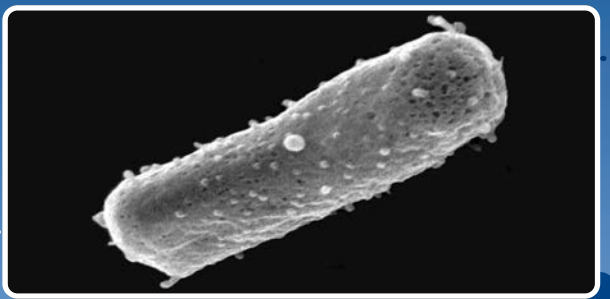
EMBL

Halos

Latin name: Halobacteriaceae

Archaea

Halos are microorganisms living in the sea. Their red-pink pigmented members are best known for causing the reddish colour of their large blooms. These archaea also produce vitamins that are good for humans.



Where do you find them?
Sea and beaches

Who do they live with?
Unknown

SUPERPOWER Thrive in extremely salty water and tolerate heavy metal pollution

WEAKNESS Will not survive in less salty waters

Visible to naked eye

Invisible — 5 µm — Visible

Tolerance to pollutants

Intolerant — Tolerant

Halos may be candidates for life on Mars, because they can develop a thin crust of salt to reduce the effect of the harmful UV light.

EMBL

Teen Platys

Latin name: Platynereis dumerilii – juvenile stage

Eukaryotes

Teen Platys stay under rocks or algae, catching food as it goes by. The juvenile stage of this worm uses its jaws to eat algae and seagrass. Scientists study them to figure out changes in the environment.

Where do you find them?
Sea

Who do they live with?
Seagrass, seaweeds and algae

SUPERPOWER Extending their jaws

WEAKNESS Many animals eat them

Visible to naked eye

Invisible — 0.5 mm — Visible

Tolerance to pollutants ?

Intolerant — Tolerant

Do not try to raise them in captivity: if you don't give them enough food, the Teen Platys become cannibals and eat each other.

EMBL

Algae-Handlers

Latin name: Radiolaria

Eukaryotes

Algae-Handlers are organisms living inside beautiful mineral shells that they share with algae. Algae-Handlers keep these algae in their shells to harvest and consume the food they make.

Where do you find them?
Sea

Who do they live with?
Polaris

SUPERPOWER Can live in open ocean waters poor in nutrients

WEAKNESS Cannot survive without its algae

Visible to naked eye

Invisible — 100-500 µm — Visible

Tolerance to pollutants ?

Intolerant — Tolerant

Algae-Handler shells accumulate on the bottom of the ocean and stay there as microfossils. They are used to gather information about past oceanic life.

EMBL

Salty-Or-Not

Latin name: Procerodes littoralis

Eukaryotes

Salty-Or-Not are soft-body flatworms. They can live on shores where sea and freshwater meet. This makes Salty-Or-Not useful organisms for studying the impact of changes in both environments.

Where do you find them?
Sea and shores: underneath rocks or on seaweeds

Who do they live with?
Other small organisms like snails

SUPERPOWER Can live in salty water (sea) and freshwater

WEAKNESS Cannot live without both environments

Visible to naked eye

Invisible — 7 mm — Visible

Tolerance to pollutants

Intolerant — Tolerant

Salty-Or-Not like to speak English: they are the most common flatworms on the coasts of Britain.

EMBL

Seahorse

Latin name: Hippocampus erectus

Eukaryotes

Don't let the unique look of Seahorse fool you! They are actually a fish and feed on smaller sea animals. Did you know that Seahorse feel distressed by sound pollution in the sea caused by humans?

Where do you find them?
Sea

Who do they live with?
Vinfecto

SUPERPOWER Difficult to spot: they are masters of disguise

WEAKNESS Vibrio bacteria make them sick

Visible to naked eye

Invisible — 19 cm — Visible

Tolerance to pollutants

Intolerant — Tolerant

Male Seahorse are the ones carrying out the pregnancy.

EMBL

Sea Bees

Latin name: Idotea balthica

Eukaryotes

Sea Bees are tiny sea organisms that share some traits with crabs and shrimps. They help pollinate red algae, a type of seaweed, moving from one red algae to the next, just like an underwater bee!

Where do you find them?
Sea: on seaweed close to rocky shores

Who do they live with?
Seaweed

SUPERPOWER Underwater pollinator

WEAKNESS Might be harmed by microplastic

Visible to naked eye

Invisible — 4 cm — Visible

Tolerance to pollutants

Intolerant — Tolerant

Sea Bees use the seaweed as shelter against animals that want to eat them, while feeding on crunchy organisms (diatoms) that live on the seaweed's surface.

