Sidedoor Season 4, Episode 9
The Dinosaur War

[INTRO MUSIC]

Lizzie Peabody: This is Sidedoor. A podcast from the Smithsonian with support from PRX. I'm Lizzie Peabody.

Lizzie Peabody: I bet it's right there…This… as you know… is my first episode hosting Sidedoor. And in my first interview… I got to take a sneak preview of the biggest thing to hit the National Mall in years.

Siobhan Starrs: We closed the, uh, rotunda entrance, so this is the only way in and out of the hall…

Lizzie Peabody: Ohhhh….

Siobhan Starrs: until opening.

Lizzie Peabody: Ah… so we're taking the

Justin O'Neill: Ohhhh!

Lizzie Peabody: secret back way

Siobhan Starrs: Yes, the secret back door into the exhibit!

Lizzie Peabody: I met Siobhan Starrs and she took me on an elevator big enough to fit a dinosaur! And wanna know how I know? Because… this is how dinosaurs get into the museum.

Lizzie Peabody: Woah.

Siobhan Starrs: Oh my gosh, welcome!

Lizzie Peabody: Thank you!

Siobhan Starrs: Hahahahaha!

Lizzie Peabody: This place is amazing.

Siobhan Starrs: Yea! So you came in through a door that a visitor will never enter through.

Lizzie Peabody: This place is the new Fossil Hall at the Smithsonian's National Museum of Natural History. It was still being built when we visited, so there's a bit of extra noise in the

background. Starrs is one of the brains behind the exhibition's design -- which took more than fifteen years of work, from beginning to end. And I thought that was a long time… but my sense of time was very quickly re-calibrated…
Siobhan Starrs: We have some amazing insect fossils in this Hall. We have cockroaches that are over 350 million years old. So, cockroaches really will outlive us all and they look like a cockroach you would find today. It's amazing.

Lizzie Peabody: But other fossils are less familiar: there's a 30 foot long Mosasaur. Think of it as a crocodile's head mounted on a whale's body. It hunted sharks and other swimming predators. And when they excavated it, they found the remains of its last supper.

Siobhan Starrs: It ate a Plesiosaur, which also had its last meal still preserved. So, it's like a Russian nesting doll of meals in one specimen.

Lizzie Peabody: Whoa. Okay. That's right there. I see it suspended inside the rib cage. It looks like a collection of bones.

Siobhan Starrs: Exactly.

Lizzie Peabody: So, this is its last meal?

Siobhan Starrs: That's its last meal. It's a plesiosaur.

Lizzie Peabody: Wow.

Siobhan Starrs: And then in the little box right here, you can see what the Plesiosaur ate.

Lizzie Peabody: So, within minutes of arriving at the new Fossil Hall, I'd already seen like five of the ten coolest things I've seen this year. Including a T-Rex… that is eating a Triceratops. It almost looks like a frame frozen from Jurassic Park, if all you could see was their skeletons.

Lizzie Peabody: So, these dinosaurs are all obviously extremely cool. Do you have any dinosaurs that are sort of like the average Joe dinosaur?

Siobhan Starrs: I don't think we have an average Joe, but we have dinosaurs that probably made mistakes in life. Umm… Bad choices… Unwise choices… Umm, most dinosaur fossils that have ever been discovered are teenagers. They're usually in adolescence. Umm… And so, you think about things that even human teens do today. We're not always that smart. And I have a great example of that actually right over here.

Lizzie Peabody: Siobhan walked us over to two dinosaurs who looked pretty familiar: A Stegosaurus. And a mini T-Rex-looking dino called Ceratosaurus.

Lizzie Peabody: The Stegosaurus looks more or less like what I have seen before. But this Ceratosaurus looks… looks like he's having a bad time.

Siobhan Starrs: He had a really bad day.
Lizzie Peabody: For your mental image: the Ceratosaurus is displayed as if he tried to hunt the Stegosaurus… but… failed. Miserably.

Siobhan Starrs: I think the Ceratosaurus decided to make a meal of somebody who was not the right dinosaur to make a meal of --

Lizzie Peabody: Ahhh.

Siobhan Starrs: Umm… As you can tell from Stegosaurus's armored plating on his back, uh… the armor underneath his neck and the vicious tail spikes on the tip of his tail.

