



DepthQuest

Meet the Cast

Advanced Edition

Spark & Anvil

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This advanced edition collects 6 chapter books from the DepthQuest cast — each character embodies a different curricular primitive; together they teach the full subject.

Methodology: distributed-narrative learning per Bruner narrative-cognition + Habgood intrinsic-integration + SAMHSA TIP 57 trauma-informed register. Advanced edition: upper-middle-grade register (Wonder / Hatchet / Holes band) for readers ages 11-14 ready for longer sentences + more nuanced subtext.

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For everyone who learns by reading between the lines.

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Introduction

The DepthQuest cast was authored to embody the curriculum, not decorate around it. Each of the 6 characters you'll meet in this book teaches a specific primitive — a particular tactic, a particular technique, a particular way of seeing. Together they form an ensemble: the cast IS the curriculum.

Read in any order. Each chapter stands alone.

Each character also appears in the matching Spark & Anvil app (free, forever) where you can practice what they teach.

This is the **Advanced Edition** — written for readers who are ready for longer sentences, layered subtext, and the trust that comes with not having every joke explained. The Standard Edition covers the same characters at a lighter register; pick whichever feels right for the reader at hand.

— *The editors at Spark & Anvil*

Trench and Plume



The deck of the research vessel *Depthquest* hummed with the quiet thrum of machinery. Two sampling containers sat on the main lab bench, still slick with seawater. They looked identical, but Trench and Plume knew they held completely different worlds. A heavy winch had just pulled them up from the same spot in the ocean, a single invisible column of water stretching from the sky to the seafloor.

Plume, who always seemed to be buzzing with the same energy as the sunlit waves, tapped her fingers on her container. It was taken from the surface. "Mine's going to be a party," she announced. "A microscopic, green-and-gold, photosynthetic party."

Trench, standing beside his own container, gave a slow, deliberate nod. His sample was from the crushing dark, two miles straight down. "And mine," he murmured, his voice as quiet as the deep, "will be a ghost." He gently wiped a bead of condensation from the cold metal. "A single, patient ghost, waiting for the party leftovers to rain down."

Plume grinned. "Ready to compare? Same place, different worlds."

"Always," Trench said.



Plume practically danced over to her station, a brightly lit table with a wide, shallow tray. With a flick of her wrist, she unsealed her container and poured the contents out. The water wasn't clear at all. It was a thick, greenish-brown soup, shimmering with millions of tiny lives. It smelled alive, like a garden after a rainstorm.

"Look at that!" Plume exclaimed, leaning in with a magnifier. "It's a bloom! A total traffic jam of phytoplankton." She pointed a thin probe at the swirling water. On a nearby screen, the image jumped to life. Countless tiny, jewel-like diatoms drifted past, their glassy shells forming intricate patterns. Little copepods, like tiny aquatic insects, zipped through the crowd, their legs paddling furiously.

"This is where it all starts," Plume said, her voice filled with energy. "Sunlight hits the water, and—BAM!—these little guys turn it into food. They're the base of everything. They're the blades of grass in the biggest pasture in the world." A tiny, almost invisible larval fish wiggled past the camera lens. "See? The grazers are already here. It's a complete ecosystem in a single jar of water. It's loud, it's crowded, and it's beautiful."



Trench moved his own sample to a darkened corner of the lab. His station was the opposite of Plume's: cool, dim, and quiet. He didn't pour his sample out. Instead, he placed the entire container into a refrigerated chamber with a camera port. The water inside looked perfectly clear, almost sterile. There was no green soup here, only blackness.

"Lights to minimum," Trench whispered to the computer. The screen next to him flickered, showing only a few lazy white specks drifting in the dark. "That," he said, pointing to the specks, "is marine snow. The leftovers from Plume's party." He adjusted the camera, zooming in slowly, methodically. For a long moment, there was nothing. Plume might have gotten a whole pasture, but Trench was hunting for a single wolf.

Then, something moved. It was long, pale, and seemed to be made of glass and whispers. A spindly crustacean, like a shrimp drawn from memory, drifted into view. It had enormous, delicate antennae that swept the water in front of it and eyes that were little more than faint gray dots. "There," Trench said, a rare smile touching his lips. "An amphipod. A scavenger. It doesn't need sunlight. It doesn't need a crowd. It just needs patience. It waits for food to fall from a world it will never, ever see."



