

Tar AR

As you join, please answer the following questions in the chat.

How familiar are you with XR technology?

- I'm jacked into the Matrix right now.
- I have a VR headset at home.
- I've tried a few VR headset experiences.
- I played Pokemon Go a couple times.
- X what now?

Have you ever visited La Brea Tar Pits?

- Yes, toured the pits and the museum.
- Just the pits outside.
- No.

#TarAR

Tar AR

Bringing the past to life in place-based
augmented reality science learning

#TarAR
MW21 Online
April 30, 2021



TAR AR IS A TEAM EFFORT

Natural History Museums of Los Angeles County

Natural History Museum

- Matt Davis
- Molly Sjoberg
- Molly Porter
- Clyde Crossan

La Brea Tar Pits

- Emily Lindsey

External Evaluator

- Kate Haley Goldman

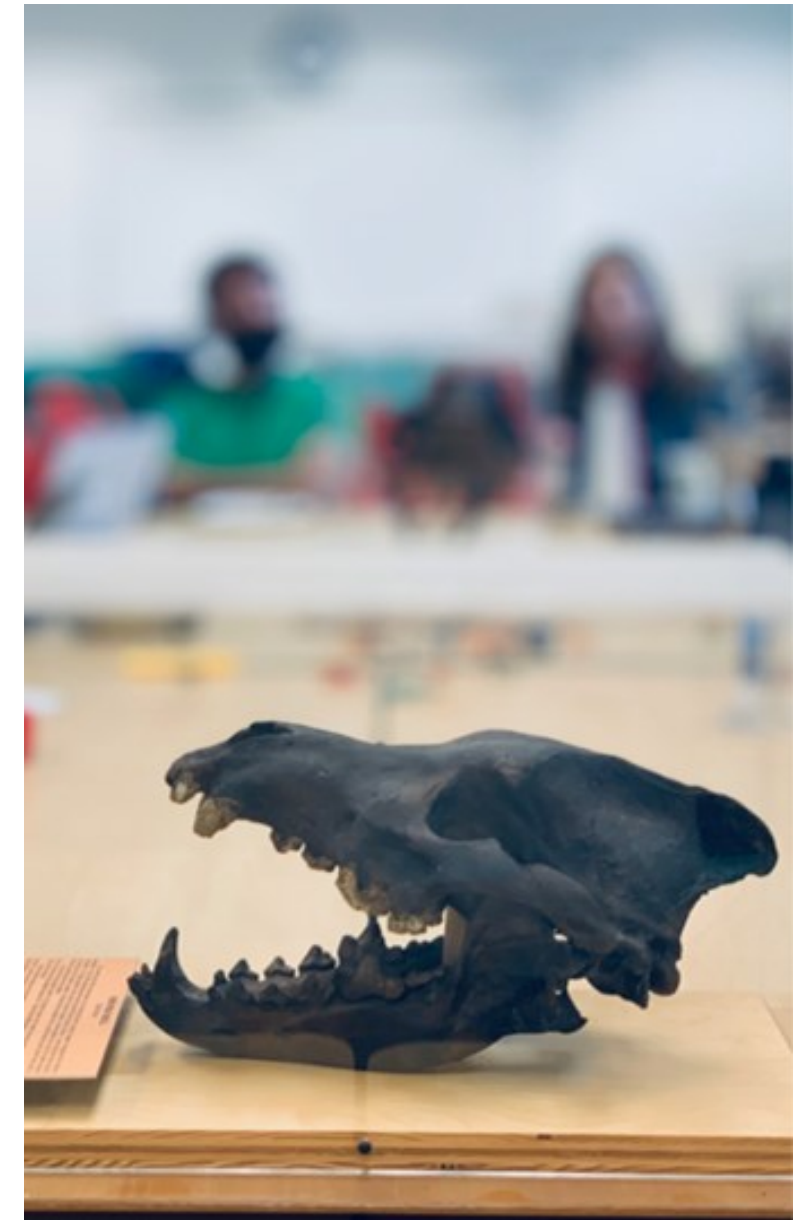
University of Southern California

Institute for Creative Technologies

- Benjamin Nye
- Bill Swartout
- David Nelson
- Pranav Ghate

Rossier School of Education

- Gale Sinatra
- Imogen Herrick



OUTLINE

- Introduction to the Tar AR project
- How to make scientifically accurate virtual assets
- Narrative control in the Tar AR experience
- Initial findings
- Forum: What is the next step for museums and AR?



[ARIELLE PARDES](#) GEAR 09.21.18 07:00 AM

FOR MUSEUMS, AUGMENTED REALITY IS THE NEXT FRONTIER



MIRANDA KATZ CULTURE 04.23.18 12:00 PM

SHARE



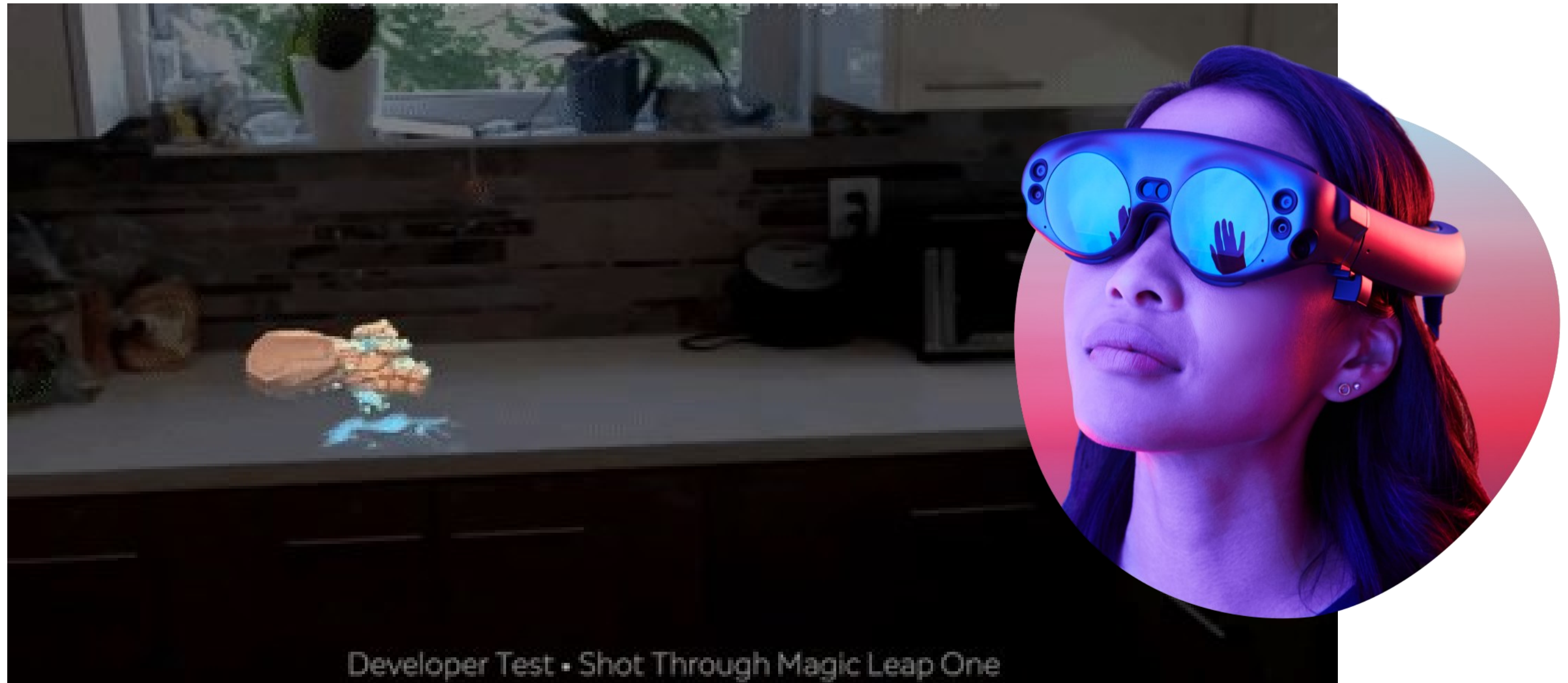
AUGMENTED REALITY IS TRANSFORMING MUSEUMS



THE PITCH FOR AUGMENTED REALITY



THE REALITY OF AUGMENTED REALITY

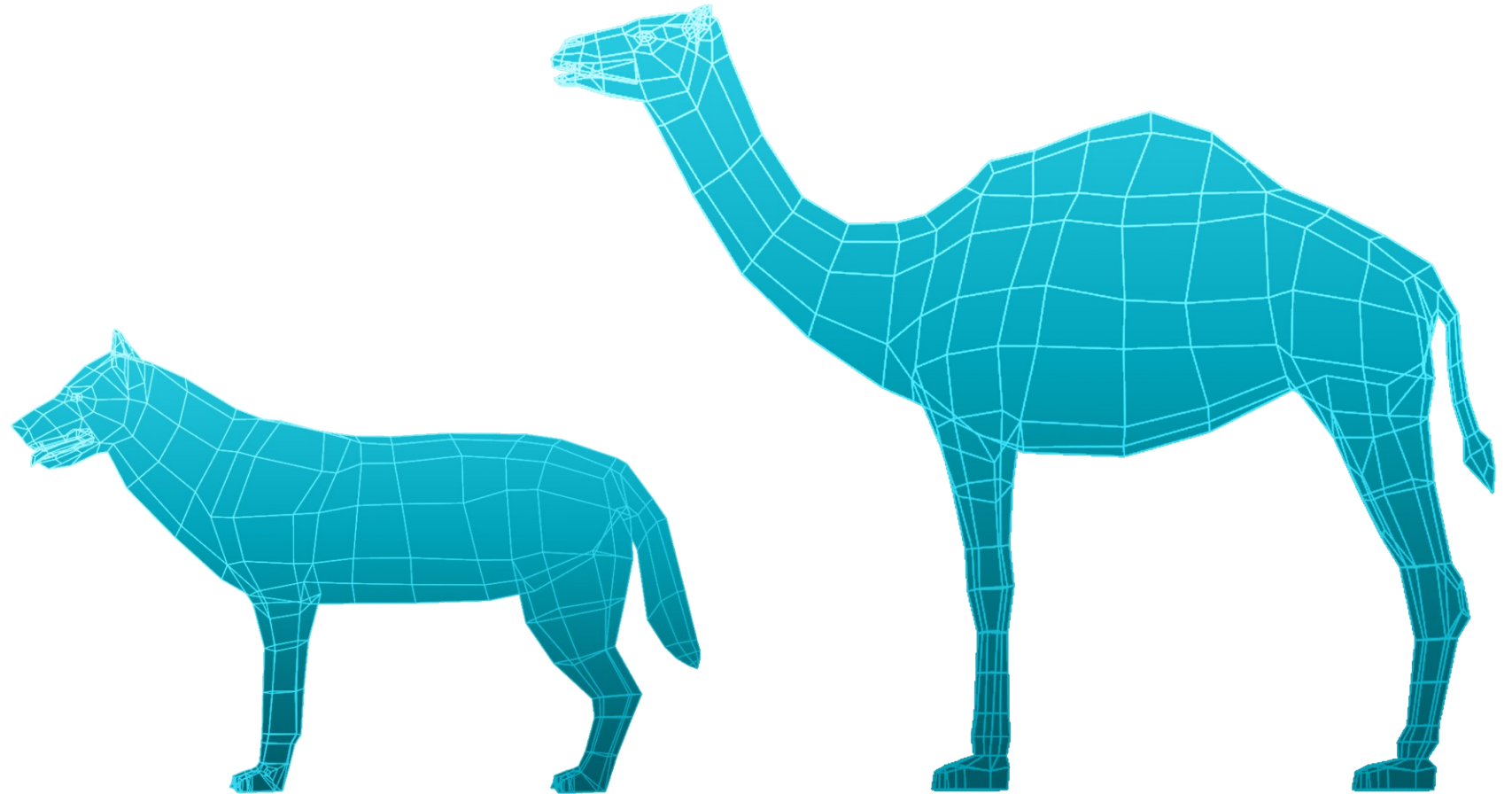


Developer Test • Shot Through Magic Leap One

HOW EFFECTIVE IS AR IN MUSEUMS?

Do visitors actually learn better with AR compared to normal museum labels?

If so, is more immersive and/or interactive AR better than simple, smartphone based AR?



LA BREA TAR PITS

Pit 91

How do paleontologists use fossils to reconstruct La Brea's habitat?

Welcome to La Brea Tar Pits! Thank you for joining our team of scientists. Your mission is to help us understand the habitat of La Brea during the Ice Age, 25,000 years ago. Start by forming a hypothesis.

What do you think La Brea looked like during the Ice Age?



