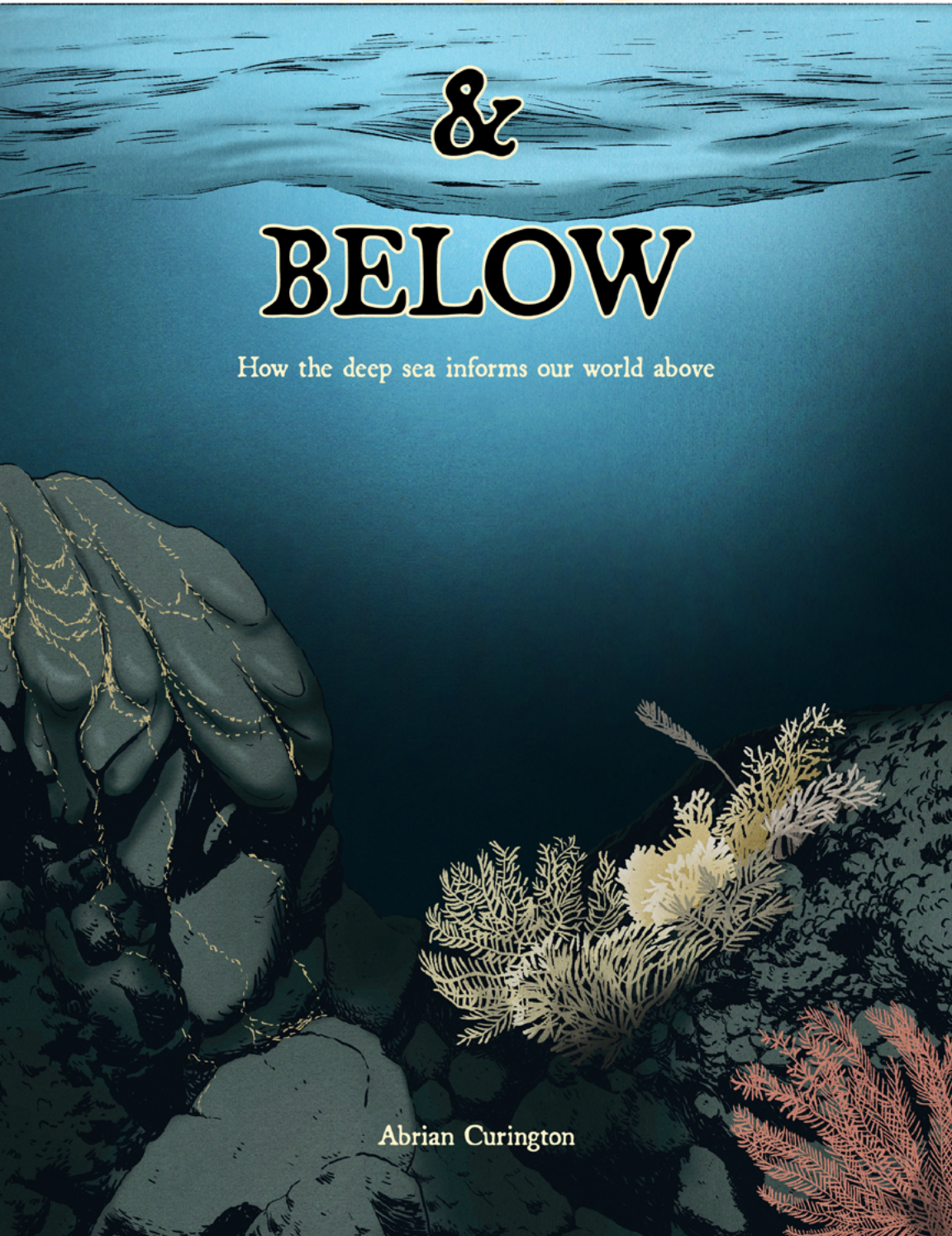
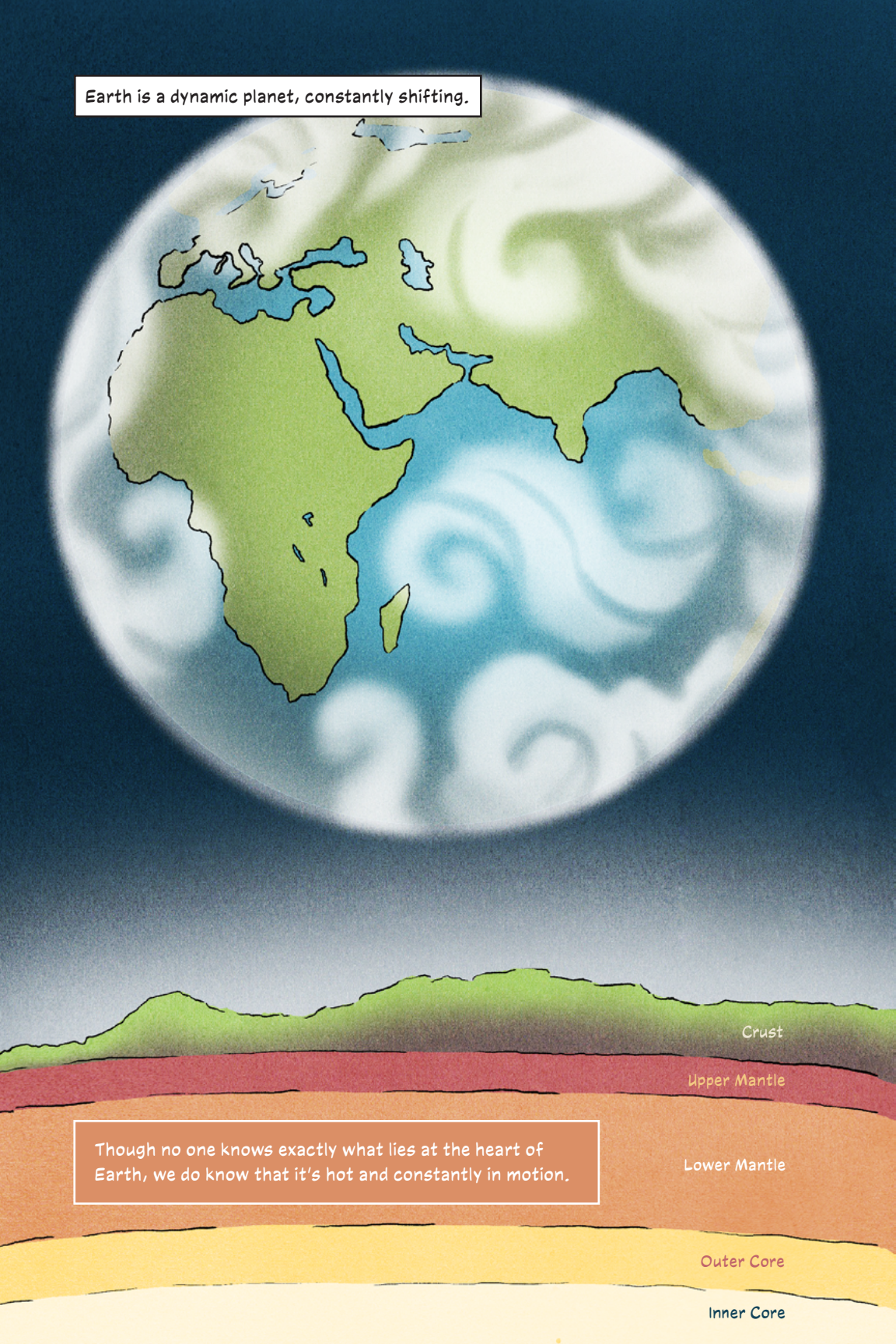