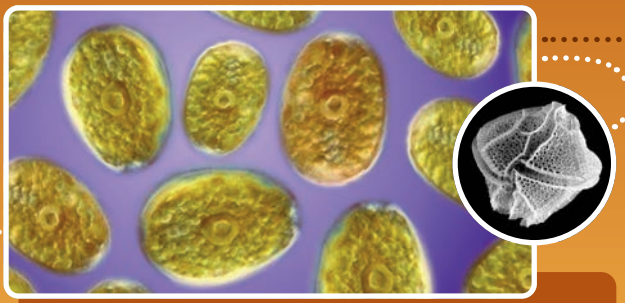
EMBL

Dinoshiba

Latin name: Dinoroseobacter shibae

Bacteria

Dinoshiba are microorganisms that can live without oxygen and use waste products of algae to grow. These bacteria produce vitamin B1 and B12 that are essential for the growth of algae like Ocean Glow.



Where do you find them?
Sea

Who do they live with?
Algae like Ocean Glow

SUPERPOWER Produce vitamin B1 and B12

WEAKNESS Unknown

Visible to naked eye

Invisible — 0.7 µm — Visible

Tolerance to pollutants ?

Intolerant — Tolerant

Part of the Latin name of Dinoshiba shibae comes from the name of the scientist, Tsuneo Shiba, who played a key role in the study of sea bacteria.

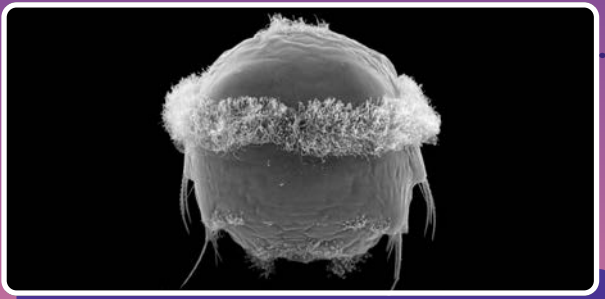
EMBL

Baby Platys

Latin name: Platynereis dumerilii – larvae stage

Eukaryotes

Baby Platys are the baby stage of a worm that lives in the sea. These annelid worms have very simple eyes. They use their little arms (cilia) to swim.



Where do you find them?
Sea

Who do they live with?
Their Baby buddies

SUPERPOWER Swimming with their thousands of cilia

WEAKNESS Many animals eat Baby Platys

Visible to naked eye

Invisible — 200 µm — Visible

Tolerance to pollutants

Intolerant — Tolerant

Baby Platy larvae don't feed until after they are six days old.

EMBL

Seagrass

Latin name: Posidonia

Eukaryotes

Seagrass are flowering plants. By using sunlight, water and carbon dioxide gas, they create food for themselves and for other organisms (for example fish) that humans consume.

Where do you find them?
Bottom of the sea

Who do they live with?
Platy

SUPERPOWER Produce oxygen gas and shelter other animals

WEAKNESS Sensitive to pollution

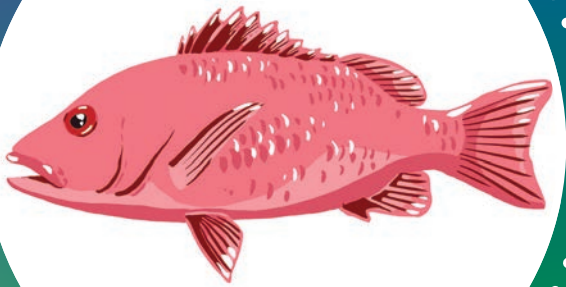
Visible to naked eye

Invisible — 1 m — Visible

Tolerance to pollutants

Intolerant — Tolerant

Seagrass are named after the God of the Sea, Poseidon (check their Latin name). Their floating fruits are known as "olives of the sea" in Italy.



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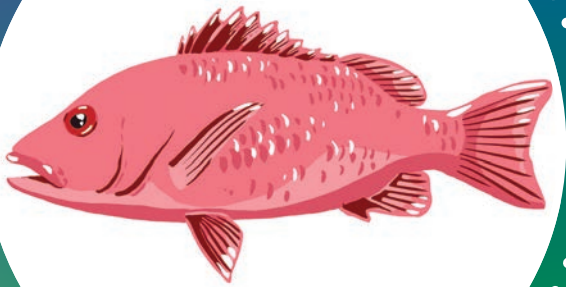

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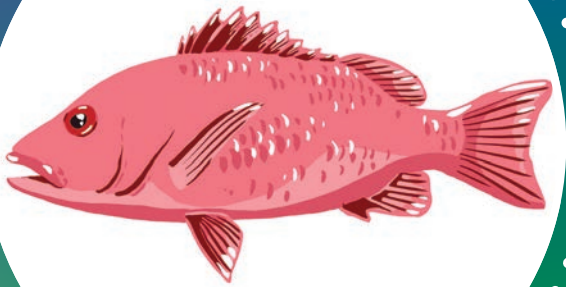

EMBL

Pop-Heads

Latin name: Girardia tigrina

Eukaryotes

Pop-Heads are flatworms from America. They are avid eaters, and so since coming to Europe they took over the natural homes of a few local flatworms. If their head is cut, they can regrow it in 6 days!

