Body in Motion

Story and exhibit guide

Welcome to Body in Motion!

Body in Motion is the story of Mika, a young girl as she travels through a fantastical world of animals on her journey home. Based in scientific research into animal physiology and anatomy, this story uses dance and sculpture to bring humor and whimsy to the fantastic wonders of the natural world.

Throughout the exhibit, there are written chapters tp guide you through the story. Each chapter contains three parts: the story, a brief explanation of the scientific research, and a glossary potentially new words.

This booklet contains the same text and can be used as you visit the exhibit or as accompaniment to the dance film.

The dance film is located at the end of the installation and will begin at the top of every hour. Running time for the film is ~35 minutes.

Thank you and we hope you enjoy *Body in Motion!*

Chapter 1: The Fall

In which Mika begins her misadventure

Mika was enjoying her time in the trees. She liked the different shades of green and listening to the voices of the world around her - the murmur of the brook , whispers of the grass, the occasional castanets of nearby bugs. She had climbed into the lap of her favorite tree, a grandmother of a cottonwood perched over a stream, when she saw a sharp glimmer in the water.

"I wonder what that is," thought Mika, clambering down for a closer look.

It seemed so close she could almost reach it. She stretched out her hand and -

PLOP

The cold, dark water enveloped her.

Chapter 2: The Bloom

In which Mika is helped by a jellyfish

Mika's mind raced to catch up to the shock of her nerves. Around her, pulses of translucent colors tangled with tentacles. She was surrounded by jellyfish. She somersaulted through them, grasping for a sense of up and down, lost in the twilight of the water and the weightlessness of her body. She floated in the bloom, helplessly lost.

"You must be new!"

A tranquil, luminescent bell appeared before Mika. She introduced herself as Medusa.

Mika explained that she had fallen in and needed to get back up to the surface, but couldn't tell which way was up and which way was down.

"You're from the surface? Far out! I hear it's like a whole different planet up there, like the colors are *out of this world.* I've never been above it, but I can get you to the surface - we go that way every night for the midnight munchies."

Mika looked around at the lilting jellies, each bell tipped a different direction from the next.

"How can you tell which way is up if you're all facing different ways?" asked Mika.

"Facing? What is facing?" Laughed Medusa, "We don't have faces like you, narrow little eyes and mouths, always pointing the way you're traveling. No, you gotta be open to the pull of the current, the sun, the moon, the tide - you don't need a face toward the sky to find up, you just gotta *feel it.*

"All moving beings have an inner guiding balance. For us jellies, it is an orb filled with crystals. If you tip, the crystals tumble around, alert your body, and then settle themselves

so you always know which way is down.

"I don't know what it's like for you surface-folk, but you can take this!" She passed Mika an ornate compass.

"Its counterweight always settles point-down, so you will know which way is down, and which way is up, no matter how turbulent it gets. It's very grounding."

"Medusa!" A far off jelly bubbled, "You want in on some Sargasso Seaweed?"

"Coming!" called Medusa, and then to Mika, "Good luck!" She floated away with her bloom.

Mika was still looking at the compass when a swift noise came from behind her. She turned to see a giant Manta Ray, mouth agape, headed straight towards her. Without a chance to get out of the way, Mika was swallowed.

Chapter 2 Takeaways

When she meets Medusa, Mika is disoriented by the relative weightlessness of being in the water. Without the proprioceptive input of gravity, her body has a hard time understanding direction.

Medusa the jellyfish, on the other hand, migrates nightly to and from the surface, using the directional input from her statocyst, a rudimentary balance organ that exists in many marine invertebrates. The statocyst is structured similarly to the balance organs found in terrestrial animals, using relatively heavy granules of calcium carbonate to stimulate sensitive hair cells as the animal tips in relation to gravity.

The compass that Medusa gives Mika is a very simplified representation of the statocyst. It is weighted in a way that continuously pulls down - no matter the direction it is tipped or tilted, the compass will always point down (and in an equal and opposite measure, up).

