Animating Hooved Composite Creatures

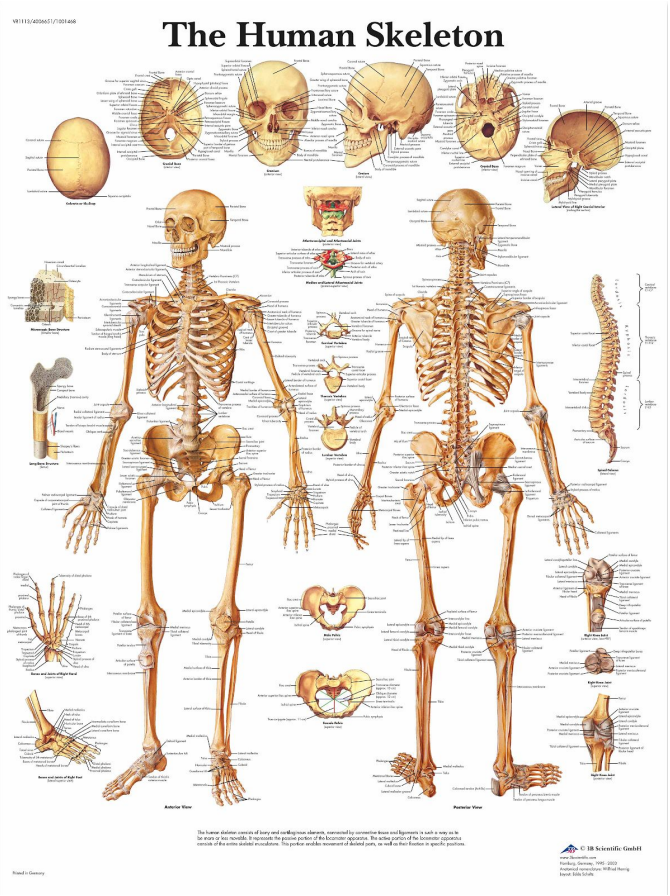
Technical Paper by Erin Bergin

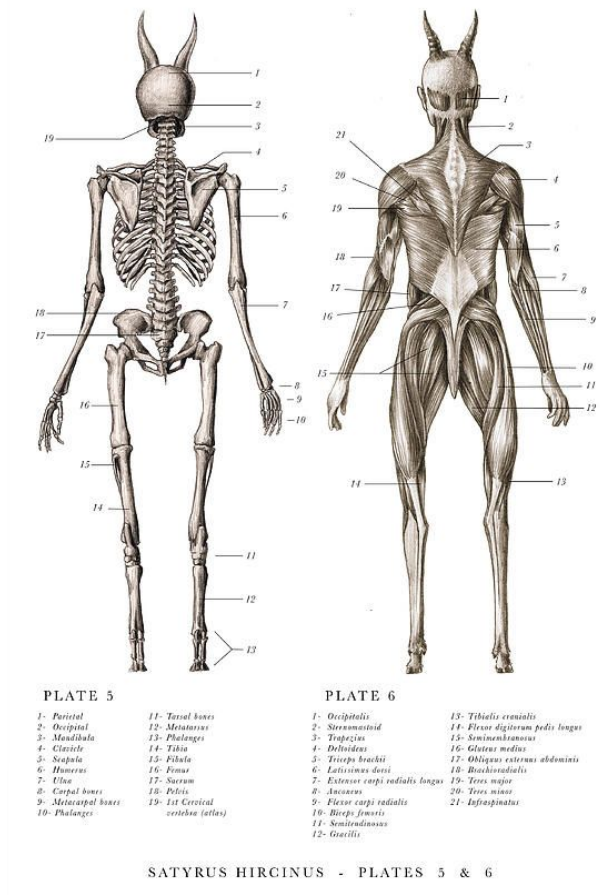
The Question: How does one animate a creature that does not exist in the real world?

