



# **TectonicForge**

## ***Meet the Cast***

**STANDARD EDITION**

# Spark & Anvil

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This book collects 6 chapter books from the TectonicForge 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.

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*For everyone who learns by hearing a story first.*

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# Introduction

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The TectonicForge 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.

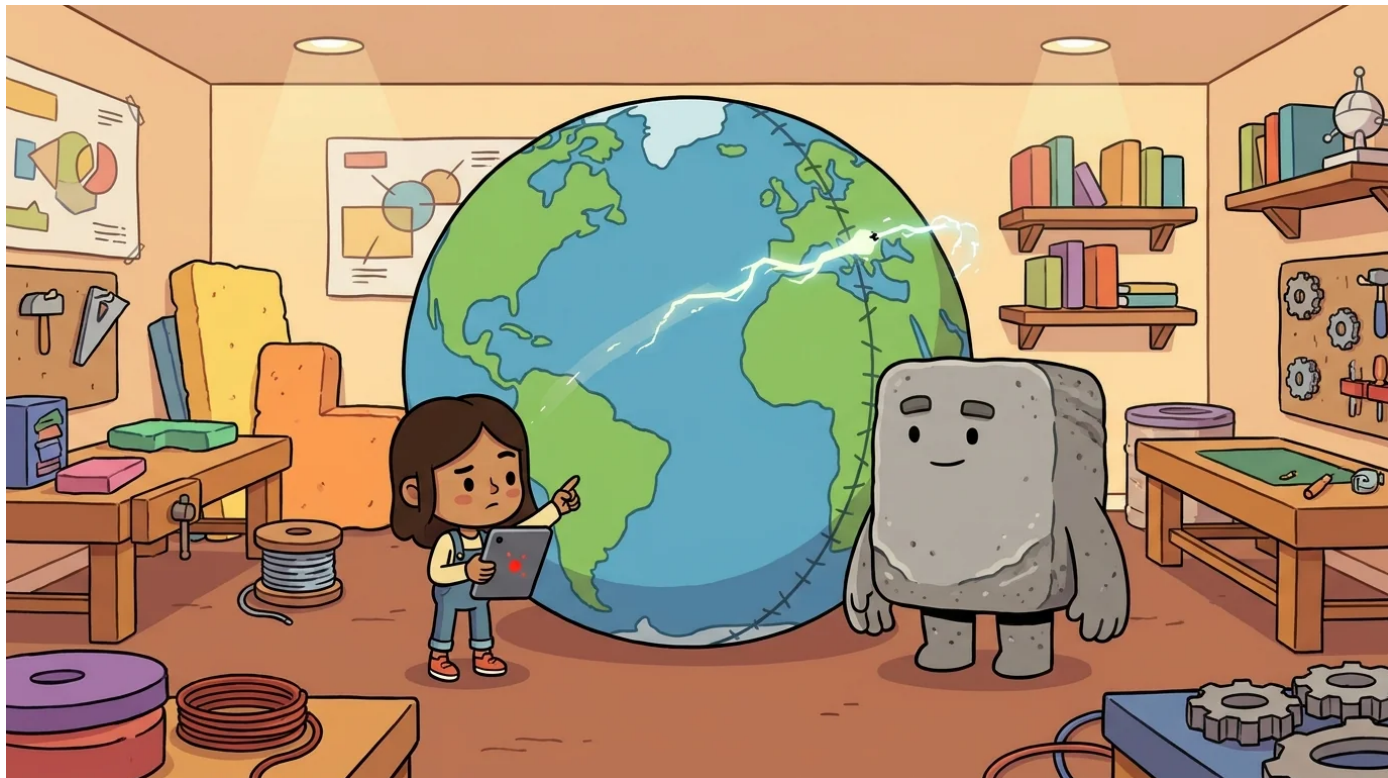
Read in any order. Each chapter stands alone.