Chapter 2 Glossary

Bell - the bell of the jellyfish is the umbrella-shaped body, out of which trail the tentacles and the oral arms.

Sargasso Seaweed - *Sargassum is a unique seaweed that grows in the Sargasso Sea. Unattached to land, it forms giant island-like mats that support whole ecosystems.*

Medusa - a mature jellyfish in the last stage of its life cycle, which is the stage in which we usually see jellyfish. The name 'Medusa' is taken from a Greek mythological character of a woman who has snakes as hair and is so hideous that she turns anyone who catches her gaze into stone.

Statocyst - a rudimentary balance organ in many marine creatures. A statocyst is an organ lined with highly sensitive hair cells and filled with calcium carbonate crystals. When it is tipped off balance, the crystals fall towards gravity, alerting the hair crystals, which send messages to the nervous

system to help the animal maintain equilibrium.

Vestibular System - the system that regulates balance, spatial awareness, and equilibrium in vertebrates (things with spines). Structures in the vestibular system have highly sensitive hair cells that are alerted to changes in orientation, acceleration, and direction by the movement of granules of calcium-carbonate. The two main structures in the vestibular system are otoliths and the semicircular canals.

Proprioception - the sense of the body's movement and positioning

Otolith - In vertebrates, the otolith organs detect acceleration, or changes in the speed of movement. There are generally two, one for detecting acceleration forwards and backwards (as in a car), and one for detecting movement up and down (as in an elevator).

Semicircular canal - the semicircular canals are three tubes in the inner ear that are oriented to detect movement in the three planes of direction: transverse (tabletop), lateral (side to side) and sagittal (front and back).

Chapter 3: The Medians

In which a prison break is planned

Inside the Manta Ray was dark and cavernous. The way she had come closed and gills barred any possible opening out. She sensed movement behind her. Mika's eyes slowly adjusted to the darkness, and turned to find three creatures, each stranger than the next. The first, Mollusca, was flowy and gelatinous; Mika could not tell where its head stopped and its body began, or where its body stopped and its limbs began. The second creature, Arthropoda, was armored in a hard exoskeleton, limbs bending in harsh, articulated segments. The third, Chordata, had a huge spine protruding from its back.

"What are you in for?" croaked Mollusca. Mika explained that she had simply been in the wrong place at the wrong time. The three creatures exchanged a sympathetic glance.

They too, were imprisoned in the Manta Ray. Each of them represented a group of animals known for being the same left to right, symmetrical down a central midline. And they had used this knowledge to make a plan.

"We'll escape through the mouth," said Chordata. She had told Mika that her family included every creature with a spinal cord, from mammals to birds to fish. And yes, she had sighed, this did include their current captor.

"You see," said armored Arthropoda, whose group included spiders, lobsters and crabs, "like most of us bilateria, the Ray has a digestive tract. From her belly, there are two ways out."

"How do you know, er, which way is which?" asked Mika, thinking this would be very important information.

"You have to feel for the direction of travel," said Mollusca, cousin to snails, octopus, clams and squid. "All bilateria

have sense organs in the top, front half of their bodies - eyes, ears, mouths and the like - and when they move, they lead with that part. The face is always forward."

Mika tried to tune into the rhythmic movement of the Ray, trying to discern which way her body was moving in space, which way the exit would be. She was lost in her thoughts when she heard Chordata's cry.

"There it is, mouth is open, it's now or never!"

By the time Mika rushed from deep in the belly, the Medians had disappeared through the quickly closing mouth.

"Augh, I'm never going to get out of here now," cried Mika, "at least, not with any dignity."

She looked out after the escaped Medians.

Something reeled behind her. She turned to see a fish hook offering her a new way out. Unsure of where it led, but sure she couldn't stay, she grabbed on and hoped for the best.

Chapter 3 Takeaway

The three characters in this section are all bilateria, a name for animals that are symmetrical from left to right. Despite the vast diversity in each of their groups, they understand their predicament and hatch their escape plan through the lens of the basic shared features of all bilateria.