Well, it's likely that your fantasy creature pulls influence from real world subjects. Many creatures from folklore and mythology tend to be strewn together from animals found throughout the world. That's how they lend themselves to a degree of believability. Mythological beasts that are merged from various animals or humans are known as composite creatures. Such examples would be chimeras, manticores, griffins, centaurs, fauns, and lamassu, just to name a few.

A manticore (left) would predominantly use the mechanics of a lion's body, with the mannerisms of a scorpion's tail for flair. While a faun (right) would have the upper body motions of a human, but with the gait of a goat or similar hoofed mammal. To animate a composite creature that takes influence from a multitude of other animals, you need to have a basic understanding of each of those parts. Is your creature like a griffin: part lion, part bird? Well, you know that the core of the body is based on a lion, so it's reasonable that the primary movement would be centered around a lion's anatomy. But remember! You must accommodate for the front feet, which are the talons of an eagle. How do you get those talons to move in a way that realistically supports a four-legged beast, when you'd typically only ever see eagles walk on two feet? And how would your griffin hold itself when it flies? There's a multitude of references of birds flying, but you'd be hard pressed to find references of a quadrupedal animal like a lion soaring through the air. You now must find a way to adjust this creature's structure so that it can be animated with believability; able to move flawlessly both on land and in the air without looking awkward.

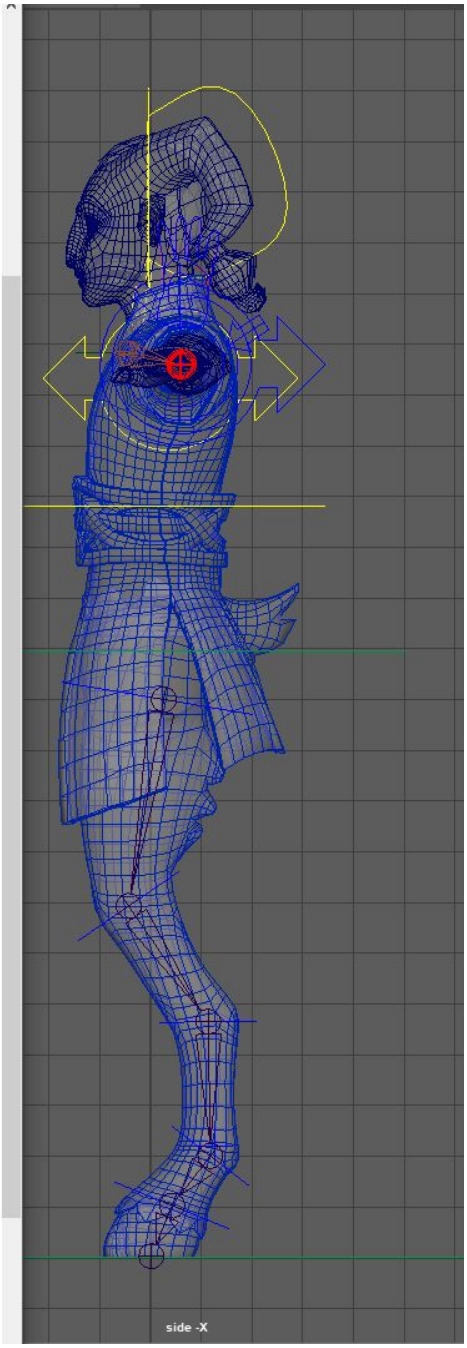
For this demonstration, we will look specifically at ungulates – or hooved animals – and how their anatomy can be applied in animating a fantastical creature. But keep in mind that the principles used here can go into researching and understanding the anatomy of other composite creatures as well. Many pitfalls come from animating animals without reference, or attempting to treat the anatomy like a human's, when the skeletal structure simply won't allow for it. Putting proper thought and research into the way an animal moves and acts will lend to the believability to the animation.