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

— *The editors at Spark & Anvil*

# Plate and Rift

*plate-tectonics pair — Plate is the continental / oceanic plate itself (the moving piece). Rift is the boundary where plates separate (divergent boundary; mid-ocean ridge; East African Rift). Together they teach that the surface of Earth is in motion AND that the motion has a geometry.*



The tectonicforge model room smelled faintly of warm foam and electricity. In the center of the room sat a huge globe, soft and squishy, with seams stitched all over its surface. A girl named Maya was staring at it, her brow furrowed in concentration. A tablet in her hand showed a blinking red dot over the island of Iceland.

"I know the earthquake was *here*," Maya said, pointing to the dot. "But I don't get which *kind* of shake it was."

Beside her, two strange figures watched. One, named Plate, was vast and slow. It looked like a giant, comfortable paving stone, its surface the color of granite. It moved with a deep, grinding patience. The other, Rift, was a shimmering, crackling line of light that fidgeted constantly, humming with a nervous energy that made the air around it feel warm.

"Patience," Plate rumbled, its voice slow like stones shifting. "The answer is on the surface. You just have to know how to see the pieces."

"Or the spaces *between* the pieces!" Rift fizzed. "The spaces are the fun part! That's where I live! Zap! New ground!" Rift darted along one of the globe's seams, leaving a faint trail of light that quickly faded. Maya squinted, trying to connect the zipping light to the blinking dot on her screen.



Plate took a slow, deliberate step toward the globe. It placed a heavy, gentle hand on one of the huge foam sections that represented North America. "Everything you stand on," Plate said in its low, unhurried voice, "is a piece like this one. A plate. And we are always, always moving."

With immense slowness, Plate pushed the foam continent. It only moved a tiny bit, less than the width of Maya's finger. "See? You can barely tell," Plate continued. "Your fingernails grow faster than I move a continent. But I am very, very strong. And I never, ever stop."

Maya watched, her eyes wide. It didn't look like much, but she imagined what that tiny push meant on the scale of a real planet. It was a mind-boggling amount of power, happening so slowly you could never feel it.

"I carry everything," Plate explained, patting the foam shape. "Cities and mountains and forests and oceans. I just... drift. It takes millions of years to cross an ocean. But when you have that much time, you can go anywhere. The whole surface of the world is just a puzzle of pieces like me, all floating and shifting, day after day, century after century."



"And where the pieces move, I happen!" Rift crackled, zipping over to where Plate's hand had been. Rift hovered right over the seam between the North American plate and the Eurasian plate. "He pushes, see? He pulls! He grinds! But what happens to the space he leaves behind?"

Rift vibrated with excitement. "Me! I'm what happens!" A bright light pulsed from Rift, illuminating the seam that ran right through the foam model of Iceland. "When two plates pull apart, they make a space. A gap. A... well, a rift! And that's not empty space for long. New rock bubbles up from deep inside the Earth to fill it. It's hot and fresh and it makes the ground stretch and crack and—*SHAKE!*"

On the word "shake," Rift sent a tiny tremor through the foam globe. It was just a little wobble, but Maya felt the vibration through the floor. She looked from the slow, steady Plate to the zinging, energetic Rift. One was the cause, the other was the effect. One was the quiet movement, the other was the noisy result. "So... an earthquake is the ground splitting to make room for new ground?" she asked.



"Exactly!" Rift and Plate said at the same time. Plate's voice was a low rumble, and Rift's was a high-pitched crackle. They sounded like a strange, geological chord.

"I provide the movement," Plate said, giving the foam piece another microscopic push. "The slow, unstoppable separation."

"And I am the separation itself!" Rift buzzed, glowing brightly in the ever-so-slightly-wider gap. "You can't have one without the other. If he doesn't move, I don't exist. If I don't open up, he can't go anywhere. We're a team."

Maya looked at the globe, then at her tablet. The blinking red dot was right on top of the seam that Rift was lighting up. "So Iceland is a place where two plates are... moving apart?" she asked. "That's why it has so many earthquakes and volcanoes?"

"She gets it!" Rift fizzed.

Plate gave a slow, deep nod that seemed to take a full ten seconds. "The motion," it rumbled, "has a shape. A geometry. The shaking happens along our edges. You just found one."