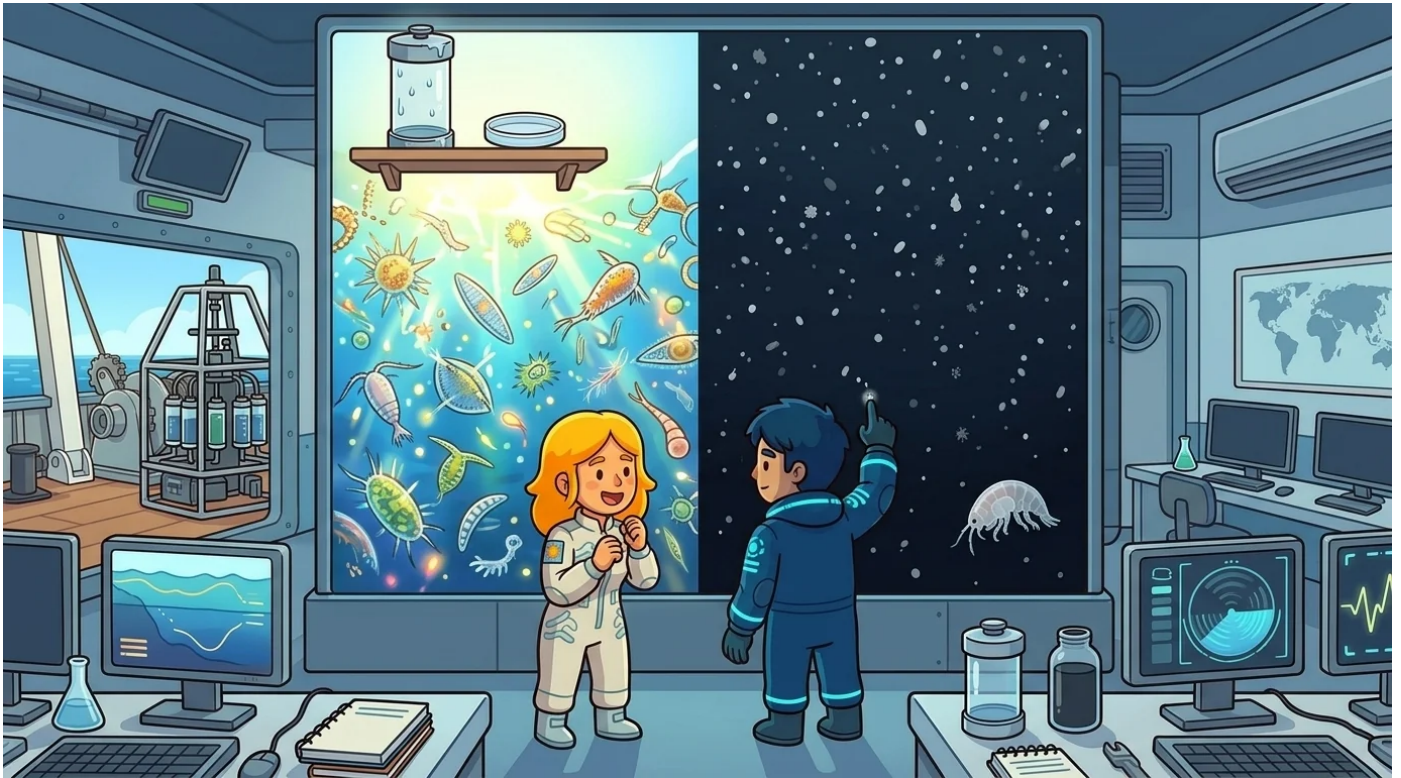
Plume came over, peering at Trench's screen. The glowing green chaos of her sample was still fresh in her mind. She looked at the single, lonely creature drifting in the dark.

"That's it?" she asked, trying not to sound disappointed. "Just one little spindly guy?"

"He's not alone," Trench said calmly. He tapped the screen, highlighting the falling flecks of marine snow. "He's surrounded by food. Or, at least, the memory of food." He looked over at her bright, messy tray. "All those beautiful diatoms and copepods in your sample? When they die, they sink. They drift down, for miles, through the cold and the dark. They become this."

Plume leaned closer, her expression changing from confusion to understanding. "The party leftovers," she repeated softly, recalling Trench's earlier words.

"Exactly," Trench confirmed. "Your world is the kitchen, making a huge, wonderful feast. My world is the deep, dark dining room, where we eat what falls from the table." He pointed to the amphipod's long antennae. "He's not looking. He's tasting the water, waiting for the faintest hint of your world to drift by."



They projected both their samples onto the lab's main wall, side by side. On the left, Plume's world churned with vibrant green life, a frantic, sun-powered dance. On the right, Trench's world was a vast, silent black, punctuated by a single, pale creature and a slow blizzard of falling specks. It was impossible to believe they came from the same patch of ocean.

"They look like two different planets," Plume said in awe.

"But they're not," Trench added. He traced a line with his finger, from a diatom on Plume's screen, down into the darkness, to a speck of marine snow on his own. "They're just two different floors of the same house. One can't exist without the other. The top floor is bright and makes all the food, and the bottom floor is dark and recycles all the leftovers."

Plume nodded, finally seeing the whole picture. It wasn't just a column of water; it was a connection. A lifeline. "So my party is his food delivery service," she said, a new kind of excitement in her voice.

"A perfect system," Trench murmured, watching the lonely amphipod finally catch a flake of snow. "One ocean, full of layers. Full of secrets."

Listen along + meet more of the cast at:



<https://spark-and-anvil.com/cast/depthquest/trench-plume>

Drift



Drift was a lanternfish-tween, small and quick. His body shimmered with chunky, iridescent belly-stripes, a deep cobalt blue. Glowing spots dotted his sides and belly, like tiny, living stars. Beside him zipped his ROV, a remote-operated vehicle. It was a miniature submarine, sleek and silent, and he piloted it himself to find creatures in the deepest parts of their zone.