Cold and dry Cold and wet Cold and moist Warm and dry Warm and wet Hot and wet

Use these fossils from Pit 91 as evidence to test your hypothesis. Hypothesis = a possible explanation that can be tested with evidence



Pit 91: Active dig site
These fossils were in asphalt when the tar pits were active. The fossils are still here at La Brea.

Tiny fossils give us clues.
These small fossils are from species still alive today. They tell us a lot about the Ice Age habitat of La Brea.



Sturgeon fossil
The fish was about 10 cm long. It was found in the same layer as the fish fossils.

Western cottonwood
These trees grew in the same place as the fish fossils. They were probably the main food source for the fish.

Yellow oak
These trees grew in the same place as the fish fossils. They were probably the main food source for the fish.

Western meadowlark
These birds lived in the same place as the fish fossils. They were probably the main food source for the fish.

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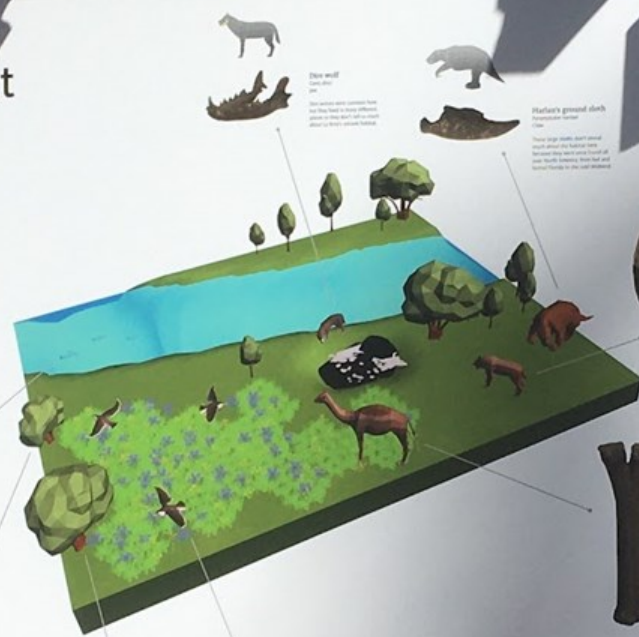
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Dino wolf
These wolves were about 10 cm long. They were found in the same layer as the fish fossils.

Harlan's ground sloth
These sloths were about 10 cm long. They were found in the same layer as the fish fossils.

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Big bones from big animals.
These fossils all come from megafauna that went extinct. Megafauna = animals the size of a person, or larger.

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Did the fossil evidence cause you to revise your hypothesis?

Ice Age La Brea wasn't snowy
During the Ice Age, huge glaciers covered Canada. But just like today, it didn't snow everywhere. The evidence we have suggests that ancient La Brea looked similar to the habitats currently surrounding Los Angeles, only a little colder and wetter.

Megafauna went extinct
Most of the 600 species of plants and animals found as fossils in the Tar Pits still live in California today. However, almost all the large animals that lived here, like sabertooths, died out.



LOS ANGELES IS A GREAT PLACE FOR AR/VR INNOVATION



Wevr



Camera IQ

TALESPIN

EMBLEMATIC.
REACH BEYOND



DREAMSCAPE™

LOS ANGELES IS A GREAT PLACE FOR AR/VR INNOVATION



LOS ANGELES IS A GREAT PLACE FOR AR/VR INNOVATION



WE PROTOTYPE MANY DIFFERENT XR TECHNOLOGIES



LA BREA TAR PITS IS A GREAT PLACE TO IMPLEMENT AR





TAR PITS SHOWS THE WHOLE PROCESS OF SCIENCE

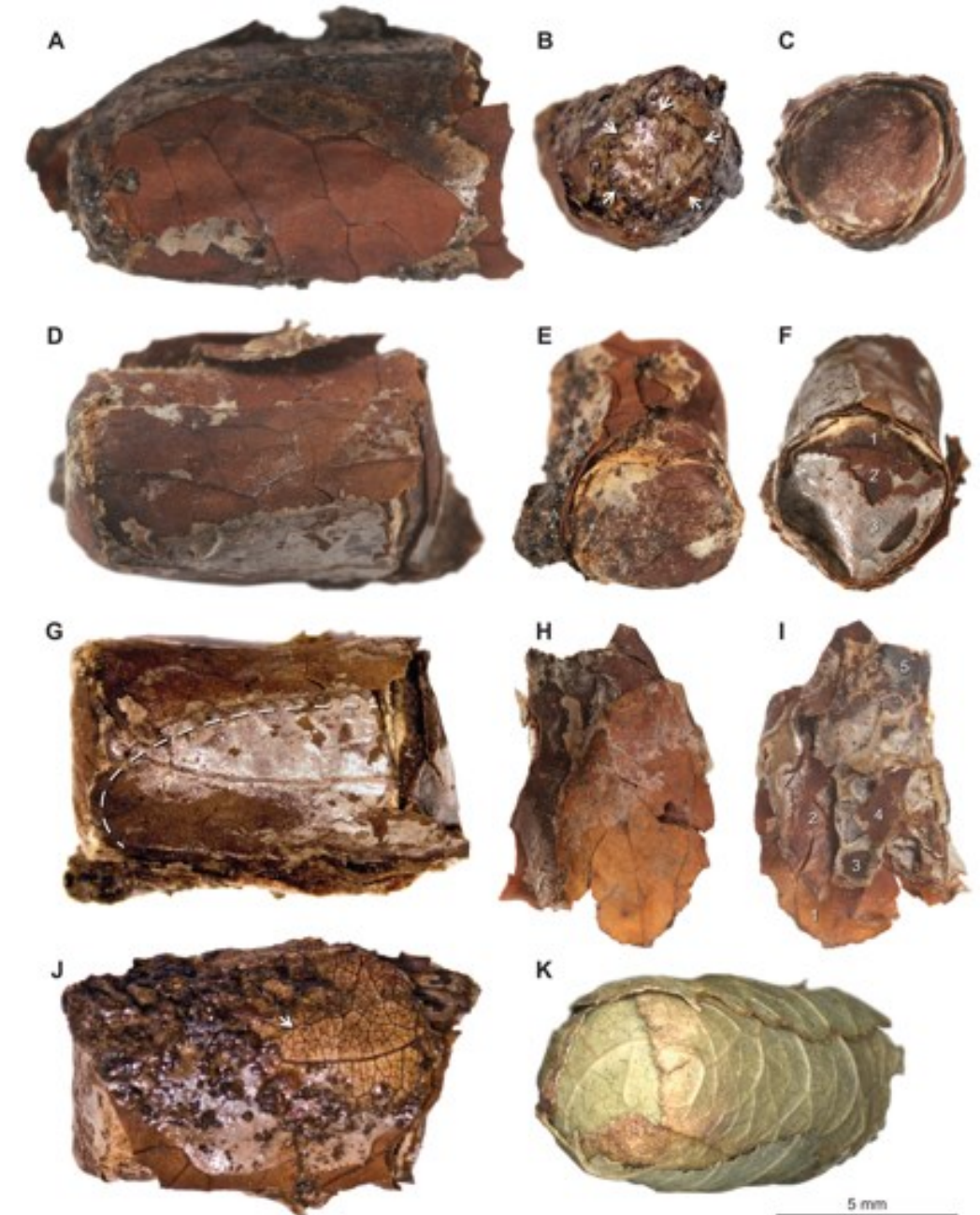


*No photos in this presentation show human remains.

THE TAR PITS PRESERVE A LOT!



THE TAR PITS PRESERVE WHOLE ECOSYSTEMS



THE TAR PITS ARE STILL ACTIVE!



LA BREA TAR PITS IS A GREAT PLACE TO IMPLEMENT AR



CAN AR CORRECT VISITOR MISCONCEPTIONS?

Visitor misconceptions

“All the fossils are from big animals that are extinct today”

“Only big things matter”

“Science is just a collection of facts”

“We know everything already”

“The scientists are all actors and the lab is just for show”

“L.A. was covered with ice”



CAN AR CORRECT VISITOR MISCONCEPTIONS?

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“The scientists are all actors and the lab is just for show”

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Learning goals

The Tar Pits capture everything

Science involves testing ideas with evidence and revising hypotheses

Science happens at the Tar Pits

L.A.’s current ecosystem is different than the past



FACTOR IN THE COST OF MAKING ACCURATE ASSETS



RAIN ENTERTAINMENT
Mammoth
(not enough ratings)
\$4.99



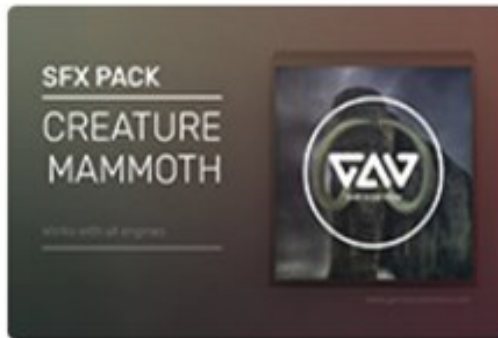
BLACK CURTAIN STUDIO
Mammoth Hut
(not enough ratings)
\$7



4TOON STUDIO
Cartoon Animal - Mammoth
(not enough ratings)
\$30



ARKAYA VENTURE LIMITED
Space Mammoth
(not enough ratings)
\$34.99



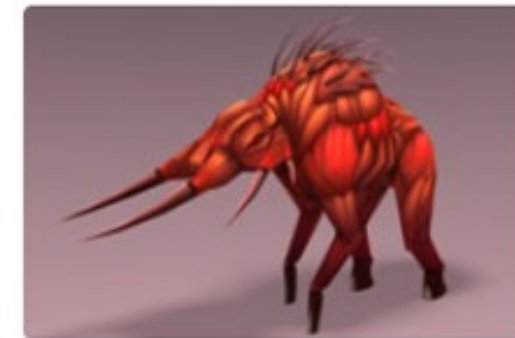
GAMEAUDIOVISION
Creature Mammoth
(not enough ratings)
\$9.99



RAIN ENTERTAINMENT
Mammoth Monster
(not enough ratings)
\$7.99



BLACK CURTAIN STUDIO
Mammoth Skull
(not enough ratings)
\$5



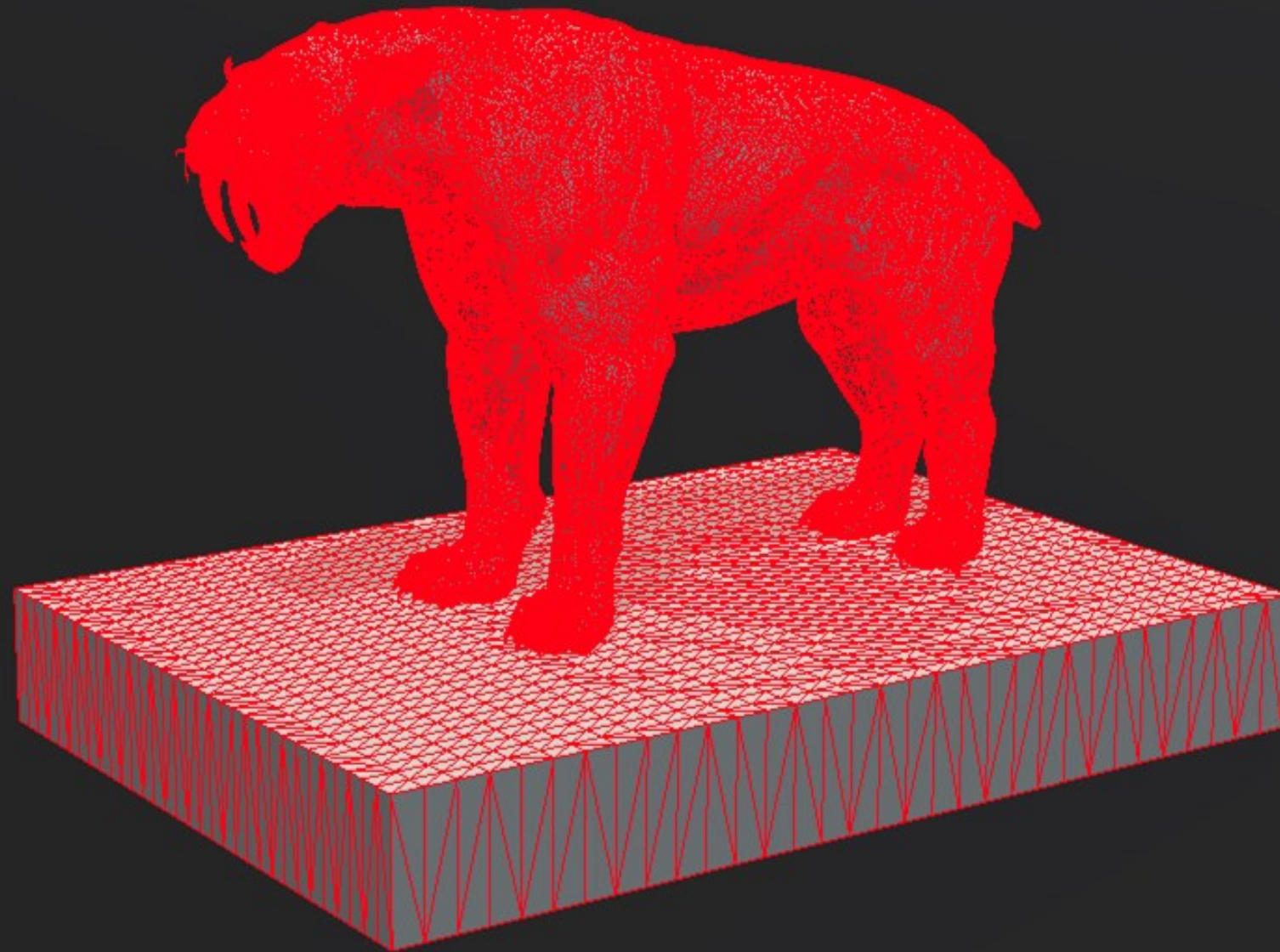
ARTCITIZEN
Sci-Fi Mammoth
(not enough ratings)
\$10