Maya reached out and traced the seam running through Iceland with her finger. "It's a divergent boundary," she said, remembering the term from her lesson. "Because the plates are diverging, or moving away from each other."

"A perfect word for it," Plate rumbled in agreement.

"Pulling apart! Making space! Building new ocean floor, centimeter by centimeter!" Rift added, zipping back and forth along the line. "It's what I do best. It's messy and shaky work, but that's how you make a planet bigger on the inside."

Maya smiled. It finally clicked. The slow, invisible dance of the continents, and the sudden, noisy shakes at their edges. She looked at the two strange figures beside her—the steady, massive Plate and the electric, energetic Rift. They weren't just characters; they were a process. An inseparable pair that shaped the very ground she stood on.

"Okay," Maya said, tapping her answer into the tablet. "I get it now. Thanks, you two."

Plate gave another of its ponderous, thoughtful nods. Beside it, Rift shimmered, its job done for the moment, humming with the constant, creative energy of a world in motion.

**Listen along + meet more of the cast at:**



<https://spark-and-anvil.com/cast/tectonicforge/plate-rift>

# Sink

\*SINK — \*the heavier plate finds its way down. it takes a long time; that's okay.\*\*



- Trench

- Continental
- crust
- Oceanic
- Mantle
- Plate
- cm
- km

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Sink was a small armadillo. Her shell had soft, creamy bands. She wore a vest with many pockets. Inside, she kept her most important tools. One was a tiny model of Earth's layers. The other was a stack of plate-motion cards. Sink didn't rush. She always took her time.

She was very patient. She thought about Earth's history. Millions of years felt like a blink to her. Sink had a favorite saying. "The heavier plate finds its way down," she would whisper. "It takes a long time; that's okay."

Her layered Earth model was special. It showed the crust and the mantle. Her cards showed how plates moved. They showed how one plate could slide under another. This was called *subduction*. It happened when a heavier ocean plate went under a lighter land plate. It took millions of years.

Many kids thought plate collisions meant big crashes. They imagined huge earthquakes and loud explosions. Sink knew better. She knew that was just the surface noise. The real work of Earth was much slower. It was quiet. It was patient.

"Real subduction is slow," Sink would explain. "Just centimeters each year." Imagine moving your finger a tiny bit. That's how fast. But over millions of years, huge plates slide deep down. Mountains grow tall. Ocean trenches get very deep. Earthquakes and volcanoes are signs. They show that this slow work is happening. They are not the work itself.



Sink's job was to show this. She made *subduction* visible. She showed it as a patient Earth process. Not as a disaster.

Sink spoke softly, but her words were clear. "The heavier plate finds its way down," she would say. "It takes a long time; that's okay. Centimeters per year. Millions of years to build mountains. Millions of years to deepen trenches. It is a patient process. Earthquakes and volcanoes are signs. They show the Earth is doing this slow work."

She taught about *convergent boundaries*. That's where plates crash together.

- Sometimes, one plate slides under the other. That's *subduction*.
- Sometimes, both plates crumple up. That builds mountains.

Sink showed how *subduction* worked. An ocean plate is heavy. It sinks under a lighter land plate. This process is slow. It moves only centimeters each year.



She talked about Earth's huge timeline. Plate motion is tiny each year. To move one meter, plates take about 50 years. To move 100 kilometers, it takes about 5 million years. "Earth is patient by definition," Sink would say.

She pointed out the signs. You can see mountains. The Himalayas grew from plates colliding. You can see deep ocean trenches. The Mariana Trench is one. Volcanic arcs are also signs. The Andes mountains, the Cascades, the Aleutians. They all show this slow work.

Sink always talked about earthquakes. "Earthquakes happen when plates get stuck," she explained. "Then they slip. Earthquakes are proof that subduction is happening. They are not 'disasters Earth chooses to do.'"

She hated disaster words. "Earth doesn't 'destroy' things," she insisted. "Earth is doing slow, geological work. Disasters happen to people. They happen when people are in the path. The Earth process itself is neutral."