Lizzie Peabody: The Ceratosaurus is flat on his back.

Siobhan Starrs: and he's flailing upside down like you would imagine a defenseless critter with its arms waving in the air.

Lizzie Peabody: It's very undignified.

Lizzie Peabody: Meanwhile, Stegosaurus looks totally unfazed -- like it's about to trundle off and chomp some ferns.

Lizzie Peabody: So how did this Ceratosaurus come into the hands of the Smithsonian?

Siobhan Starrs: So, this Ceratosaurus and the Stegosaurus have a long and sordid story, which is kind of a mystery in and of itself and too much for an exhibition. Umm, but they're part of what's known as the "Dino" or "Bone Wars" of the late 1800s and – really, really interesting story. And this one was collected by O.C. Marsh.

Lizzie Peabody: So, this time on Sidedoor, that "really, really interesting story:" how O.C. Marsh and his unquenchable thirst for fossils delivered so many ancient animals to the halls of the Natural History Museum. The answer… involves bones… Betrayal… And a battle between two early paleontologists who destroyed each other's lives in pursuit of fossils. Come for the dinosaurs -- stay for the grudges.

[BREAK]

Lizzie Peabody: Othniel Charles Marsh -- better known as O.C. because "Othniel" is a rough first name -- didn't have many friends, but he had a pretty great mustache-beard combo… imagine a walrus… give him some piercing blue eyes, put him in a suit… then turn him into a human. That's Marsh.

Lizzie Peabody: He was unsmiling, serious, and he loved to be right. Starting in 1866, he was America's first professor of paleontology. He taught at Yale. And he pursued fossils with a single-minded focus that made him a legend in his field.
Lizzie Peabody: Around the United States, people had long found fossils -- but they didn't always know what they were looking at. Remember: evolution was a very new idea at the time. Darwin just published his breakthrough text, "On the Origin of Species" in 1859. Before that? Even the idea of extinction was pretty radical[1].

Lizzie Peabody: Today, we all know about fossils. But just for a quick refresher course, we visited Matt Carrano.

Mark Carrano: Uh, my name is Matthew Carrano and I'm the curator of "Dinosauria" at the Smithsonian's National Museum of Natural History.

Lizzie Peabody: Okay Matt. What is a fossil?

Mark Carrano: What is a fossil? It's a surprisingly complicated answer, I suppose. Uh, the easiest way I think to, to find a fossil is a fossil is any evidence of past life.

Lizzie Peabody: Hmmm…

Mark Carrano: Um, it could be a bone, it could be a footprint, it could be a piece of poop. Um, any of those things could be a fossil.

Lizzie Peabody: Carrano says that when you think of a fossil, the most typical image is a bone that has mineralized over millions of years.

Mark Carrano: Usually, it involves, uh, groundwater that has minerals dissolved in it, kind of percolating through the place where these things are buried and molecule by molecule you're replacing the original mineral with the secondary mineral.

Lizzie Peabody: Basically? It turns into rock. So, it was these prehistoric mineralized bones that got Marsh fired up. But the general public didn't really know what to think when they dug them up in their fields and mines.

Mark Carrano: So, in New York and in Indiana and all of these places, they were digging up Mastodons and Mammoth bones when they were, you know, maybe they were looking for coal or digging a well or who knows what. And they were pulling these things out.

[1] Lamarck adamantly opposed Cuvier's idea of extinction; there was no process he could imagine that was capable of wiping an organism out entirely. (Interestingly, the only exception he entertained was humanity, which, Lamarck allowed, might be able to exterminate certain large and slow-to-reproduce animals.)

Lizzie Peabody: These bones would find their way to scientists who knew what *living* animals looked like -- but with these ancient bones? They were bumfuzzled pretty quickly.

Mark Carrano: And so, you know, you had, Peale's Museum in, in Philadelphia, which had a Mastodon, which, you know, he didn't first correctly understand was an elephant. And reconstructed the tusk pointing down, maybe it was like a Walrus, you know, so they were really working to, you know, understand even just with these things were, but they were finding them.

Lizzie Peabody: These mysterious animals had some parts that looked familiar -- and others that didn't. But soon… people started piecing these animals together… and they looked like nothing found on Earth in the late-19th Century.