Drift was always curious. He especially loved exploring the twilight zone, the ocean layer where sunlight faded to almost nothing. "Down here, the light comes from us," he liked to say, his voice a soft hum. Those glowing belly spots were his signature feature. They were called photophores, and they made a natural light he could dim or brighten with a thought. His little ROV also let him survey deeper than his own safe zone, past the last hint of sunlight.



The **twilight zone** was his world. It stretched from 200 meters down to a thousand meters, a vast, dim ocean layer. Here, the sun's light grew weaker and weaker. By the time you reached a thousand meters, only a billionth of the surface light remained. It wasn't completely dark, not like the pitch-black abyss, but it was too dim for plants to grow or for photosynthesis to happen. Yet, this dim world was teeming with life.

Drift aimed his ROV's camera. On the screen, a hatchetfish drifted by, its body thin and silvery, almost transparent. Its eyes were enormous, like dark marbles, designed to catch every stray photon of light. Other creatures appeared: some had bodies so clear you could see right through them. Many were red, which looked like black in the deep blue light, making them almost invisible to predators. But the most amazing thing, Drift thought, was the light they made themselves.

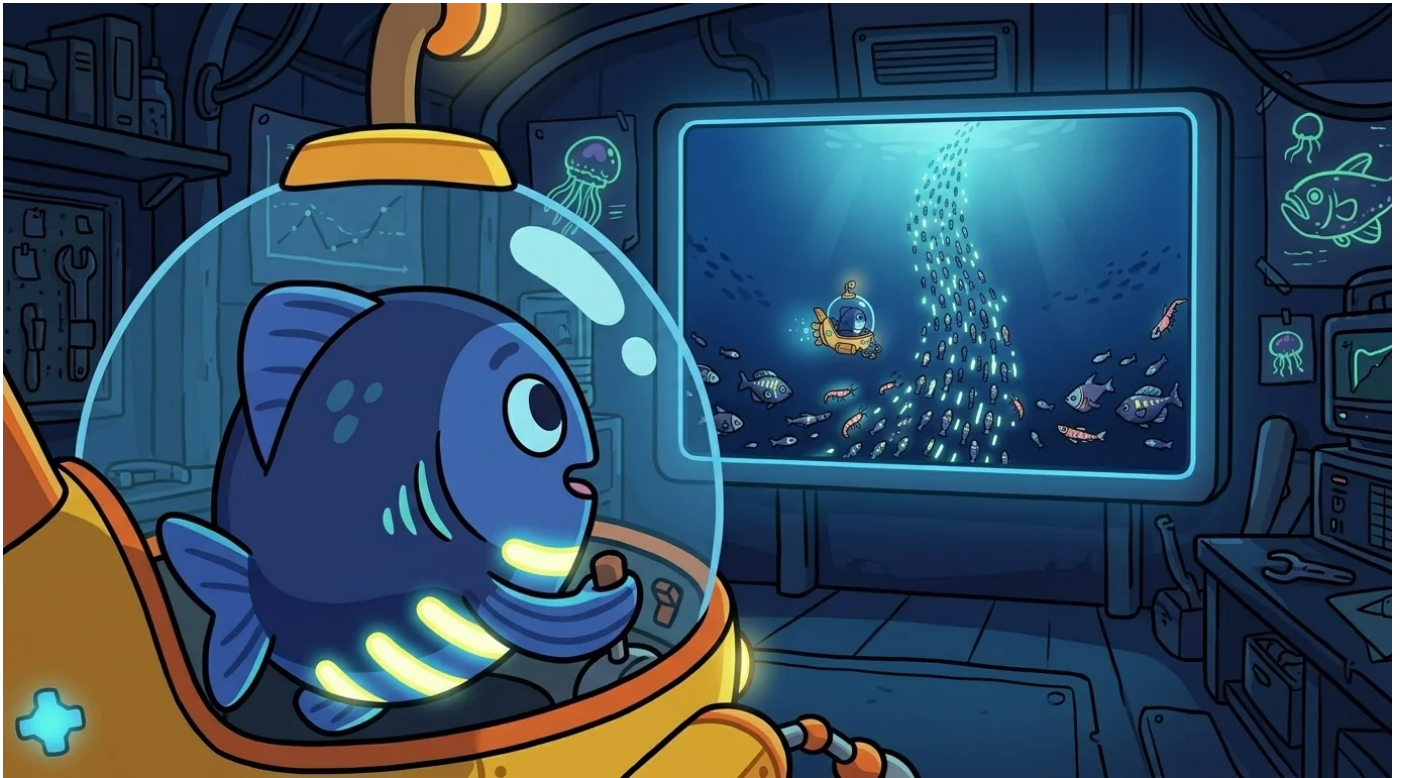
"Bioluminescence," Drift murmured, watching a small squid flash. "It's chemistry, not magic." He tapped a control on his console, and his own belly spots pulsed softly. "Our bodies make light through a chemical reaction. We have special compounds, like luciferin, and an enzyme called luciferase. When they mix, *poof!* Light." He paused, thinking. "It's cold light, too. No heat wasted, just pure glow."



He guided the ROV deeper, past a school of tiny krill. "See them?" he asked the empty space around him. "They're part of the biggest show on Earth." Every night, as dusk settled on the surface, something incredible happened in the twilight zone. Vast numbers of fish, squid, and krill began to rise. They swam upward, hundreds of meters, toward the surface waters.

