

Luke Masella
Project Summary

My short story, *Breaking the News*, aims to educate a college level audience on the different types of convergent evolutionary patterns that are observable in nature. In order to do this, I decided to set the short story on Noah's ark after the great flood has commenced. Noah and his wife discover that there are animals on the ship that either share many similarities with one another or that look extremely similar to one another. Since their job is to take only two of each animal, combined with the fact that they are not as educated on the concept of convergence as is necessary to tell some organisms apart, they confront these organisms to deliver the bad news that some will have to exit the boat. These organisms that they encounter each represent a personified version of the different types of evolutionary convergence or instances where it is believed a situation is convergent, when it actually is not.

The ideas that are going to be incorporated into the short story start with the different types of convergent evolution. Evolutionary convergence is the idea that organisms, which evolve individually from one another, can form similar traits. There is more than one way for scientists to observe this phenomena in nature. The first way is mimicry, which can be split into Batesian and Müllerian mimicry.

Batesian mimicry, observable in nature through the scarlet king snake and eastern coral snake. The scarlet king snake, a non-venomous organism, has evolved a very similar color pattern to the red, yellow, and black eastern coral snake. This coloration pattern is what helps predators avoid the mimic (the scarlet king snake) due to the fact that they mistake it for a poisonous organism (Source 1).

The second form of mimicry is Müllerian mimicry, which differs from Batesian mimicry due to the fact that it occurs when both of the organisms involved are non-palatable to predators (Source 1). An excellent example of this are bees and wasps, which have both evolved a similar yellow and black color pattern. This mimicry acts as a reinforcement of the danger predators may face when trying to attack either of these organisms. If a predator only encounters wasps, and knows from experience that they are dangerous to try and eat, then that same predator will not be interested in going after a bee due to the fact that the color pattern suggests that it is just as dangerous as the wasps (Source 4).

Next, we can observe convergence in the form of molecular adaptations in order to overcome the same ecological hindrances. This is observable in the form of bats and dolphins, which both have trouble seeing due to the fact they are either swimming through water, or flying through the night sky. Both have evolved echolocation in order to better navigate through their environments. This echolocation, however, is due to extremely similar genetic adaptations in the bat and dolphin auditory processing genes. This shows that evolution found the same way in two very different mammals to overcome this ecological issue (Source 2).

Behavioral convergence is next and it is very easy to mistake this for molecular convergence. In the case of the Aye-Aye, a lemur-like mammal found in Africa, they use a type of echolocation to hunt for prey. Aye-Ayes will tap on a tree with an extremely long and thin finger in order to hear insects that may be inside. Although this is a form of echolocation, it is not at the molecular level and this adaptation was instead learned

through behavioral patterns of the Aye-Aye, which distinguishes it from the echolocation of the bat and dolphin (Source 3).

Finally, there is convergent evolution when filling an ecological niche. Throughout the world we see many different, yet strikingly similar, species of small cylindrical-bodied fish with reduced swim bladders that rest on the bottom of freshwater bodies of water and feed on small invertebrates. The point is that this niche in freshwater environments throughout the world is clearly important and plays a major role in the ecosystem. Therefore, many different fish species have evolved in the same way in order to fill this niche that facilitates their survival in a habitat (Source 6).

It is important not to mistake these instances of convergence with two very similar phenomena: coevolution and parallelism. Coevolution relies heavily on the idea of mutualism, which is when one organism's adaptation is heavily influenced by the adaptation's of another. Unlike convergent evolution, there is a very noticeable symbiosis that two organisms demonstrate like how a hummingbird's beak is specifically designed to extract nectar from a flower with the same shaped stem (Source 7). Convergence is inherently selfish and takes place due to the own benefit of the organism instead of through the direct interactions of two organisms (Source 4).

Lastly, the concept of parallelism can very easily be mistaken for convergence because parallelism also results in two organisms evolving to look extremely similar to one another. We can see this is the form of mantises and mantispids, which look like smaller mantises with wings. Although it can mistakenly we thought that these two organisms evolved similarly to fill a specific niche or to mimic one another, they actually evolved this was due to splitting off from a very closely related ancestor of the two organisms (Source 5). This is what makes this instance parallelism instead of any of the aforementioned forms of convergence.