Lizzie Peabody: Around 1870, a farmer in Cañon City, Colorado tripped across a big bed of fossils.

Mark Carrano: And it proved to be one of the richest dinosaur quarries that had ever been found.

Lizzie Peabody: Our main man O.C. Marsh read about it in the newspaper and pounced. Marsh sent a pair of his trusted fossil collectors to help the farmer dig up whatever bones he could. Over the next few years, 35 boxes of bones were pulled from the quarry, including one specimen that lay in the rock, almost as if it had fallen over dead, mid-stride.

Mark Carrano: Finding a really fully connected, articulated would be the word we use -- skeleton, um, it's really very rare… generally speaking, you know, when you find dinosaur bones, you find a handful of bones. Um, most dinosaur species are known from less than one skeleton.

Lizzie Peabody: The collectors sent the boxes to Yale, where Marsh got to work studying them. And he was astonished by what he saw.

Mark Carrano: So, when he got to it, the head was attached to the neck all the way down to the tail. The legs were still in position.... So, he, pretty quickly realized that it was an important find…

Lizzie Peabody: Marsh eagerly analyzed this new find and named it for the horn found on its face: Ceratosaurus nasicornis.

Mark Carrano: The ceratosaurus part means 'horned lizard' and then nasicornis, which is its species means 'nose horn'. So, it's sort of twice named for the fact that it has this horn on its nose.

Lizzie Peabody: Spiked Lizard, Nose horn. That was my nickname in high school. (laughs)

Lizzie Peabody: This fierce creature was the first of its kind to be found. And Marsh wouldn't have seen anything like it before -- and remember the Ceratosaurus at the beginning of the episode -- the bad hunter? Same guy!

Mark Carrano: It's probably about 20 feet long, although we have some specimens that might be bigger than that… Umm…

Lizzie Peabody: That still sounds pretty big.

Mark Carrano: Big yes. But you know, um, probably weighs less than a ton as opposed to say eight tons, which is what a T-Rex would weigh.

Lizzie Peabody: Wow.

[MUSIC]

Lizzie Peabody: But Marsh wasn't the only paleontologist looking for these prehistoric animals. There was another young scientist that Marsh had met when he was studying animal anatomy in Germany -- a guy called Edward Drinker Cope.

Lizzie Peabody: Here's Mark Jaffee.

Mark Jaffee: I'm Mark Jaffee. I'm the author of the, "Gilded Dinosaur:" the story of Cope and Marsh and the rise of American science.

Lizzie Peabody: Jaffee says that Cope was handsome and charismatic:

Mark Jaffee: He was a self-taught scientist, but brilliant man, but with a tremendously pugnacious, uh, personality that, uh, made it easy for them to clash with other people. Although at the same time, he engendered a great affection from his friends.

Lizzie Peabody: Like Marsh, Cope had some distinguished facial hair himself. He changed it a lot -- but he always kept a long moustache with lightly waxed tips. And especially when they were young, Marsh and Cope had this cute budding friendship. In 1867, when young Cope discovered an ancient, extinct amphibian, he called it "Ptyonius marshii", honoring Marsh. The next year? Marsh returned the favor, naming an extinct Mosasaur after Cope. He called it Mosasaurus copeanus. And if we ended the story here… you'd think "Well, that's nice." But… there's more.

Lizzie Peabody: So, in 1869, Marsh went down to Philadelphia. His buddy Cope had just unveiled his reconstruction of the Elasmosaurus -- another large, fierce-looking sea-creature. It

had taken Cope months to sort through the jumble of tiny bones that composed this massive predator[2].

Lizzie Peabody: And Cope was proud of his work. He had commissioned these fancy illustrations to show off his Elasmosaurus using his own money. These were to be published alongside his description of the ancient animal in an academic journal later that summer.

Lizzie Peabody: But… when Marsh saw Cope's Elasmosaurus, something looked… wrong. He suggested to Cope that maybe Cope had attached the head… to its tail. Cope disagreed. They called in another paleontologist friend who looked at it, and agreed with Marsh. At this point, Cope likely stared at his Elasmosaurus for quite a while, and said something like: "Oh no." "Oh yea." And worse yet: the expensive drawings of the head-on-its-tail Elasmosaurus had already been published.