"It's called the diel vertical migration," Drift explained, watching the ROV footage. Thousands of lanternfish, their photophores blinking like tiny signals, joined the upward journey. Hatchetfish and swarms of krill followed. "They go up to feed in the rich surface waters, where there's plenty of food. Then, before dawn breaks, they swim all the way back down." He zoomed in on a group of migrating lanternfish. "It's the largest animal migration on the planet, by sheer biomass. Every single day."

He loved showing this footage. Most people imagined the deep ocean as a scary, empty place. But Drift knew better. His family had been light-keepers for generations, lanternfish whose photophores helped synchronize the schools' nightly rise. They understood that "the daily rise and fall is the rhythm of the ocean's middle layer." Drift had carried that lesson forward.



He remembered walking into DepthQuest when he was twelve. Marlin, the big, wise mentor, had asked him a simple question. "Drift," Marlin had rumbled, "what is the twilight zone?"

Drift had stood tall, his own photophores glowing with excitement. "It's 200 to 1000 meters down. Sunlight fades to almost nothing. Life makes its own light there. Bioluminescence — chemistry, not magic. And every night, my whole zone migrates UP to feed, then back DOWN by morning. The largest daily migration on Earth."

Marlin had simply nodded. "You are appointed."



Now, in his workshop, Drift demonstrated his belly-photophores. He dimmed them until they were barely visible. Then he brightened them, a soft, steady glow. He made them pulse, a quick, rhythmic flash. "Different patterns mean different things," he explained. "Mate-finding, predator-confusing, prey-attracting. Each species has its own signature pattern, like a secret code."

He pulled up more footage from the ROV. Thousands of lanternfish, hatchetfish, and krill streamed through the water column at dusk. Their tiny lights glittered in the dimness. "Every night," Drift said softly. "Every species. Every ocean. The biggest movement on Earth, hidden in the dark." He looked at the screen, a small smile on his face. "I am Drift. The primitive I teach is the **twilight zone**. The move is wonder, not fear. The dark middle of the ocean is alive with daily migration and self-generated light. Marvel-stuff."

He often heard people call the deep ocean "creepy." He always shook his head. "Don't be scared of the deep ocean," he would say gently. "It's not 'creepy.' It's a chemistry-driven light show with a daily rhythm. The fear comes from stories that don't know how rich it truly is."

He believed wonder was the only right response. "Marvel at the bioluminescence," he urged. "Picture the migration. Imagine the chemistry. It's all happening, right now, just below the surface."

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<https://spark-and-anvil.com/cast/depthquest/drift>

Press



Press wasn't exactly tall. She was a giant-isopod-tween, which meant she was built low to the ground, soft and rounded like a smooth, deep-violet-and-cream stone. Not spiky at all. Her eyes were deep-set, dark pools that seemed to absorb light, or perhaps, create it. She wore a small pressure-gauge on a strap around her wrist. It was her signature feature. The dial showed the local water pressure, which down here was immense. Over one hundred atmospheres, the needle read. That's like a small car pressing down on every single square inch of you. Press wore it casually, as if it were just a normal watch. To her, it was. "Crushing pressure," she often said, a patient smile on her face, "is just home pressure here. Life adapts."

Press lived and breathed the **midnight zone**. This was the deep layer of the ocean, a vast space from one thousand to four thousand meters down. Here, no sunlight ever reached. The water was near-freezing, and the pressure was enormous. Most people, especially those new to the deep, thought nothing could survive in such a place. They were wrong. Life was everywhere, thriving in ways that seemed impossible to surface dwellers. Giant squid, those elusive titans, called it home. Anglerfish, with their glowing lures, swam through the blackness. Vampire squid, comb jellies, and countless other creatures lived here. Each one had found a way to adapt to the extreme cold, the crushing pressure, and the endless dark. Scientists still discovered new tricks these animals used every year. Pressure wasn't a problem, Press would explain, if your body was built to match it. Her work was about telling the story of the midnight zone as a marvel of adaptation, never as a place of horror.



Press made her point very clear. "It's one thousand to four thousand meters down," she'd say, holding up three fingers. "Pitch black. Crushing pressure. Freezing cold. But life thrives anyway." She'd list her favorite residents. "Giant squid. Anglerfish. Vampire squid. Each one adapted to its home conditions." She paused, letting the words sink in. "Pressure isn't a problem if your body matches it. Cold isn't a problem if your *metabolism* is built for it. That's how your body uses energy. These creatures burn energy slowly, perfectly tuned to the cold water." She'd tap her temple. "And darkness isn't a problem if your senses don't depend on light at all."

In her lessons, Press started with the basics. "First, the zone itself," she'd say, pointing to a holographic projection of the ocean layers. "From one thousand to four thousand meters. It's right below the twilight zone, where the last bit of sunlight fades out completely. Down here, it's totally dark, like being inside a closed box. The water stays around two to four degrees Celsius, just above freezing. And the pressure? It's immense. One hundred to four hundred times what you feel on the surface. Imagine the weight of a hundred elephants standing on your head."