Where do you find them?
Freshwater: underneath rocks or dead leaves

Who do they live with?
Undisclosed

SUPERPOWER Can regrow their heads

WEAKNESS Don't like winter

Visible to naked eye

Invisible — 1 cm — Visible

Tolerance to pollutants

Intolerant — Tolerant

From America, Pop-Heads managed to get also to Japan.

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EMBL

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Latin name: Phaeocystis

Eukaryotes

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Where do you find them?
Sea and sea ice

Who do they live with?
Algae-Handlers

SUPERPOWER Produce oxygen gas and sulphur substance

WEAKNESS Unknown

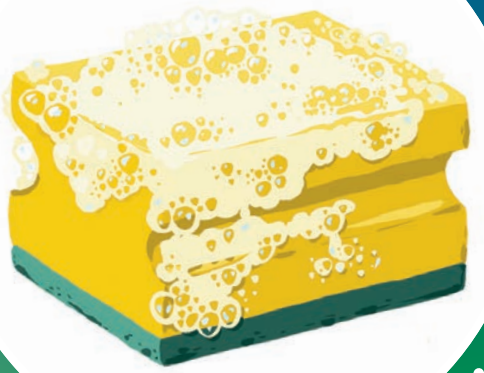
Visible to naked eye

Invisible — 5 µm — Visible

Tolerance to pollutants ?

Intolerant — Tolerant

The quantity of sulphur substance that these Polaris produce can affect cloud formation and climate regulation.



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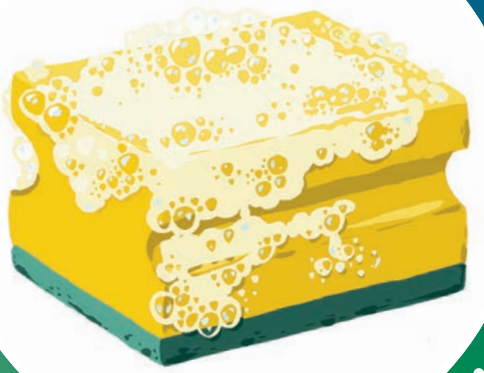


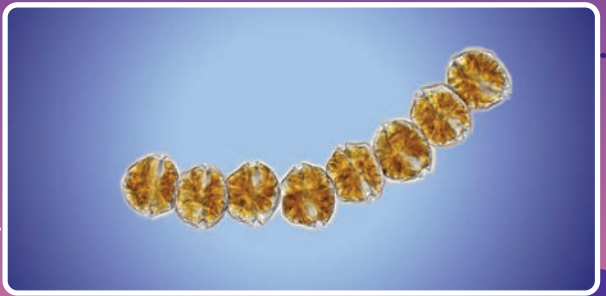
EMBL

Super Bloom

Latin name: Alexandrium catenella

Eukaryotes

Super Bloom are algae. They use sunlight to transform water and gas into sugar, which iseaten by other organisms. With too many nutrients, they grow out of control (bloom) creating a toxic environment.



Where do you find them?
Sea: cold coastal waters

Who do they live with?
Many other organisms that eat them

SUPERPOWER Toxic bloom!

WEAKNESS Unknown

Visible to naked eye

Invisible — 20–32 µm — Visible

Tolerance to pollutants

Intolerant — Tolerant

Their blooms happen when nutrients from sources such as lawns and farmlands flow downriver to the sea and ‚overfeed' the algae that exist normally in the environment.

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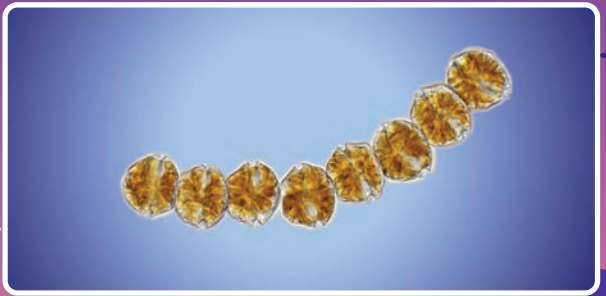

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EMBL

Bacillus

Latin name: Bacillus subtilis

Bacteria

Bacillus are rod-shaped microorganisms that are found in many environments, including water and soil. These bacteria can live without oxygen gas. Bacillus are heavily used in scientific research and industry to produce antibiotics.

Where do you find them?
Soil and sea: marine sponges, guts of animals and humans

Who do they live with?
Many other organisms

SUPERPOWER Surviving harsh conditions like drought and starvation

WEAKNESS Unknown

Visible to naked eye

Invisible — 4–10 µm — Visible

Tolerance to pollutants

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When Bacillus are in the bowel of fish, they can protect them from other harmful microorganisms, helping to reduce the use of antibiotics in aquaculture.