Mark Jaffee: And once he found that out that he made this error, he tried to gather up all those copies and destroy them. There were still a few floating around, unfortunately.

Lizzie Peabody: Cope was mortified. But how could he blame Marsh for being right? Plus, Cope had other discoveries in the works. And so, later that same trip, Cope brought Marsh to a quarry in Haddonfield, New Jersey, where he'd discovered some impressive bones. The quarry workers were digging for a mineral called marl, which coincidentally is a great material for preserving fossils.

Mark Jaffee: Cope took Marsh out to show him, you know, the work that he was doing. But the next thing he knew is that Marsh had hired a local man to be a collector and start sending Haddonfield fossils to New Haven.

Lizzie Peabody: Wait, let me get this straight. So, he, he went kind of under Cope's nose and started stealing fossils out from under him.

Mark Jaffee: Well, I wouldn't say steal, you know, this is one of those things where, they're out there, you can go find them. But again, Cope felt he has sort of proprietary interest in the marl pits and that Marsh was poaching. And so that sort of became the template. That's where, things got really frosty quickly between Cope and Marsh.

Lizzie Peabody: So… Cope definitely felt he had grievances against Marsh. And… Marsh didn't seem to care. The friendship was over. But the feud that consumed them for the rest of their days was just getting started.

Lizzie Peabody: More dinosaur discovery and paleontologist feud, after a quick break.

[BREAK]

[2] https://en.wikipedia.org/wiki/Elasmosaurus#/media/File:Milwaukee_Elasmosaurus.jpg

Lizzie Peabody: Alright, so here's where we are. O.C. Marsh was a pioneering paleontologist in the late 1800s. In fact, he was the country's first paleontology professor. And he was really an "ends justify the means" kinda guy.

Lizzie Peabody: His former paleontologist friend, Edward Drinker Cope, learned this the hard way. Marsh gloated over flaws in Cope's work, and poached off what Cope saw as his claim to a bone quarry. It's also possible that Cope was kinda sensitive. And early on in this relationship, it seems that Marsh got the best of Cope. But nobody was prepared for what came next.

[MUSIC]

Lizzie Peabody: Starting in the 1860s, there were surveys scouring the west fueled by the American ambitions of manifest destiny -- controlling everything from the Atlantic to the Pacific. This included lands that Native Americans lived on for millennia. The people on these survey expeditions documented the west's geography, geology and all available natural resources, but they were decidedly not paleontologists.

Lizzie Peabody: Both Marsh and Cope relied on these surveys to send them fossils they they'd found while studying the west. But before long, Marsh grew frustrated relying on the work of others. And in the summer of 1870, he went west himself.

Lizzie Peabody: And in that very first year, Marsh made a big splash. He published the discovery of a new type of huge flying reptile. He called it… Pterodactyl[3].

Lizzie Peabody: And so, reading about Marsh's success, Cope vowed to go west himself before Marsh and others picked it clean of choice fossils. And this is where the bulk of their discoveries would happen for the rest of their lives.

Lizzie Peabody: But while the work was fruitful, their work out west was also physical -- there were long days using hammers and chisels to dig up boulders under the hot sun. And… it could be dangerous. Here's author Mark Jaffee again:

Mark Jaffee: Marsh got caught in a buffalo stampede…

Lizzie Peabody: Really?

Mark Jaffee: Yes. And what he did was, he ran with the herd shooting at buffalo on his side,

Lizzie Peabody: Oh my gosh.

Mark Jaffee: Trying to clear a path, you know…out.

[3] Jaffee, p. 386, note 25

Lizzie Peabody: That's quite an image. (laughs)

Mark Jaffee: Yea…

Lizzie Peabody: The feud kind of moves west to Wyoming and the Dakota territories and Montana and Colorado, um, where Cope and Marsh did a lot of hunting for dinosaur fossils. Um, but it wasn't until they started discovering the Jurassic fossils, a lot of what the Smithsonian actually has in the new Deep Time Fossil Hall, that their rivalry really seem to take off. So, what was it about the Jurassic discoveries, like the Ceratosaurus that really caused that rivalry to heat up?