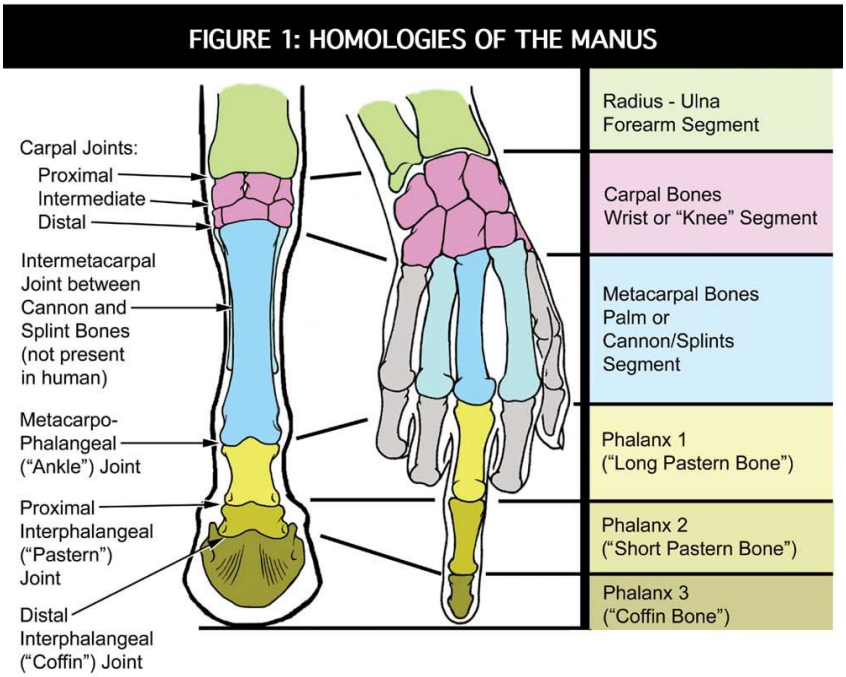




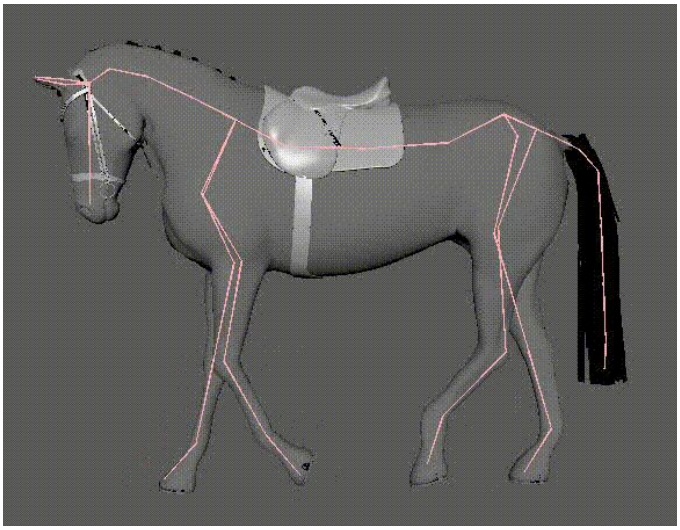
In the case of fauns from Symfaunic, everything from the pelvis up is structured the same way as a human. The femur is similar to a human femur, but shorter, and everything below the knee follows the structure of a hooved leg. This means the weight distribution must be accounted for, as hoofed mammals are often supported by four legs instead of two. The hips and weight will be directly above the legs, rather than angled forward, as they would be on a normal goat. Faun legs need to be sturdier as a result.

