11/05/2026

Final Project Kickoff

cs148.stanford.edu

Final Project Kickoff

- Today's focus: What we expect for your final project!

- Topics:
  - The straightforward, "**quantitative**" requirements
  - The less straightforward, "**qualitative**" raytracing requirement
  - Grading rubric & curve
  - Bulk of the presentation: evaluating past student projects

- Reminder: The final project is worth 50% of your final grade and is usually the dealbreaker between an A or a B for students!

What you can & cannot do for the Final Project

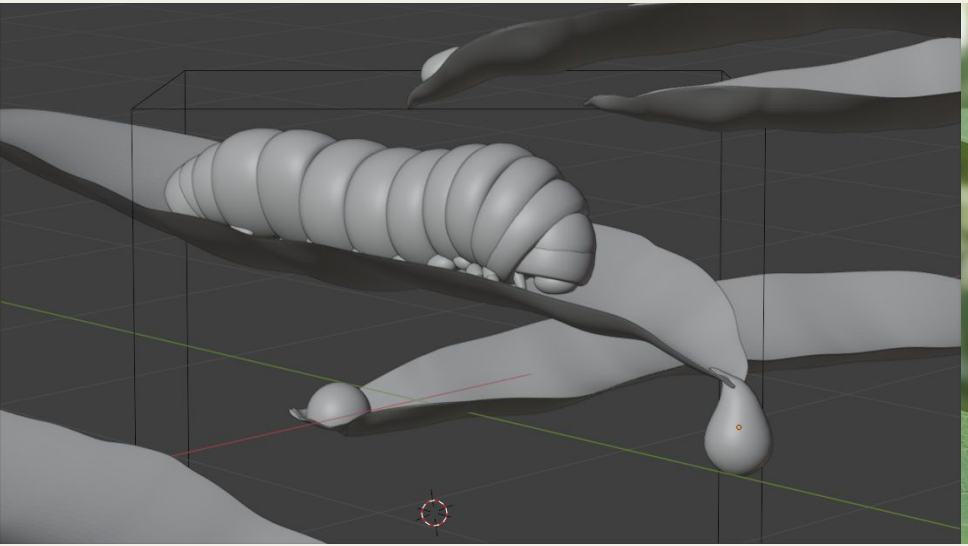
- You DO NOT need to do any coding if you don't want to!
  You CAN simply use Blender Cycles to ray trace your render!

- You DO NOT need to make everything in your image from scratch!
  You CAN use geometry & textures you made for previous HWs!
  You CAN import geometry & textures you find online (to a degree)!
  (You MUST cite your sources though in your report!)

- You CANNOT do any postprocessing on your image!
  (INCLUDES composite nodes – ask first if you think you need them!)
  Your submitted image MUST be the result of Blender Cycles!
  (or from your own raytracer for very exceptional coding projects)

Straightforward (Quantitative) Requirements

- The main geometry (the focus) of your image must be your own
- Half of the geometry that make up the image must be your own
- At least one object must be UV mapped & textured (HW8) from scratch

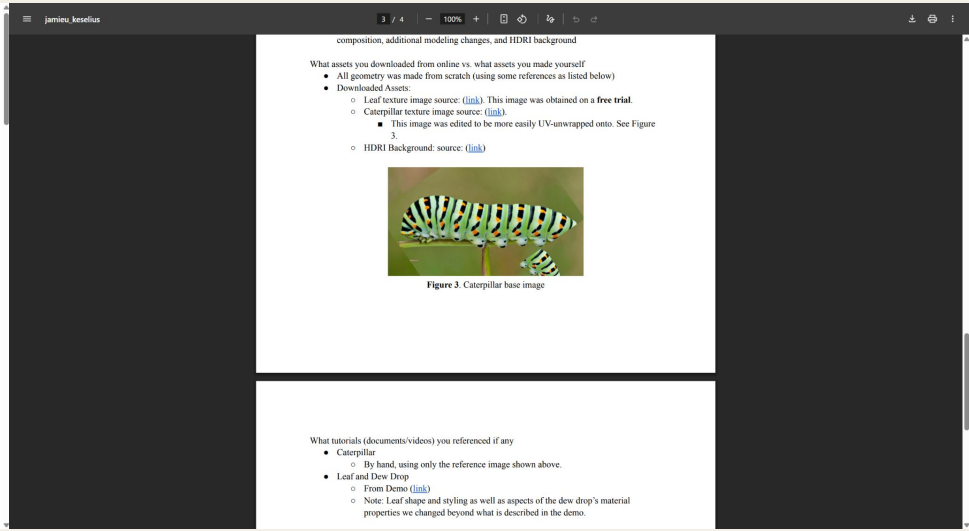




Straightforward (Quantitative) Requirements

- You MUST cite your sources in your report!
- In the "Showcase" tab of the website, click on each showcase image to see the reports (some are more detailed than others)!