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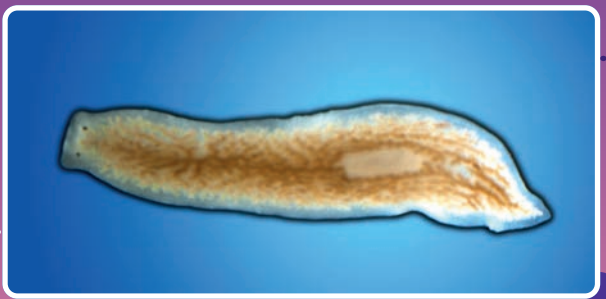
Milkies

Latin name: Dendrocoelum lacteum

Eukaryotes

Milkies are freshwater flatworms that have completely white bodies. Milkies can be found under submerged rocks and dead leaves. To feed, they use the sucker organ on their heads.



Where do you find them?
Freshwater: underneath rocks or dead leaves

Who do they live with?
Flatworms that do not eat the same food

SUPERPOWER Can regrow their heads

WEAKNESS Do not like sunlight

Visible to naked eye

Invisible — 10–25 mm — Visible

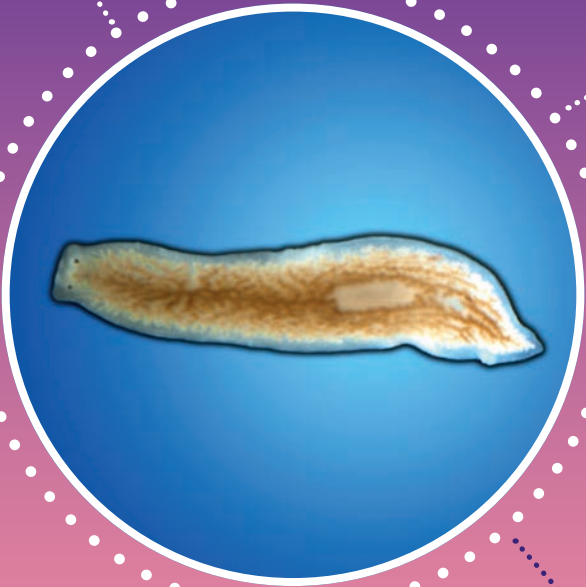
Tolerance to pollutants

Intolerant — Tolerant

Milkies are the most widespread freshwater flatworm in Europe!

EMBL

Eukaryotes



Visible to naked eye

Invisible

10–25 mm

Visible

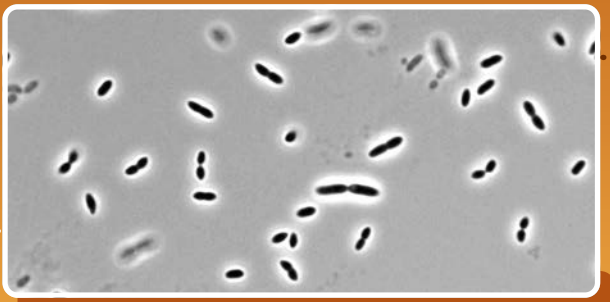
EMBL

Petroleum Sweepers

Bacteria

Latin name: Pseudomonas putida

Petroleum Sweepers are microorganisms that live both in water and soil. Because these bacteria digest petroleum, they can be used to clean oil spills. Some members of Petroleum Sweeper can also infect humans.



Where do you find them?
Sea and soil

Who do they live with?
Unknown

SUPERPOWER Clean oil spills

WEAKNESS Unknown

Visible to naked eye

Invisible — 2 µm — Visible

Tolerance to pollutants

Intolerant — Tolerant

This petroleum consuming bacteria are the first living organisms to be patented.

EMBL

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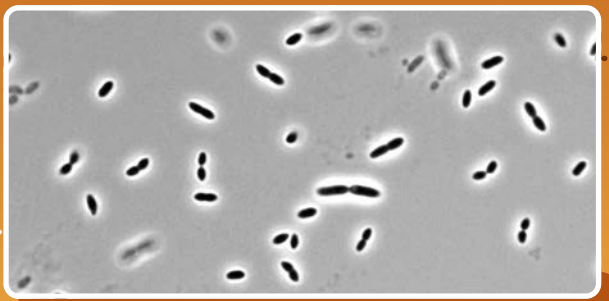

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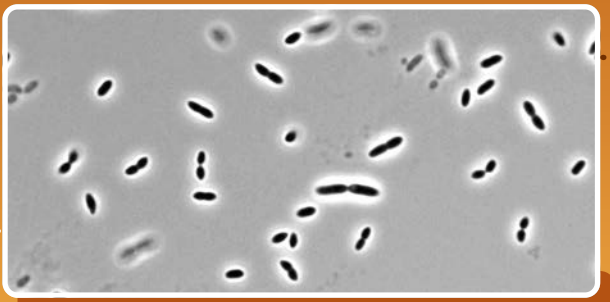

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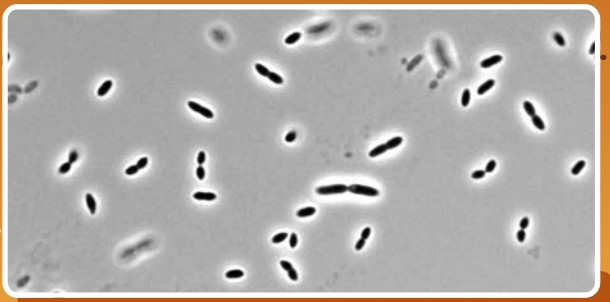