In addition to their left/right symmetry, all bilateria have distinct upper/lower and front/back body halves.

The first similarity that they mention is the digestive tract. All animals, symmetrical or not, need to consume food to get their energy. There are a host of eating strategies in the animal kingdom, but all bilateria have a gut that runs through the entirety of the body, eating through a mouth, digesting the nutrients, and excreting waste.

The second similarity mentioned in this chapter is the facing. With this innate direction, bilateria tend to have sensory organs and mouths clustered in the upper front quadrant of their bodies, which would be the first part of their body to venture into the world and receive stimuli. When you look at the body plan for any symmetrical animal - a fish, a moth, yourself - each has a face in the upper frontal part of its body, limbs that propel it forward in space, a way to ingest and then expel nutrients.

Chapter 3 Glossary

Arthropod - an arthropod (scientific name *arthropoda)* is an invertebrate animal with a segmented body, jointed limbs, and an exoskeleton. Classes of animals that are arthropods include insects, arachnids (spiders, scorpions, ticks), and crustaceans (crabs, shrimp, lobster).

Bilateria - bilateria refers to animals that display left/right symmetry. Bilateria also have upper/lower body halves (head and tail) and a front/back body half (belly and back). Bilateria also have complete digestive tracts starting

with a mouth and ending with an anus.

Chordate - a chordate (scientific name *chordata*) is any animal that has a spinal cord, the central trunk of the nervous system. While the group is named for this shared feature, chordates share other uniting characteristics, including tails and pharyngeal slits (an embryonic structure that develops into either gills or jaws). Chordates also all have a notochord, which is a cartilaginous rod running the length of the body. In some, the cartilaginous notochord develops into a bony spine, creating vertebrates which include fish, lizards, birds, mammals.

Median - The Medians are my name for these characters. The name arrives from the multitudinous applications of the word 'median' as it pertains to the middle or central part of geometrical shapes, data sets, as well as the word 'medial,' which refers to the proximity to the midline of the body.

Mollusk - a mollusk (scientific name *mollusca)* is an unsegmented invertebrate animal. Mollusks range widely in body plans and appearances, some living on land and some in water, some with shells . Classes of mollusks include cephalopods (squid, octopus, cuttlefish), gastropods (snails, slugs, sea slugs), bivalves (oysters, clams, scallops) and more.

Manta Ray - a manta ray is a species of cartilaginous fish (meaning its bones are squishy). Named for the Spanish word for 'cloak,' the manta can grow up to 21 feet wide and lives in tropical waters. Manta rays live on a diet of shrimp, krill, and plankton, which they filter through their large, forward-facing mouths. Contrary to this story, manta rays do not eat people.

Chapter 4: The Surface

In which crocodiles give very poor directions

Mika emerged from the water, sputtering. She heaved herself onto the warm sand, lungs finally full, body finally grounded. But as she came into her surroundings, her relief plummeted. It was an unfamiliar beach, filled with coarse sand and salt water. And crocodiles.

Mika started. She saw their scaly backs, yellow eyes, jagged teeth, a mass of prehistoric predation surrounding her.

But they seemed only passively interested in her, eyeing her but not moving to attack. She weighed her caution against her desire to go home and approached one of them.

"Excuse me," she said, "My name is Mika and I need to find my way home."

The crocodile's name was Ron. She lived at the beach with the posse who were currently basking in the sun. They liked being close to the water, she explained. It was prime real estate for hunting, basking, bathing - all the things, she explained - you need for a fulfilling life.

"We live in a society of walk-a-holism. It's always walk-walk-walk-walk-walk. As soon as you're born BAM - you're just an animal with limbs and they assume that your worth is just, what? Walking, squatting, running, stepping, basic land dwelling. It's like, if everyone knew that they could CHOOSE when they want to bear weight on their appendages and didn't HAVE to all the time, you don't have to be a little land-dwelling puppet, the whole system would fall apart. And that's EXACTLY what they're afraid of us knowing."