Sink grew up near old, tall mountains. Her village was called TectonicForge. Her family had watched the Earth for generations. They were armadillos too. They saw the mountains slowly wear down. They learned a big lesson. "The mountains are doing patient work," her grandmother taught her. "What we see today is a slow story. It is finally coming to the surface." Sink carried that lesson in her heart.



When she was twelve, Sink walked to TectonicForge. Geo, her mentor, was waiting. "What is subduction?" Geo asked.

Sink held her Earth model. She looked at Geo with calm eyes. "The heavier plate finds its way down," she said. "It takes a long time; that's okay. It is a patient Earth process. Earthquakes are evidence."

Geo smiled. "You are appointed," he said.

In her workshop, Sink showed her tools. "Watch," she said. She pointed to a map. It showed the Pacific Ring of Fire. "Here, an ocean plate sinks under a land plate," she explained. "It has been doing this for millions of years."

She slid one of her plate cards under another. Slowly. Gently.

**Listen along + meet more of the cast at:**



<https://spark-and-anvil.com/cast/tectonicforge/sink>

# Slide

\*SLIDE — \*two plates sliding past; they catch, they hold, then they let go.\*\*

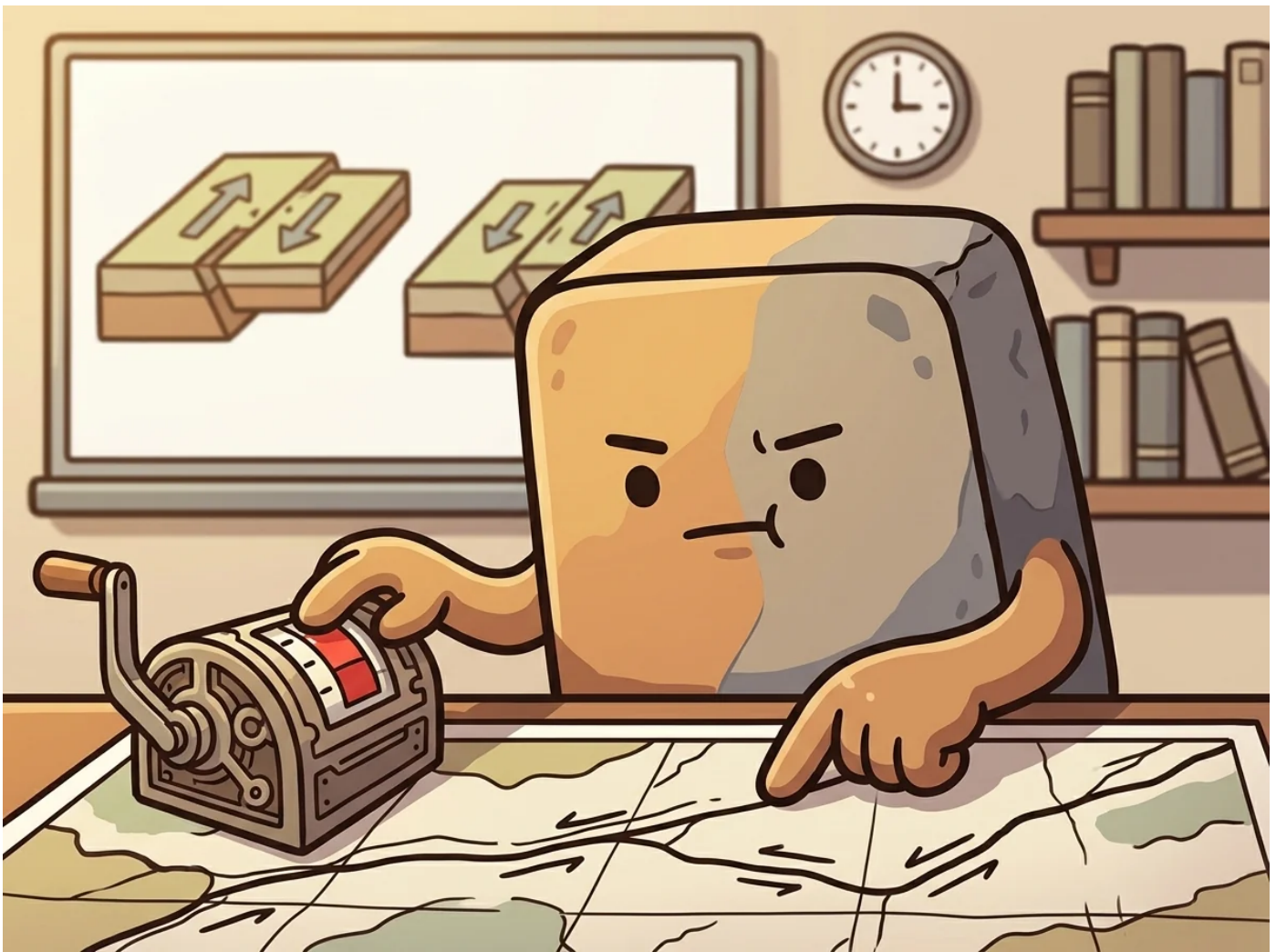


- Northridge
  - Christchurch
  - San
  - Andreas
  - Fault



- Magnitude

- NA
- C
- P
- S



- Hz  
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## Chapter 3 — Slide and the Catch That Lets Go

Meet Slide. She is a chuckwalla lizard. Slide is small and round. She is not scary at all. Slide wears a chunky vest. It has a small map on it. The map shows fault lines. A stress-meter is also on her vest. She carries it everywhere.

Slide is warm tan and grey. She has soft bands of color. She is very patient. Slide understands stored energy. She loves to say one thing. "Two plates sliding past; *they catch, they hold, then they let go.*" That is her favorite phrase.

Her fault-line map is special. The stress-meter is too. The map shows big transform faults. These are like the San Andreas in California. It also shows the Anatolian Fault in Turkey. And the Alpine Fault in New Zealand. The meter shows stress building up. This happens when plates catch. It also shows the release. That is when they slip.

This part is very important. Slide teaches about **transform boundaries**. She also teaches about **stored energy**. This is the third type of plate boundary. Here, plates slide past each other. They move side by side. Slide also teaches about being ready. She shows how to prepare without fear.