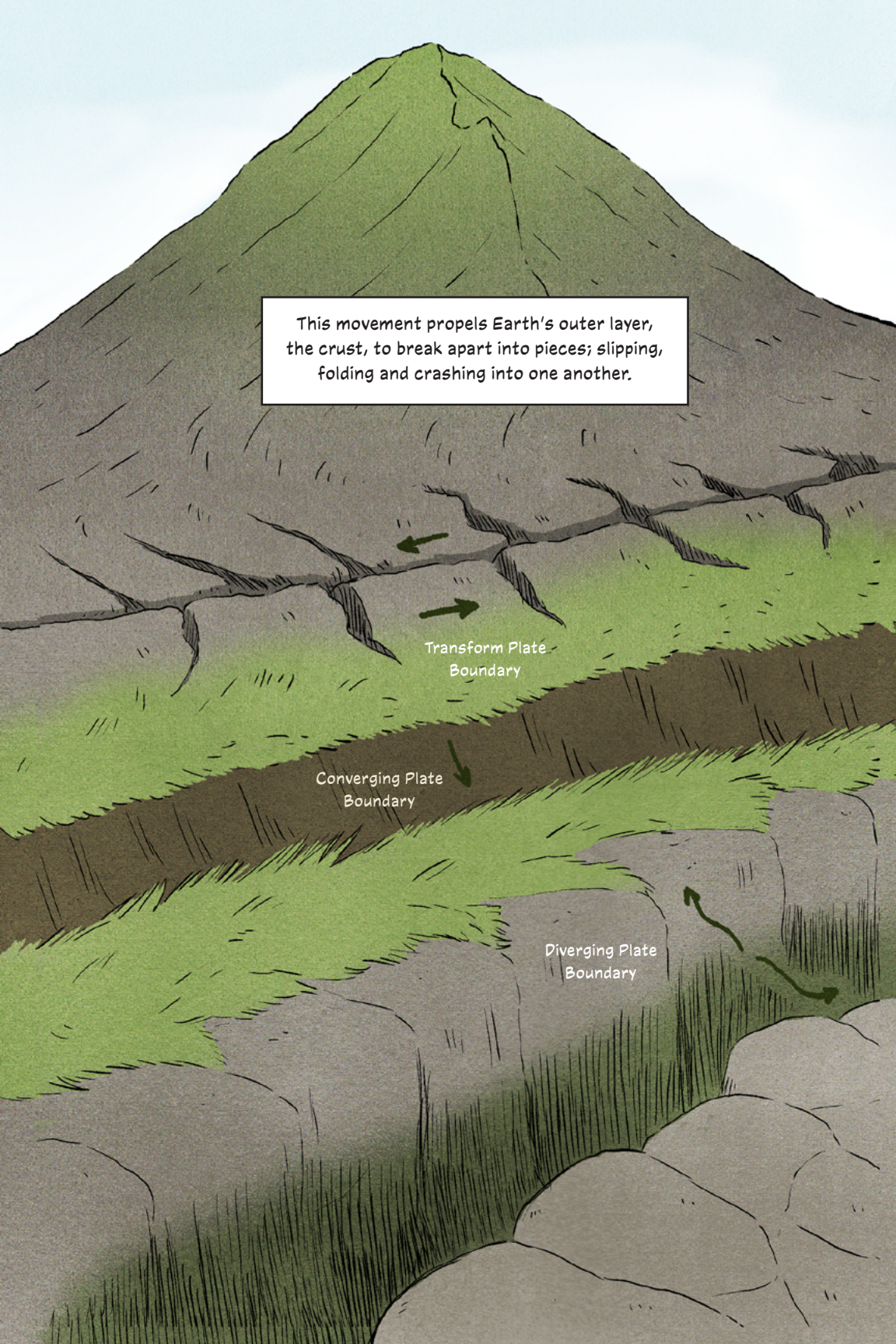
ABOVE & BELOW