"Exactly what *who is afraid of you knowing?"* asked Mika.

Ron didn't seem to hear.

"It's like, our lobe-finned fish forebears didn't do all that or-

ganizing and reorganizing their limb plans just so we could slave away all day on our hands and feet in meaningless CONFORMITY."

"Excuse me, that sounds like… a lot… but I'm just trying to get home," inserted Mika.

"Well there's a great spot one beach over," Ron pointed. "Bunch of us got squatters rights. Gotta stick it to the man - they'll try to make you leave and get a job so that you can use their monopoly money to pay for all the things you could have just had if you never left the beach. They control your money, they control your time, they control your mind, and you get, what for it? Nothing. No thank you."

"Uhm," said Mika, biting back frustration, "I can't really live at the beach."

"Oh, so you want something more brackish? Hey, no judgement, that's what my cousin Caiman is into, too." Ron pointed towards a nearby tributary habitat.

"No, I can't LIVE in the water, I live on land, in a house!" Mika had overboiled.

"Oh," scuffed Ron "You're one of those. Gonna live all day on your feet. Fine. Don't say I didn't warn you. If you ever open your eyes, come back to the beach I guess."

Ron slunk off to the shallows with her posse, leaving Mika quite alone.

"Well, that was no help," muttered Mika. She scoured the beach, looking for any indication of what to do next.

In the distance, a blur of movement caught her eye. A figure galloped away from her.

"Excuse me!" She flailed her arms. "Excuse me! Hey wait!!"

She sprinted after it only to see it disappear into a lone red door.

"Hey, wait a minute!"

Mika reached the door just as it closed, unsure of whether to follow the mystery figure.

"I'll just take a peek," she said.

Chapter 4 Takeaway

During her transition from water to land, Mika meets Ron the Crocodile, who represents the transition from land to water.

Crocodiles are not the closest living relative to nor the closest representation of our first land-dwelling ancestors, but they are uniquely positioned to show three locomotive principles which are crucial to the transition of vertebrate life from water to land.

In water, crocodile movement resembles that of a fish, moving with lateral flexion in the spine and tail, using the limbs as rudders for direction. On land, crocodilians have two types of walks: a high walk and a low walk. In the low walk, crocs push themselves with their limbs while their bodies' weight is fully supported by the ground. This is similar to how the first terrestrial lobe-finned fishes are suspected to have moved.

The second type of crocodilian walk is the high walk. Crocodiles are the only living group of reptiles known to high walk, which resembles the walk of a mammal with the limbs directly under the body during movement.

While they are not the direct evolutionary link between aquatic life and human life, crocodiles represent physiological principles that are present in fish, early terrestrial vertebrates, and humans.

Chapter 4 Glossary

Lobe-finned fish - lobe-finned fish are a particular type of fish whose fins are connected to the body by a single bone. The pattern of limb bones in lobe-finned fishes is the same as that of all land-dwelling limbed vertebrates, and certain lobe-finned fish were the predecessors of all limbed vertebrates, including mammals, reptiles, amphibians and birds.

Crocodilian - Crocodiles are a large, lizard-like reptile who live semiaquatic lifestyles. The order 'crocodilia' also includes alligators, caiman, and gharial. Crocodilians can be found in freshwater, saltwater, and brackish water habitats.

Brackish - brackish water is saltier than fresh water but not as salty as seawater. Brackish water is most commonly found in estuaries, where rivers and streams meet the sea.

Caiman - a caiman is a relatively small crocodilian that lives in marshes, swamps and mangroves in Mexico, Central America, and northern South America

Chapter 5: The Dance Class

In which a lemur leads a workout class

Inside the door, Mika could see the loping figure clearly: a lemur, rusty brown and white, all fluff and tail. A sifaka.

The lemur bounded to the front of a rapt and ready group of animals.

"Alright y'all, I'm Linda and I'm here to help you feel fit and fabulous. Are you ready to WORK?" She cried.