CHOOSING AN AESTHETIC



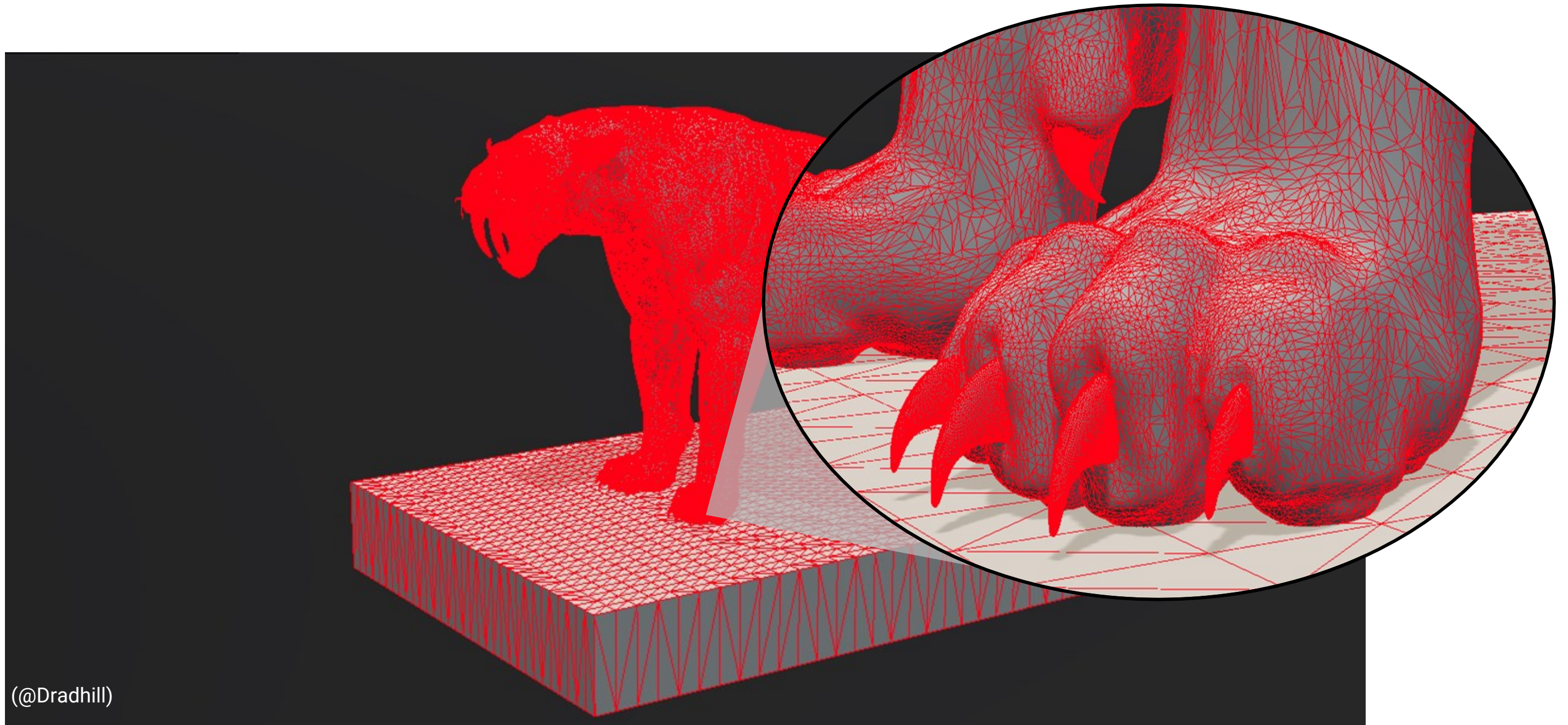
(@Dradhill)

HIGH POLYGON COUNT



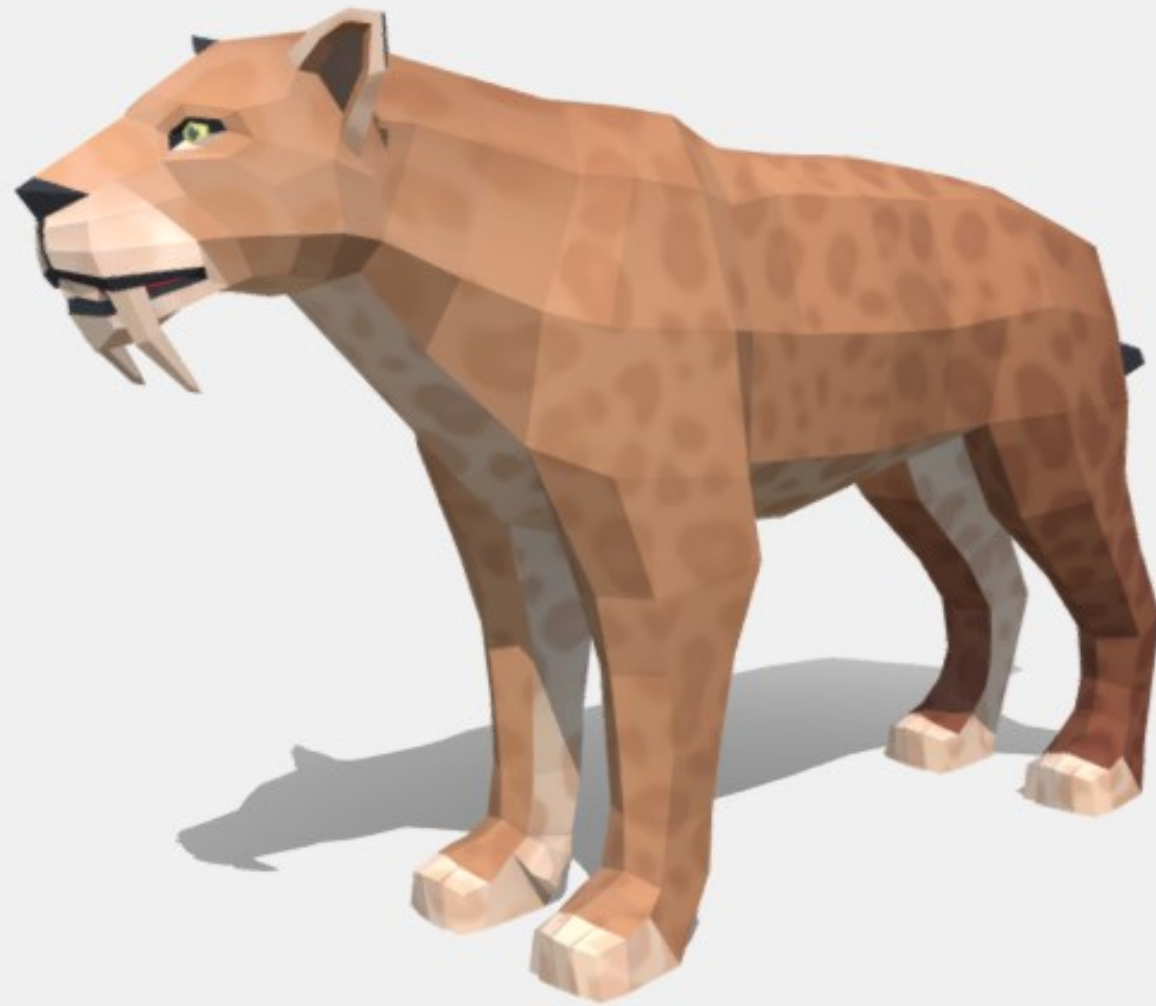
(@Dradhill)

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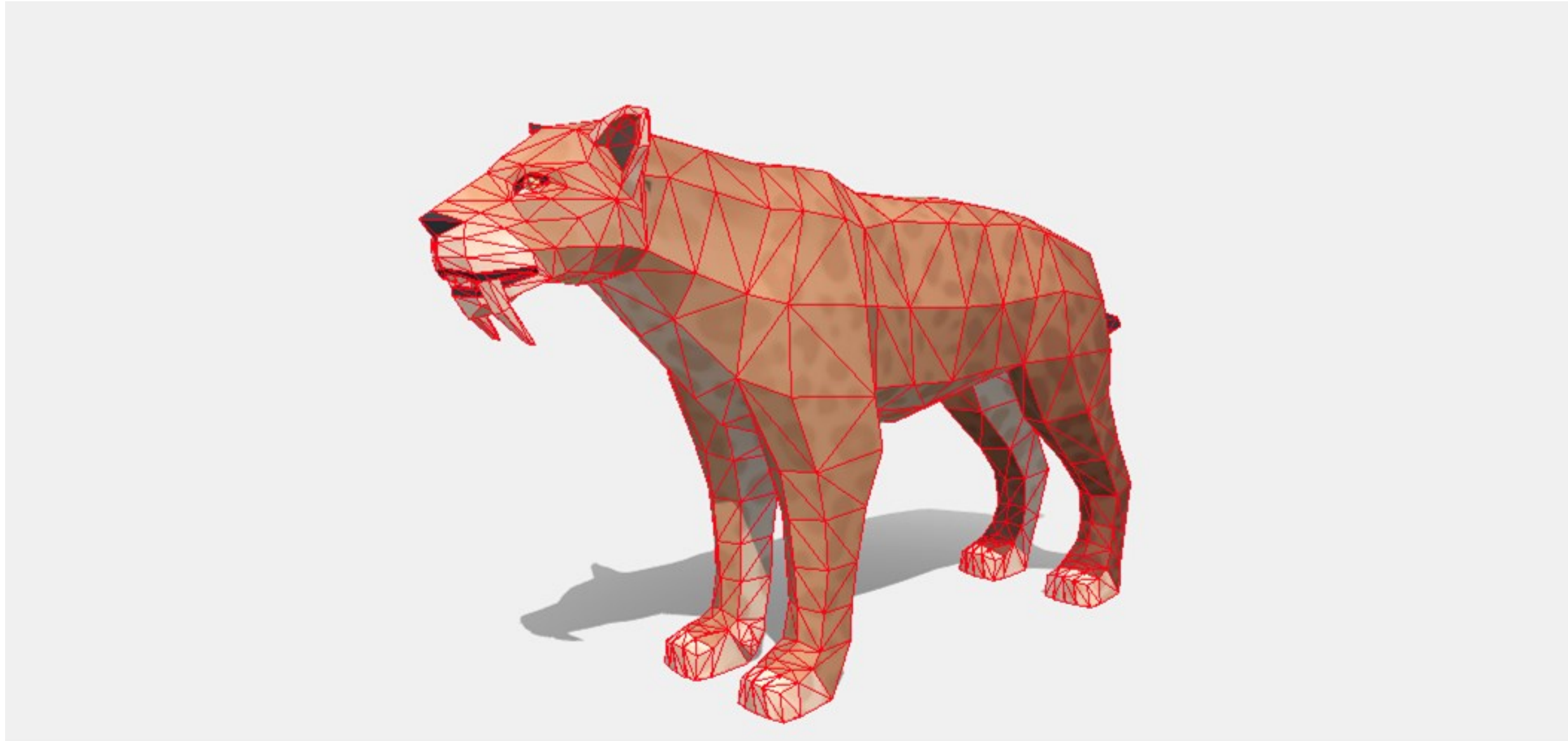


(@Dradhill)