In order to transcribe these concepts into my short story, I am going to personify the animal characters on Noah's ark (where the whole story takes place). By doing this I am hoping to capture the non-mutualist tendency of convergent evolution. For some people, or in this case animals, the fact that somebody is completely ripping off your "style" for their own benefit can be extremely frustrating to deal with. In the wild, any form of mimicry can easily be taken as unfair copying and pretending to be something that you are not; all human emotions and natural occurrences.

Although seeing somebody directly copying you is frustrating, running into somebody so similar to you that you've never met before can be an exhilarating feeling and situation. Some animals share so many similar traits to one another, but never get the chance to meet. On the ark, where all the animals are smushed into a tight space, they are offered the opportunity to meet with one another and bond over their similarities. The story is very satirical in nature and I hope is relatable for a college-level audience where these types of social interactions are prevalent in our day-to-day lives and interactions that are extremely synonymous to the friendship making and friendship ending process.

This source gives the information pertinent to the back-stories of Eastern Coral Snake and Scarlet King Snake. By explaining Batesian mimicry it becomes more clear why there is animosity between the two organisms and why Batesian mimicry is only beneficial for one animal that parasitizes the look of another.

2. Hayden, Erica Check. "Convergent evolution seen in hundreds of genes." *Nature: National Weekly Journal of Science*, 4 Sept. 2013, www.nature.com/news/convergent-evolution-seen-in-hundreds-of-genes-1.13679. Accessed 29 Sept. 2017.

This source provides the case study that shows the great similarity between Bat and Dolphin, which demonstrates how their convergence can be found at a molecular level. This distinct similarity, that shows that the two creatures have more in common than meets the eye, provides the basis for their friendship in the story.

3. Bankoff, Richard J, et al. "Testing Convergent Evolution in Auditory Processing Genes between Echolocating Mammals and the Aye-Aye, a Percussive-Foraging Primate." *GBE: Genome Biology and Evolution*, 26 July 2017, academic.oup.com/gbe/article/doi/10.1093/gbe/evx140/4037174/Testing-convergent-evolution-in-auditory. Accessed 29 Sept. 2017.

This source provides the info necessary to understand the difference between the echolocation of the Aye-Aye and of Bat and Dolphin. The Aye-Aye's echolocation, despite being a form of echolocation, can only be found at a behavioral level and not a molecular one, which, despite being convergent, is a different sort of convergence.

4. "Batesian Mimicry Vs. Mullerian Mimicry." *Biology Wise*, 2017, biologywise.com/batesian-mimicry-vs-mullerian-mimicry. Accessed 29 Sept. 2017.

This source provides the information essential to understanding Müllerian mimicry that can be found in Wasp and Bee. The source details the benefits of sharing a similar coloration with an organism that possesses the same potency as you and also how this, despite seeming mutualistic, is only mutualistic accidentally and the adaptation forms not through interactions with one another, but instead for the purpose of only buffing an organism's defenses.

5. "Parallel and Convergent Evolution Similar Terms That Are Difficult To Distinguish." *Wayne's World*, 2005, www2.palomar.edu/users/warmstrong/convevol.htm. Accessed 29 Sept. 2017.

This source shows that parallelism and convergence are difficult phenomena to distinguish from one another. Despite this being the case, they are very different things and the example of the mantis and mantispid is used to show how two organisms, sharing no relation in environment, can look similar due to ancestry.

6. Winemiller, Kirk O, et al. "Functional traits, convergent evolution, and periodic tables of niches." Wiley Online Library, 21 June 2015, onlinelibrary.wiley.com/doi/10.1111/ele.12462/full.

This source looks at convergent evolution in the instance of filling ecological niches. It provides the example of cylindrical bodied fish that all fill the same ecological niche and that is where their similarities stem from.