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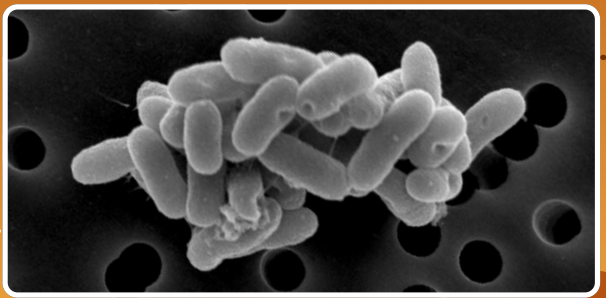
Super Cleaners

Latin name: Sphingobium

Bacteria

Super Cleaners are astonishing microorganisms. There are several members in this group of bacteria and they can degrade herbicides and other potentially dangerous chemicals.



Where do you find them?
Soil, water (Sewage treatment plants)

Who do they live with?
Other organisms that tolerate pollutants

SUPERPOWER Can degrade chemicals

WEAKNESS Unknown

Visible to naked eye

Invisible — 1.5 µm — Visible

Tolerance to pollutants

Intolerant — Tolerant

One type of Super Cleaners can use herbicides as their sole source of energy.

EMBL

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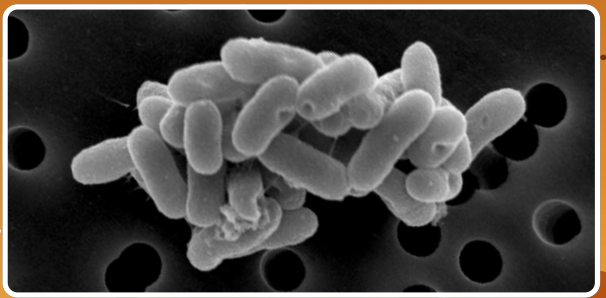

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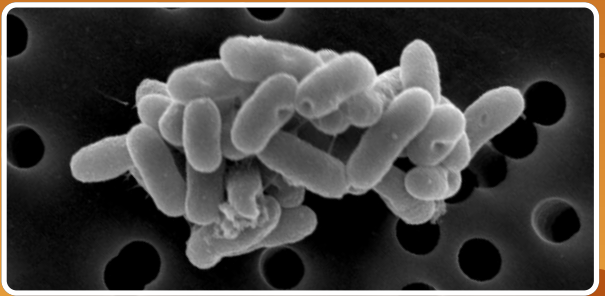

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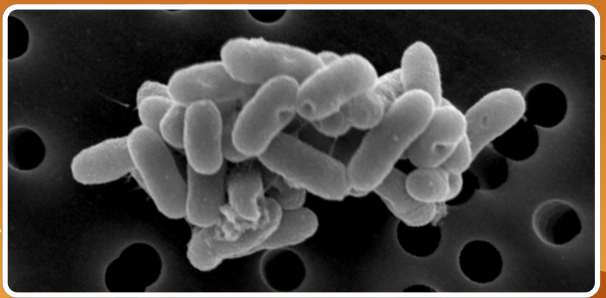
Bacteria

Super Cleaners are astonishing microorganisms. There are several members in this group of bacteria and they can degrade herbicides and other potentially dangerous chemicals.



Where do you find them?
Soil, water (Sewage treatment plants)

Who do they live with?
Other organisms that tolerate pollutants

SUPERPOWER Can degrade chemicals

WEAKNESS Unknown

Visible to naked eye

Invisible — 1.5 µm — Visible

Tolerance to pollutants

Intolerant — Tolerant

One type of Super Cleaners can use herbicides as their sole source of energy.

EMBL

Forams

Latin name: Foraminifera

Eukaryotes

Forams are small organisms that live at the bottom of the sea. Depending on the type of Foram found, scientists can predict if there is pollution impacting the environment.

Where do you find them?
Sea: bottom of coastal waters

Who do they live with?
Small algae they feed on

SUPERPOWER Can become solar-powered

WEAKNESS Overly acidic sea weakens their shells

Visible to naked eye

Invisible — 200 µm – 1 mµm — Visible

Tolerance to pollutants

Intolerant — Tolerant

Forams can use some of the parts of the algae (chloroplasts) they eat to transform solar energy. Thanks to this ability, they can produce their own oxygen gas and sugar.

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Loki

Latin name: Lokiarchaeota

Archaea

These microorganisms with wisp-like extensions live in the darkest and deepest parts of the ocean bed, away from oxygen gas. These archaea can also give us clues on how life evolved.

Where do you find them?
Bottom of sea and rivers

Who do they live with?
Bacteria partners

SUPERPOWER Living in places without oxygen gas

WEAKNESS Can‘t live on their own but rather with bacteria

Visible to naked eye

Invisible — 0.2–0.4 µm — Visible

Tolerance to pollutants

Intolerant — Tolerant

Loki were first discovered on the seabed of the Arctic Ocean.