How the deep sea informs our world above

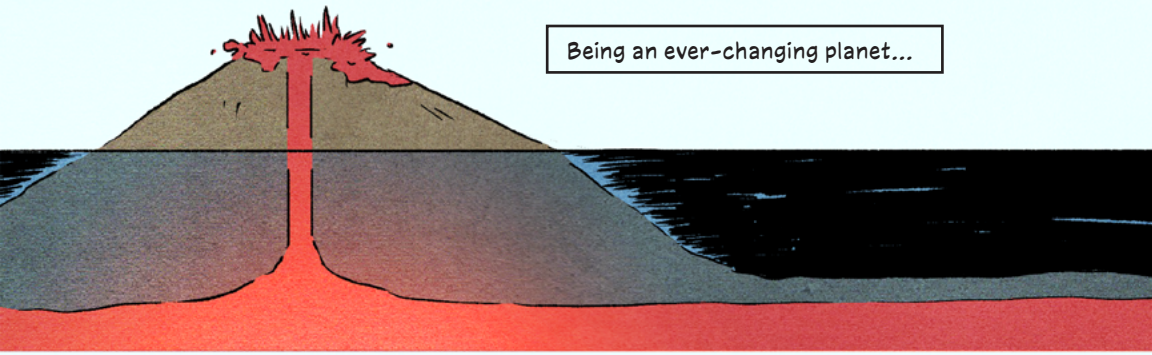


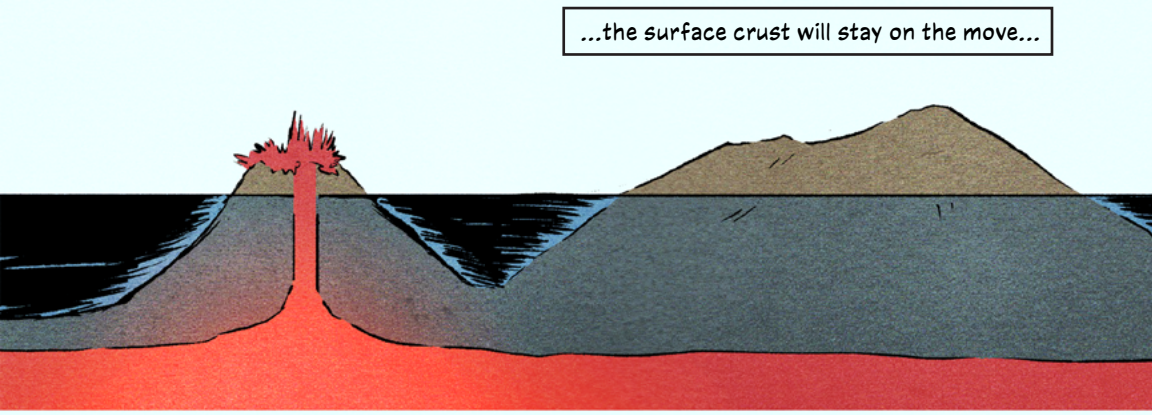
Abrian Curington

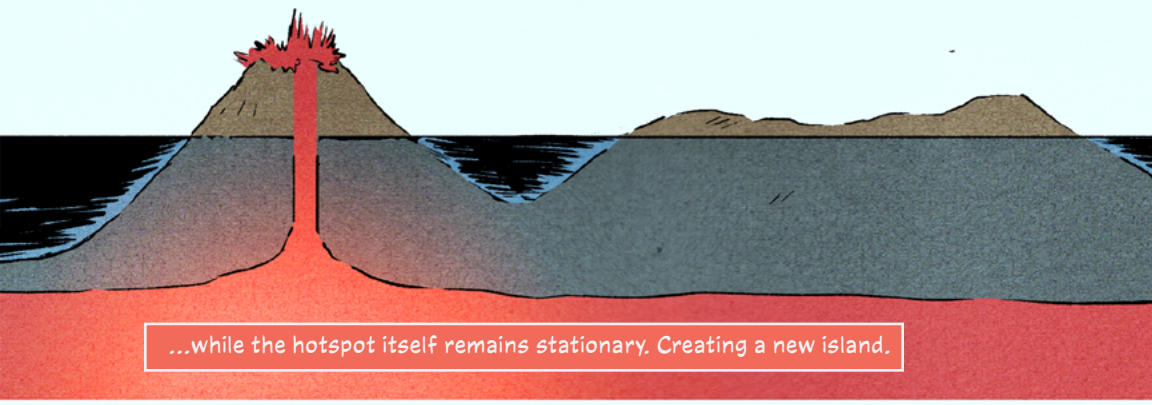

Earth is a dynamic planet, constantly shifting.
Crust
Upper Mantle
Though no one knows exactly what lies at the heart of Earth, we do know that it's hot and constantly in motion.
Lower Mantle
Outer Core
Inner Core