7. Zimmer, Carl . Evolution: The Triumph of an Idea. 1st ed., New York, NY, HarperCollins Punlisher Inc.

This source details how coevolution is a mutualistic phenomena the is very deliberate is nature. There are cases of convergence where this mutualism can be thought to be observed, but in reality convergence is a selfish phenomena that does not take the symbiosis of two species into account. That is the main telling card and the main differentiation.

Breaking The News

“Please, for my sake, I’m asking you for once in your life to just put your foot down and tell them what has to happen.”

Noah, sitting against the wall like an embarrassed eight year old, looked up at his stern and towering wife, Naamah.

“Is that too much to ask? Sometimes you just gotta break the news,” said Naamah.

“I know...” said Noah lifting his head from his arms, “It’s just that it’s heavy news, ya know?”

Naamah rubbed the bridge of her nose, “Of course it’s heavy news! The entire world is up to it’s ass in water! BUT... what was your instruction?”

“Build an ark...”

“Then...”

“Get my family on the boat...”

“And then...”

“Get two of every animal and put them on the boat,” said Noah.

Naamah extended her ear, “I’m sorry I didn’t quite catch that.”

Noah sat up with a slightly larger stroke of confidence, “Get two of every animal and put them on the boat.”

Naamah smiled, “I’m sorry, how many of each animal?”

“TWO!” Exclaimed Noah.

“You’re gosh darn right!” Said Naamah as she helped her husband to her feet. “So you get your ass in there and tell the animals that sneaked on here that they need to get the fuck off your ark!”

Noah composed himself and wiped the small traces of tears from his eyes. He turned and walked down the long dark corridor of his ark with his wife following closely behind him. Through the wooden walls the sound of the harsh rain and waves smashed against the side of the ark and swayed the rickety ship from left to right. For people who didn’t quite develop their sea legs yet, it was enough to make Noah and Naamah stumble from side to side.

“After this, make sure to tell Bat that if he can’t keep this boat straight than God’s wrath isn’t the only thing he’s gonna have to avoid,” said Naamah balancing herself up against the wooden wall of the corridor.

Noah rested his hand on a large double door, “Yes, dear.”

With a deep inhale Noah pushed on the large double door and it swung open to reveal a massive room of about every animal and animal sound imaginable. Monkeys howled, frogs croaked, lions roared and the humongous hall was cramped and crowded. Noah walked up to a podium at the front of the hall.

“OK, I need everybody’s attention!” Demanded Noah as his voice was lost in the mix. He tried again, “Excuse me everybody! I need your attention!” Once again the animals did not listen.

Naamah walked up to the podium, “EVERYBODY SHUT YOUR FUCKING MOUTHS AND LISTEN UP!”

Naamah's voice blasted throughout the hall and shut the animals' mouths as it reached their ears. One by one they popped their heads up to see the couple that had saved their lives.

"OK... how is everybody doing?" Noah asked the crowd.

"It's hot as hell in here!" Shouted the Turtles.

"It's too crowded!" Yelled the Ostriches.

"And we're out of orange slices!" Projected the Beetles.

Noah, keeping his frustration at bay, took a nice long inhale and exhale, "If you all cooperate with me for the next five minutes I promise that I will take care of all those things. Does that sound OK with everybody?"

The animals all murmured in agreement with one another as the room silenced once again.

"Fantastic!" Said Noah with his first smile in God only knows how long. "It turns out I received word that there are more than two of some animals on the ark.

The animals all murmured in curiosity to one another.

"That's bullshit!" yelled Flamingo. "We won the raffle fair and square —"

"I am aware," said Noah. "Unfortunately, rules are rules and some animals gotta go. So, could the Eastern Coral Snakes please slither up to the front of the boat!"

The middle of the crowd of animals began to separate with haste as the Eastern Coral Snakes began to make their way to the podium. All of the other animals were very aware that one bite from the red, yellow, and black serpent meant that it was game over, so they made sure to give the snakes plenty of room.

Mr. Eastern Coral Snake, relishing in the respect given to him by the other larger creatures, propped himself up next to his wife in front of Noah.