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Big Platys

Latin name: Platynereis dumerilii – adult stage

Eukaryotes

Big Platys are sea worms living near the coast. With their enlarged eyes, these annelid worms follow the lunar cycle to swim to the water surface, where they dance and mate just after the new moon.

Where do you find them?
Sea: in and around rocks and seaweed near the coast

Who do they live with?
Seagrass

SUPERPOWER Regenerating their body

WEAKNESS They die after mating

Visible to naked eye

Invisible — 3 cm — Visible

Tolerance to pollutants ?

Intolerant — Tolerant

Male and female Big Platys have different colours; females are yellow while males are red and white.

EMBL

Eukaryotes

Visible to naked eye

Invisible

3 cm

Visible

EMBL

Vinfecto

Latin name: Vibrio parahaemolyticus

Bacteria

Vinfecto are microorganisms in the shape of a comma. These bacteria cause diseases in marine creatures and humans. They stick to and travel on microplastics, making plastic pollution more dangerous.

Where do you find them?
Usually the sea

Who do they live with?
Marine creatures like the Seahorse and shellfish

SUPERPOWER They can live without oxygen gas

WEAKNESS They cannot survive without a host

Visible to naked eye

Invisible — 1.4-2.4 µm — Visible

Tolerance to pollutants

Intolerant — Tolerant

If Vinfecto are present in drinking water, they cause serious illness.
This typically happens when drinking water gets mixed with sewage - yuck!

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Coli

Latin name: Escherichia coli

Bacteria

Coli are microorganisms that live in the bowel of humans and other animals. Some of these bacteria cause illnesses, but most Coli help us by producing vitamins or protecting us from harmful bacteria.

Where do you find them?
Animal guts, poo, sewage

Who do they live with?
Bowels of animals and humans

SUPERPOWER Double themself in 20 minutes!

WEAKNESS Can be killed by viruses, fungi, or bacteria

Visible to naked eye

Invisible — 2 µm — Visible

Tolerance to pollutants

Intolerant — Tolerant

Coli are found in the bowel of a baby within less than 2 days after birth.

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Gassy

Latin name: Methanosarcina

Archaea

Gassy are microorganisms that produce ...gas! This gas is called methane, which can be dangerous for the environment. These archaea live in the gut of many animals, including cows, sheep, and humans!

Where do you find them?
Places without oxygen: landfills, sewage heaps, deep sea

Who do they live with?
Themselves: they really like to live in groups

SUPERPOWER Help animals digest food

WEAKNESS Killed by oxygen gas

Visible to naked eye

Invisible — 2 µm — Visible

Tolerance to pollutants

Intolerant — Tolerant

Scientists think that in the past Gassy produced so much methane gas that they caused the largest extinction event in history!

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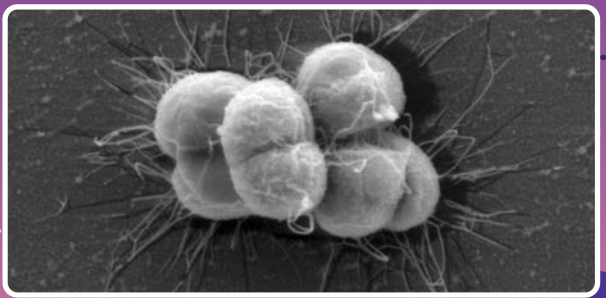
Dead Eaters

Latin name: Thraustochytrids

Eukaryotes

Dead Eaters are the oceans' vultures - they find dead organisms and eat what's left of them. Sometimes they also feed on live cells. To get their food they cast long nets that also help digest it!



Where do you find them?
Sea

Who do they live with?
Unknown

SUPERPOWER Recycling dead organisms and ectoplasmic nets

WEAKNESS Yummy snack for other organisms

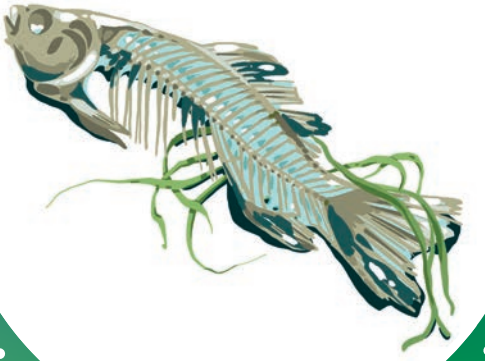
Visible to naked eye

Invisible — 3–20 µm — Visible

Tolerance to pollutants

Intolerant — Tolerant

Dead Eaters produce special nutrients (Omega-3 fatty acids) that are good for your health.