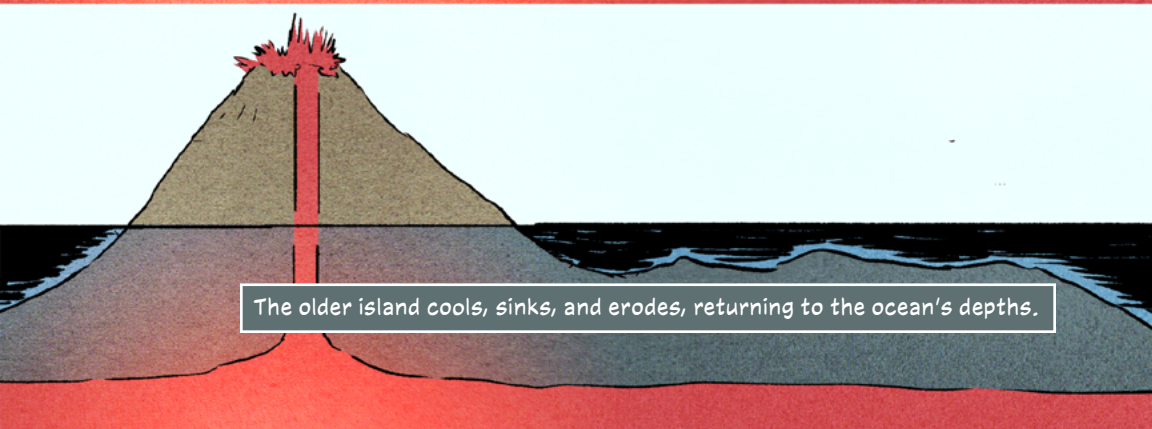

This movement propels Earth's outer layer, the crust, to break apart into pieces; slipping, folding and crashing into one another.
Transform Plate Boundary
Converging Plate Boundary
Diverging Plate Boundary


Magma occasionally bubbles up from the Earth's molten mantle and breaks the surface, cooling to form new surface crust.
These hot spots, areas where mantle rock rises through Earth's crust, often initially breakthrough in the ocean's depths, away from human eyes.
After centuries of welling in the darkness of the seafloor, a volcanic mountain can build up to the surface, breaking through the waves.


Being an ever-changing planet...

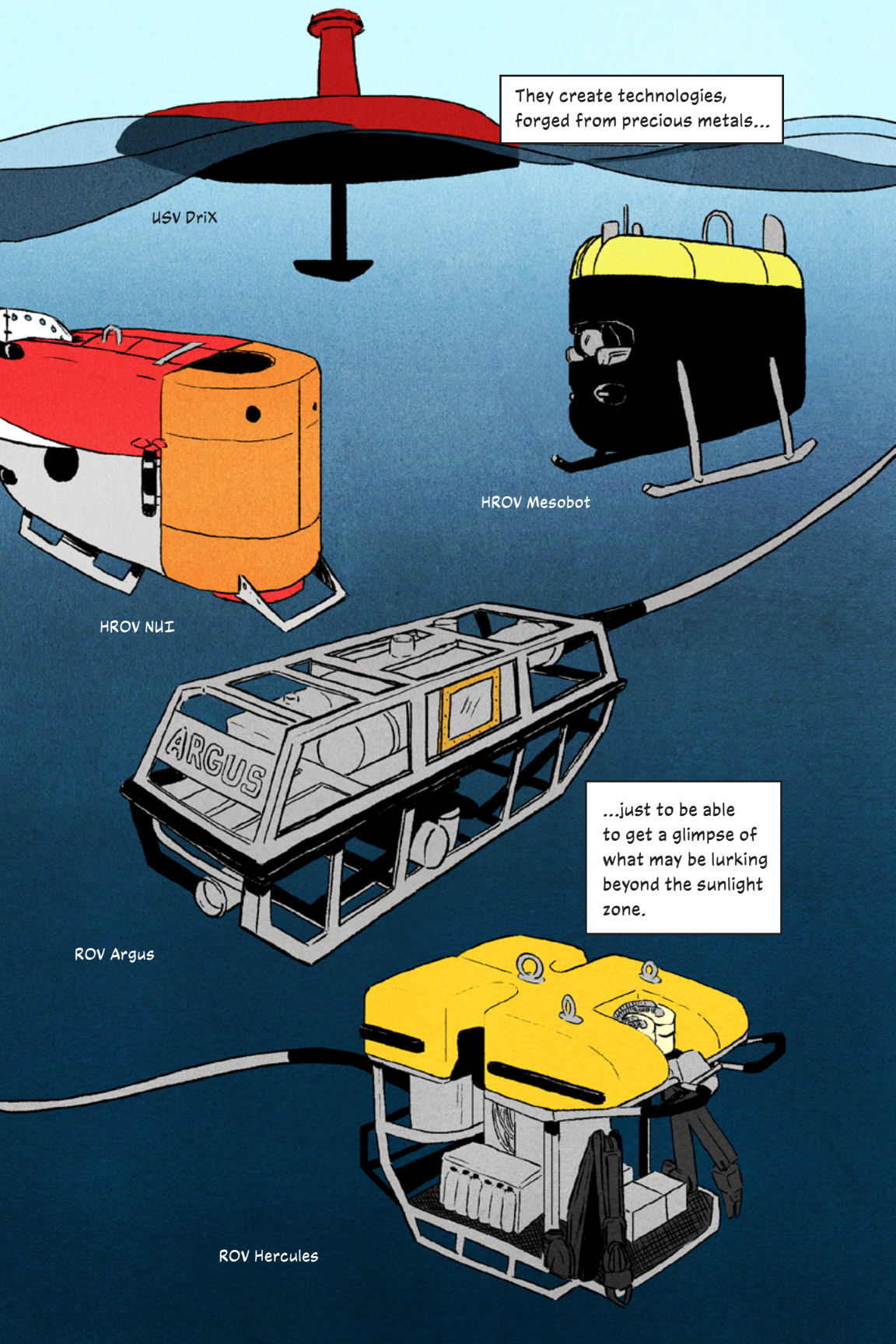

...the surface crust will stay on the move...