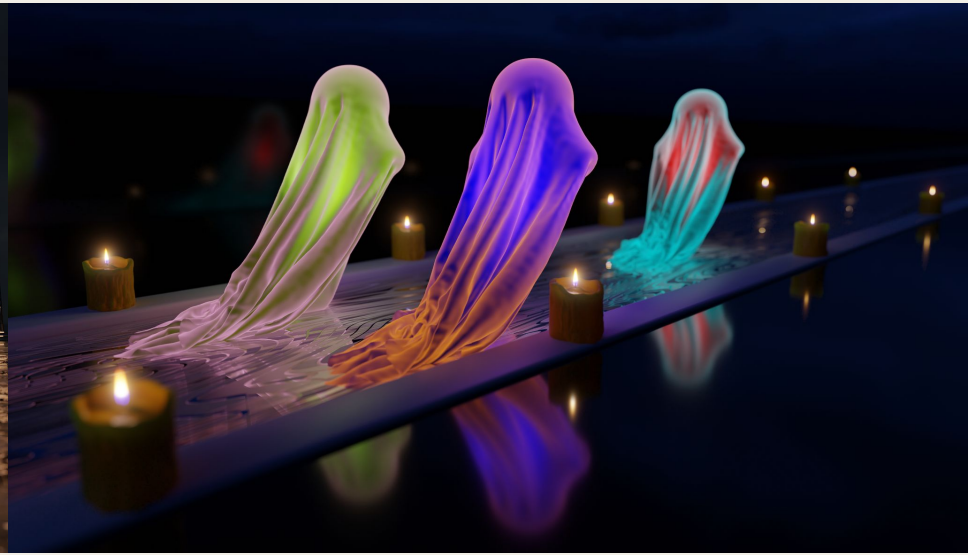


Quick Aside: Simulating Geometry in HW7

- We are DONE talking about geometric modeling EXCEPT for doing so via simulation (e.g. simulating splashing water or cloth folds)
- Youtube tutorials: your best friend for more complex modeling!



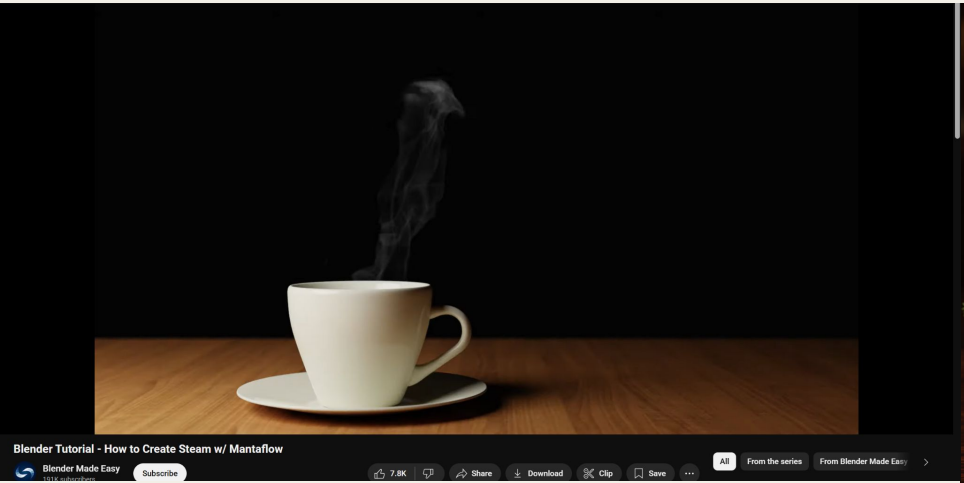
Kelly He and Yiyun Liang, Fall 2020



Bogdan Burlacu, Fall 2021

Straightforward (Quantitative) Requirements

- One Blender Cycles advanced feature: depth of field, motion blur, volumetrics (e.g. fog/steam), etc
- Youtube tutorials: your best friend for more complex phenomena!