The students seemed to be familiar with the choreography, punches and lunges all in sync.

"Rotate in that hip joint, knees flex and toes POINT! I see you Wanda! Yes I know your toes are technically hooves, but you can still extend more than that! THERE you go, that's more like it!"

As synchronized as they were, it seemed to Mika that they were all a little… different. How could a turtle and a gazelle be following the same fitness instructor?

"Alright, time for squats! Lower, and up. Lower, and up. Deeeeeeep flexion in the shoulders and hips, I want to see your mid-limbs bend. This should BUUUURN."

Mika watched the turtle enthusiastically lower its belly to the floor and then push away on repeat.

"It doesn't matter if you're two-legged, four-legged, bird-legged or bow-legged, I wanna see you WORK. THOSE. GLUTES!"

Mika decided that she might have better luck finding directions elsewhere.

But when she emerged from the door, the beach had disappeared and a dark warehouse loomed around her.

Chapter 5 Takeaway

Workout classes are designed to increase the tone and flexibility of the commonly used large muscles and muscle groups in the core and extremities. In Linda's workout class, all tetrapods are welcomed because of their shared physiology of spines, limb, lungs, and hearts.

Linda's workout class is based on an understanding that all tetrapod limb plans are the same: from the limb girdle (shoulder or hip), there is one bone (humerus or femur) that meets at a joint to two bones (radius/ulna or tibia/fibula), which meets the joints in the ankle or wrist bones and onto hands/feet. This pattern holds true in all tetrapods, whether they are flying, swimming, or walking. To Linda, all tetrapods have hips and shoulders that can abduct and adduct, knees that can flex and extend, and spines that can rotate and derotate. Her class is not dominated by aesthetic achievement, but by maximizing the strength and efficiency of bodies in relation to their own anatomy and ranges of motion.

Chapter 5 Glossary

Tetrapod - A tetrapod is any limbed vertebrate or animal whose ancestry is of the limbed vertebrates. This includes all terrestrial limbed animals (lizards, birds, mammals, amphibians) as well as aquatic animals that are descended from land-dwelling animals (whales, manatees, dolphins, seals, walrus, etc.) Tetrapods are specialized for land dwelling and share similar structures in their jaws and teeth, lungs, hearts, eyes, ears, and limb girdles and extremities.

Sifaka - A sifaka is a type of lemur, a primate native to Madagascar. Sifakas live primarily in trees and are skilled with vertical movements as well as jumping large distances between trees. On the ground, they hop sideways on their hind legs.

Glutes - The glutes are a group of three muscles, the most famous being the gluteus maximus, positioned in the back of the hip and used to extend the leg backwards, outwards, and rotate it in the hip socket. In humans, the glutes are a well-defined muscle that aids in the motion of walking and running. In all tetrapods, the gluteus maximus or analogous muscles are responsible for extending the hind limb away from the belly.

Chapter 6: The Art Class

In which a mantis shrimp instructs the finer points of painting

In the dark of the warehouse, Mika caught sight of the most colorful creature she had ever seen. It had a body like a lobster, eyes like a fly, front arms like a praying mantis - a Mantis Shrimp. It peered at her through big, multi-faceted eyes and scuttled towards a light at the end of the corridor.

Mika followed.

Inside the lighted room at the end of the hallway, the mantis shrimp stood at attention by an easel, a group of students watching eagerly.

"Good evening class," she said.

"Good evening, Draca," they murmured in response.

"This week, we are continuing our study of color balance. Now, last week we talked about giving our paintings dimension through light and shadow, creating volume by contrasting areas of light with areas of dark."

The students studied a pair of human figure models huddled tightly in the corner.

"Look at the overtones and undertones of the complex fleshy colors. Flesh isn't just one color and it's unique balance of the twelve primary colors changes as the subject is in light or shadow."

Mika didn't remember there being twelve primary colors. If any of the students had similar hesitations, Draca did not seem to notice.