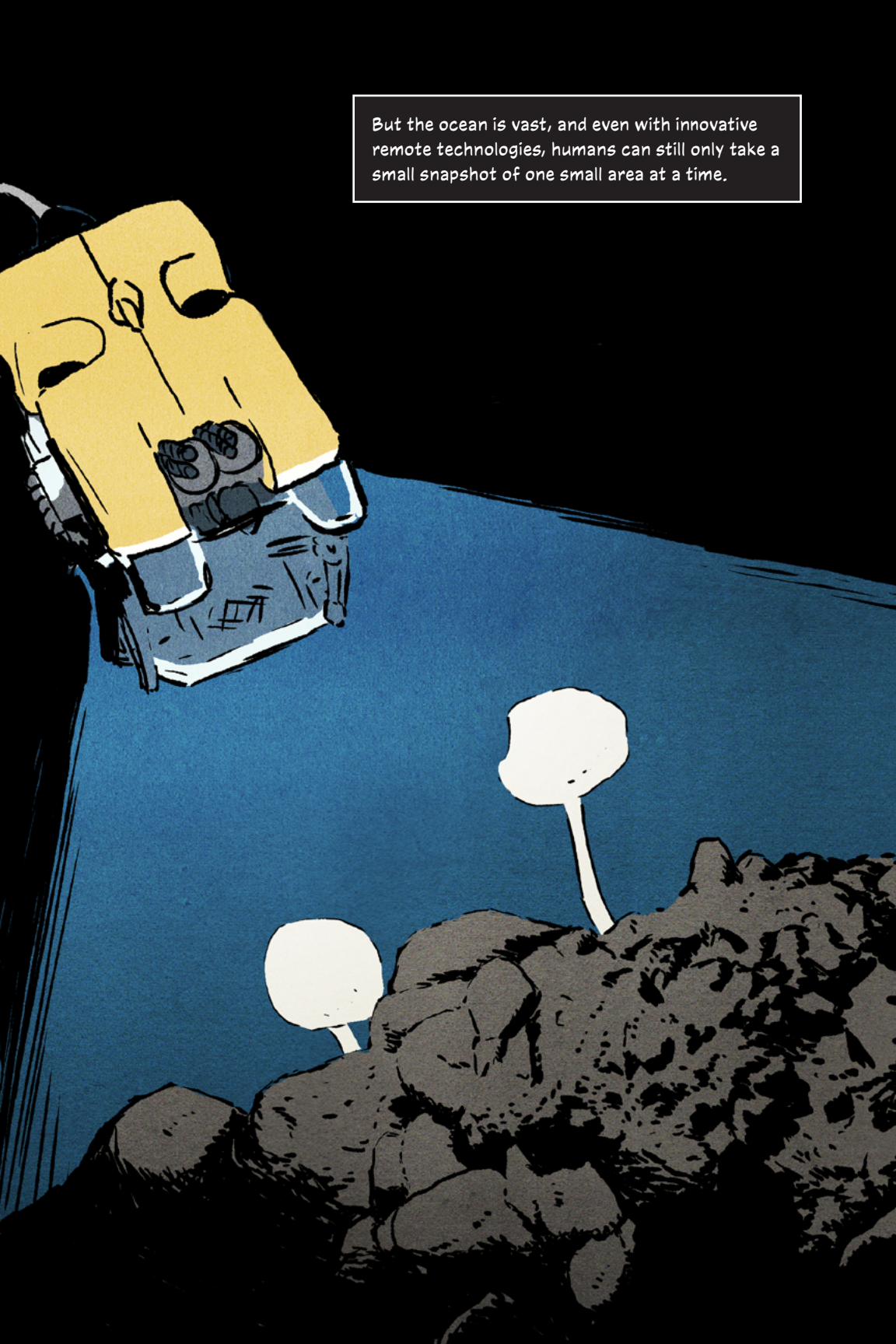

...while the hotspot itself remains stationary. Creating a new island.


The older island cools, sinks, and erodes, returning to the ocean's depths.

Before the island sinks below the waves, life will likely begin to grow on its cooled surface. The island will also probably be habitable, even by humans.