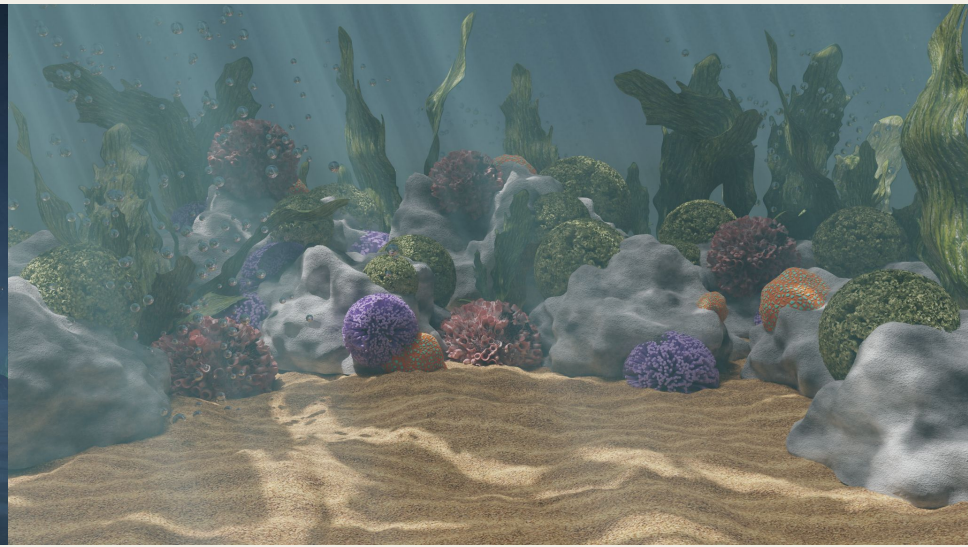
Luna Yang and Xuelin Yang, Fall 2021

Quick Aside: Emissive Materials & God Rays

- Youtube tutorials: your best friend for more complex phenomena!
- Emissive materials: make your objects glow or “bloom”
- God rays: show the shape of your light (think light through stained glass)



Tassica Lim and Tatiana Wu, Fall 2020



Aditya Mundada, Fall 2021

Straightforward Requirements: 2 Variants

- Variant A:
  - Rendered image with different camera angle
- Variant B:
  - Rendered image with no textures
- .blend file

- These DO NOT have to look nice!
- You MAY NOT generate these variants with AI

Straightforward Requirements: AI Policy

- You CAN use AI for a conceptual walkthrough to achieve a certain look on Blender, as long as you do it yourself. (like a YouTube tutorial)
- You CAN use AI tools to generate geometry, images, and code that DOES NOT make up the main focus of your image.

- You CANNOT use AI to generate your written proposal.
- You CANNOT use AI tools to generate ANY of the 3 required features.
  - Main geometry, Custom UV map & texture, Advanced feature
- You CANNOT use AI to generate code for ANY of the 3 required features.

- You MUST cite every AI tool you use.

Questions?

Ray Tracing (Qualitative) Requirements

- Now, the not-so-straightforward requirement for that A or A+...
- “Leverage the power of ray tracing”?
- Does this mean you just need to use Blender Cycles and be done?



Scanline Rendered (Blender Eevee)



Ray Traced (Blender Cycles)

Ray Tracing (Qualitative) Requirements

- Now, the not-so-straightforward requirement for that A or A+...
- “Leverage the power of ray tracing”?
- ~~Does this mean you just need to use Blender Cycles and be done?~~ – **NO!**



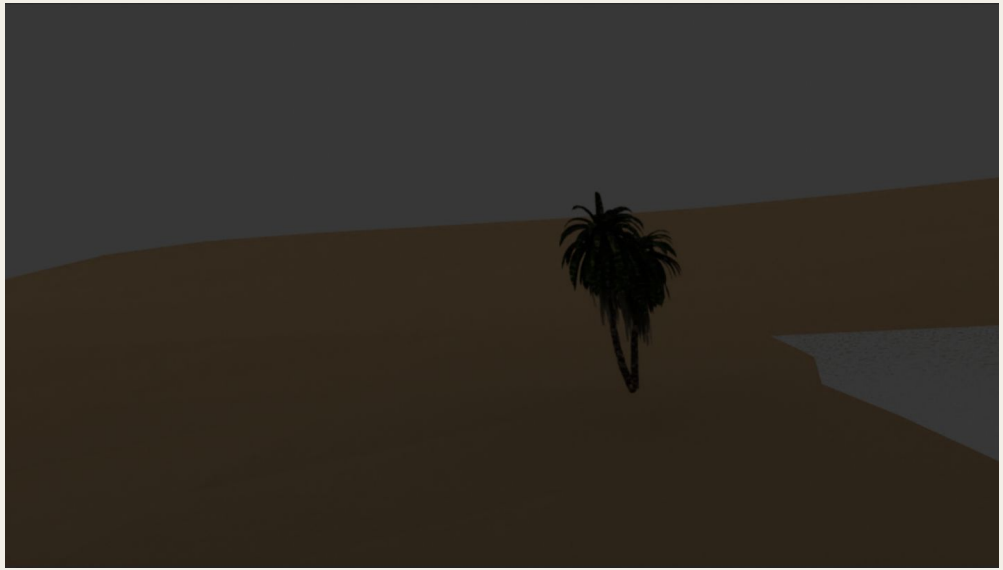
Scanline Rendered (Blender Eevee)



Ray Traced (Blender Cycles)

Ray Tracing Requirements – what not to do…

- The following is from a past student rendered in Blender **Cycles**
- All geometry & textures made from scratch; Depth of field enabled!
- Would you give this an A? Or even a B?