"What can I do for ya, boss?" said Mr. Eastern Coral Snake to Noah.

"Have you heard anything about more Eastern Coral Snakes sneaking onto the ship?"

Mr. Eastern Coral Snake smirked, "Yeah, now that you mention it, I do suppose that I've seen a couple of Eastern Coral Snakes slithering around here when it was us that won the raffle fair and square."

"Do you know where they are?" Asked Noah.

Mr. Eastern Coral Snake thought to himself, "You know, I think I heard word of them hiding in the storage closets. But, let me tell you something, Noah. When you find them you make sure that to tell them, from me, that I don't very much appreciate or stand for liars, crooks, and most of all cheaters —"

"Shut your fuckin' mouth you lying son of a bitch!" Exclaimed a voice from the middle of the crowd. Mr. Eastern Coral Snake's smirky confidence immediately dissolved.

From out of the crowd of animals, *two more* Eastern Coral Snakes slithered up to Noah. Both with an ire in their eyes that could set the wooden ark on fire. The male of the new pair looked up at Noah.

"Don't listen to these lying sons of bitches, Noah!" said the new male, "We are the Eastern Coral Snakes!"

The crowd of all animals all gasped. The fake pair of snakes tries to hide themselves in embarrassment being hands they wished that had.

The real Mr. Eastern Coral Snake continued, "These animals here are nothing more than some harmless Scarlet King Snakes! And they have been pretending to be me and my wife for as long as I could remember!"

The animals all began to boo the Scarlet King Snakes, both hanging their heads in shame.

Noah's head swung back and forth from the Scarlet King Snakes to the Eastern Coral Snakes, "But you guys look the same —"

"We look very *similar*," interjected Eastern Coral Snake. "My great-great-great grandfather would always tell stories of how the Scarlet King Snakes started getting all cocky as soon as they started adapting the red and yellow color pattern just like the poisonous Eastern Coral Snakes that lived next door to them. They've been swindling the animal kingdom for generations!"

"Do you have any idea what it's like to be eaten?!" Asked Scarlet King Snake to Eastern Coral Snake. "Half the predators on this boat would eat me if they knew I wasn't you!"

Noah itched his head and turned to Eastern Coral Snake, "Why are you so mad? It's not like he's hurting you and you're helping someone out."

Hummingbird flew out of the crowd and up to Eastern Coral Snake, "Yeah it's like how my beak is only able to fit in certain flowers. You end up developing this relationship with other organisms, man."

Eastern Coral Snake brushed Hummingbird away angrily, "No! It's not like that at all. At least you and the flower are working together and get something out of your relationship. You know what I get from these two looking like me? A whole lotta NOTHING! They hijacked our look to make predators stay away, but sometimes predators get so hungry that they go after any freakin snake they see!" Mr. Eastern Coral Snake lifts up his tail, which has the end of it bitten off. "So yes, I do know what it's like to be eaten thanks to these two copy-cat bastards! You should kick them off on general principle alone!"

The ship shook back and forth as the animals all stumbled to catch their balance. Noah and Naamah exchanged glances with one another. For once, Naamah didn't have an answer to give her husband.

"Listen, we can't just kick animals off because they look similar. It doesn't matter how much you two hate each other," said Noah.

"Actually I don't hate anybody," said Mr. Scarlet King Snake still refusing to look at Mr. Eastern Coral Snake.

From the crowd of animals, Mrs. Bee and the Wasp couple buzzed up to Noah.

"Let us talk to them," said Mrs. Wasp to Noah.

"Yeah we know a thing or two about this whole situation," added Mrs. Bee.

Noah huffed and shook his head yes to the flying insects, "Where's Mr. Bee?"

Mrs. Bee blushed, "Well, ya see... he uh... kinda exploded."

Noah hung his head to the ground again, "Fuck it, I'll deal with that later. Just talk to them please so I can have peace on my ark."