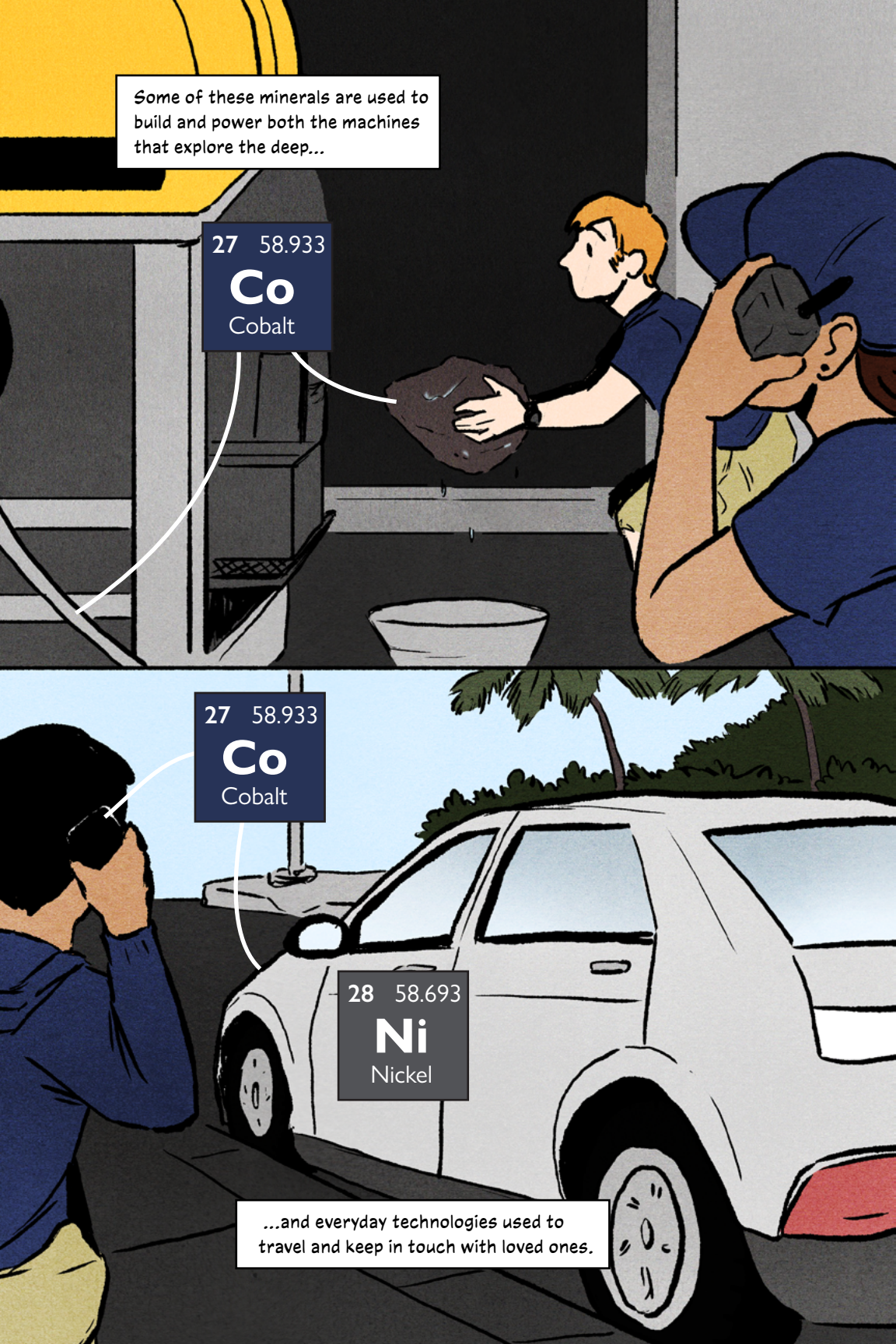

Being air-breathers, humans choose to live above the ocean's surface...
...only straying beneath the waves briefly, no farther than the light can reach.
The Sunlight Zone
The fact that there is such a vast unknown just beyond their reach makes many humans fiercely curious.

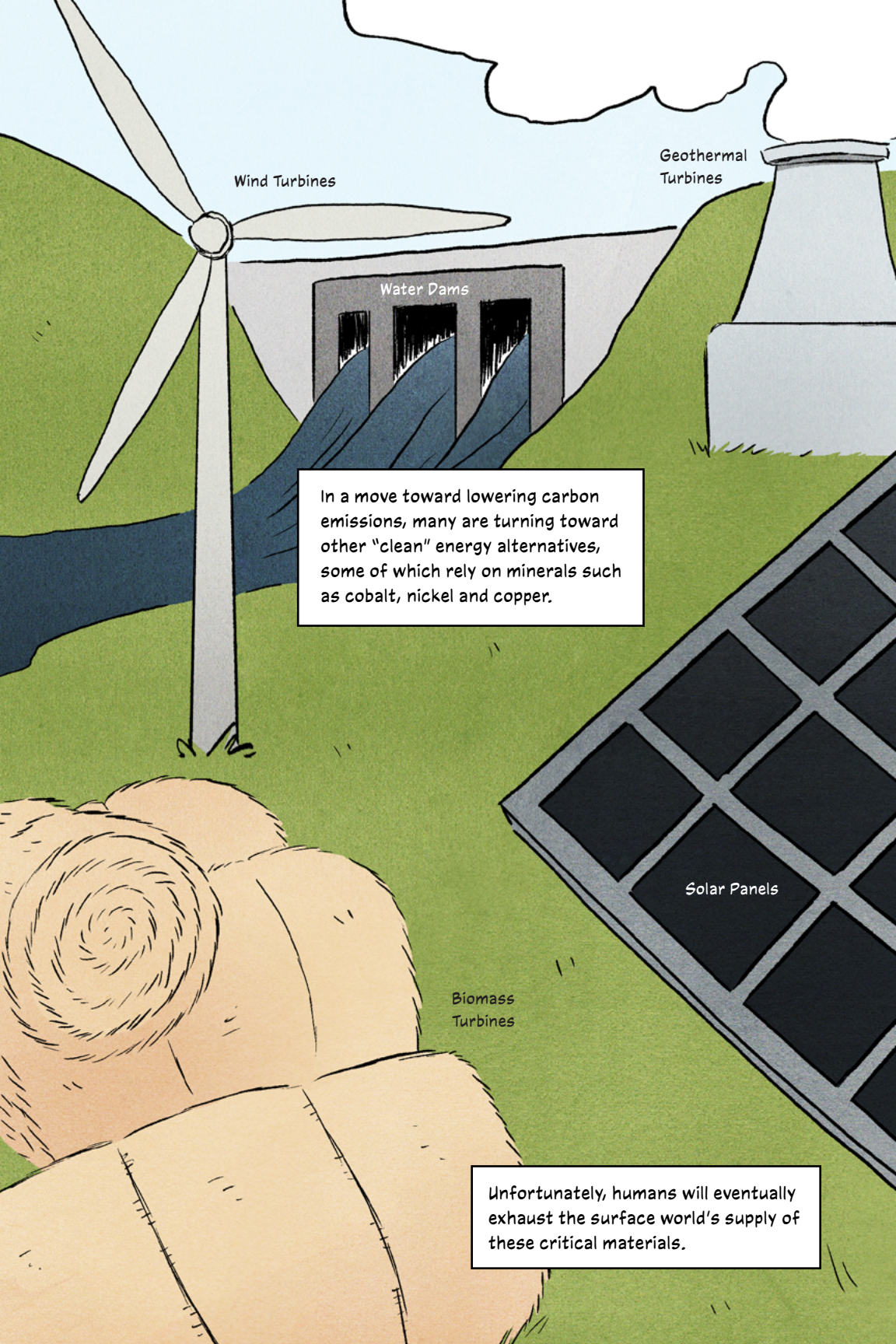

They create technologies, forged from precious metals...
USV DriX
HROV Mesobot
HROV NUI
ARGUS
...just to be able to get a glimpse of what may be lurking beyond the sunlight zone.
ROV Argus
ROV Hercules


But the ocean is vast, and even with innovative remote technologies, humans can still only take a small snapshot of one small area at a time.