Then she moved to the adaptations. "How do they handle all that pressure?" she'd ask, her eyes sparkling. "Most deep-sea creatures have soft, gelatinous bodies. No hard shells or air spaces inside them to get crushed. Think of a jellyfish, but tougher, more resilient." She'd explain how their cells were different too. "They use special proteins called *piezolytes*. These are unique molecules that help all the tiny cell machinery work perfectly. They keep everything from collapsing under the weight. And no swim bladders, which are gas-filled sacs that help fish float. Those would just explode under this kind of pressure."

Next came the cold. "How do you stay alive when it's practically freezing?" Press would lean forward, her voice dropping slightly. "Slow *metabolisms*. Their bodies don't burn much energy at all. They move slowly, grow slowly, and live for a very long time. Their bodies also have *enzymes* that work best in the cold. Enzymes are like tiny tools in your cells that make everything happen, from digesting food to building new cells. Some deep-sea species even have natural antifreeze proteins in their blood, just like a car's radiator fluid."



And the darkness? "It's not a problem if you don't need light to see," she'd say. "Some have huge, telescopic eyes to catch the faintest flicker of bioluminescence, light made by other living things. Others have long, sensitive tentacles to feel their way around, like a blind person using a cane. Many rely on smell, tasting the water for food or mates. Some even use electroreception, sensing tiny electrical fields given off by other creatures. They don't miss what they never had, because they have other, better ways to navigate."

Press loved to introduce her "famous residents." She'd show a picture of a giant squid. "This one, *Architeuthis*, can grow up to thirteen meters long. That's longer than a school bus! Imagine meeting that in the dark." Then an anglerfish, its bioluminescent lure dangling. "The females are a hundred times bigger than the males. He literally attaches to her for life, becoming a permanent part of her body." She'd show a vampire squid, a creature that looked like it belonged in a horror movie, with its dark, webbed arms. "But it's not a vampire," Press would correct gently. "It's an ancient relative of both squid and octopuses. And it eats marine snow, not blood." She'd finish with the adorable Dumbo octopus, with its big, ear-like fins that made it look like it was flying through the water.

"Many stories make these animals seem monstrous," Press would explain, her voice firm. "But they aren't monsters. They are extraordinary survivors. Each one is a marvel of adaptation, a perfect solution to living in extreme conditions." She'd even describe the special equipment scientists used. "Marine biologists use pressure-vessel cameras and sample chambers. These keep the creatures under their natural pressure, so we can study them without them getting crushed or decompressed at the surface. It's like bringing their home to the lab."

Press grew up on the abyssal plain, a vast, flat expanse of the deep ocean floor. Her family had lived there for generations. They were giant isopods, like her, scavenging the "marine snow" – a slow, steady rain of organic bits falling from the waters above. From her earliest days, Press learned a fundamental truth: what looked extreme to a surface visitor was simply home to its residents. She carried that lesson deep in her heart.



When she was twelve, Press made the long journey to DepthQuest village. Marlin, the wise old mentor, had asked her a single question. "What is the midnight zone?"

Press hadn't hesitated. "It's one thousand to four thousand meters. Pitch black. Crushing pressure. Freezing cold. But life adapts." She listed off her favorite creatures. "My zone has giant squid, anglerfish, vampire squid. They're extraordinary survivors of extreme conditions. Not monsters, Marlin. Adaptations."

Marlin had simply nodded. "You are appointed, Press."

In her workshop, Press kept a collection of stunning photos and slow-motion videos of midnight-zone residents. She'd point to a female anglerfish, its bioluminescent lure glowing faintly. "This anglerfish uses her lure to attract prey. She doesn't 'haunt' anyone. She's a fisher. Her tool is her own light."



Then she'd show a vampire squid, its dark webbed arms spread wide. "Doesn't drink blood," Press would state, a hint of dry humor in her voice. "It eats marine snow, all that falling organic debris. Vegan, basically."

"I am Press," she'd tell new students, her voice calm and steady. "I teach the **midnight zone**. My goal is to show you the marvel of adaptation, not the horror. The residents of my zone are brilliant problem-solvers. Each one is like a perfect chemistry experiment that worked."

She was always gentle when students looked nervous. "Don't be scared of these pictures," she'd say. "They look strange because they're adapted to a strange environment. If you adapted to crushing pressure and total darkness, you'd look strange too." She'd pause, letting her words sink in. "Strange doesn't mean scary. Strange means clever evolution."

"Think wonder, not horror," Press would insist. "These animals are the same kind of marvel as a giraffe. They just evolved for the dark."

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<https://spark-and-anvil.com/cast/depthquest/press>

Reef



Reef wasn't much bigger than a school of sardine fry, but her scales shimmered with the vibrant stripes of a healthy parrotfish: warm coral-pink, cream, and edged with bright blue. She moved with a quick, darting grace, her fins propelling her through the clear, sun-dappled water. Always clutched in one fin was her species-cataloging-tablet, a small, smooth slate that glowed faintly. She tapped it often, adding new entries to her growing record of the ocean's living patterns.

Reef had a saying she liked: "The colors live where the light reaches." It was a simple truth, one she saw proven every day. Her curiosity about biodiversity was boundless. She spent hours observing, recording, and learning.