Ray Tracing Requirements – what not to do…

- The following is from a past student rendered in Blender **Cycles**
- All geometry & textures made from scratch; Depth of field enabled!
- ~~Would you give this an A? Or even a B?~~ **– NO!**



Photorealistic Lighting is NEEDED!

- The focus of the past few weeks has been on ray tracing!
  - The Lighting Equation – how to model the real physics of light!
  - How to model BRDF materials, shadows, reflections, refractions & transmissions!
  - Sampling with area lights for (soft) shadowing & light scattering for color bleeding!
  - Misc topics: depth of field, motion blur, volume rendering

- All of the above lead to **photorealism** in a rendered image

- It is possible to render an image with Blender Cycles and have NONE of the above components due to bad scene composition, materials, lighting choices, etc, etc!
  YOU WANT TO AVOID FALLING INTO THIS TRAP!

Photorealistic Lighting is NEEDED!

- **Goal:** Create a scene that when rendered in Blender Cycles has most if not all the components of ray tracing for **photorealistic lighting**
- Even stylized scenes need photorealistic lighting to look good!



Yifan Wang
Fall 2020

Photorealistic Lighting is NEEDED!

- **Goal:** Create a scene that when rendered in Blender Cycles has most if not all the components of ray tracing for **photorealistic lighting**

- Even stylized scenes need photorealistic lighting to look good!



Mai Hoang, Fall 2023

Photorealistic Lighting is NEEDED!

- Left: this is actually a reference scene from a Japanese animation (2D!)
- **Even though it is a 2D, hand drawn scene, it still has photorealism!**

Weathering with You (Tenki no Ko) (2019)



Cameron Mohne and Nicholas Vo, Fall 2021



Photorealistic Lighting is NEEDED!

- Left: sometimes the reference scene might not lend well to ray tracing
- Right: the students got creative in modifying the scene for the project! (when in doubt, add glass/water for reflections, etc!)

Xi Yan and Siyun Li, Fall 2021





Start Early and Ask for Feedback!

- Iterate with us in OH! Ask friends, family, coworkers too for opinions!
- Most people can tell you whether an image looks “good” or “bad”!

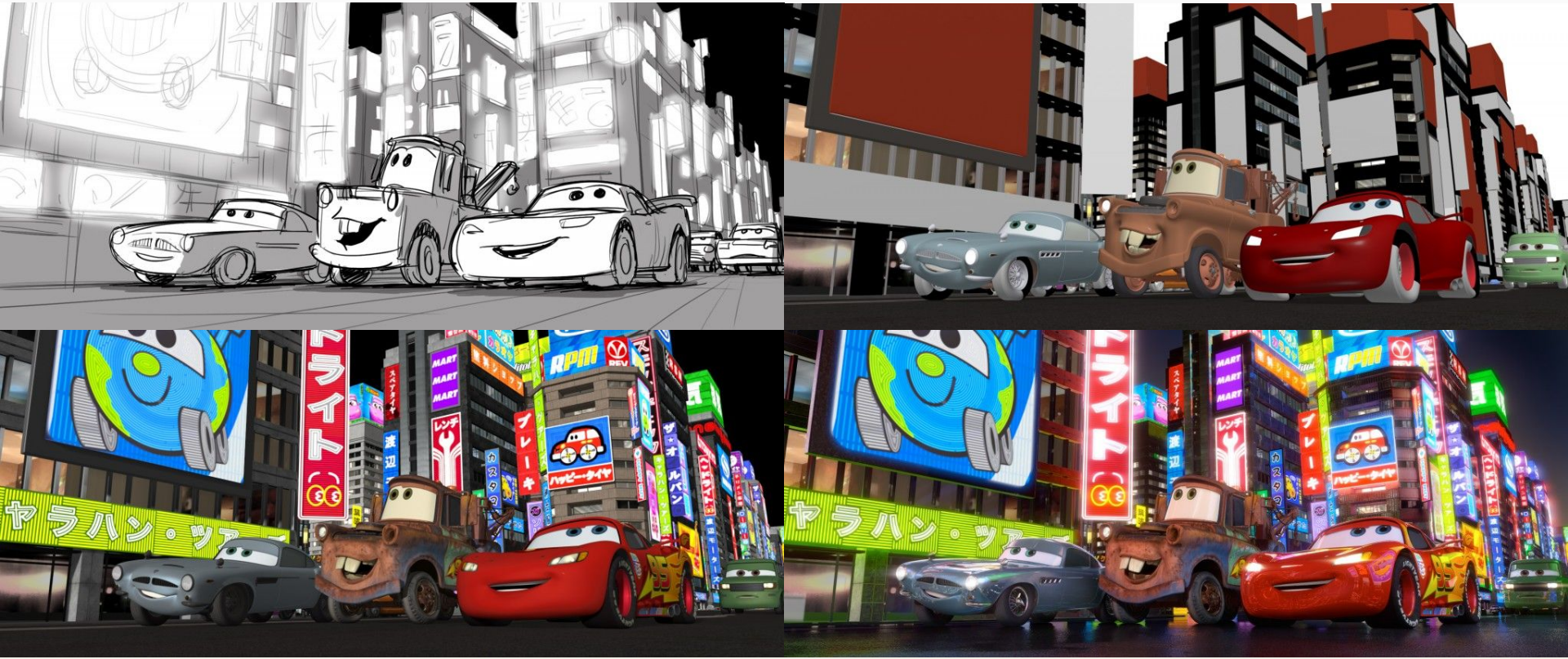
Justin Jasper, Fall 2023 - Initial Version