"You need to learn to see the differences. Take for instance this red. This would never be a substitute for the color we see here," she said, indicating its neighbor swath that looked to Mika to be identical. "We would need to add

some ultraviolet to balance it, see?"

Draca's movements were growing in amplitude, her voice elevating. Mika thought it might be best to ask for directions before Draca grew more agitated.

"Um, excuse me…" she began.

"Ah! Yes! Finally an engaged pupil! Let us look at how we can use this stippling technique to capture the polarization of light!"

"No, I just…" Mika stuttered, moving away from Draca's shockingly aggressive embrace. Draca charged, undeterred.

"You must first find your composition! Can you move your eyes independently from one another? No? Then this will be easy, we will deal with depth of field rather than breadth of field for you!"

Mika jumped back to avoid another thunderous grasp, but stumbled on the easel and found herself falling deep into Draca's painting.

Chapter 6 Takeaway

Draca the Mantis Shrimp, who has one of the most complex visual systems in the world, is an art teacher for a diverse group of animals with different kinds of eyes and visual systems.

There are an abundance of ways to process visual information in the animal kingdom. Some eyes are simple clusters of photosensitive cells that collect information about relative light and shadow. Some, like fly eyes, are compound eyes, domes of thousands of photoreceptors. Some eyes, like our own, are camera eyes, which focus light on an optic nerve.

There is also the matter of eye positioning. Human eyes, and those of most predator animals, are in the front of the skull which allows for depth perception. It is a relatively narrow field of vision when compared to, say, a goat or other prey animal, whose eyes are on either side of its skull, giving it a panoramic view of its world. Still others increase their field of vision with eyes that move independently from one another, as with a chameleon.

In addition to the mechanics of various eyes, different eyes have different varieties of light-sensitive versus color-sensitive cells. Humans, for example, have three types of color receptor cells, from which our brain synthesizes all of the different colors that we see. Dogs, and many other mammals, have only two types of color receptor cells, rendering them unable to see the difference between the colors we call 'red' and 'green.' They do, however, have a higher density of light-sensitive cells than humans, which means that their ability to see in the dark far surpasses ours.

Draca the Mantis Shrimp has compound eyes that sit on eyestalks and move independently of one another. She has between twelve and fifteen types of color receptor cells in her eyes and can see frequencies from infrared to ultraviolet. With such specialized sight, it is no wonder she has diffi-

Chapter 6 Glossary

Breadth of Field/Depth of Field - In this context I use breadth and depth of field to refer to the composition of a painting based on the field of vision of the painter. Since both of Mika's eyes are facing forward, the scope of her painting will be more narrow than that of a goat, whose eyes are on the sides of its head.

Primary Colors - in color theory, three primary colors can be mixed in varying amounts to make all the different colors seen on the visual spectrum. Red, Yellow, and Blue are considered to be the three primary colors in that they can be used in combination to make any other color and that no other colors can be combined to make them.

Stippling - stippling is a technique of using dots or circles in different densities to create a composition.

Polarization - Polarized light refers to light that is all refracted in parallel. Polarized light can rarely be perceived by human eyes without technological intervention, but is a tool for many animals, including bees, cuttlefish, and mantis shrimp. It is suspected that being able to perceive polarized light helps with direction.

Mantis Shrimp - Mantis Shrimp are large, carnivorous crustaceans that live in shallow tropical and subtropical waters. They have some of the most complex visual systems in the animal kingdom with twelve types of color receptor cells in their eyes (humans have three). Their compound eyes can also move independently of one another. Mantis Shrimp are ambush predators. They burrow and use their long forelimbs to spear passing prey.

Ultraviolet - Ultraviolet Radiation is a wavelength of light that is too short to be visible to the human eye but can be seen by many insects, birds, and other animals. Ultraviolet can be simulated for humans using blacklights.

Chapter 7: The Extended Family

In which Mika learns what it means to be human

Mika could see the canvas from whence she came but there seemed to be no way back out.

"How is this possible?" she whispered into the dark void, and turned.