Reef understood the ocean wasn't just one big blue mass. Many novices imagined it that way. But the ocean had distinct layers, like a giant cake with different ingredients. Each layer had its own light, its own temperature, its own pressure, and its own unique life. Reef's world was the **sunlit zone**. This was the very top layer, about two hundred meters deep. Sunlight streamed into this zone, reaching far enough for something incredible to happen: **photosynthesis**.

Photosynthesis was like the ocean's magic trick. Tiny plants, both visible and microscopic, used sunlight to create food. This process powered an extraordinary web of life. Coral reefs, with their intricate structures, thrived here. Most of the fish you'd ever heard of swam through these waters. Even a major chunk of the planet's oxygen came from the photosynthesis happening right here. The sunlit zone was tiny compared to the ocean's eleven-thousand-meter depth, but it held most of its living richness.

"The colors live where the light reaches," Reef would explain, her voice bright. "Photosynthesis powers the food web. Reefs build the structure. Fish swim through. Birds dive in. The sunlit zone is small—about two hundred meters—but it holds most of the ocean's living richness."



She often shared what she called the sunlit-zone scaffolds:

- **Zone definition.** The sunlit zone stretches from the surface down to about two hundred meters. Enough light reaches this layer for photosynthesis to happen. Temperatures here are warm to moderate.
- **Coral reefs are alive.** Coral isn't just rock. It's made of tiny animals called polyps. These polyps live in a special partnership with photosynthesizing algae, called zooxanthellae. The coral provides a safe home, and in return, the algae provide food through photosynthesis. *The bright colors you see in healthy coral? Those are the algae.*
- **Bleaching = stress response.** Sometimes, when the water gets too warm, corals get stressed. They expel their colorful algae. The coral then turns white, or "bleached." *When coral bleaches, it isn't dead—it's just stressed.* If conditions improve, the algae can return, and the coral can recover. If not, the coral might die. *Many reefs have*

survived bleaching events in the past.

- **Coral resilience is real.** Some coral species are proving they can adapt to warmer waters. Marine biologists are also developing new techniques to help reefs recover. *It's about awareness, not despair.*
- **Biodiversity hotspots.** Coral reefs are like the rainforests of the ocean. They cover a small area but host an enormous number of species. The Great Barrier Reef alone is home to around 1,500 different kinds of fish.
- **Sunlight + photosynthesis = food web foundation.** Think of phytoplankton, microscopic plants floating in the water, as the ocean's grass. They feed tiny animals called zooplankton, which then feed small fish. Those small fish feed bigger fish, and so on. *All of it traces back to the energy from sunlight.*
- **Anti-doom complement.** Yes, coral bleaching happens, and it's serious. But reefs *can* recover. Conservation efforts *do* work. *Don't carry the whole ocean on your shoulders—but do learn its layers.*

Reef had grown up on a healthy reef, nestled in a quiet lagoon village. Her family had been reef-stewards for generations. They were parrotfish, just like her, and they had a vital job. By feeding on the algae that would otherwise grow too thick and smother the coral, they kept their home healthy and vibrant. It was a lesson passed down through her lineage: "The reef and the fish are one community; each tends the other." Reef carried that wisdom in her very fins.

She remembered the day she walked to DepthQuest, a little nervous but mostly excited, when she was twelve. Marlin, the wise old mentor, had looked at her with piercing eyes. "What is the sunlit zone?" he'd asked.



Reef hadn't hesitated. "The top two hundred meters of the ocean," she'd recited. "Where light reaches. Where photosynthesis happens. Where the colors live. Coral reefs, schools of fish, sea-grass meadows—most of the biodiversity you've heard of lives here."

Marlin had simply nodded. "You are appointed."

Now, in her own workshop, surrounded by the soft glow of her tablet, Reef scrolled through thousands of cataloged species. Fish, coral, anemone, seagrass, plankton—each one a tiny piece of the sunlit zone's story. She tapped an image of a parrotfish, its striped scales identical to her own.

"This parrotfish," she explained, pointing, "me—I eat the algae that would smother the coral. Because of me, the coral stays healthy. The reef stays alive. *I'm a steward, not a tourist.*"



She swiped to another image, this one showing a patch of coral with both brilliant, colorful sections and stark, bleached white areas. "This reef has both," she said, her voice thoughtful. "Some coral bleached during a warm summer. But look, the colorful coral right next to it didn't. Marine biologists are studying which species are more heat-tolerant. That's hope-shaped work."

Reef knew her purpose. She was Reef. Her job was to help others *observe the layer where light lives*. The colors were the algae. The algae fed the corals. The corals built the reef. And the reef held the entire food web together.

She always spoke gently, especially when the conversation turned to the ocean's challenges. "Don't let bleaching headlines convince you the ocean is dying," she'd say. "Some reefs are stressed. Some are bleached. Some are recovering. Some are stable. The picture is complex. *Awareness of the complexity is hope-shaped work—not despair-shaped.*"

"Observe. Catalog. Learn. *The reef tells its story if you watch.*"

Listen along + meet more of the cast at:



<https://spark-and-anvil.com/cast/depthquest/reef>

Smoke



Smoke wasn't like the spiky, alien-looking creatures some people imagined lived in the deep sea. He was a small tube-worm-tween, soft and plush, with a cream-colored trunk and a bright-red plume that fanned out like a delicate flower. His movements were slow, deliberate, as if he had all the time in the deep ocean. He always carried a small, laminated card. On it, a list of strange words glowed faintly: hydrogen sulfide, methane, hydrogen, iron. These weren't just words; they were the secret ingredients, the fuel for his entire world.