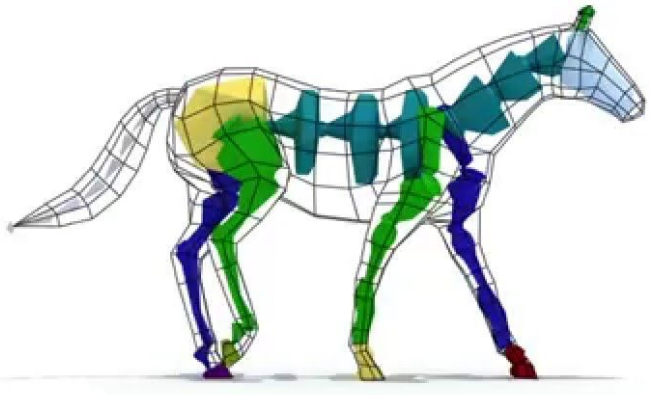
Make sure the rig of your composite creature will be accommodating for the range of motion that you want to achieve. You don't want to find out halfway into animation that the joints of your creature were not aligned properly to the anatomy, thus causing the animation of your creature to be limited in its movements. I closely referenced a horse leg for anatomy when designing Cornelius, and made sure our team's riggers knew to include the proper joints in order to make sure his legs moved the way they were intended. The skeletal structure of Cornelius' legs takes influence from horse anatomy, in order to accommodate for the height and elegance that the character portrays.



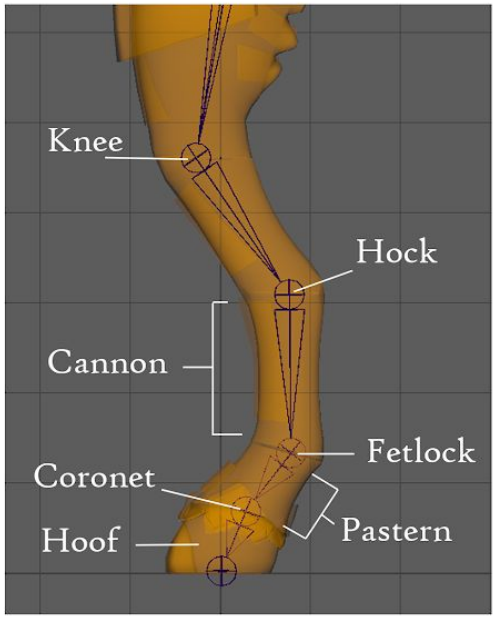


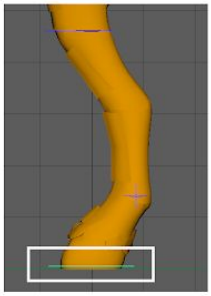
Lower horse legs actually have a similar structure to a human finger. You may notice instances of horse legs in media that have been rigged without a joint for the intermediate phalanx, or short pastern. This causes a noticeable stiffness in the gait when the horse moves. When looking carefully at an adult ungulate's stride, there's the distinct bend from the short pastern when the hoof goes to push off from the ground, and when it's lifted at its apex. It's subtle in the overall gait but having it between the hoof and the joint found at the base of the metacarpal allows the stride to move more fluidly than it would have without. Below you can see an example of a rear horse leg that doesn't have the joint (left) compared to a rig that does have it (right). Notice the natural bend in the lower foot on the right.

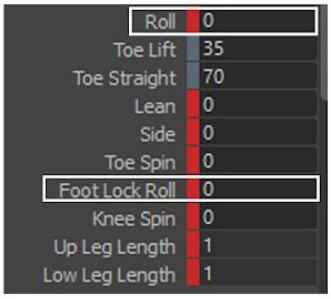




Just so you understand what part of the leg we're talking about, this is the terminology for the joints.



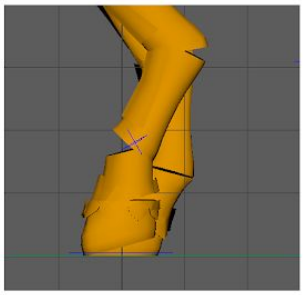


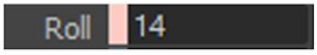


Selecting the foot_anim with the Channel Box open, you have access to Roll, which controls the lift of the hoof, and Foot Lock Roll, which controls the position of the pastern. BOTH are necessary to get the full range of motion.
(**Controllers are subject to change with Rig updates)