Mark Jaffee: Well, it was in 1877 that the big dinosaur find in Morrison, Colorado, uh, came about. And that went to Marsh. And out of that, came the Titanosaurus and Stegosaurus.

Lizzie Peabody: Titanosaurus. Stegosaurus. The finds coming out of the Morrison pits were a big win for Marsh… and would definitely have made Cope jealous. There were so many fossils out west that Marsh and Cope couldn't analyze them fast enough. The pace was relentless. They'd find bones. Quickly analyze them. Rush to publish. Rinse. Repeat. Dozens of times a year.

Mark Jaffee: Cope still holds the record of most scientific papers by one scientist in the United States.

Lizzie Peabody: Wow. Still?

Mark Jaffee: Yeah. 1500. Well, you know, at one point, he actually bought the American Naturalist, so, unlike most scientists actually had his own publication, which helps, (laughs) I would guess.

Lizzie Peabody: This rapid-fire science created a problem, where different specimens of the same animal were named two and three times over. For example, in the late 1870s, Cope trumpeted the discovery of a new dinosaur named Hypsirhopus… but Marsh had already discovered that one and called it: Stegosaurus. This type of academic malpractice created a logjam of improperly understood fossils and names that took paleontologists the better part of a century to untangle.

Lizzie Peabody: And… it got worse:

Lizzie Peabody: There are stories that Marsh ordered fossils that he couldn't collect himself to be destroyed. Like if I can't have it, nobody else can either. Is there anything in your research that supports that?

Mark Jaffee: Yes. Now, this goes to the next really big dinosaur find was Cuomo Bluffs, Wyoming. And again, uh, it initially went to Marsh. But then Cope showed up. And um, there is a

letter from one of the fellows who collected for Marsh, saying that he was told to uh, take what he could and destroy the rest.

Lizzie Peabody: To destroy fossils just so Cope -- or anyone else -- couldn't have them… it's not just underhanded… it's a crime against science.

Lizzie Peabody: There were also rumors of Marsh and Cope spying on each other. There's another story about Marsh stealing a railway car full of bones heading to Philadelphia, although Jaffee says he couldn't find evidence of that one. They'd even get at each other by mail.

Lizzie Peabody: After Cope received a box of specimens intended for Marsh… he forwarded them, rather generously. Marsh, in his reply to thank Cope started off pretty friendly. But then, his letter took a turn. Here's Marsh.

Lizzie Peabody: "The Kansas fossil you sent came all right, but where are the rest? And how about those from Wyoming? The information I received on this subject made me very angry."

Lizzie Peabody: To which Cope writes back:

Lizzie Peabody: "It is far more irritating to me to be charged with dishonorable acts than to lose material, species, etc. Had I chosen, they all would have been mine."

Lizzie Peabody: Basically: if I wasn't being so nice, I could have kept all of them. I did you a solid, man. Even though they barely saw each other, hard feelings sat at a rolling boil, for years.

[MUSIC]

Lizzie Peabody: And this feud-by-post spilled into the public eye in 1881, shortly after the United States Geological Survey was formed, and Marsh was named chief paleontologist. This meant that Marsh held the keys to all kinds of funding that many of Cope's expeditions relied upon.

Lizzie Peabody: So, Cope, shut out of government funding, but dedicated as ever to acquiring more fossils, makes some unwise investments in gold and silver mines. He loses all of his money, and winds up having to move from his house, into a small apartment, surrounded only by his fossils and research papers.

Lizzie Peabody: And then, Marsh's close friend -- the USGS director -- John Wesley Powell -- made a bold move. He went after Cope's fossils. As in, the only thing Cope has left. Powell argued that all of Cope's fossils were collected while he accompanied official government surveys in the west… those expeditions were paid for by the U.S. Government… so… in Powell's view all of Cope's fossils belong to the government.

Lizzie Peabody: But Cope was ready for this… he had paid his own way out west and kept meticulous records. So, he gathered up all the receipts and proved once and for all his ownership of all his fossils. They were his to keep.

Lizzie Peabody: And though Cope won that battle, he was infuriated about the grab for his life's work. He had reached. His. Limit. … and vowed revenge.

Mark Jaffee: You remember, I told you, that Cope was pugnacious?

Lizzie Peabody: Yes.