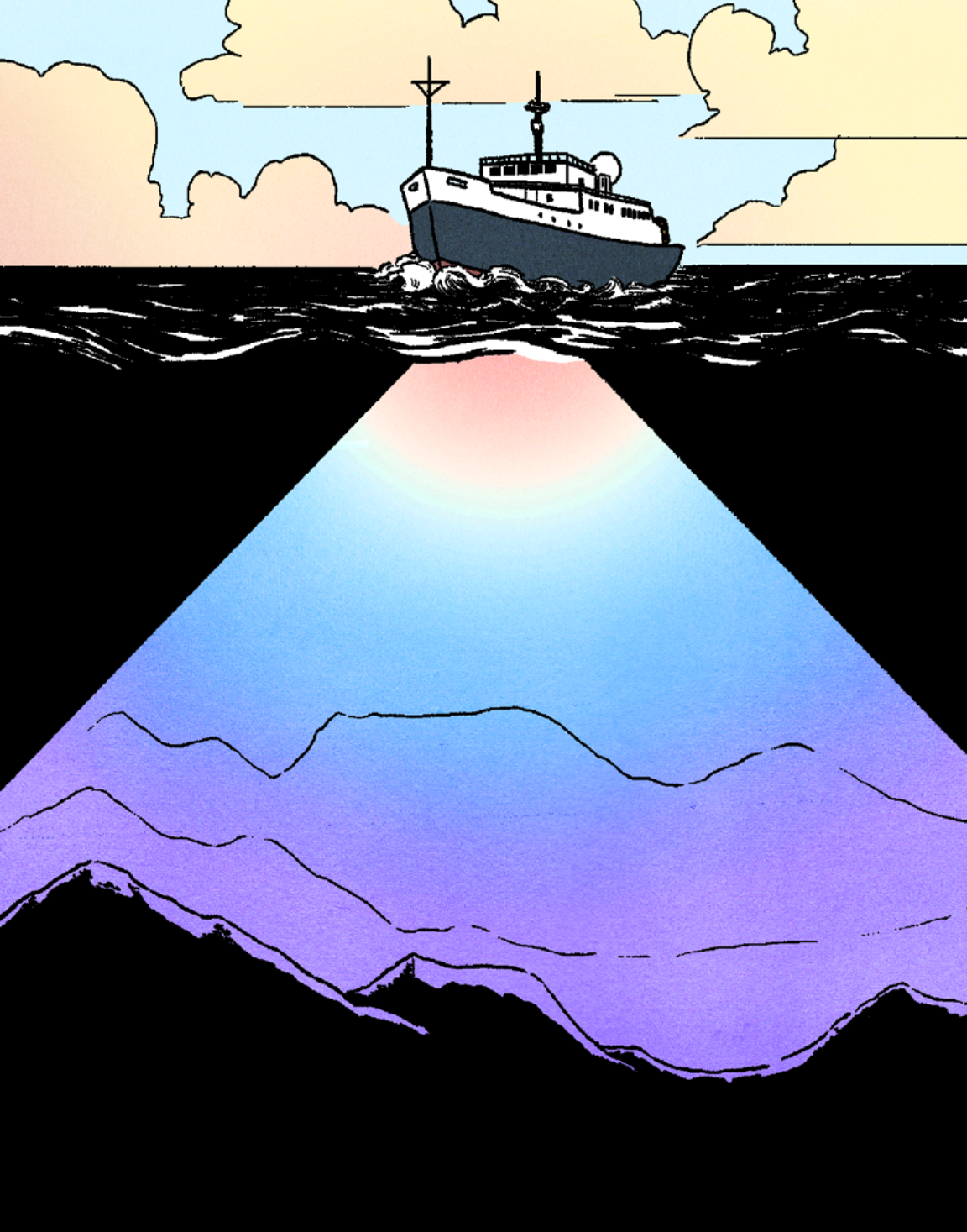

Even so, these snapshots have revealed animals that thrive without light...
Acorn Wo
Cook
Stalked Sponge
Sea Cucu
Slit Snail
Halosaur


And rocks that tell stories of how this world came to be.
Spending centuries on the seafloor, these rocks become encrusted in a coating of rich minerals.


Some of these minerals are used to build and power both the machines that explore the deep...
27 58.933
Co
Cobalt
27 58.933
Co
Cobalt
28 58.693
Ni
Nickel
...and everyday technologies used to travel and keep in touch with loved ones.