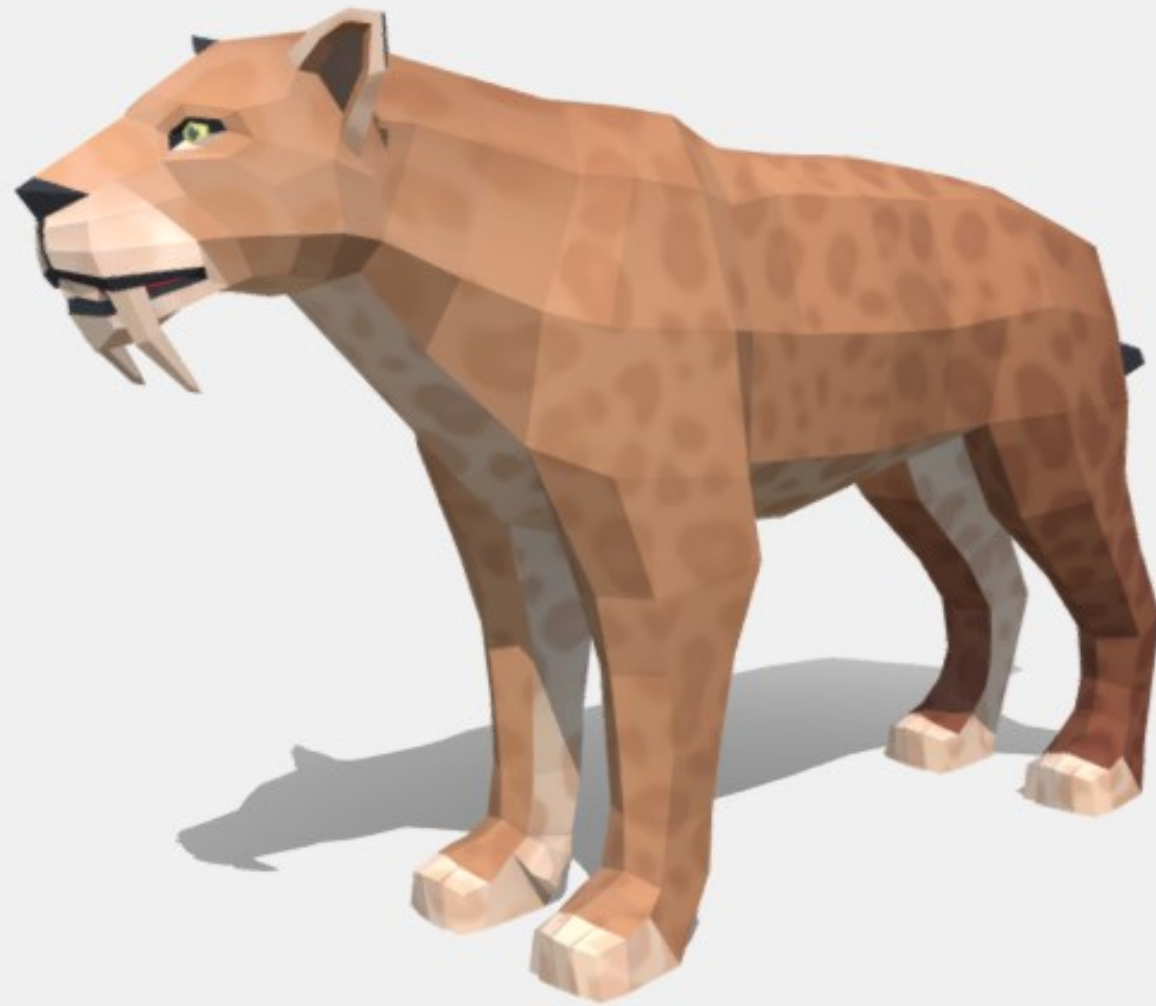
WHY WE CHOSE A LOW POLY AESTHETIC



WHY WE CHOSE A LOW POLY AESTHETIC



WHY WE CHOSE A LOW POLY AESTHETIC



ANIMATION IS MORE IMPORTANT TO BELIEVABILITY THAN PHOTOREALISM



ANIMATION IS MORE IMPORTANT TO BELIEVABILITY THAN PHOTOREALISM



Nothotherium



GROUND SLOTH

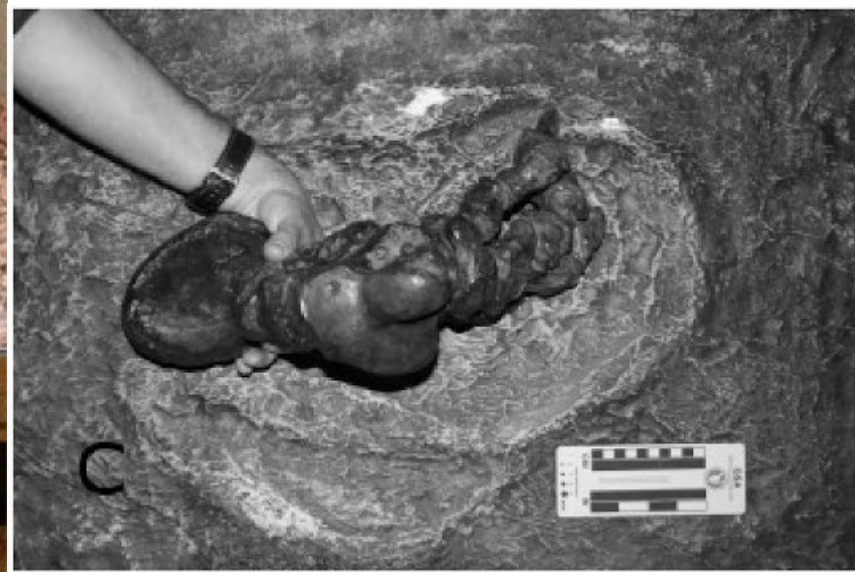
Nothotherium sladeni

This remarkable ground sloth was discovered in 1928 not far from the town of Abo, New Mexico. It had fallen into a pit in the side of a volcanic crater and was found on the floor of the pit, 100 feet below the surface, almost completely buried in dry, loose hot guano. The specimen has been dated by radiocarbon methods and found to be approximately 11,500 years old.

The specimen is complete, the bones being held together by their original ligaments and tendons. Also preserved are patches of skin with hair, the mucous membrane lining the hard palate, and some muscle fibers. Apparently the greater part of the hide was devoured by rodents, as the marks of rodent teeth are visible on many parts of the body. A dung ball found near the body consists of densely packed woody fragments, mostly the remains of small twigs and roots. The sloth apparently was feeding upon low-growing, desert scrub vegetation, such as one grows in the modern United States.



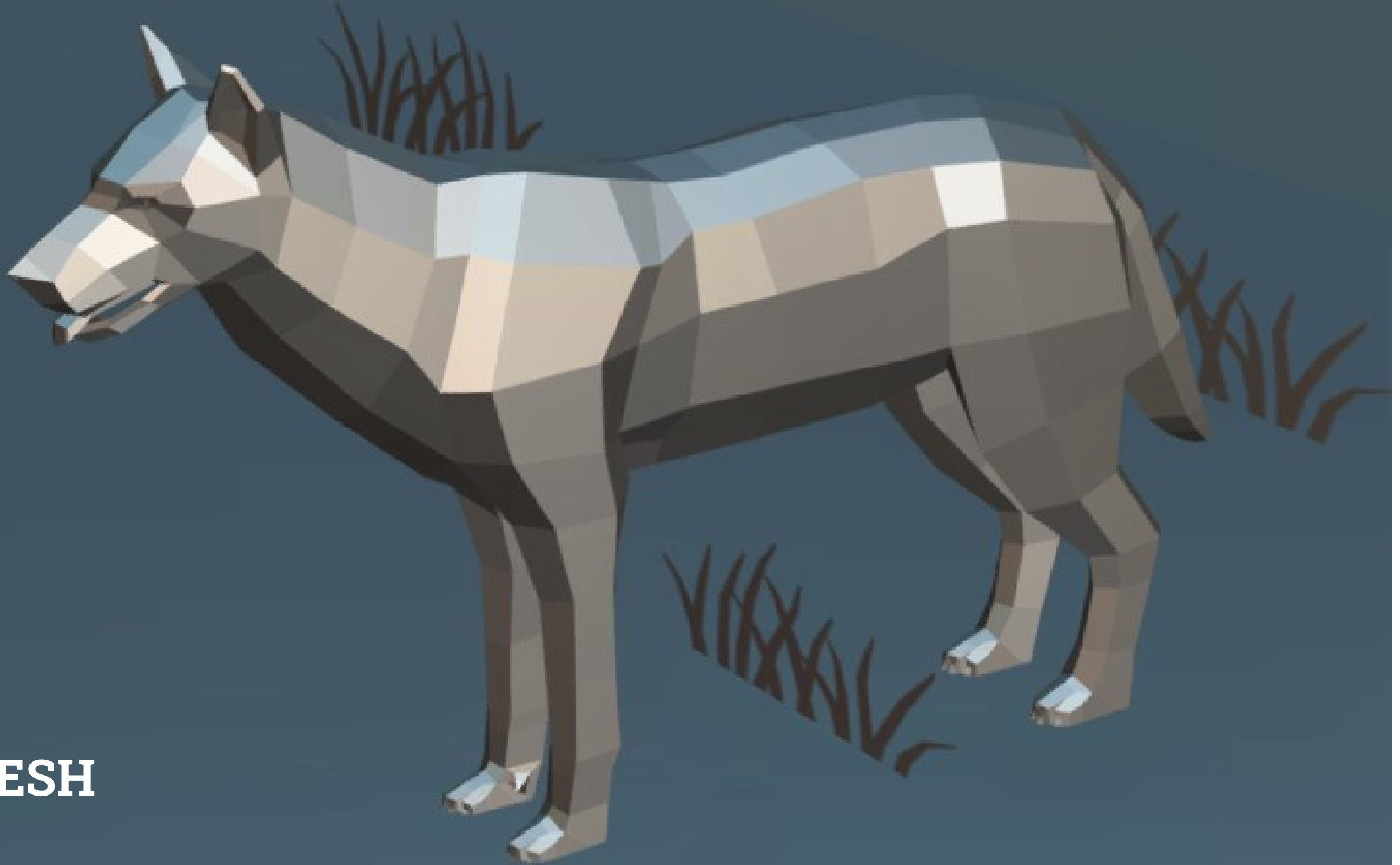
(McDonald 2007)