Mrs. Wasp flew up to the snakes, "Listen fellas, we all know tensions are high between you two. But, you have to learn that looking like each other is not the worst thing in the world. In fact, it's pretty cool if you ask me! When you see black and yellow, what's the first thing you think of?"

"I dunno, bees and wasps, I guess," said Mr. Eastern Coral Snake.

"Exactly," said Mrs. Wasp ecstatically, "and now everybody knows that yellow and black means stay away! And you know how predators are, they'll attack anything eventually. Plus, I'm sure if you just reach out to the Scarlet King Snakes you'll see they're really not that bad after all. Mrs. Bee and I are great friends!"

"Eh..." added Mrs. Bee.

Mrs. Wasp spun around, "What do you mean 'Eh'?"

Mrs. Bee shrugged, "Friends is a bit of an overstatement. Sure predators know not to mess with us, but you never come visit me or anything. You always say we're friends just because we look alike. Hummingbird has a better relationship with a fuckin' flower than we have with each other."

The tears festered in Mrs. Wasp's eyes. She quickly buzzed away as her husband followed in a comforting pursuit.

"You guys don't get it either!" Yelled Mr. Eastern Coral Snake. "You two may not look alike on purpose, but at least it still helps the both of you! I'm completely getting the shit end of the deal here! The only reason people are scared of Scarlet King Snakes is because I'm the one doing all the damn work by biting predators!"

At that moment the ark hit the largest bump of all. Animals were sent into the air and landed all around the room in an uproar of barks, croaks, and squawks. Bat bursted into the hall and flew up to Noah like a bat outta hell.

"What the hell are you doing up there?!" Shouted Naamah at the poor flying mammal.

"Mr. Noah, we got a problem!" Shouted Bat with the last of his breath. "We're approaching some rocks and, I know I can navigate the ship in the dark and all, but I can't see underwater worth a damn!"

"Wait a gosh darn second!" Exclaimed a voice from the crowd of animals. Noah, Naamah, and Bat all turned toward the voice. As they were looking, Dolphin came waddling out of the crowd and up to Bat.

"I couldn't help but overhear that you need a copilot that can see underwater."

"You can see underwater?" asked Bat.

Dolphin wagged his head as if the explanation would cost too much detail, "Not really. I can do this thing where like... I make these sounds... and I can like see what's in front of me because I'm making these sounds and stuff."

"Dude..." said Bat eagerly, "I can do that same exact thing bro!"

Dolphin's mouth dropped open, "You're shittin' me!"

"No way dude!" Said Bat nearly jumping out of his non-existent shoes. "I fly around in the dark, man, I can't see shit!"

"Dude, I swim in water / can't see shit!" Shouted Dolphin. "Are we in salt water now?"

"You're gosh darn right we are!" said Bat. "Dude I can't wait to chirp in the dark with you!"

Just then a small voice came from the crowd of animals, "I can help too!" Aye-Aye emerged and ran up to Bat and Dolphin. "I can do that thing too guys!"

"Dude that's sweet," said Dolphin.

"Yeah man! I do this thing where I learned to tap on trees and I can hear what's inside!"

Dolphin and Bat exchange a skeptical glance.

“What do you mean you *learned* how to do it?” asked Bat.

“You know... you see other Aye-Ayes do that when you're little and then you start doing it —”

Dolphin interrupted, “I mean that doesn't really sound like the same thing as us.”

“Yeah I never really learned how to do anything. It was just always ingrained in me or something,” said Bat.

“Yeah ingrained is a good word,” added Dolphin.

Aye-Aye's kind exterior faded away quickly, “Well fuck you two! Out of the three of us I'm the only now that actually earned this ability! You two just had to exist to get your ability.”

“Whatever, man. Keep tapping on trees dude,” said Bat as he walked to steer the ship with his new friend.

“Awful feeling when somebody doesn't earn something isn't it?” asked Mr. Eastern Coral Snake to Aye-Aye.