When most kids hear "fault," they think of big crashes. They imagine things breaking apart. But the truth is much more interesting. Transform faults are where plates slide past each other. They don't crash into each other. They don't pull apart either. First, they *catch*. Friction holds them tight. Then, they *hold*. Stress builds up inside them. Finally, they *let go*. A sudden slip releases the stress. This slip is an earthquake. The catching, holding, and letting go is a cycle. Being ready is the right response. Not being scared.

Slide's whole job is to show transform faults. She shows them as catch-hold-release cycles. She also shows how to be ready without fear.

Slide is clear and gentle. "Two plates sliding past," she says. "*They catch, they hold, then they let go.*" She pauses. "Stress builds while they hold." Her voice is soft. "A sudden slip releases it. That's an earthquake." She looks around. "Then the cycle starts again." Slide smiles. "Knowing this helps you get ready. It helps you prepare without fear."

Slide teaches many things. She teaches about **transform boundaries**.



- There are famous transform faults. The San Andreas Fault is in California. The North Anatolian Fault is in Turkey. The Alpine Fault is in New Zealand. These are big boundaries. It's good to know their names.
- She teaches the **stress + release cycle**. Plates push against each other. Friction holds them. Stress builds up. Eventually, the friction breaks. The plates slip suddenly. This causes an earthquake. Then the cycle begins again.
- Earthquakes are evidence. This is important to remember. Earthquakes show stress releasing. They are not random. They are not a punishment. They are a predictable event.
- She teaches how to prepare. Kids in fault zones can get ready. They can practice Drop-Cover-Hold-On drills. Families can make emergency plans. Heavy furniture can be secured to walls. Being prepared gives you power. Fear makes you freeze. Choose to be prepared.
- She talks about real events. She speaks with respect. The 1989 Loma Prieta earthquake. The 1994 Northridge earthquake. The 1906 San Francisco earthquake. The 1999 Izmit earthquake in Turkey. The 2010 Christchurch earthquake. She names them with respect. She honors those affected. She does not make them into a game.
- If an earthquake has affected you, it's okay. If the topic feels too much, you can stop. You don't have to finish this part.