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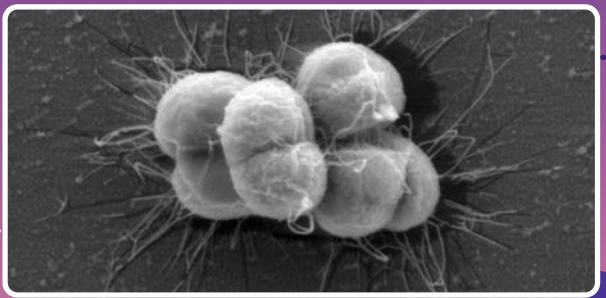

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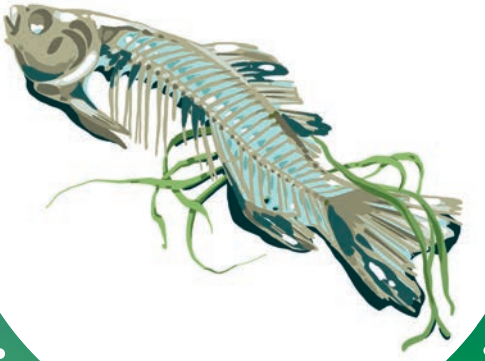


EMBL

Mint-Sauces

Latin name: Symsagittifera roscoffensis

Eukaryotes

Mint-Sauces are sea flatworms. Their green colour is the result of their partnership with algae which live under Mint-Sauces' skin. These algae produce substances that are vital for the worms.

Where do you find them?
Sea: North Atlantic coastline

Who do they live with?
Algae (Tetraselmis convolutae)

SUPERPOWER Can regrow their bodies when cut

WEAKNESS Cannot live without the algae

Visible to naked eye

Invisible — 5 mm — Visible

Tolerance to pollutants

Intolerant — Tolerant

Mint-Sauces are called "roscoffensis" because of its abundance in the vicinity of the Station Biologique de Roscoff - where the TREC expedition started!

EMBL

Eukaryotes

Visible to naked eye

Invisible

5 mm

Visible

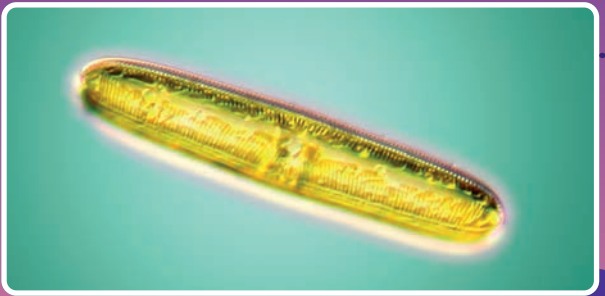
EMBL

Green Sailors

Latin name: Navicula oblonga

Eukaryotes

Green Sailors are organisms shaped like a boat. These algae help make the majority of oxygen gas that many organisms, including humans, need to survive. They are part of a group of algae called Diatoms.



Where do you find them?
Estuaries, lakes, rivers, sea

Who do they live with?
Unknown

SUPERPOWER Produce oxygen gas and resist chemicals from agricultural fields

WEAKNESS Can not live in overly acidic sea

Visible to naked eye

Invisible — 80 - 180 µm — Visible

Tolerance to pollutants

Intolerant — Tolerant

Their scientific name "Navicula" means small boat in Latin.

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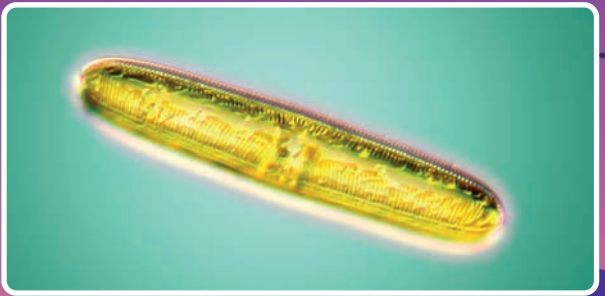

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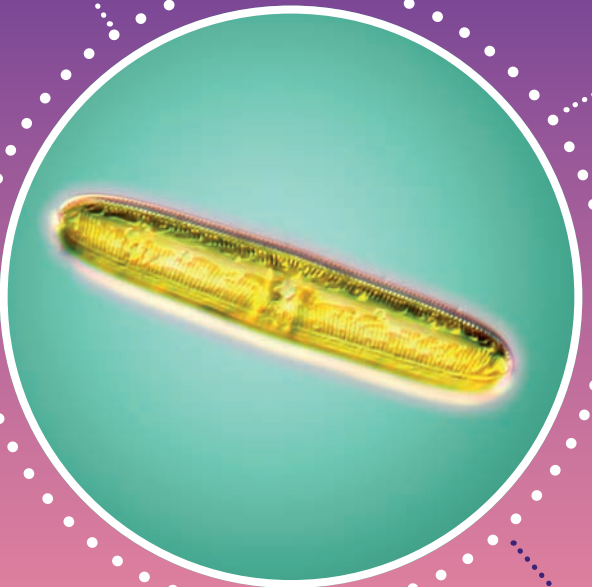

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80 - 180 µm

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EMBL

Nitroso

Latin name: Nitrososphaera

Archaea

Nitroso are microorganisms living in the soil. These archaea provide natural fertilisers and nutrients, which boost plant growth.