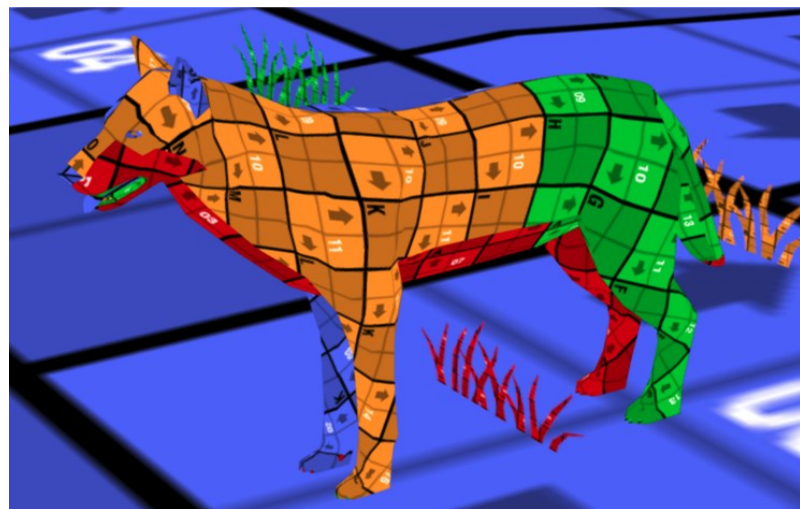




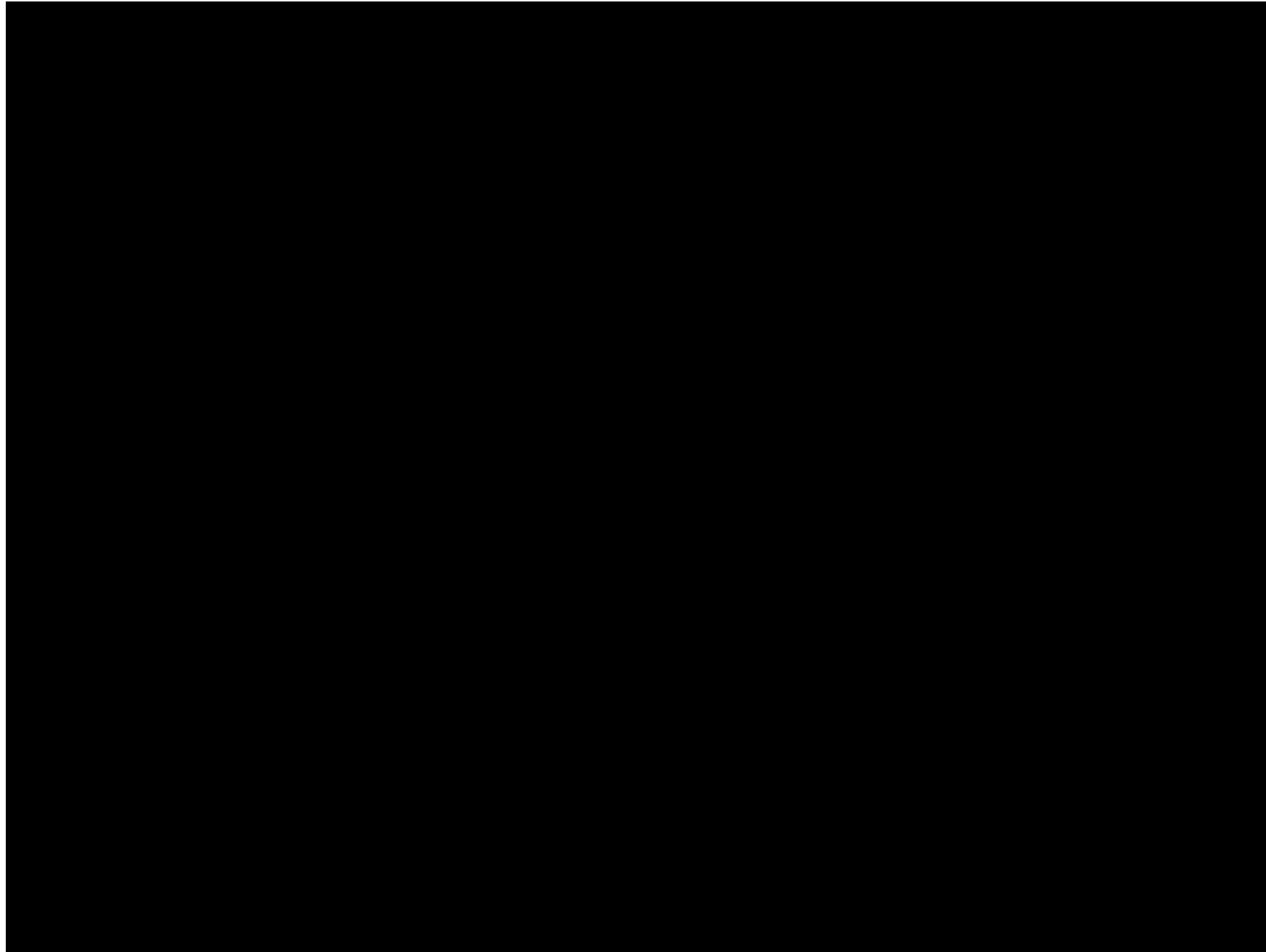
MESH



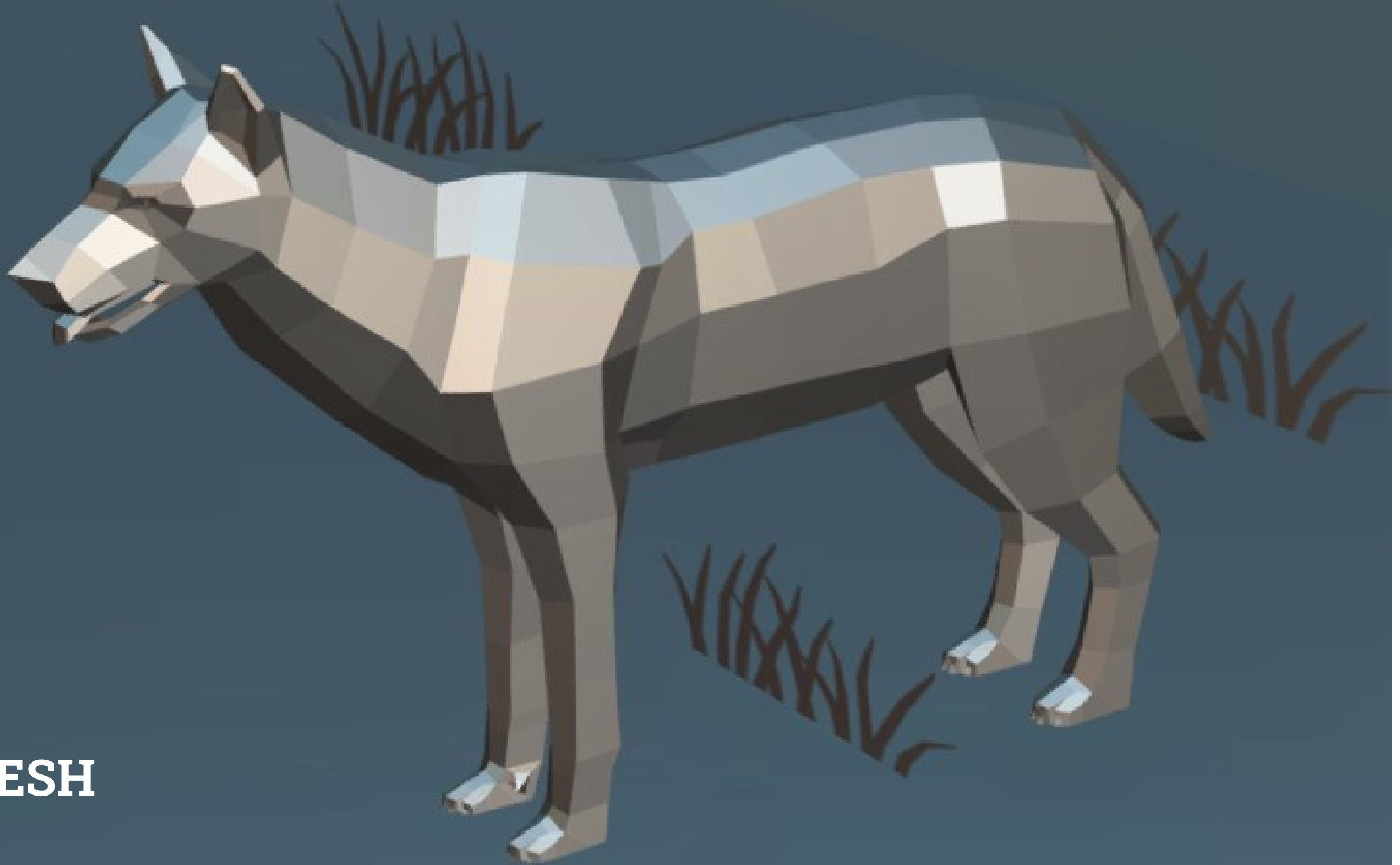
TEXTURE



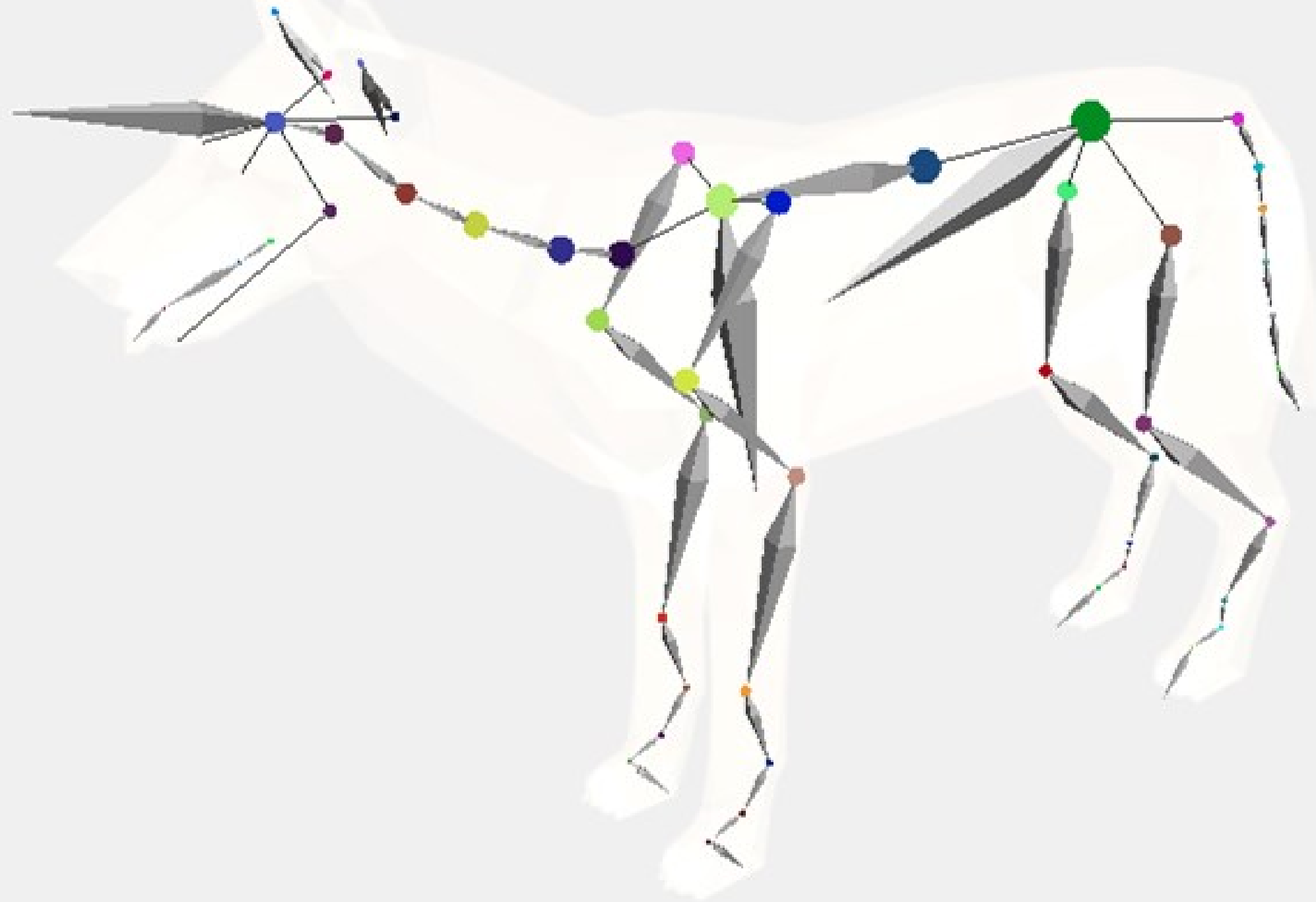
LOW POLY DOESN'T HAVE TO LOOK LOW POLY

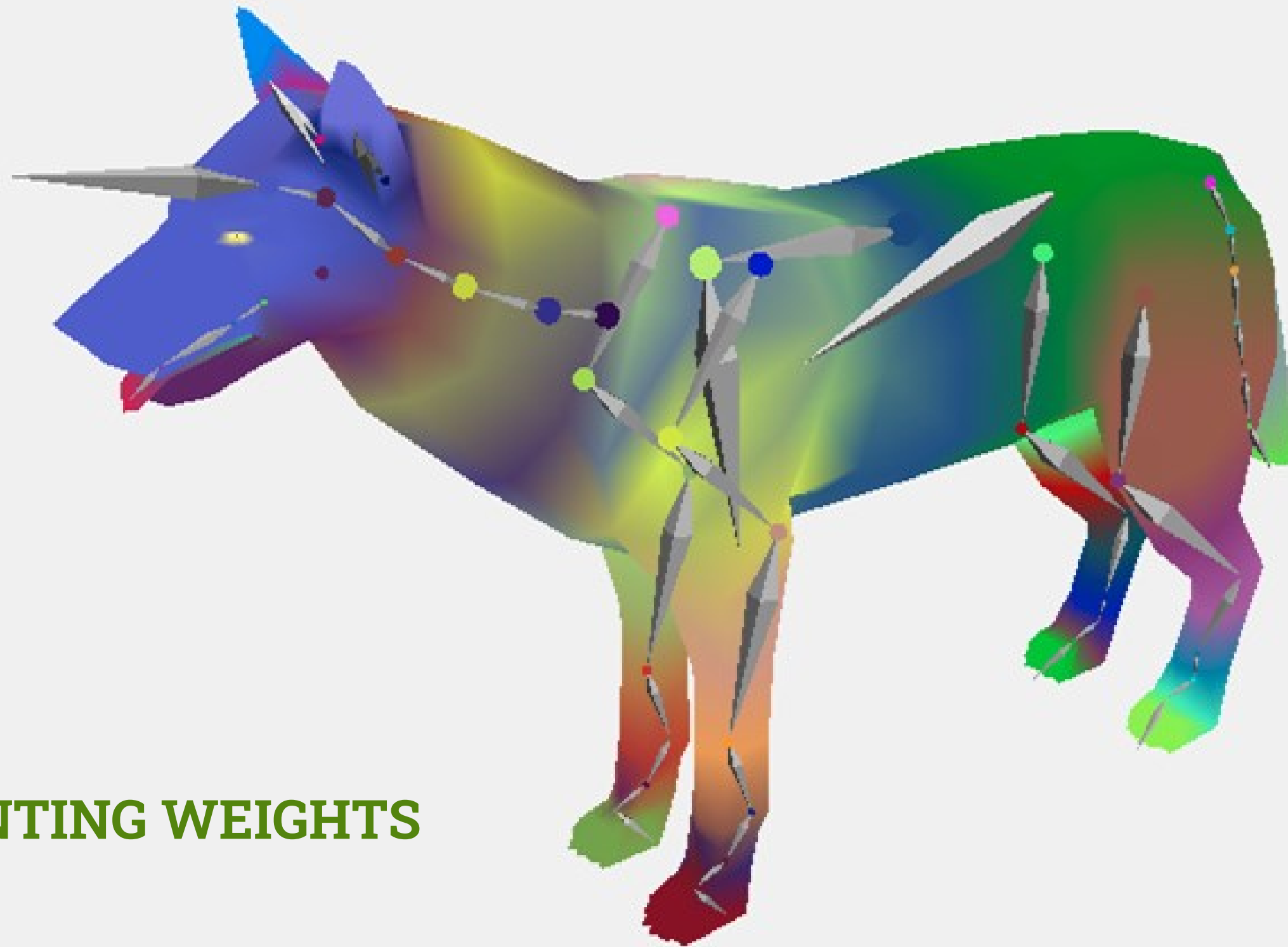


MESH

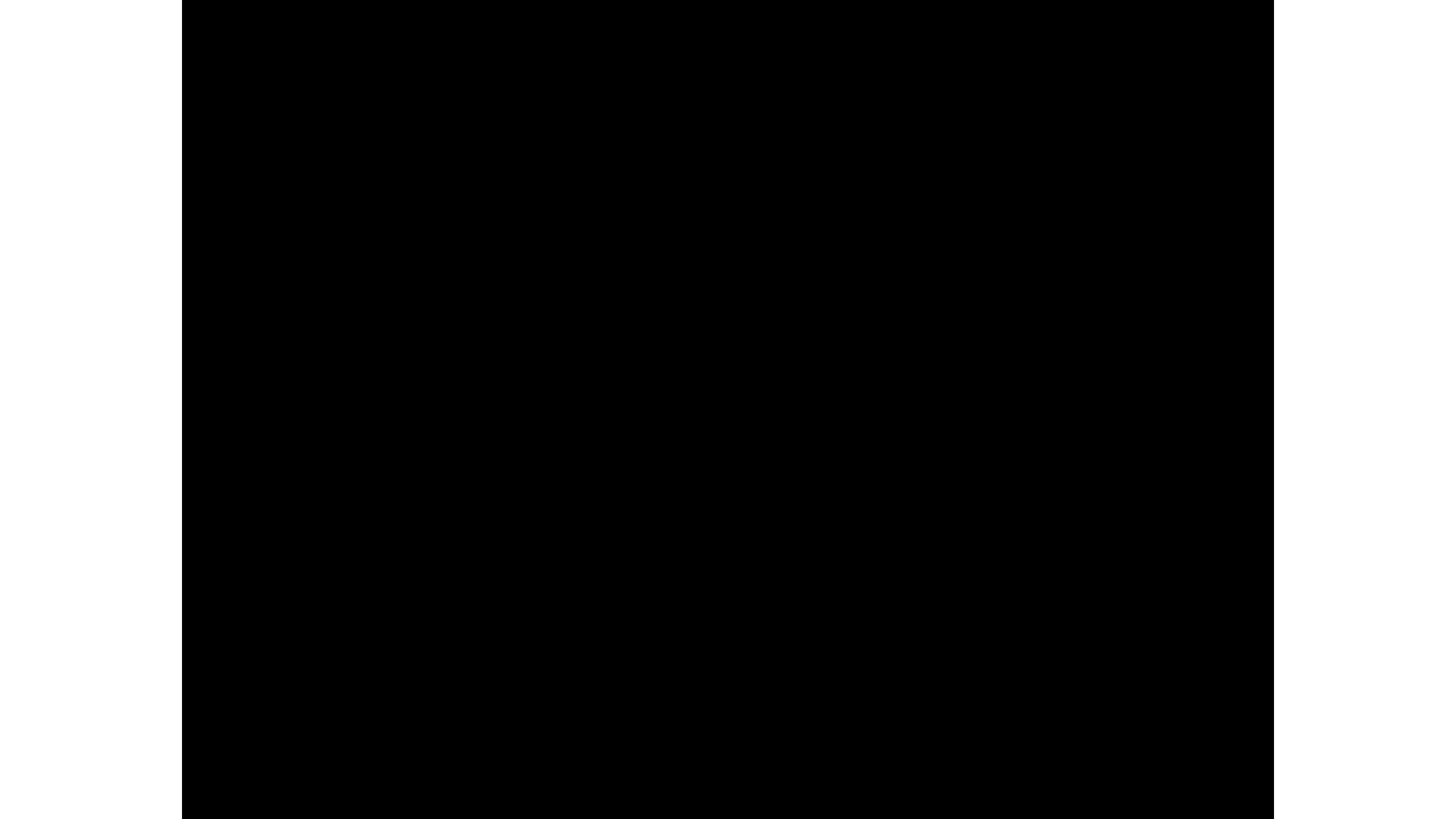


RIGGING THE SKELETONs





