Weird critters: A visual narrative inspired by paleontology and teratology

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WEIRD CRITTERS: A VISUAL NARRATIVE INSPIRED BY PALEONTOLOGY AND TERATOLOGY

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INTRODUCTION

Attempts to fuse fantasy and science fiction art work tend to be unidirectional. The artists begin with things that don’t make sense and then force them to make sense to the audience. This can be accomplished in a variety of ways. In some images, dinosaurs are given mechanically sound contraptions; dragons are given tendons, and basilisks are drawn with surprising accuracy. It applies science to the fictional to create an image that is plausible. However, my experience with developmental biology and paleontology suggests that it is equally possible to take it in the other direction and begin with things that are completely real and based in scientific fact and create artwork that is descriptive and laughably implausible. This project examines the history of science fiction and fantasy artwork and its attempts to apply science to create something the viewer can understand and accept. From there, I will delve into some examples of teratology and look at the abnormal fetal development that have been scientifically explained. Finally, I will present some original art applying imagination to these examples based in science which results in fantastical images that the viewer will find difficult to accept as fact. This shows that fantasy and science fiction can develop in both directions.

HISTORY OF SCIENCE FICTION AND FANTASY ARTWORK

Science fiction and fantasy are often lumped together as one genre. There are, however, generally accepted differences. Science fiction is rooted in science and technology. It often deals with “the future.” Science fiction writers and illustrators like to have a veneer of plausibility. Early sci-fi artists were praised for paying close attention to the details in their machines, like including ankles on the alien spaceships in the cover of H.G. Wells’s War of the Worlds, whereas fantasy doesn’t feel much need to justify whether or not their creations are in any way realistic. Fantasy leans more into the mythological, supernatural and a world that could never really exist. It can be set in the past, present or future.
In much the same way as the War of the Worlds cover art, James Guerney’s Dinotopia begins with an illogical premise and then insists on applying mechanical structure and logic to it. In the case of War of the Worlds the premise is “aliens are attacking” and the logic is how the attack unfolds and the ships maneuver. In the case of Dinotopia, the premise is “this brachiosaurus is a firefighter and firetruck simultaneously” and the logic is how the brachiosaurus can accomplish this task alongside human counterparts.

Dinotopia also has parts that seem much better suited to the fantasy genre, such as characters whose outfits are designed to match their partners, in the same way as Cicely Mary Barker’s flower fairies are designed to match their respective flowers. There is no argument that fairies belong in the fantasy realm and in this case illustrations in Dinotopia also display similar elements consistent with fantasy art.

The cover of Anne McCaffrey’s Acorna by John Ennis fuses fantasy and science fiction art in a very literal way. In the foreground sits a young girl in pure white, with hooves and a spiraling horn, but far in the distance strange metallic structures can be made out, and on the back cover a sleek futuristic ship of some kind rests just above the water. Visually, however, the two genres still seem quite separated as there is no interaction between them. If I copy and paste Merlin onto the USS Enterprise that doesn’t mean Star Trek is a fantasy show, it just means the holodeck broke again.

A Natural History of Dragons by Marie Brennan is another entry into the list of works that begins with an illogical idea and then forces it to make sense. It recontextualizes dragons as something that can be studied and dissected by combining an illustration of a mythical beast with an anatomical diagram. Tendons, muscle, bone, and an external ear hole are all clearly visible and numbered, such as you might expect to see if there were a key to name all the structures shown. Dragons, according to this, are logical creatures, and even the strangest of things can make sense.

Illustrations found in The Snouters: Form and Life of the Rhinogrades by Gerolf Steiner (written under the pen name of Harald Stümpke), and Dougal Dixon’s After Man are not
attempting so much to convince the viewer that an illogical thing can be logical. Instead they simply imagining perfectly logical things that don’t exist, but theoretically could. Like A Natural History of Dragons, Steiner creates anatomical diagrams with labeled parts, but goes a step further and also provides the key. The rhinogrades are not things that could make sense if only you had the whole picture, they are things that do make sense. Dixon’s illustrations are what you might expect to see in a museum exhibit set in the future depicting creatures resulting from current evolutions trends. Steiner and Dixon both have backgrounds in paleontology, which in many ways can be similar to this speculative biology. We lack the full picture but can theorize and speculate on the organisms based on what we do know, which may be things such as evolutionary trends, fossils, or trace imprints. It is a creative and thought provoking scientific exercise, but has little to do with fantasy.

WHERE SCIENCE OVERLAPS

No one reads The Odyssey and takes issue with Homer failing to explain the biology of the cyclops, because cyclops are not real, so it doesn’t matter. Or does it? There is a scientific theory to explain the origin of the cyclops. The most common explanation for a cyclops, if one had to be given, is that it was inspired by mammoth skulls. Imagine this: You are from 300 BCE and you do not know extinction can occur. If you find bones from a creature that means the creature is still alive somewhere in the world. A skull is found that looks similar to a human’s but much larger, and there is only one hole in the center where you would predict eyes go. The reasonable conclusion with this evidence is that somewhere there are large humans with one eye in the middle of their face (Asma, 2009).