Smoke often tapped the card with a soft segment of his trunk. His red plume would twitch with enthusiasm. "Hydrogen sulfide," he'd say, his voice calm and steady. "That's the breakfast of trillions of bacteria. The first meal in a whole food web, down where sunlight never touches." He was deeply patient about explaining how life could thrive in the darkness.



Most people, when they thought about life, imagined sunshine. They pictured green plants, bright flowers, and creatures basking in the light. But Smoke knew better. His home was the **abyssal zone**, a vast, dark plain stretching between four and six thousand meters deep. Down here, sunlight was just a rumor from another world. Yet, life didn't just survive; it *thrived*. Entire cities of creatures flourished around glowing cracks in the seafloor. These were hydrothermal vents, and their discovery in 1977 had completely changed how scientists understood life on Earth.

Instead of sunlight, these communities used chemistry. It was a process called **chemosynthesis**. Imagine bacteria, tiny beyond belief, living right where hot, mineral-rich water gushed from the vents. They didn't need light to make food. Instead, they took chemicals like hydrogen sulfide or methane from the vent water. They *oxidized* them – a fancy word for breaking them down to get energy, kind of like how our bodies break down food. This energy then let them build their own sugars, a process called *carbon fixation*, just like plants do with sunlight.



These bacteria were the base of everything. They fed giant tube worms, which had no mouths of their own but hosted billions of bacteria inside their bodies. Crabs scuttled, picking at the worms. Shrimp darted through the plumes of hot water. It was a complete food web, all powered by chemicals, not by the sun. This was the amazing truth Smoke wanted everyone to see: life could find a way, even in the darkest, most unexpected places. Smoke's whole work was making chemosynthesis visible and celebrating the 1977 discovery that rewrote biology.

Smoke held up his chemical-spectrum card. "See these? Hydrogen sulfide, methane. These are the building blocks," he explained. "Sunlight isn't the only food source. *Chemistry is the other one.* Down at my zone's hydrothermal vents, hot, mineral-rich water gushes from cracks in the seafloor. It's superheated by magma deep inside the Earth, sometimes reaching 400 degrees Celsius. But the cool ocean water above creates a perfect temperature gradient." He paused, letting the image sink in. "Bacteria eat those chemicals. They *chemosynthesize*. Then, tube worms host the bacteria inside them. Crabs eat the worms. *A whole food web – no sun involved. Just chemistry.*"



Smoke had grown up near the East Pacific Rise, a place where vents bubbled and life teemed. His family were vent-dwellers, tube worms who had lived for generations in those chemical-fueled communities. They knew, deep in their very being, that the world held more than one way to power life. Smoke carried that ancient lesson forward.

When he was thirteen, he came before Marlin, the wise old mentor of DepthQuest. "What is the abyssal zone?" Marlin had asked, her voice a low hum. Smoke hadn't hesitated. "Four thousand to six thousand meters deep. Hydrothermal vents. Life without sunlight. Chemosynthesis powers a whole world. Hydrogen sulfide instead of sunlight. Tube worms instead of plants. It's the same biology lesson, just a different energy input." Marlin had simply nodded. "You are appointed," she'd said. It was all Smoke needed.



Smoke's workshop smelled faintly of salt and something metallic, like old pennies. Scaled-down vent chimneys, twisted and dark, stood on his worktables. Beside them, clear tanks held delicate, shimmering tube-worm samples. He gestured to a large screen displaying a stylized image. It showed a vent erupting, spewing dark, cloudy water into the ocean. "Watch," he murmured. "That's a 'black smoker.' It gets its name from the iron compounds that blacken the seawater as they pour out. The chemistry is intense. And the bacteria? They *love* it. They thrive on those chemicals. Then, the tube worms host the bacteria inside them. These worms, up to two meters long, have no mouth or gut. Instead, they have a special organ, a *trophosome*, where their bacteria garden lives. It's a perfect *symbiosis*."

He continued, "Crabs scuttle around the worms, picking at them. It's a whole community, all without the sun." He turned, his red plume fanning out. "I am Smoke. The primitive I teach is the **abyssal zone** and **chemosynthesis**. The big idea is that chemistry can power life. Sunlight is not the only fuel. The 1977 discovery of these vents completely rewrote biology textbooks. It's hope-shaped, marvel-shaped science." He often reminded new recruits that the chemistry of these vents connected directly to the inorganic and redox chemistry they studied in ChemQuest, showing how different sciences were linked.

Smoke's voice softened. "If you ever feel like science has figured everything out," he said, "remember 1977. Less than fifty years ago, we didn't even know these entire ecosystems existed at the bottom of our own ocean. Science is still discovering. There's still so much wonder." He picked up his chemical-spectrum card again, turning it over in his segments. "Chemistry is life's other recipe. *And it might be the one used on alien worlds, too.* Imagine life on icy moons like Europa or Enceladus, far from any sun. They might be powered by chemistry, just like my vents."