PAINTING WEIGHTS





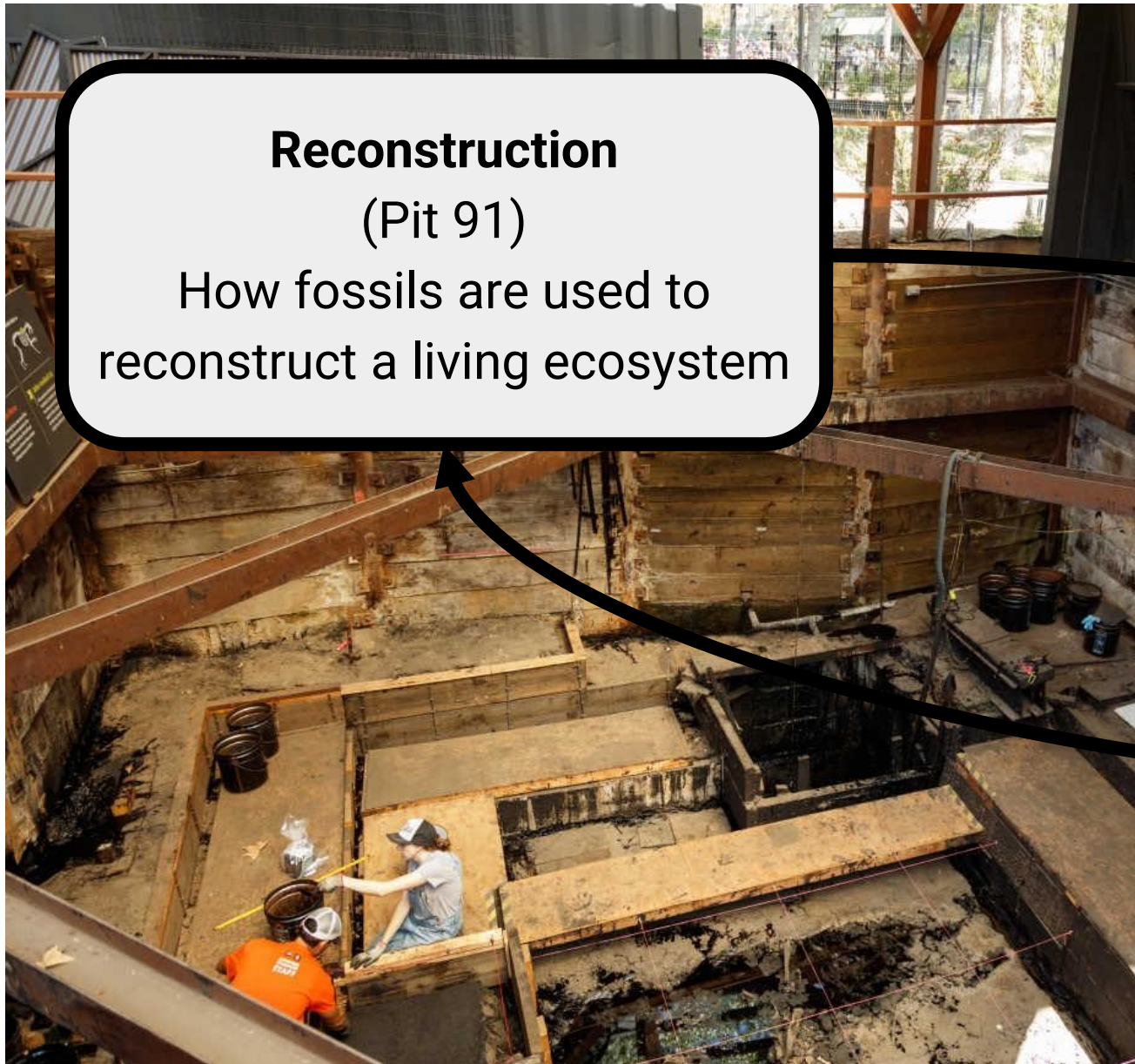


TAR PITS AR DISCOVERY NARRATIVE

Reconstruction

(Pit 91)

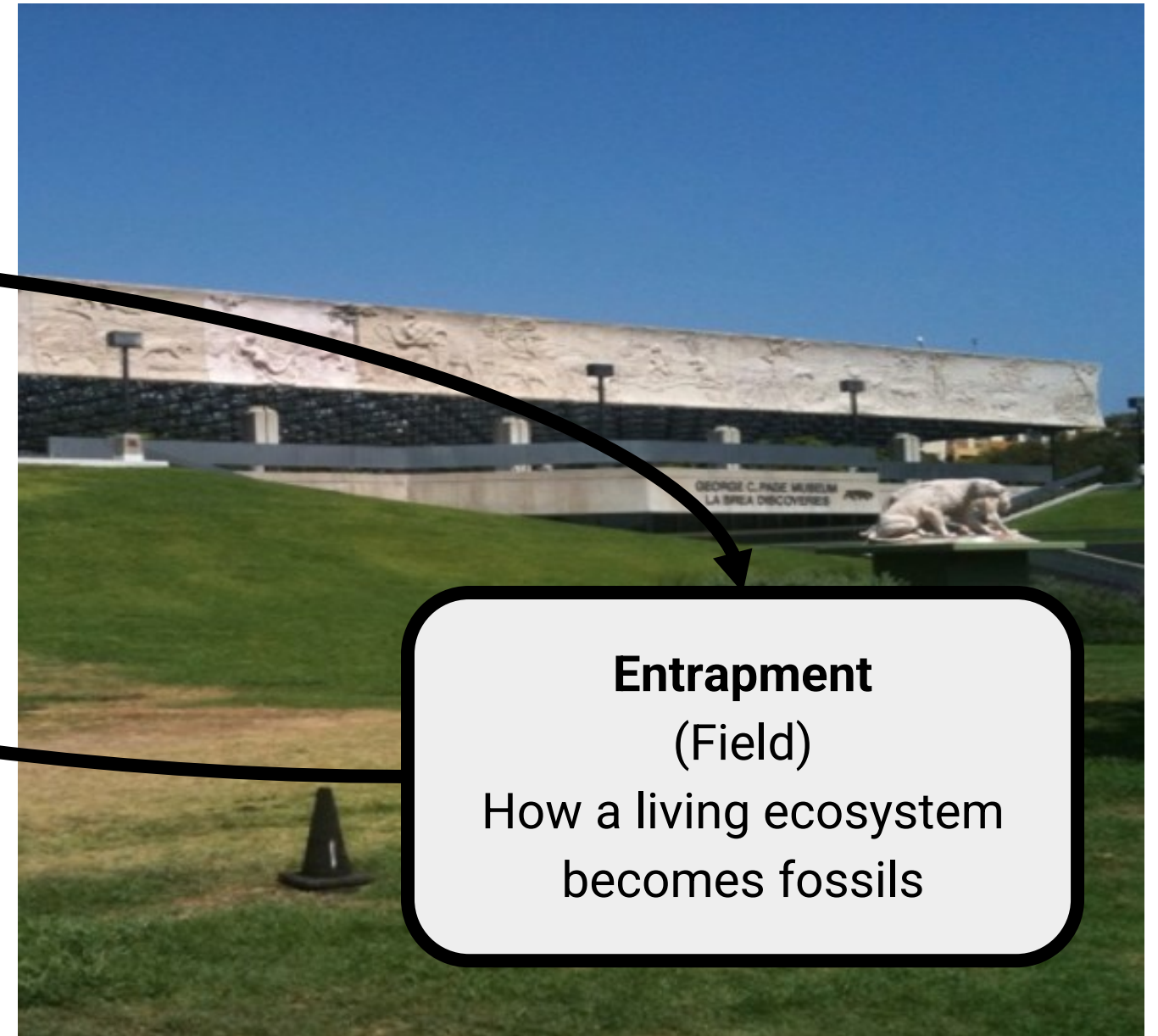
How fossils are used to
reconstruct a living ecosystem



Entrapment

(Field)

How a living ecosystem
becomes fossils



How do paleontologists use fossils
to reconstruct La Brea's habitat?