This theory has been generally accepted since it was published in 1914, but allow me to put forth a different theory: Cyclops are real. On the 14th day of pregnancy- and it has to be the 14th day or it won’t work- a sheep eats the false hellebore plant. There’s a chemical in the plant, called cyclopamine, that prevents the face of the lamb from forming properly by interfering
with Sonic the Hedgehog, a genetic signaling pathway trying to deliver important instructions on how to properly make a face. Hellebore is known for interrupting the signals in the developing fetus. The cells get confused on how to make a face and how many eyes it should have, and a cyclops is born. This is real true scientific information from an article published in 2013 by the journal Birth Defects Research Part C.

Every time I try to explain this to someone they assume I am making it up for the sake of artistic license. I learned about this in a Developmental Biology class I took with Dr Byrd in the Fall 2021 semester, and one of the things that struck me about the class was that occasionally he sounded like he was teaching us spells. Hearing a professor say the words WNT and Frizzled in the same sentence right after teaching you about cyclops sheep very much makes you feel as though you’re two weeks away from a test on how to slay dragons. Another example of class lecture that sound a lot like magic, despite being completely verifiable, include the description of the surgeon John Hunter who stole the bones of a giant from a burial at sea or that there are multiple causes for muscle to slowly turn into rock hard bone. In fact, the word “monster” itself was a medical term until the 20th century. All of these facts seem fantastical despite their very real origins!

This class and the information brought to life an interesting overlap where the implausible and the scientific intersect in images. There are already some examples of artists exploring the bounds between science and fantasy. Medieval bestiaries, a sort of proto-field guide, are a good example. They list creatures such as bears, basilisks and unicorns with no distinction between them as being more or less real than the others. The fantastical creatures are studied in the same way as any other animal, and the mundane creatures are given fantastical qualities, such as the bear in Image 4. She has just given birth to this unformed mass and is now sculpting it into the correct shape of a bear cub. So where does leave me in my research and creative endeavors?
I began the creative part of this process with research. There was no particular end goal for this research, other than something that feels interesting and weird enough to be just “this side of possible.” If I went into the process knowing exactly what information I wanted then the element of exploration and essential surprise would be missing. Looking up the causes of polymelia, a developmental anomaly resulting in extra limbs where they should not exist, is a very different thing than being casually blindsided by an article or professor mentioning birds with extra legs.

From this research I took the most interesting parts and piece them together through various associations or logic leaps, taking scientific fact and creating the implausible image for the viewer. Medusa and fibrodysplasia ossificans progressiva (FOP), which is a disorder that slowly turns muscle into bone, become two Gorgonopsids, synapsids whose names are derived from Greek mythology, one of which is seen with a mailbox on fire. This makes perfect sense logically, because FOP is caused by a mutated receptor, which is symbolized by the mailbox, and extreme burns can also cause heterotopic bone ossification. The fire ants are carrying letters because they are bone morphogenetic proteins. As the viewer looks on, it is just a fantastical image. Absolutely none of this scientific process is understood without an explanation, and that disconnect is partially what makes the transformation from science to fantasy. If magic is science we don’t understand, as Arthur C. Clarke put it, then it follows that the worse I explain a concept the more magical it gets.

THE ORIGINAL ARTWORK

The following pieces are all original creations. They are pen and ink drawings with watercolor on Bristol board. Each piece is described below for the viewer. The factual basis is included as are any incidentals that provided inspiration.
Art #1
The false hellebore, Californium veratricum, contains a chemical named cyclopamine (Shepard 1989). If a pregnant mother, usually a sheep or cow, ingests this chemical it interferes with a gene pathway named the Sonic Hedgehog pathway which is in charge of a great many things, including the symmetrical formation of the face. If it is ingested on the fourteenth day of pregnancy specifically then it interferes in such a way that the Hedgehog messages get scrambled and produce a cyclops (Cordero et al. 2004).

Cyclops have also been theorized for many years to be the result of ancient civilizations misunderstanding mammoth skulls (Asma 2009). The ancient Greeks did not have an understanding of extinction, so if they found a skull they had to assume the animal it came from was still wandering in the world somewhere. Mammoth skulls, with the tusks broken off, look almost as if they were the skull of a large human, but with a singular socket in the front where you might expect an eyeball to go.

Art #2
There is a gene called the AVCR1 receptor, in this metaphor a mailbox, and if it is mutated in a specific way it can produce a condition known as Fibrodysplasia Ossificans Progressiva, which slowly turns muscle into bone (Shi et al. 2020). Severe burns are also known to ossify muscle, particularly in the elbows (Agarwal et al. 2017). In short, stem cells and bone morphogenetic proteins, which are in charge of making bone, get confused about where they are and what they are supposed to be making, so they make bones where they aren’t supposed to. FOP is lethal by means of slowly encasing the ribcage in bone. If the ribs cannot expand to breathe the patient suffocates.

Gorgonopsids are synapsids named after the gorgons from Greek mythology. We know of them purely because their bones turned to stone and were preserved as fossils.