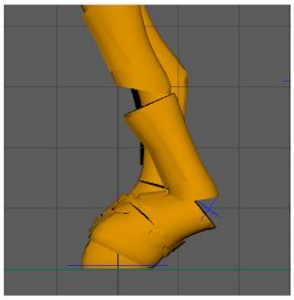
Roll:

Set this first to place the hoof at the angle you want it. *Adjust this as opposed to rotating the foot-anim.*





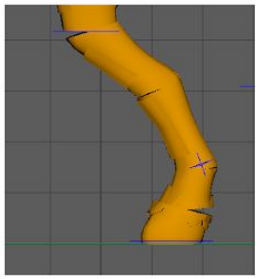
Putting a positive value on the Roll will allow the hoof to lift.



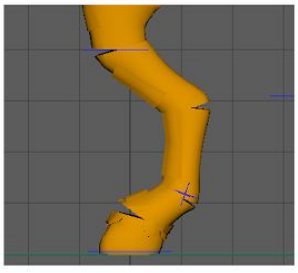
Putting a negative value on the Roll will lift the hoof in the opposite direction.
Should be used situationally for different strides.

Foot Lock Roll:

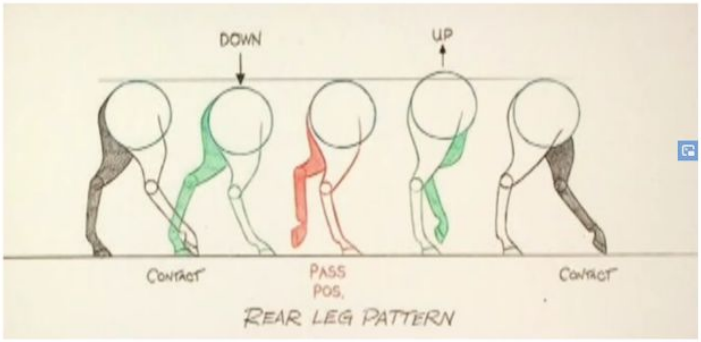
Once you've got your hoof in place, adjust this to get a natural bend on the pastern.



A positive bend will allow the pastern to push upward. (Here, the fetlock goes up to help the leg extend backward.)



A negative bend will allow the pastern to push down. (Here, the fetlock goes down with the weight of the knee pushing down.)

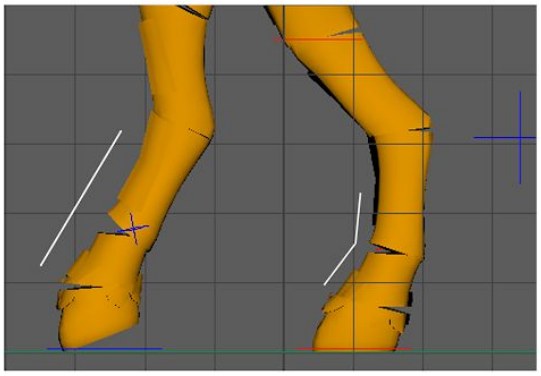


Walking

For Cornelius in particular, his stride is very elegant and refined with minimal bouncing in the steps.

Contact:

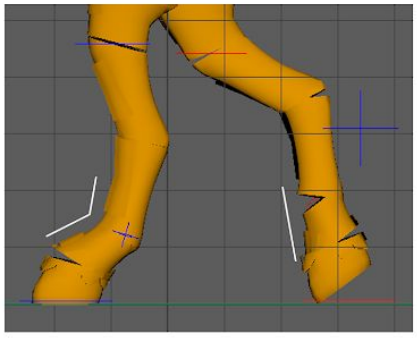
The tip of the hoof should touch the ground first before the rest of the hoof does. The pastern and cannon form a straight line as the leg extends outward.



Down:

As the leg fully comes down, the pastern will bend down to accomadate the weight. The pastern on the opposite leg will raise in extenstion as the foot is about to lift from the ground.

Straightening Bending



Pass/Up:

When the hoof first lifts up, it will be almost perpendicular to the ground. As it passes, it'll sweep forward until it reaches the contact position.