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Trench



The first thing you noticed about Trench was her stillness. She moved with a slow, deliberate grace, like a cloud of mist drifting through water. Her body, a soft translucent pink-cream, seemed to glow faintly in the dim light of her workshop. She was small, even for a snailfish, and her movements were always calm. On her back, she carried a small, rolled-up chart. It was her **time-depth-chart**, a diagram that showed how ocean depth connected to the vast stretches of geological time. She often said, "The deepest places are also the oldest. These adaptations took millions of years."



Trench taught about the **hadal zone**. This was the deepest part of the ocean, a world of narrow, elongated trenches plunging from 6,000 to 11,000 meters down. These deep gashes in the seafloor formed when one oceanic plate slid beneath another, a process called *subduction*. The Mariana Trench, the deepest known, reached nearly 11,000 meters. Down there, the pressure was immense, more than 1,000 atmospheres. Imagine a ton of weight pressing on every square centimeter of your body. Most people thought nothing could live in such a place. They were wrong. Snailfish swam happily at 8,000 meters. Tiny amphipods scuttled across the trench floor. Strange, ancient species thrived in isolated pockets of these deep, dark valleys.

It wasn't just about survival; it was about persistence. The hadal zone was a refuge, a place where life had found a way to survive for millions of years. These creatures were living fossils, direct descendants of lineages that had thrived in deeper seas eons ago. While the surface waters changed, the deep ocean remained a stable, unchanging sanctuary. Trench called it the ocean's living archive, a place where evolution had paused, content with its ancient masterpieces. Trench's job was to show everyone the wonder of this extreme, ancient world.



Trench spoke with a quiet, steady voice. "The deepest places are also the oldest," she would say. "Extreme pressure. Total darkness. And still—life. Ancient time. Ancient adaptation. My zone is where evolutionary patience meets physical extremity. The species here have been here, mostly unchanged, for many millions of years."

Trench herself had grown up in the deep, deep trenches. Her family had lived there for what felt like forever. They were a lineage of snailfish whose ancestors had looked much the same for millions of years. Generations of her family had passed down a single, vital lesson: "The deepest places change the slowest. Time runs differently here." Trench carried that truth inside her, a quiet strength.



When Trench was thirteen, she made the long journey to DepthQuest. Marlin, the wise old mentor, met her at the entrance. "What is the hadal zone?" Marlin asked, his voice echoing in the vast chamber. Trench took a deep breath. "The deepest trenches," she began. "Six thousand to eleven thousand meters down. Extreme pressure. Total darkness. And still—life. Ancient time. Ancient adaptation. My ancestors have been in roughly this body-shape for millions of years. Deep-sea stability preserves ancient lineages." Marlin simply nodded. "You are appointed," he said. And Trench, the small snailfish, had found her place.

In her workshop, Trench unrolled her time-depth-chart. It was a beautiful, intricate diagram. One side showed the layers of the ocean, from the sunlit surface down to the crushing depths. The other side showed geological time, stretching back hundreds of millions of years. "See?" she said, tracing a line with a delicate fin. "The surface ocean changes rapidly with climate. The twilight and midnight zones change slower. The abyssal zone is slower still. But the hadal zone? It's glacially slow. The deepest trenches barely change over millions of years." She paused, letting the thought settle. "So, creatures here haven't needed to change much either. That's why some of my neighbors look 'ancient'—they *are*."

She then showed footage from a 2017 expedition to the Mariana Trench. On a large screen, a snailfish drifted into view. Its body was translucent, almost ghostly, and small. It moved with an unhurried calm, its tiny eyes seemingly unfocused in the perpetual darkness. "This snailfish was discovered at 8,178 meters," Trench explained. "The deepest known fish. It survives where land animals couldn't last a second." She pointed out its soft, cartilaginous skeleton and the lack of a swim bladder. "These are key adaptations," she said. "No rigid bones to be crushed. No gas-filled bladder to explode under the pressure. Just specialized membranes and proteins that work perfectly down there. And they have a very slow *metabolism*," she added, "meaning they use energy slowly, like a deep-sea battery that lasts for ages." She also showed images of amphipods, small crustaceans scuttling across the trench floor, breaking down "marine snow"—the constant shower of organic particles from above—and the occasional carcass. "They're the clean-up crew," she added with a hint of dry humor. "Efficient and ancient. Some of their lineages are very, very old." It made you think about time differently. What did 'new' even mean when some creatures had been perfectly adapted for millions of years?



"I am Trench," she stated, her voice clear. "The primitive I teach is the **hadal zone + deep-time adaptation**. My message is simple: deep places are old places. Stability preserves the ancient."

Then, her expression turned serious. "Even the deepest trench has been touched by plastic," she admitted, her voice softer now. A hush fell over the workshop. "That's sobering, yes. But it's also motivating. Cleanup work is happening at multiple ocean scales. We need awareness, not despair. My zone is recoverable too."

She finished by looking around at her students. "Wonder at the depth," she urged them. "Wonder at the time. Both are vast. Both hold marvels."

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