Art #3
Hands are finicky things, and any number of steps can go wrong when forming them. Five fingers per hand is an average, not a rule, and conditions such as symbrachydactyly, ectrodactyly, and split hand malformation result in hands with fewer fingers than expected. In 2003 Kate Murray, a young scholar with symbrachydactyly, remarked that a two fingered hand is comparable in some respects to the hands of tyrannosaurid dinosaurs. To quote: “Rawr, I a T-Rex.” This was the only creature Murray was aware of that had two fingers. These two paleontologists, one a Utahraptor with five fingers and one a human with three, are shown discussing an incomplete skeleton. The hands are missing from the skeleton and given that it is partially humanoid and partially raptor it is unclear whether the hands would be human or raptor, and what that would even mean.

Art #4

Charles Byrne, known as the Irish Giant, was seven feet tall. He made a living for a short while by showing off how tall he was, and was approached by multiple scientists asking to buy the rights to his autopsy after he passed. This being the 1800’s dissection was considered an insult after death, and Byrne requested that his body be weighed down and sunk in the sea after his death, because it was the 1800’s, merely burying it would not deter any curious grave robbing scientists. Even this plan was foiled, however, when his body was obtained by John Hunter sometime after his death, and his skeleton is still on display (Herder 2012, Wood 1868).

Irish elk are commonly thought to have died out because their antlers grew too large, and took too much energy to grow. This is not a well supported theory, because there is nothing to suggest they simply could not have evolved smaller antlers, but once it is in the public mind an idea will linger like a ghost (Worman & Kimbrel, 2008).

Art #5

Sirenomelia, or “mermaid malformation” is the incomplete formation of the lower limbs, resulting in a “tail” instead of legs (Xu et al 2018). This is incompatible with life, as it also means several necessary structures such as the anus are absent. It is more common in twins, and one hypothesis is that it forms from a lack of nutrients and bloodflow to the legs, possibly through the
vascular steal phenomenon. Early whale ancestors such as Pakicetus already had tails, but slowly lost their hind limbs, through a much different process. Rather than a single stochastic loss their limbs slowly evolved to be smaller as they became less necessary, which carries less risk (Gingerich et al 2017).

Art #6

Protoceratops are cited as a possible etiology of gryphons (Asma 2009). As noted with cyclops, before the concept of extinction was commonly accepted people had to reason that any bones they found were the bones of a creature that was alive somewhere in the world. Protoceratops had a beak, and feet like paws. One possible interpretation of this is that somewhere in the world there is an animal with a bird’s head and four paws.

It is also possible for a bird to be born with four feet. Really, it is possible for any animal to be born with supernumerary limbs, a condition known as polymelia (Morath-Huss et al 2019, Rajendra et al 2016). This can even be induced by implanting beads soaked in FGF-8 protein into a developing embryo (Vogel & Izpisúa-Belmonte 1996). This signals that a limb bud is supposed to be formed at the marked location. These limbs are rarely functional, as they lack appropriate attachment joints, but do not appear to harm the animal.

CONCLUSION

This has been an interesting project to me because before I started doing research into teratology I had no idea that many of these things could happen. We become, in our day to day lives, very sure that the world is predictable and makes sense. We are assured that there is obviously no way a chicken could have four legs, or that a human could have a naturally three fingered hand. And yet, I am an intersection, of sorts, physically and creatively. Having been born with a limb difference, I was well aware that there are a variety of different shapes people
can take, especially when it comes to hands and limbs. I knew that obviously hands can have as many fingers as they want, but was unaware that it is also possible to have entire extra legs. Yet learning of some of these other mutations was still very surprising to me. It tested my creativity and let me take leaps, blending my scientific curiosity with my artistic skill. I Researching this topic reminds me that there is always something new and exciting out there so long as you ignore your common sense about what is reasonably plausible. I allowed myself to explore this junction, to reverse the direction of traditional science fiction art. I hope the reader and viewer was able to enjoy the fantastical original artwork rooted in science.
Works Consulted


Fig 1. The War of the Worlds, August 1926

Fig 2. Polyphemus and Odysseus, Louvre F342
Fig 3. Monkey-faced cyclops lamb, Cordero et al.

Fig 4. F15R Aberdeen Bestiary, a unicorn and a bear with her infant ball of flesh
Fig 5. Acorna the Unicorn Girl

Fig 6. Brontosaur firefighter from Dinotopia: Journey to Chandara
Fig 7. Character sketches from Dinotopia: Journey to Chandara

Fig 8. Character sketches from Dinotopia
Fig 9. The Fumitory Fairy from Flower Fairies of the Wayside
Fig 10. A Natural History of Dragons cover

Fig 11. Anatomy of a Snouter

Fig 12. Simplified logic net used in the creation of my illustrations
Fig 13 (left). The Gorgon Opsid and Heterotopic Stone.

Fig 14 (bottom left). Gryphon Beads

Fig 15 (bottom right). The Hell Boar and the Hedgehog Child
Fig 16 (left). John the Hunter Surgeon and the Giants’ Graveyard

Fig 17 (bottom left), Mary and Mary the Dragon Hunters Discuss Their Findings

Fig 18 (bottom right). The Whalefall Siren’s Dance
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