I DIG91

Asphalt Pit



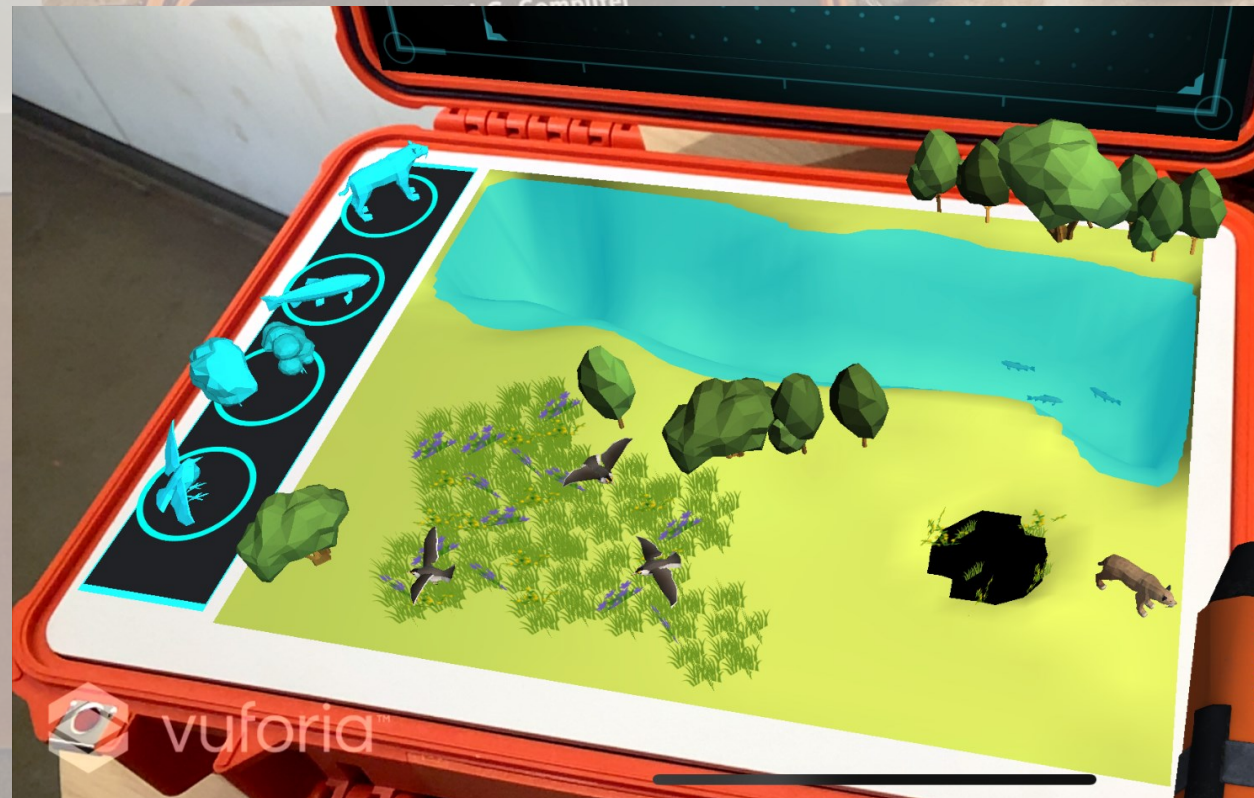
What do you think the habitat of La Brea looked like during the Ice Age?

How do paleontologists use fossils to reconstruct La Brea's habitat?





How do paleontologists use fossils
to reconstruct La Brea's habitat?



vuforia™



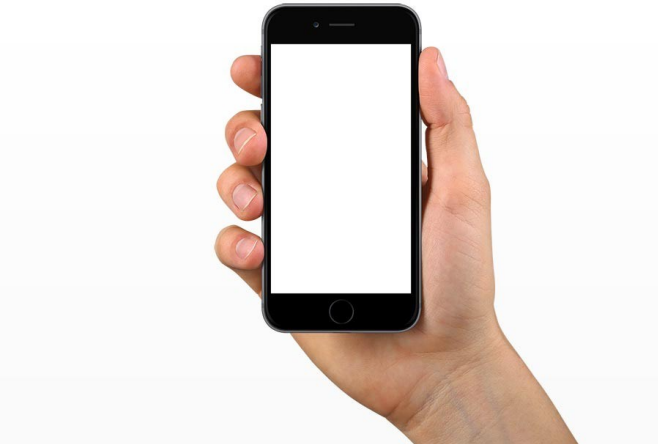
What do you think the habitat of La Brea looked like during the Ice Age?





TOO MUCH NARRATIVE DIRECTION?





	Low interactivity	High interactivity
Handheld		
Headset		



Control/Baseline:
Standard museum
label



Pit 91

Welcome to La Brea Tar Pits! Thank you for joining our team of scientists. Your mission is to help us understand the habitat of La Brea during the Ice Age, 25,000 years ago. Start by forming a hypothesis.

FIG. V1: Active dig site
These fossils track a pathway from
tree plants and animals that live
and died, right here at La Brea.



Butcherfish
Giant
Shark

The fish that
eats everything
that is placed
before it.

Western Agreement
 Western nations
 say



Valley oak
Quercus laevis
oak

These trees grow in thick forests on limestone ridge tops. There are probably many more scattered around.

Western Kingbird
Tyrannus tyrannus
king bird

The bird house is open fields and there are generally thousands of them in the area.

Ice Age La Brea wasn't snowy
During the Ice Age, huge glaciers covered Canada. But just like today, it didn't snow everywhere. The evidence we have suggests that ancient La Brea looked similar to the habitats currently surrounding Los Angeles, only a little colder and wetter.

Mega fauna went extinct
Most of the 600 species of plants and animals found as fossils in the Tar Pits still live in California today. However, almost all the large animals that lived here, like sabertooths, died out.

Big bones from big animals.
These fossils all come from megafauna that went extinct.
Megafauna = animals the size of a person, or larger.

Harlan's ground sloth
Megamelasodon harlani
Carnivore

These large sloths don't stand much about the habitat here because they were once found just north of Mexico. They had a normal lifestyle in the wild state.

Subertown's
Includes (Single)
T-shirt

Western Canada
Canadian Rockies

RANDOMIZED CONTROLLED TRIAL

135 Participants

5 Conditions

Pre Measures

- Multiple choice knowledge items
- Semi-structured knowledge questions

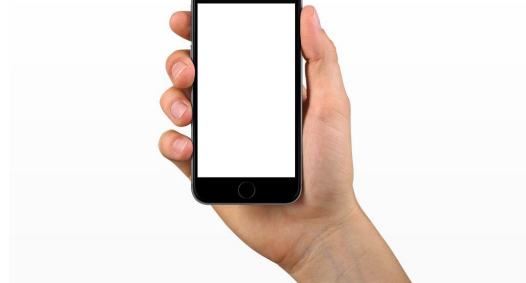
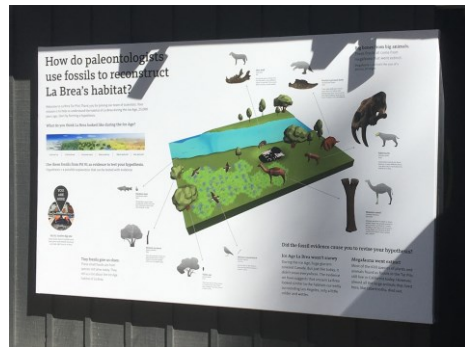
10 minute AR experience (or control)

Post-Measures

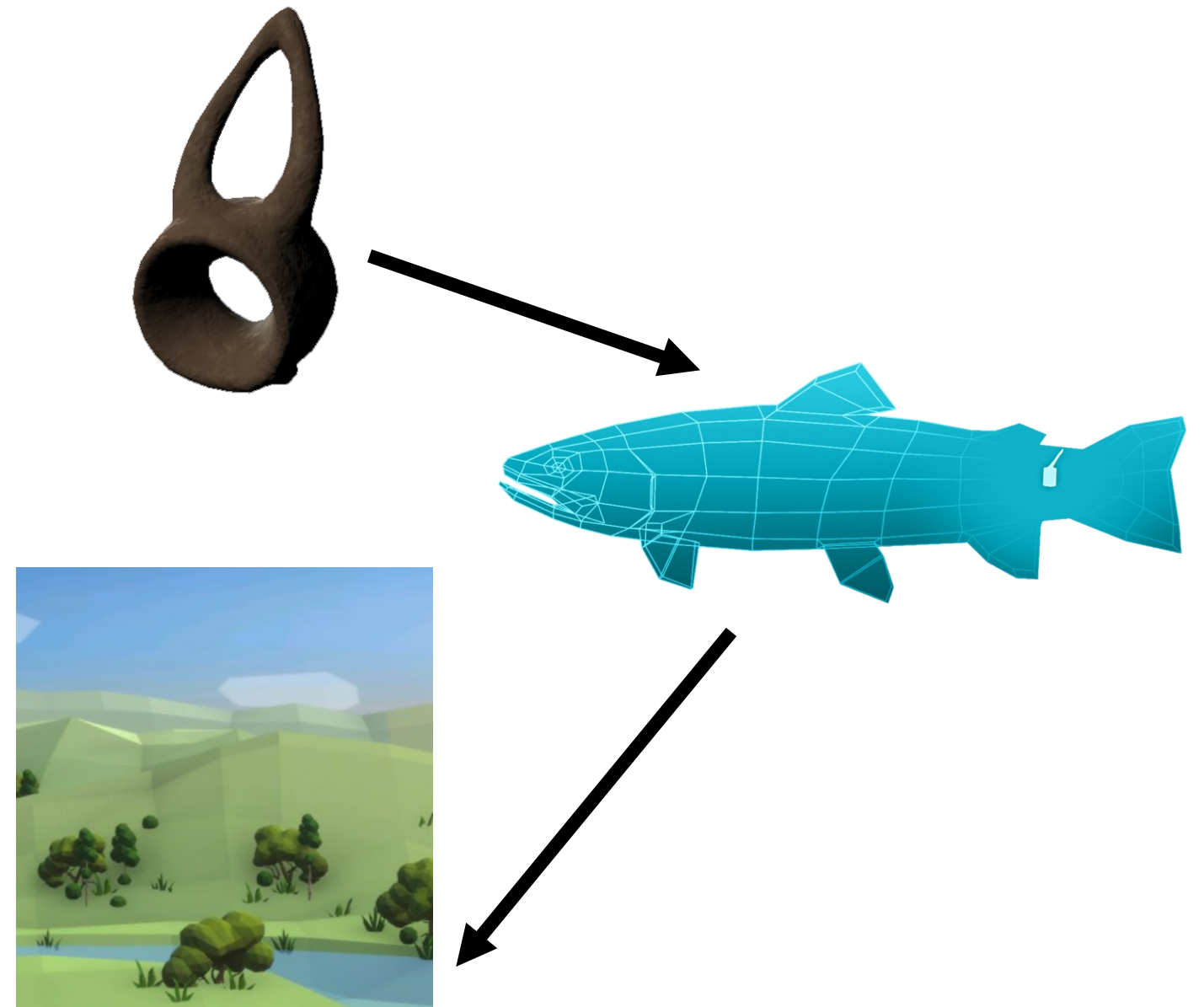
- Multiple choice knowledge items
- Semi-structured knowledge questions
- Interest, engagement, and emotions measures