Mark Jaffee: He was just seeing red at that point. That's what led to the final big battle between the two of them, which was the expose in the New York Herald. Cope had for years, been collecting what he called his “Marshiana.” All this evidence about how bad Marsh was. I mean, he had done things like he'd gone up to New Haven and interviewed Marsh’s assistants who were... had been treated, you know, badly or unfairly by Marsh. And um, Cope took all this material and um, he found a um, not quite reputable journalist to write up a multi-part series based on the “Marshiana.” Um, it appeared in the New York Herald in January 1890.

Lizzie Peabody: The headlines shouted about “ignorance, plagiarism, and incompetence.” And helpfully suggested “Will Congress Investigate?”

Lizzie Peabody: In a reply article, Powell said that Cope, “was a fine scientist if he could be made to realize that the enemy which he sees forever haunting him as a ghost is himself.”

Lizzie Peabody: Cope then went after Marsh, saying “No man can, by the use of money only, palm himself off successfully as a representative of the science of America.”

Lizzie Peabody: It was… a total embarrassment for both Cope and Marsh’s colleagues and professional peers.

Mark Jaffee: I mean, everyone in the scientific community was just horrified to be dragged into it. And it was so unseemly.

Lizzie Peabody: Also in the articles? Cope accused Marsh of the same thing he’d been accused of himself: that he collected fossils for Yale on the government dollar. Those accusations caught Congress’ attention. They investigated. And decided to go after Marsh's fossils.

Mark Jaffee: In a damaging way, Cope drew blood.

Lizzie Peabody: Unfortunately for Marsh… the U.S. Geological Survey DID fund a lot of his research. And… the government demands for his collections grew stronger. In the meantime, Marsh continued to study and organize his specimens… properly, this time. Until, after ten years of dragging his feet, O.C. Marsh died mostly alone in 1899.

Mark Jaffee: It wasn't until, um, Marsh was dead that finally a five car loads of fossils were shipped from, uh, New Haven to Washington, DC.

Lizzie Peabody: A few months after his death, 80 tons[4] of Marsh's fossils -- and among them our friend, the Ceratosaurus -- came to their final resting place, at the Smithsonian Institution.

Lizzie Peabody: Today, a handful of Marsh's best specimens delight visitors and spark curiosity in the Smithsonian's new Fossil Hall. But… perhaps the exhibition's best tribute to Marsh and Cope -- are the Ceratosaurus and the Stegosaurus we met at the beginning of this story. The Ceratosaurus, lies on the ground, a victim of his own bad decision… trying to eat a meal he couldn't quite take down… reminds me lot of O.C. Marsh, who tried to ruin Cope… but ended up having his own fossils carted away.

Lizzie Peabody: By the end of his life, Cope had discovered 56 new species. And Marsh? He discovered 80. Both numbers are remarkable.

Lizzie Peabody: But it's not really about the numbers -- it's about what we know today, thanks to this silly but legendary feud between two men… who pushed the boundaries of our scientific understanding, put American paleontology on the map... and had really excellent facial hair.

Lizzie Peabody: You've been listening to Sidedoor, a podcast from the Smithsonian with support from PRX.

Lizzie Peabody: If you live in DC and want to check out our Ceratosaurus friend -- and all of the other stunning dinosaurs found in the National Museum of Natural History's new Fossil Hall -- come check them out! But if you aren't local -- and even if you are -- subscribe to our newsletter for some extra pictures and dino facts that we collected while reporting this story. You can subscribe at si.edu/sidedoor.

Lizzie Peabody: And if you liked this episode, leave us a review on Apple Podcasts. Your recommendations will help others find our podcast, as we bring you behind the scenes with more stories of science, history, art and culture from around the Smithsonian.

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Lizzie Peabody: Our podcast team is Justin O'Neill, Jason Orfanon, Ellen Rolfes, Jess Sadeq, Lara Koch, and Greg Fisk. Extra support comes from John Barth and Genevieve Sponsler. Our show is mixed by Tarek Fouda. Our theme song and other episode music are by Breakmaster Cylinder.

Lizzie Peabody: If you want to sponsor our show, please email sponsorship at prx.org.

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Lizzie Peabody: I’m your host, Lizzie Peabody. Thanks for listening.

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