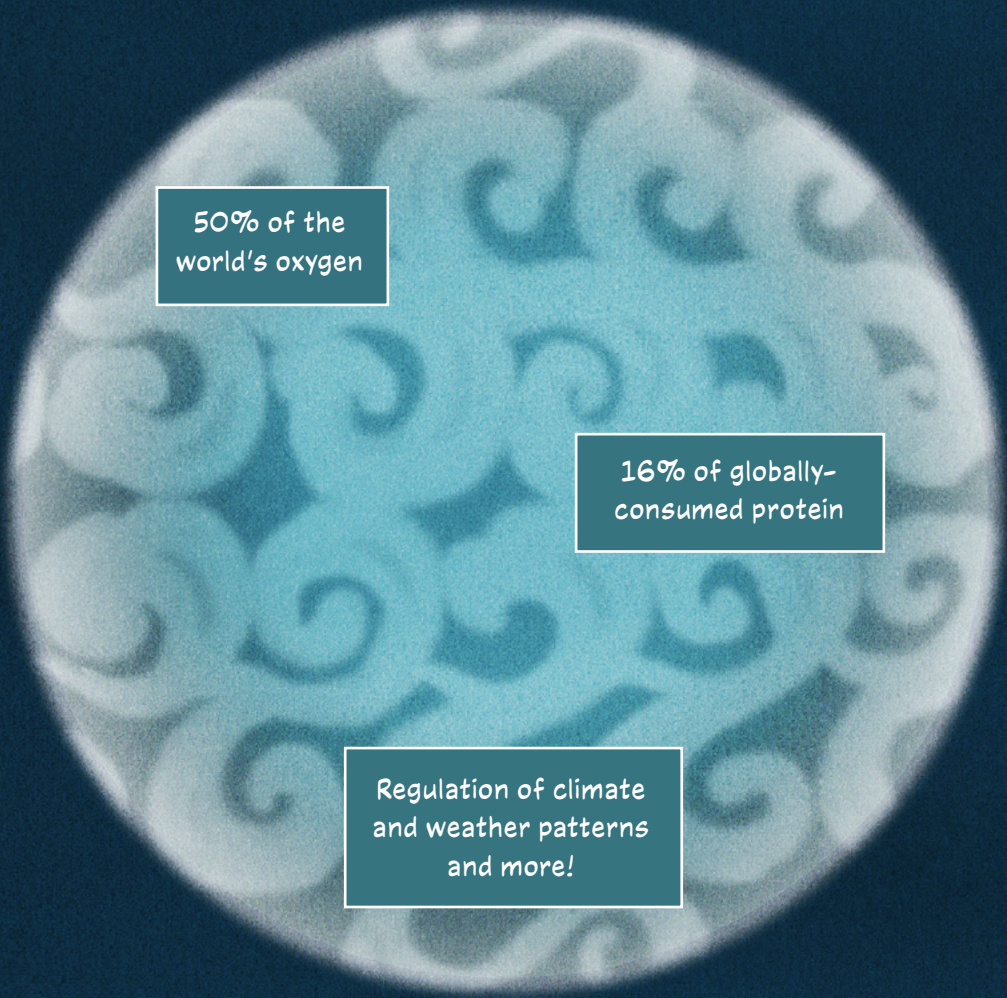

Wind Turbines
Geothermal Turbines
Water Dams
In a move toward lowering carbon emissions, many are turning toward other "clean" energy alternatives, some of which rely on minerals such as cobalt, nickel and copper.
Solar Panels
Biomass Turbines
Unfortunately, humans will eventually exhaust the surface world's supply of these critical materials.


Some will turn to the ocean, mining the deep sea for its resources.
In doing so, there may be disturbance and even destruction of deep undersea communities that are not yet fully understood.
BEFORE
AFTER?



Though there may be a way to sustainably, safely harvest minerals from the seafloor, humans must first know much more about the deep-sea communities they will be interacting with, through high-resolution seafloor mapping, and biological and mineral sampling.

What *is* known, is the ocean's importance in sustaining human life, providing:



In order for the surface world to remain habitable for humanity, humans must keep the ocean healthy and thriving. Who knows what wild wonders are yet to be discovered in the ocean's dark beyond?

Lu'u a ea, lu'u a ea, a hiki i Waikoloa

In 2021, Ocean Exploration Trust's Exploration Vessel *Nautilus* began conducting operations within the central Pacific, with the intent of spending several years mapping and exploring the region. Each expedition within this area attempts to acknowledge and honor the indigenous and local communities of the Pacific Rim and Oceania.

Lu'uaeaahikiikekualonokai Expedition

The imagery in this narrative is inspired by the Lu'uaeaahikiikekualonokai expedition, which took place West Southwest of the Hawaiian Islands, near Chautauqua Seamount. The expedition targeted an unnamed seamount chain consisting of seven seamounts of varying sizes. The area was explored both visually with the use of ROVs Argus and Hercules, and bathymetrically, using single and multibeam data.

This unnamed seamount chain holds a whole host of mysteries, including its origin. It is thought to be much older than the Hawaiian island chain, and cracking the mystery of its creation will add another step toward assembling the puzzle of Earth's tectonic construction. The hope is to gain clues through geochemical analyses of the rock samples collected from these seamounts. Because this seamount chain is so old, most of the rocks found there are rich in ferromanganese crusts, likely containing rare metals. ROV exploration has also confirmed a variety of interesting marine habitats in various locations along the seamount chain. Studying and comparing these habitats can help further the understanding of genetic flow across seamount habitats.

This expedition was sponsored by NOAA Ocean Exploration through the Ocean Exploration Cooperative Institute.

Learn more about Ocean Exploration Trust's work at NautilusLive.org.

The Author!

Abrian Curington is a visual storyteller and cartographer, with a BA in Fine Art from Western Washington University and a Capstone Certificate in GIS Fundamentals from University of Wisconsin—Madison. She is dedicated to producing engaging graphic novels, illustrated prose and maps that ignite curiosity, and champion fun and adventure. She also serves as a Science Communication Fellow aboard E/V Nautilus. Find her work at her website BlueCatCo.com or on social media @AbrianCArt.