Aye-Aye turned to Noah with a spiteful gaze, “Yeah! I say you kick off those copy-cat snakes and the dolphins and the bats and anybody else that didn't earn —”

“Aye-Aye shut your mouth and get the hell back in the crowd before I swing *you* off of the boat by your creepy little fingers!” shouted Naamah. Aye-Aye was quick to listen and get back into the crowd. Naamah pushed Noah to the side and stood at the podium, “Who here has found somebody that looks like them in some way shape or form?!”

From the crowd, six little cylindrical bodied fish came crawling up to the podium, “We all look pretty much the same!” Said the little fish in unison. “And we all eat the same stuff on the bottom of freshwater bodies of water too!”

“Then four of you gotta go!” shouted Naamah.

“What!” proclaimed the fish in unison. “We're all different fish!”

“You're the same fuckin' thing! You just said you are!” Yelled Naamah nearly tearing the podium in half.

“I'm from Africa!” Yelled one couple of little fish.

“I'm from Europe!” Yelled another couple of little fish.

“And I'm from Asia!” Yelled the last couple of little fish.

Naamah slammed her head against the podium, “So you're not the same fish?”

“What, just because we fill the same role in our environments means we're the same fish?!” Shouted the little fish in aggravated unison.

Naamah rolled her eyes, “I didn't mean it like that.”

The little fish shook their heads in disgust, “As soon as we reach freshwater I think we'll all just get off, sink to the bottom, and feed on some invertebrates together. So, thank you Noah for allowing us to be on your boat, but you, Naamah, need to educate yourself before you begin opening your mouth again!”

The little fish all wiggled their way back into the crowd. Naamah, knocked down about 10 notches, slumped down next to the podium. Her husband came up to her and slumped down as well.

“Who knew the world was made up of a bunch of rip-offs? Not me... that's for sure. You'd think somebody with a better understanding of this shit would have been chosen to load all of the animals on this rickety old boat,” said Noah.

As Noah hugged his wife, a small Mantispid couple walked up to the human couple.

“Hello,” said Mr. Mantispid, “I was just wondering if we’d have to leave the ark.”

“Why would you have to leave?” Asked Noah.

“Well, my wife and I, who have never seen a Praying Mantis before, just ran into the fine Praying Mantis couple on the ship. We kinda immediately realized that we just look like smaller Praying Mantises and didn’t want to cause you folks any more trouble or confusion,” said the adorable little Mr. Mantispid.

“Honestly,” said Noah, “I think that’s just more of what we’ve been seeing with the snakes, bees, and everything else.”

“Yeah I thought that at first,” said Mrs. Mantispid, “but then I realized that we have nothing in common other than the fact that we look very similar. So maybe we’re cousins of some sort, which would mean we’re related, which would mean we’re the same animal.”

Noah huffs, “Listen, Mr. and Mrs. Mantispid. Even if you two are descendants of the same mantis-like creature at some point, I can’t imagine that if you’ve never met each other than you’re the same creature. So, forget about your great-great-great-great-great-great-great grandparents and find a place on the ark to ride out this storm.”

The Mantispids both hug each other and then buzz away. Noah gets up and turns to the crowd of animals.”

“What are you doing?” Asked Naamah.

“Putting an end to this,” Noah said with a dash of confidence.

Across the room, Mr. Scarlet King Snake and Mr. Eastern Coral Snake are still in a heated argument with each other. Noah stormed across the room and ripped them both apart.

“Here’s what’s gonna happen!” Screamed Noah. “You two are gonna cut the shit right now because I am not spending God only knows how long on this boat together if I have to listen to you two.”

Eastern Coral snake opened his mouth, “But —”

“But nothin,” Noah interrupted. “The fact of life is you gotta survive any way you can. If that means looking like somebody, pretending to be something you’re not, or shoving every animal you can find onto an ark that is clearly too small for them, then that’s what you gotta do. So suck it up, shut up, and remember that we’re all just trying to have some kids, pass on our weird traits to the next generation, and hope they can do the same!”

For the first time, the entire hall was completely silent. All of the animals looked up at Noah and began to applaud any way they can. For the first time, everybody on that ship realized that they may not be so different after all; and that’s always some tough but important news to hear.

The End