Where do you find them?
Soil: nutrient rich environments such as agricultural regions

Who do they live with?
Other soil organisms and plants

SUPERPOWER Thrive in soils polluted by agricultural chemicals

WEAKNESS Unknown

Visible to naked eye

Invisible — 0.6–0.9 µm — Visible

Tolerance to pollutants

Intolerant — Tolerant

Even if they cannot be seen with the naked eye, they are one of the most abundant microorganisms around us!

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Nitro Fixers

Latin name: Rhizobium

Bacteria

Nitro Fixers are soil microorganisms living in close relationship with specific plants. They produce a key nutrient for the plants (nitrogen), playing a vital role in agriculture.

Where do you find them?
Soil: roots of flowering plants like beans, chickpeas, and peanuts

Who do they live with?
Plants

SUPERPOWER Help plants to grow

WEAKNESS Decrease in soil when plants die

Visible to naked eye

Invisible — 2 µm — Visible

Tolerance to pollutants

Intolerant — Tolerant

In exchange for the nutrient (nitrogen) that they provide to plants, Nitro Fixers get food from the plants! This type of close relationship is called mutualism.

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Ocean Lords

Latin name: Pelagibacterales

Bacteria

Ocean Lords are possibly the most abundant organisms on Earth! These bacteria feed on the remains of other organisms. They transform part of what they eat into carbon dioxide gas, which plays a key role in climate change.

Where do you find them?
Sea

Who do they live with?
Nobody in particular

SUPERPOWER Perfectly adapted to life in the ocean

WEAKNESS They do not like winter, when there are fewer of them

Visible to naked eye

Invisible — 0.5 µm — Visible

Tolerance to pollutants ?

Intolerant — Tolerant

A specific Ocean Lord, called Candidatus pelagibacter, is one of the smallest self-replicating organisms known.

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Green Poison

Latin name: Pseudo-nitzschia australis

Eukaryotes

Green Poison are algae that are found in many oceans of the world. Their growth is boosted by the presence of fertilisers, for example in river runoffs, and they produce a poison (toxin).

Where do you find them?
Sea

Who do they live with?
With each other: they like to form long chains

SUPERPOWER May cause poisoning in animals and humans

WEAKNESS Unknown

Visible to naked eye

Invisible — 70-140 µm — Visible

Tolerance to pollutants

Intolerant — Tolerant

Blooming Green Poison produce large amounts of toxins. During a bloom, fishing is dangerous and is forbidden because humans can get poisoned by eating shellfish that ate the algae.

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Pill-Makers

Bacteria

Latin name: Streptomyces

Pill-Makers are microorganisms that live in the soil and look like a rope. These bacteria help with breaking down dead organisms and produce substances that are critical to humans in medicine and agriculture.

Where do you find them?
Soil: soil and decaying plants

Who do they live with?
Plants, yeasts, and moulds

SUPERPOWER Producing natural antibiotics and insecticides

WEAKNESS Some Pill-Makers make plants and animals sick

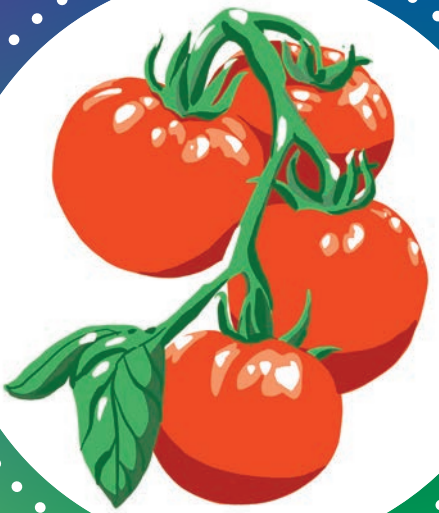
Visible to naked eye

Invisible — 1 µm — Visible

Tolerance to pollutants

Intolerant — Tolerant

Some Pill-Makers make plants and animals sick.



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Definitions

Are you having fun but struggling with some of the words you found on the cards?

We have you covered! You can find a few definitions here. Please remember that you can also ask questions to the game facilitators! And if you want, you can use the Internet ;-)

Eukaryote:

An organism whose cell(s) contain(s) structures enclosed in membranes, one of which is the nucleus, that stores the genetic material. Organisms without these characteristics are called prokaryotes.

Bacteria:

Single-cell prokaryotes that are found almost everywhere on Earth and are vital to the planet‘s ecosystems.

Archaea:

Single-cell prokaryotes that are similar to bacteria but also (and surprisingly) to eukaryotes. However, they have unique properties that separate them from the other two. They are abundant in the ocean plankton and the human gut.

Algae bloom:
rapid increase or overgrowth of algae

Antibiotic:
substance we use to fight bacterial infections in humans and animals

Fertiliser:
any material applied to soil to help with plant growth

Herbicides:
substances used to kill plants

Insecticides:
substances used to kill insects

Methane:
natural gas that is also a product of certain human activities, and has a key role in climate change

Micrometer (µm):
1 mm divided by 1000; 100 micrometers = 0.1 mm

Toxin:
naturally occurring poison

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