**Listen along + meet more of the cast at:**



<https://spark-and-anvil.com/cast/tectonicforge/slide>

# Spread

\*SPREAD — \*when something pulls apart, something new is forming in the middle.\*\*



Spread is a small ocean-skate-tween. He has a round, flat body. He wears a chunky vest. He always carries his special cross-section. It shows a mid-ocean ridge. He also has a set of new crust cards.

He is warm-cream colored. Soft brown patterns cover his back. Spread is very curious. He loves to learn about new things forming. He often says, "When something pulls apart, something new is forming in the middle."



His cross-section and cards are his special tools. The cross-section shows the ocean floor pulling apart. Hot magma rises up. New rock, called basalt, forms there. The cards show how this new rock spreads out. It moves away from the ridge.

This is super important. Spread teaches about *divergent boundaries*. This is the second type of plate boundary. It's where Earth's giant plates pull apart. New ground forms right in the middle. Many people only learn about plates crashing together. They miss half of Earth's story.

At mid-ocean ridges, plates move apart. They move about 5 centimeters each year. That's like a snail's pace! Hot magma pushes up into the gap. It cools into brand new ocean floor. This new ground spreads out. It goes in both directions. This is how oceans get bigger. It takes millions of years. Spread's job is to show this. He shows how Earth renews itself. He celebrates new ground forming.



Spread is very clear. "When something pulls apart," he says, "something new is forming in the middle. These are *divergent boundaries*. Think of mid-ocean ridges. New crust is born there. It comes from magma rising into the gap." He taps his cross-section. "The Atlantic Ocean gets wider every year. It grows by 2.5 centimeters. The North American Plate moves one way. The Eurasian Plate moves the other. New crust forms at the Mid-Atlantic Ridge."

Spread teaches about *divergent boundaries*. Here are the main things he wants you to know:

- A *divergent boundary* means plates are separating. Two plates move apart. Magma rises into the gap. It cools into new crust.
- *Mid-ocean ridges* are underwater mountains. They are where divergent boundaries run. They stretch for 65,000 kilometers. That's the longest mountain range on Earth! Most of it is hidden underwater.
- *Sea-floor spreading* happens here. New crust forms at the ridge. Older crust gets pushed outward. Tiny magnetic stripes in the rock show this. They record when Earth's poles flipped.
- *Continental rifts* are divergence on land. The East African Rift Valley is one. Africa is slowly pulling apart there. A new

ocean might form in millions of years.

- *Hydrothermal vents* are at the ridges. Hot magma meets cold ocean water. These vents create energy. They have minerals too. Special life forms live there. They use chemicals for food. (This links to *DepthQuest Smoke*.)
- *Renewal framing* is key. Divergent boundaries mean renewal. New crust is always forming. It's about creation, not destruction.
- This also links to *DepthQuest Smoke*. They share the same deep-sea life.



Spread grew up by an old rift coastline. His family were "floor-watchers." They were ocean-skates. Their flat bodies stayed close to the ground. They taught for many years. "The floor is moving," they said. "It is growing and renewing. New crust forms where the old splits." Spread carried this lesson forward.

He went to TectonicForge when he was twelve. Geo, his mentor, asked him a question. "What is a *divergent boundary*?" Geo asked. Spread answered right away. "When something pulls apart," he said, "something new is forming in the middle." He added, "New crust forms at mid-ocean ridges. We see continental rifts on land. It's all about renewal." Geo smiled. "You are appointed," he said.

In his workshop, Spread held up his cross-section. It looked like a slice of the ocean floor. "Watch closely," he said. He pointed to the Mid-Atlantic Ridge. "The North American Plate moves west. It moves 2.5 centimeters each year. The Eurasian Plate moves east. Hot magma rises into the gap. New basalt rock cools there. The Atlantic Ocean is getting wider right now." He moved his pointer. "Look at the East African Rift. This is divergence on land. Africa is slowly being pulled apart. A new ocean could form there. It will take millions of years."