ALL CONDITIONS IMPROVED LEARNING EQUALLY WELL



WITH AR, SEEING IS BELIEVING

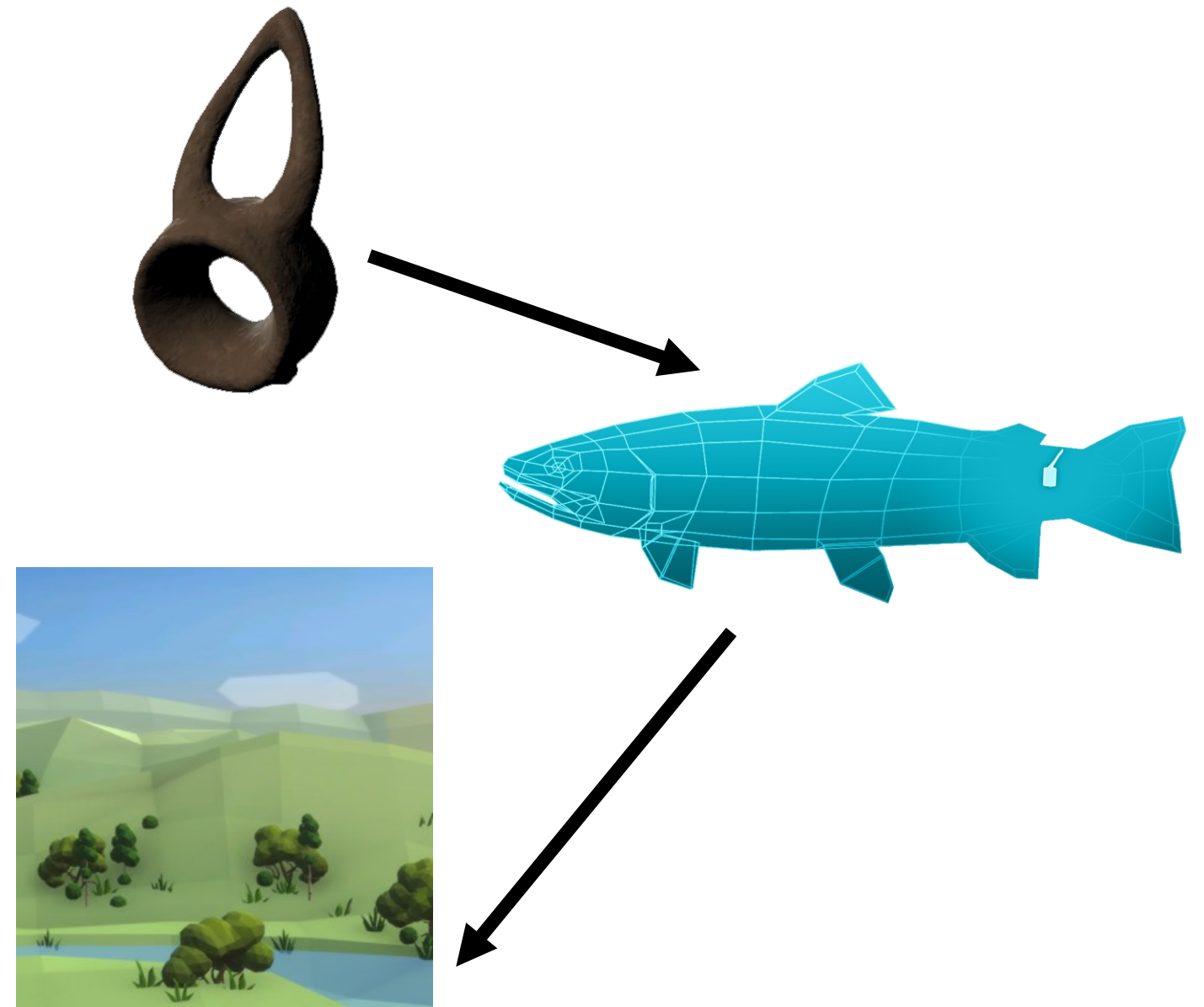


WITH AR, SEEING IS BELIEVING

Was there anything that surprised you?

Control (standard museum label)

Yes. I was surprised by how many things the tar pits preserved, including, like, plants, basically. And I was surprised that there was constantly running water and that, like, fish-- fossils were found in the tar pits.

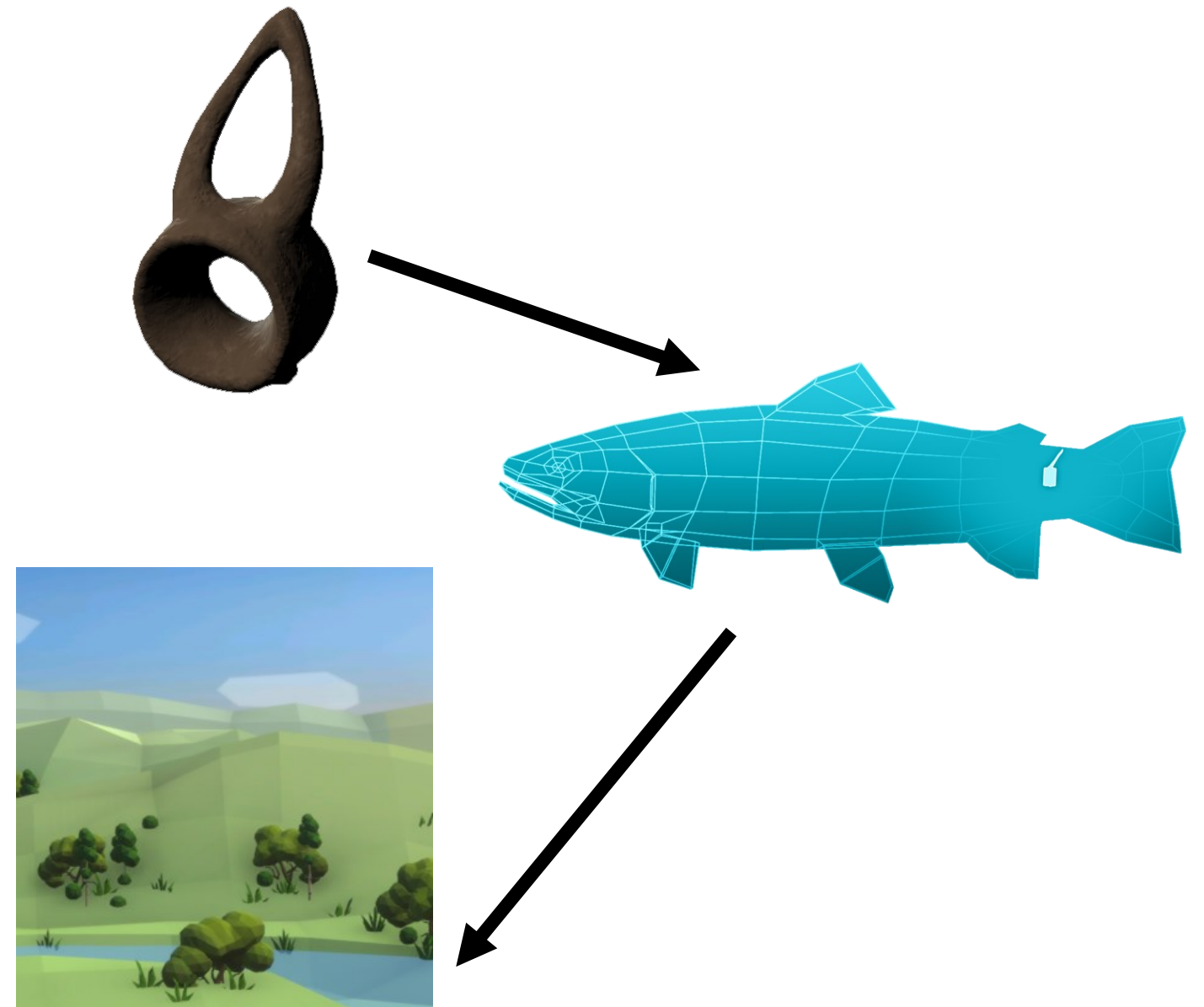


WITH AR, SEEING IS BELIEVING

Was there anything that surprised you?

AR conditions

When I **saw** the stream happen, and that-- that was fresh water coming through here, that was very-- I was like, "Oh, that's, like, don't really--" we have rivers now that are all, you know, they're all in concrete. So it's-- it's a **big realization**. Like, "Oh, like, there would've been a natural stream going through here with, of course, freshwater fish."

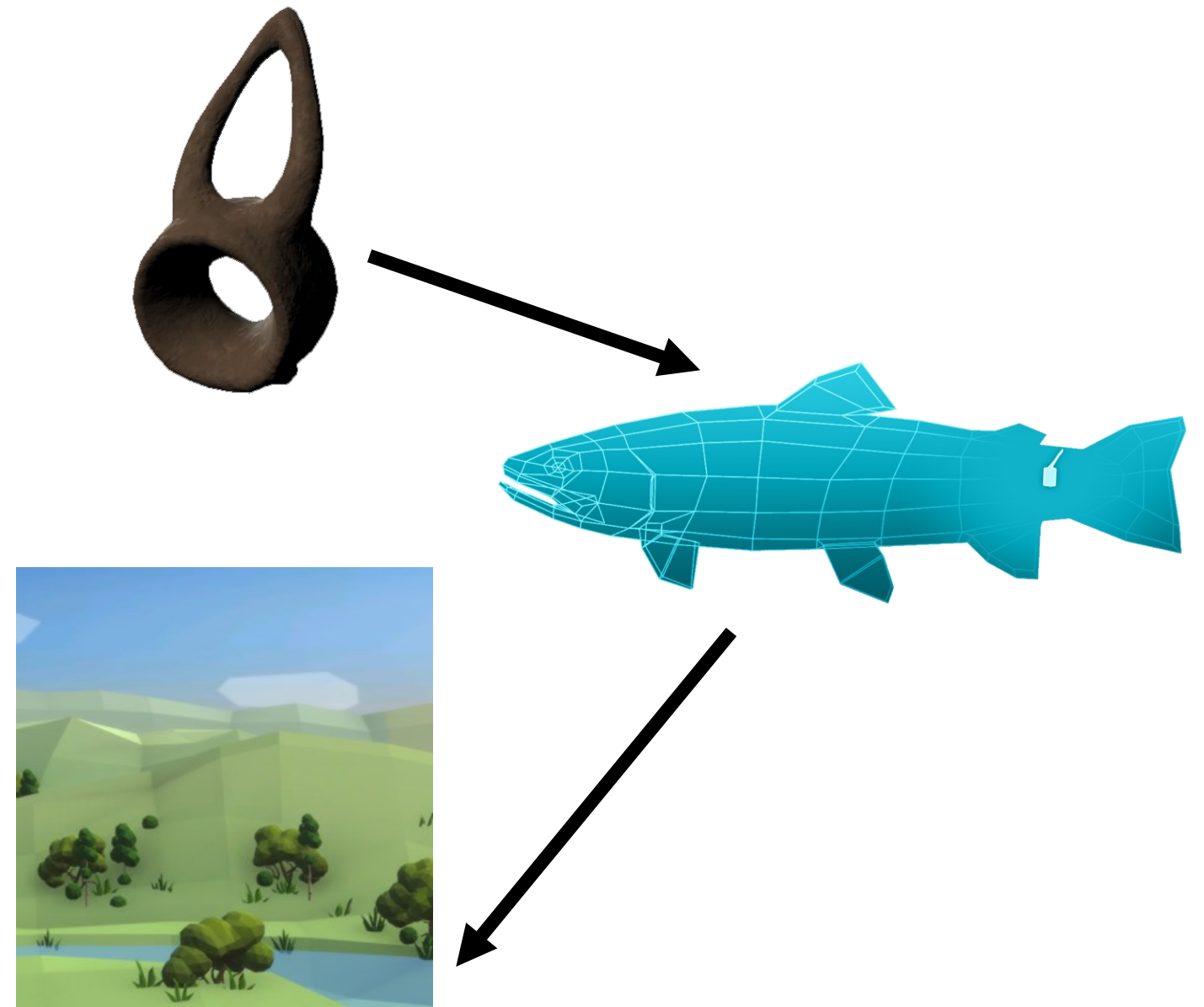


WITH AR, SEEING IS BELIEVING

Was there anything that surprised you?

AR conditions

Well, I first thought it was icy and actually, like, glaciers and all that stuff. But obviously after **seeing** the experience, **it changed my perspective** and everything. It was-- wet, but also there was trees. I thought it was just, you know, ice and all that. But **it changed my perspective in that sense**, thinking that it was actually, like, really, really cold.



LESSONS LEARNED

- Budget plenty of time and money for custom 3D assets



LESSONS LEARNED

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- Strike a balance between directing attention and letting participants explore on their own.



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- Strike a balance between directing attention and letting participants explore on their own.
- (At the moment) AR does not seem to perform better than standard museum labels...



LESSONS LEARNED

- Budget plenty of time and money for custom 3D assets
- Strike a balance between directing attention and letting participants explore on their own.
- (At the moment) AR does not seem to perform better than standard museum labels...
- ...but AR may just be better for certain kinds of learning experiences.



WHAT'S NEXT? AR FIELD EXPERIENCE



THANK YOU

Questions about Tar AR?

What questions do we still need answers to in order to effectively implement AR in museums?

What are the next steps for museum AR?



Use Snapchat to try out Tar AR right now!

#TarAR



