

STUDENT WORKSHEET

Name: _____ **ANSWER KEY**

Welcome to the Museum! Today, you'll take a dive into the *Unseen Oceans* exhibition. You will encounter many kinds of marine organisms and find out how scientists study them. Use these worksheets to help you explore each section of the exhibition.

1. Mysterious Drifters

Explore the organisms in this room. What are plankton?

Plankton are tiny living things that live in the ocean. They drift with ocean currents.

Pick one plankton to explore more in-depth.

Plankton name:

Answers may vary.

An interesting fact about this plankton:

Answers may vary.

Draw it below and **label** its parts.

Watch the Meet the Scientist video about Kelly Benoit-Bird.

What challenge did Kelly Benoit-Bird have in studying marine life 300 meters (985 feet) below the ocean surface?

It is difficult to see individual organisms that deep from the surface. They just appear as masses.

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What kind of technology did she use to overcome this challenge?

She used sound waves, or sonar. Sound travels better in water than light, so she can get more information from sonar than she could from a camera. The sonar is on a submersible that can travel to where the animals are that she is studying.

What has she learned about?

She has seen that predators prefer to feed in places where krill swarm in clumps. She has also learned that squid form schools to avoid being eaten by predators.

2. Secret Lives

Explore examples of animals that are fluorescent. These animals glow when certain colors of light shine on them!

How is fluorescence useful to these animals?

It helps them identify one another in dim environments.

Pick a fluorescent animal in the exhibition. **Draw** and **label** it in the box below.

Animal name: Answers may vary.

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Watch the Meet the Scientist video about David Gruber and John Sparks.

What question were David Gruber and John Sparks trying to answer using the specialized lights on their dives?

How common is fluorescence in marine animals? How do these animals use fluorescence?

What did they discover?

They discovered that fluorescence is more common than they originally thought, and that animals use it to recognize one another.

3. Encountering Giants

Watch the Meet the Scientist videos about Jeremy Goldbogen and Kanai Katija.

Jeremy Goldbogen attaches tags to whales to learn more about them. What did he see in the recordings?

He saw blue and humpback whales feeding on krill, whales rounding up and eating schools of fish, and a remora attaching itself to a whale.

Kanai Katija is figuring out how to attach tags to jellyfish. What challenges does she face, and what materials does she use?

Jellyfish are not very big, so the tags need to be small and light. Also, it is hard to attach something to their soft bodies without hurting them. She ended up making very small light tags that she attached with a type of glue that vets use to heal cuts in animals' skin.

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Explore maps that show what the bottom of the ocean looks like. Hint: It's not always flat!

Observe the three models in the center area of the room. For each model, **record** its name and location, as well as what the environment is like there.

Formation	Location	Environment
<i>Mariana Trench</i>	<i>Western Pacific Ocean</i>	<i>deepest place on Earth; dark, cold, high pressure</i>
<i>Hudson Canyon</i>	<i>Northern Atlantic Ocean, extending out to sea from the Hudson River</i>	<i>muddy, deep bottom; haven for many fish and cold-water corals</i>
<i>Hawaiian Islands</i>	<i>Northern Pacific Ocean; islands are the tops of mountains that are mostly underwater</i>	<i>slope creates shallow areas that are havens for animals like young whales</i>

Watch the Meet the Scientist video about Kaitlyn Becker and look at the robot hand on display.

What problem is Kaitlyn Becker trying to solve?

She is trying to figure out how to grab animals with soft delicate bodies without damaging them.

How is this robot hand different from what was used in the past?

This robot hand has soft and "squishy" fingers instead of the hard metal fingers of traditional robot hands.

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5. Taking a Dive

Look at the cups and plexiglass on display.

Why is it difficult to study the deep ocean?

In the deep ocean, it is very dark and cold, with very high water pressure that can crush styrofoam cups.

What technology have scientists and engineers used to help them overcome these difficulties?

They have made submersible vehicles with thick plexiglass domes to withstand pressure and lights to see around them.

Watch the movie in the small theater.

What are scientists able to see/find?

In the deep midnight and abyssal zones, they find animals that can tolerate these extreme conditions, such as sponges that anchor themselves to rocks, and animals that sift through the mud on the seafloor for food.

6. Vital Abundance

Watch the three conservation scientist videos about Nyawira Muthinga (Kenya), Rubaiyat Mansur Mowgli (Bangladesh), and Ruth Gates (Hawai'i).

Choose one of the three videos in this section. **Circle** the name of the scientist in the list above.