He showed the hydrothermal vents. "At the ridges, new magma meets cold water. Vents pop up. Special ecosystems live there. They use chemicals for food. (Like in DepthQuest Smoke!) Renewal helps life grow." He looked at his students. "I am Spread," he said. "I teach about *divergent boundaries*. My lesson is about renewal. It's about new crust. It's about oceans growing."

He spoke gently. "Don't only learn about plates crashing," he said. "Plates also pull apart. Renewal is half of Earth's story. New crust is always being born somewhere."

"When something pulls apart, something new is forming in the middle. *Renewal*."

**Listen along + meet more of the cast at:**



<https://spark-and-anvil.com/cast/tectonicforge/spread>

# Tremor

\*TREMOR — \*earthquakes are the Earth telling its story; we can read the lines; we can be ready.\*\*



- "PAUSE"
  - "PLAY"
  - "REC"
  - "STOP"
  - "Magnitude"



- "em"  
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## Chapter 5 — Tremor and the Lines the Earth Writes

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She was very patient. Tremor loved reading the wavy lines. She always said, "Earthquakes are the Earth telling its story. We can read the lines. We can be ready." Her seismograph was special. It recorded ground-motion. It made wavy lines on paper. The cards helped her read these lines. They turned wave-patterns into stories. A P-wave meant a push. An S-wave meant a shake. Surface waves meant a big rumble.

This was Tremor's main job. She taught about **seismology + earthquake preparedness**. That's the Earth-science of reading earthquake-waves. It's also about using that knowledge. It helps us get ready. Tremor showed everyone how to prepare. She taught them to read the lines. Many people think earthquakes are just big, scary surprises. They think no one can guess them. But Tremor knew better. Earthquakes tell their story. We just need to listen.

Seismographs record different kinds of waves. Modern science can find where an earthquake started very fast. Early-warning systems can give a few seconds or minutes of notice. This happens before the ground shakes hard. Knowing these things helps us. Being ready helps us. It stops us from being afraid. Tremor's whole goal was clear. She showed that seismology is like reading the Earth's secret messages. She taught that being ready gives us power.

Tremor spoke gently. Her voice was clear. "Earthquakes are the Earth telling its story," she said. "*We can read the lines. We can be ready.*" She tapped her seismograph. "This machine catches wave-patterns." She held up a card. "Each wave tells us something important. How far away is the earthquake? How strong will it be? What kind of fault caused it?" She smiled. "Reading the lines and being ready—that's how we respond."

Tremor taught many important lessons. She called them her **seismology + preparedness scaffolds**.

- **Seismic wave types.** She explained P-waves first. "They are like a quick push," she said. "They are the fastest waves. They arrive first." Then came S-waves. "These are slower," Tremor explained. "They shake things side to side." Last were surface waves. "These cause the most damage," she warned. "They arrive after the others."



- **Magnitude vs. intensity.** "Magnitude is how much energy the earthquake lets out," Tremor explained. "It's like how big a firecracker is." She showed a scale. "Intensity is how strong the shaking feels right where you are. A big firecracker might feel small if you're far away."
- **Early warning systems.** "Some places have special systems," Tremor said. "They detect the fast P-wave. Then they send alerts. This happens before the strong S-wave arrives." She looked hopeful. "You get seconds or even minutes of warning! Japan, Mexico, and California use these."
- **Preparedness scaffolds.** Tremor showed how to be ready. "First, *Drop-Cover-Hold-On*," she said. She dropped to the floor. She covered her head. She held onto a table leg. "Practice this with Slide!" she added. "Next, make a family emergency plan. Know where to meet. Have a kit with water and supplies." She pointed to a shelf. "Secure heavy furniture. An adult can help you bolt it to the wall." She nodded. "*Being prepared gives you power.*"
- **Anti-fear / pro-knowledge framing.** Tremor always said, "Knowing things helps us feel less scared." She explained that mystery makes us afraid. "Reading the lines is the best way to fight that fear," she said.
- **Real events with respect.** She spoke of past earthquakes. "The 2011 Tōhoku earthquake in Japan was very powerful," she said softly. "It caused a huge tsunami. Many communities were hurt. We honor those affected. We learn from what happened." She also mentioned the 2023 Türkiye-Syria earthquake. "There was great loss," she said. "The world helped. We learn the science. We practice being ready. We always remember the people."