Justin Jasper, Fall 2023 - Final Version



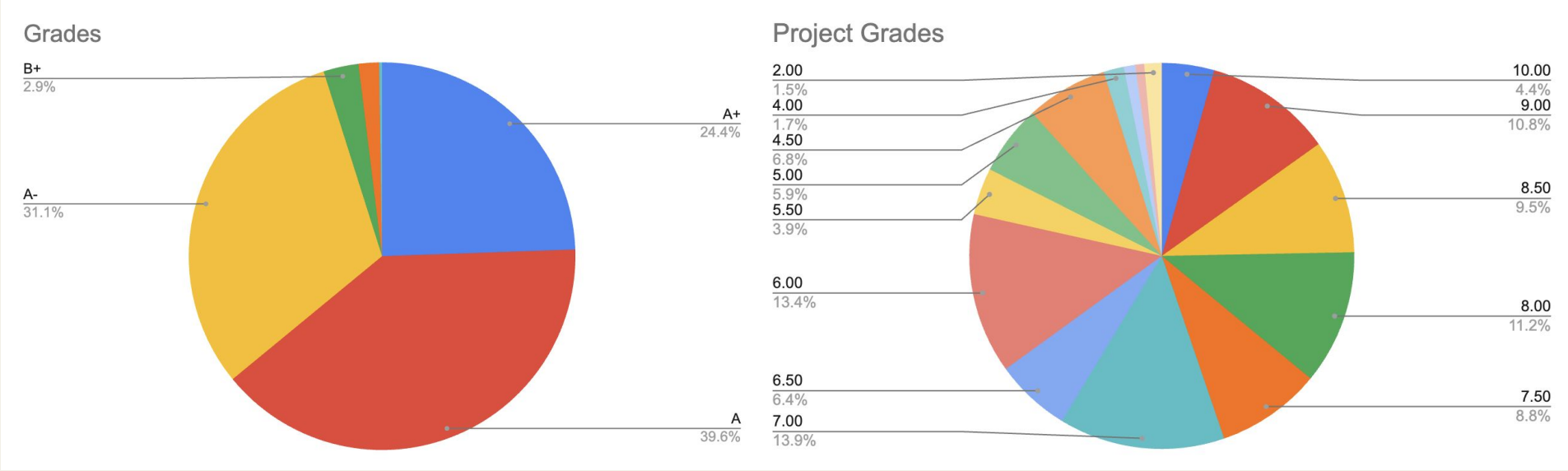
Start Early and Ask for Feedback!



(1) Sketch - (2) Geometry - (3) Materials & Textures - (4) Lighting & Ray Tracing

Final Project Grading & Curve

- Each project will be given a score out of 10 based on how well it compares to the other images in the class – see handout for details!
- Curve from last Fall offering:



Questions?