Behind her were two humans, entwined and familiar.

"Who are you?" she asked.

"We are models," they said.

"What do you mean? Like, the models for the class?"

"The class? We are models of *homo sapien sapiens, which puts us in the class of mammalia, although there are thousands of mammal models, founded 300 million years ago - very controversial to add milk and hair to the old reptilian style, but fashion is risk. And it set the stage for endless innovation - warm blood, live birth, better hearing.*"

"Oh, the mammal line wouldn't even be here without the reptiles," interjected a new human, who seemed to have appeared out of nowhere. "Their line was phenomenal - focused more on the ready-mades. The better egg delivery systems appealed to a suburban audience, made it easier and safer for them to eat and live and breed on land instead of that constant commute to and from the water."

"Please, they were standing on the shoulders of giants," said a new model. "The reptiles would be nowhere without the amphibians - they made innovations that are basically the industry standard now. Some of the lobe-finned fishes had already been dabbling in lungs, but the amphibians made them a standard feature and added jaws and teeth. They standardized limb plans and expanded their market to include land dwelling. And with that new audience, they

made some tweaks to the eyes and ears to work better out of water and voila. It's standard issue for all the models after *and all the model lines that branched from there - reptiles, birds, mammals.*"

Mika thought about Linda's workout class, the cacophony of different limbs and yet, each arm with a shoulder, elbow, wrist, hand, fingers, and each leg with hip, knee, ankle, foot and toes.

"So the amphibian model was the first, and then everything else has just been changes on top of that?"

"Oh goodness no. The amphibian model had their start with the lobe-finned fishes, and the first lobe-finned fish model started with the ray-finned fish. And the first ray-finned fish split from the bony fish, who started after a split with the jawed fish, who started after a split with the vertebrates, who started after a split with the chordates and so on…"

"But, there must have been a first," said Mika. "Who was the first model?"

The humans thought for a moment.

"The first model did not have a body - at least in the way you might think, with different types of cells, different tissues like muscle, bone, or skin. The first model did not have a way to eat food or move its body where it desired. But the first model could breathe. Not with lungs or with gills or through its skin, but in its lone, single-cell body, it harvested oxygen from water and energy from oxygen and it breathed and it lived. And it was the model for every plant, animal, fungi, protozoa, there is or ever will be. It was the first model to put the body in motion."

As Mika watched and listened to the models, their words and movement began to run together with the voice of running water, the chorus of molecules over rocks, brushing the banks, floating and gliding together as one.

Mika blinked to find herself back at the tree, surrounded not by the human creatures who had been there only moments before, but in front of the stream. In her hand, there was a key, the glistening token that had caught her eye in the stream.

She gazed at it in her hands, cold metal against her warm palms, and went off to find what it promised to unlock.

Chapter 7 Takeaway

In this chapter, Mika meets the models who are the representation of the human animal. As they explain their human attributes, they expose her to the aspects of their lives that are features derived from other evolutionary steps.

The models in this chapter begin to describe the lineages of the models before them, explaining different pivotal and important departures that created the 'industry standards' that are features in their own models.

This is a simplified comparison of fashion lineages to taxonomy. Just as studies of art and industry can be traced back to influences and innovations, phylogenies can also be traced back by looking at shared characteristics of different animals.

The models begin their explanation with a misinterpretation of 'class-' Mika is asking if they are models for the art class that she just left but they interpret her question as meaning models for the whole class of animals called mammals.

In this exploration, the 'model' is the most recent common ancestor to all mammals. The models explain the ways in which this most recent common ancestor differs from its reptile lineage. From there, they explain the unique characteristics of the most recent common ancestor to all mammals *and reptiles and how this model diverged from the amphibians.*

As Mika comes to the close of her journey, the models de-

scribe in reverse chronology all of the models from whom they - and therefore she - are descended. By mentioning the shared features of these different evolutionary branches, they nod to the fossil, genetic, and physiological evidence that has been used to understand, classify and organize the animal kingdom.