Where is this scientist working?

Answer will include one of the following:

(1) Nyawira Muthinga: Kenya; (2) Rubaiyat Mansur Mowgli: Bangladesh; (3) Ruth Gates: Hawai'i

What problem is this scientist facing?

Answer will include one of the following: (1) Nyawira Muthinga: coral reef conservation; (2) Rubaiyat Mansur Mowgli: protecting whales from fishing nets; (3) Ruth Gates: corals are being damaged by climate change

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What are they doing to try and address this problem?

Answer will include one of the following:

- (1) Nyawira Muthinga: helping teach local fishermen to use practices that won't damage reefs*
(2) Rubaiyat Mansur Mowgli: persuading the government to create a protected region for dolphins
(3) Ruth Gates: learning about the types of corals that are more resistant to climate change

Watch the Meet the Scientist video about Jules Jaffe.

Jules Jaffe invented devices called m-AUEs. What do they do?

m-AUEs drift with currents and report their location back to scientists.

What can scientists learn from them?

They can track the plankton that drift along with the m-AUEs.

7. Next Generation

Read about scientists from different parts of the world who are just starting their careers.

Choose one of the scientist panels from this section: Ashe DeVos, David Lang and Eric Stackpole, Derya Akkaynak, Chong Chen, Kiana Frank. Circle the name of the scientist(s) you chose.

What does this scientist do?

Answer will include one of the following: (1) Asha DeVos does long-term research on blue whales in the Indian Ocean; (2) David Lang and Eric Stackpole design and build underwater drones; (3) Derya Akkaynak designs, builds, and uses underwater cameras that can see like animals that live in the ocean; (4) Chong Chen studies deep-sea invertebrates; (5) Kiana Frank studies ocean microorganisms and how their populations affect the environment all over the world, both on land and in the water.

Why is it important?

Answer will include one of the following:

- (1) Asha DeVos: learning more about the lives of blue whales will help when trying to protect them*
(2) David Lang and Eric Stackpole: low-cost submersible allows more people to explore the ocean
(3) Derya Akkaynak: seeing from the animals' perspectives help us understand them better
(4) Chong Chen: understanding the animals that live in the deep sea is important as companies seek to drill for mining in these areas, so that we understand the risks of these projects
(5) Kiana Frank: understanding the role of marine microorganisms will help manage environmental threats all over the world

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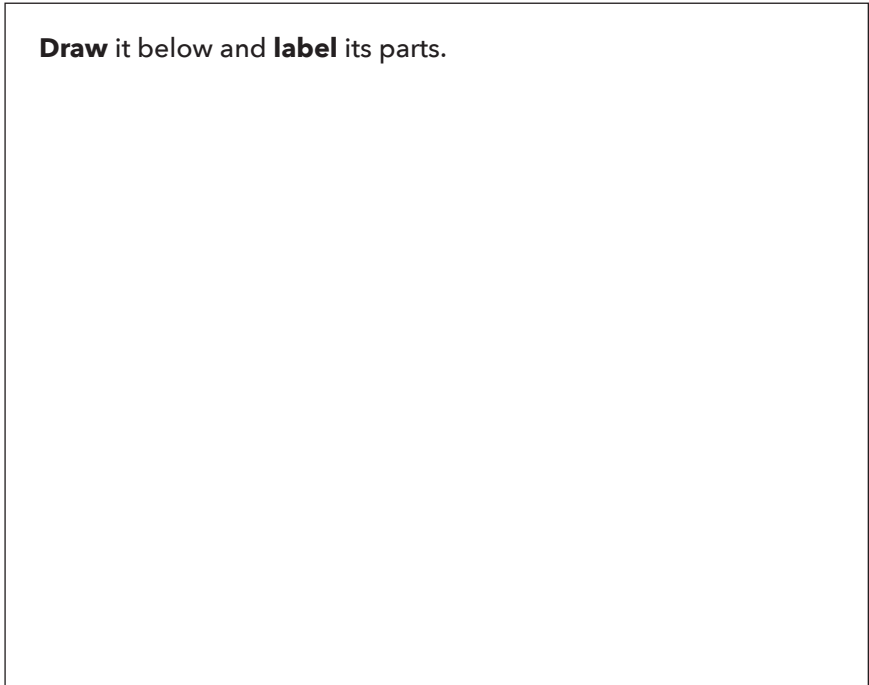
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What kind of technology did she use to overcome this challenge?

What has she learned about?

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