Rest of Class:

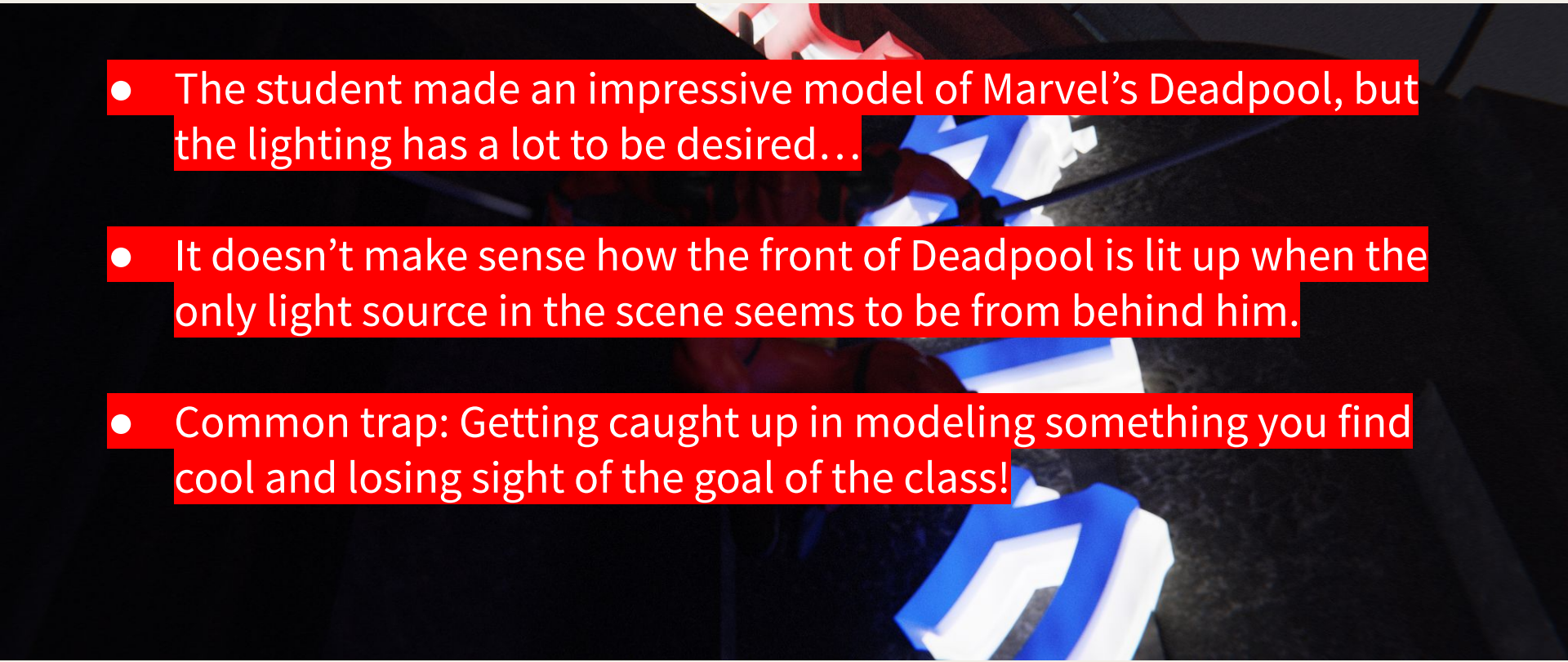
I'll show various past student projects, some good, some bad…

Your job is to identify which projects got A's and why they did or didn't get A's!

A Past Student Project – Good or Bad?