While it is a short chapter in her story, the scale of this timeline can't be overstated: The models mention that the first mammal was 400 million years ago. In terms of generations, this would be your 165-million-great grandparent. From there, the models only go further back in time, exploring their shared ancestry with reptiles, amphibians, and so on. In the end, they describe the 'first model,' a single cell whose ability to respire has been the basis for all life as we know it.

Chapter 7 Glossary

Amniote - an amniote is any animal whose embryos (offspring before they are born) are fed and protected by an amniotic sack. An amniotic fetus can develop in a womb or an egg and is born a juvenile form of its adult body, as opposed to animals born in a larval stage (eg. tadpoles, caterpillars, etc.) and metamorphosize to reach adulthood.

Amphibian - an amphibian is a semi-aquatic limbed vertebrate. While many amphibians live on land, they require water to breed and often go through an aquatic, larval stage before reaching maturity (think: tadpoles). In this story, the importance of the amphibian is as the common ancestor to all living tetrapods.

Bony Fish - Bony fish are a class of fish that are distinguished from cartilaginous fish, which include sharks and rays, because of their bony skeletons.

Class - a class is a way of characterizing animals based on shared characteristics.

Lobe-finned Fish - Lobe-finned fish are a type of fish whose body plans are that of a fish but whose limbs display the patterns of tetrapod limb girdles and appendages.

Mammal - mammals are any of a group of animals that have hair, warm blood, give live birth, produce milk, and have three bones in their inner ears.

Phylogenics - the study of animal evolution that infers relationships between animals based on shared characteristics such as body structure or generic similarity. The word can also mean something's history according to this line of study, i.e. 'an animal's phylogeny,' refers to its classification.

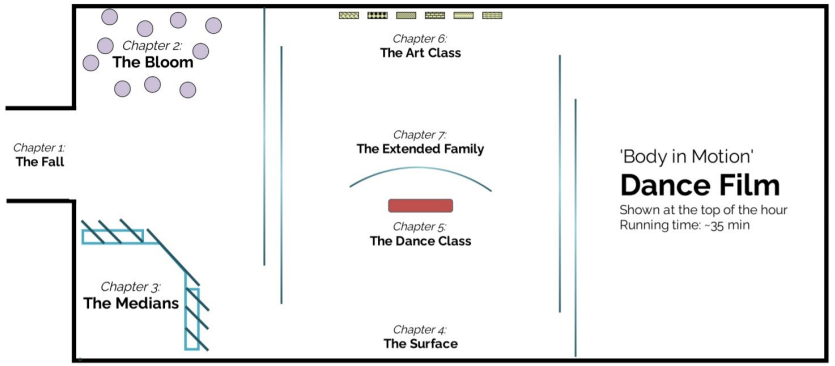
Ray-finned fish - ray-finned fish are a type of fish whose fins are supported by a bony fan structure.

Reptile - reptiles are any of a group of animals that are amniotes, have lungs, and dry skin. In this story, they demonstrate the evolution of amniotic sacs in their eggs, the move of the limbs under the limb girdles.

Tetrapod - A tetrapod is any limbed vertebrate or animal whose ancestry is of the limbed vertebrates. This includes all terrestrial limbed animals (lizards, birds, mammals, amphibians) as well as aquatic animals that are descended from land-dwelling animals (whales, manatees, dolphins, seals, walrus, etc.) Tetrapods are specialized for land dwelling and share similar structures in their jaws and teeth, lungs, hearts, eyes, ears, and limb girdles and extremities.

Body in Motion is a dance film and installation conceptualized and created by Julynn Wildman through a fellowship with Intrepid Credit Union and the Holter Museum of Art. The film was created in association with Dead Dinosaur Productions

Julynn Wildman is a dancer, choreographer, writer, and teaching artist based in Helena, MT. Julynn has danced on stages across Helena, and taught with amazing organizations including Cohesion Dance Project, the Myrna Loy, and the Holter Museum of Art. More information about Julynn can be found at embodypraxis.com



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