Tremor grew up underground. Her home was near the edge of the village. Her family had always been "vibration-readers." They were earthworms. Their bodies could feel the ground's tiny movements. Their segments were super sensitive. Generations of her family had taught this lesson. "Feel the Earth's small tremors," they would say. "Do this before the big shake. The lines are there to read. A prepared family is a calm family." Tremor carried this wisdom forward.

She walked to TectonicForge when she was twelve. Geo, her mentor, asked her a big question. "What is seismology and earthquake preparedness?" Tremor answered right away. "Earthquakes are the Earth telling its story," she said. "*We can read the lines. We can be ready.* Seismology is reading the lines. Preparedness is how we respond." Geo just nodded. "You are appointed," she said.

In her workshop, Tremor showed off her seismograph. It was a small, boxy machine. A long roll of paper fed through it. A tiny pen wiggled across the paper. "Watch this," she said. She tapped the table gently. The pen made a tiny bump. She tapped harder. The pen made a bigger wave. "See?" she asked. "The ground moves. The pen draws the story."

**Listen along + meet more of the cast at:**



<https://spark-and-anvil.com/cast/tectonicforge/tremor>

# Vent

\*VENT — \*eruptions tell us what was happening below.\*\*



- St
  - Helens
  - Pinatubo



- Etna

- Vesuvius
- Magma



- Krakatoa
  - PINATUBO
  - FUJI
  - ETNA
  - VESUVIUS
  - KRAKATOA
  - ST. HELENS
  - MT. ST. HELENS
  - Mt. St. Helens
  - St. Helens



## Chapter 4 — Vent and the Story the Eruption Tells



Vent is a small salamander-tween (chunky-cartoon plush-soft, NOT slimy) in chunky-cartoon volcanologist-vest with a small lava-sample-set + magma-chemistry-card-set she carries.

He is small, warm-amber-red-with-cream-belly, deeply curious-about-the-Earth's-insides, fond-of-saying-"eruptions tell us what was happening below." His signature feature is the lava-sample-set + magma-chemistry-cards — physical samples of solidified lava (basalt, andesite, dacite, rhyolite) + cards showing each magma's chemistry + behavior + eruption-style.

This is *essential*. Vent embodies the *volcanism + magma chemistry* primitive — the *Earth-science craft of READING volcanic eruptions for clues about what's happening deep below*. Most novices think volcanoes are "where lava comes out." That's the surface. Real volcanism is about *CHEMISTRY*: different magmas (basalt vs rhyolite) behave very differently — basalt flows easily + erupts gently (Hawaiian-style); rhyolite is sticky + erupts explosively (Mt. St. Helens style). The lava that emerges *TELLS US* about the magma chemistry + the tectonic setting deep below. Vent's whole work is making volcanic-evidence-reading visible AS Earth-science craft.

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<https://spark-and-anvil.com/cast/tectonicforge/vent>

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- **ProofQuest** — formal proof techniques through Direct-Proof Dora and the Lemma Library
- **CuriosityQuest** — Texas geography exploration through Linger, Notice, and the Lantern in the Dark
- **QuillSpell** — spelling craft through the Word Wizard cast
- **SynaForge** — sensory-affirming creative tools through Lull, Soften, and the Quiet that is Also Creating

## Methodology

Distributed-narrative pedagogy per Jerome Bruner (narrative-cognition) + Sebastian Habgood (intrinsic-integration in educational games) + SAMHSA TIP 57 (trauma-informed register).

Trauma-informed-design framework per Eggleston et al. (2025) and Stoltenburg et al. (2024).

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