A Past Student Project – ~~Good~~ or Bad

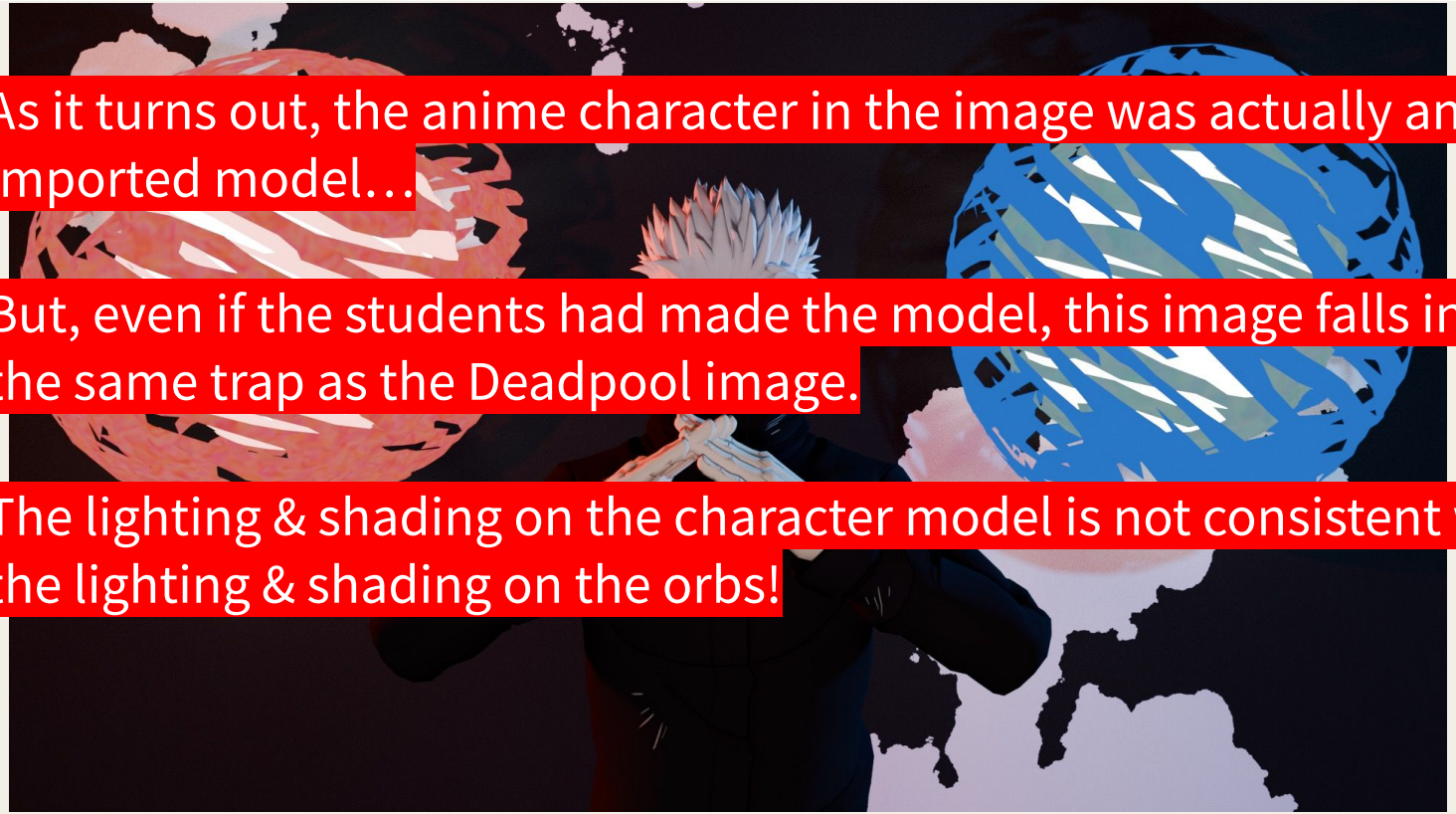


- The student made an impressive model of Marvel's Deadpool, but the lighting has a lot to be desired…
- It doesn't make sense how the front of Deadpool is lit up when the only light source in the scene seems to be from behind him.
- Common trap: Getting caught up in modeling something you find cool and losing sight of the goal of the class!

A Past Student Project – Good or Bad?



A Past Student Project – ~~Good~~ or Bad



- As it turns out, the anime character in the image was actually an imported model…
- But, even if the students had made the model, this image falls into the same trap as the Deadpool image.
- The lighting & shading on the character model is not consistent with the lighting & shading on the orbs!

A Past Student Project – Good or Bad?



A Past Student Project – Good or ~~Bad~~?

- It's not a perfect recreation of the reference scene, but that's fine!
- Has consistent lighting & shading across all objects in the image!
- Improvises by adding water for easier interactions with light!

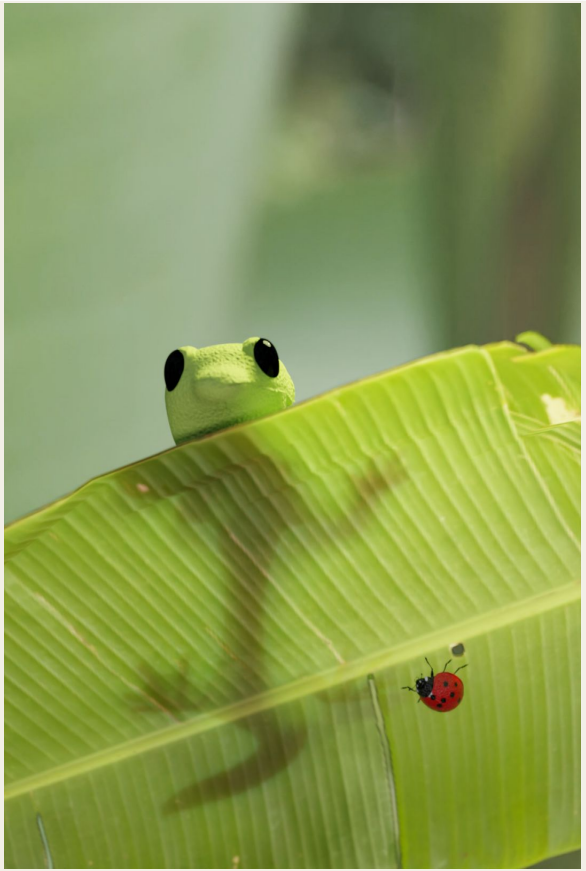


Elden Ring (2022)



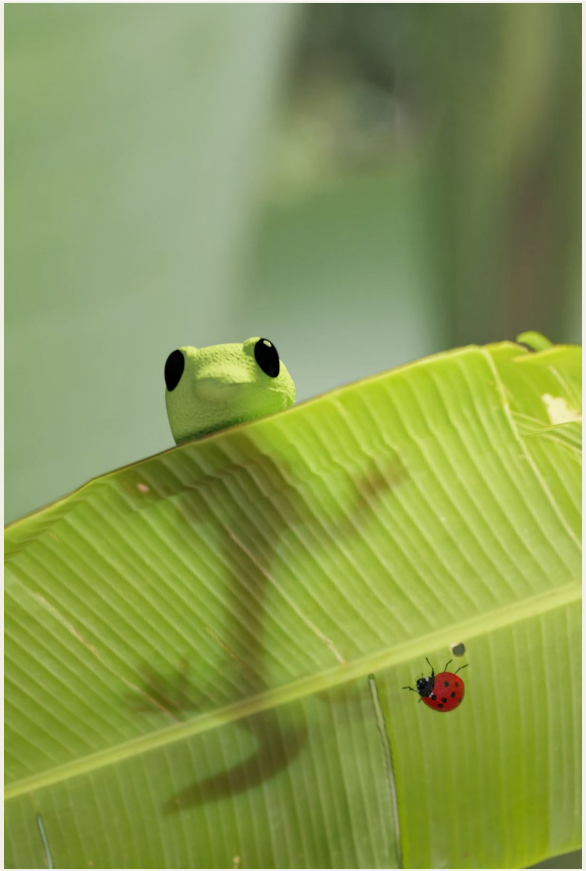
Zuyi Liz Zhao, Fall 2023

A Past Student Project – Good or Bad?



A Past Student Project – Good or ~~Bad~~?

- Very simple scene composition & geometry, but that's fine!
- Has consistent lighting & shading across all parts of the image, plus nice depth of field!
- Includes both soft shadows & transparency through clever placement of the gecko and material design on the leaf.
- Tip: it's fine to not be able to model your entire creature/object if you can find a creative way to hide the missing parts!

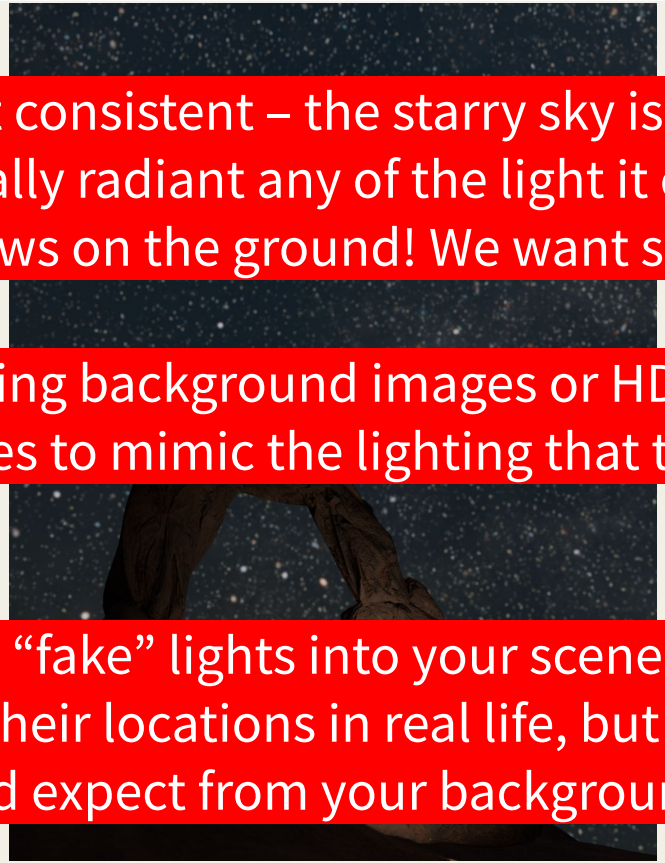


Nova Halavins, Summer 2022

A Past Student Project – Good or Bad?



A Past Student Project – ~~Good~~ or Bad



- The lighting is not consistent – the starry sky is a background photo that doesn't actually radiant any of the light it captures.
  Also: harsh shadows on the ground! We want soft shadowing!

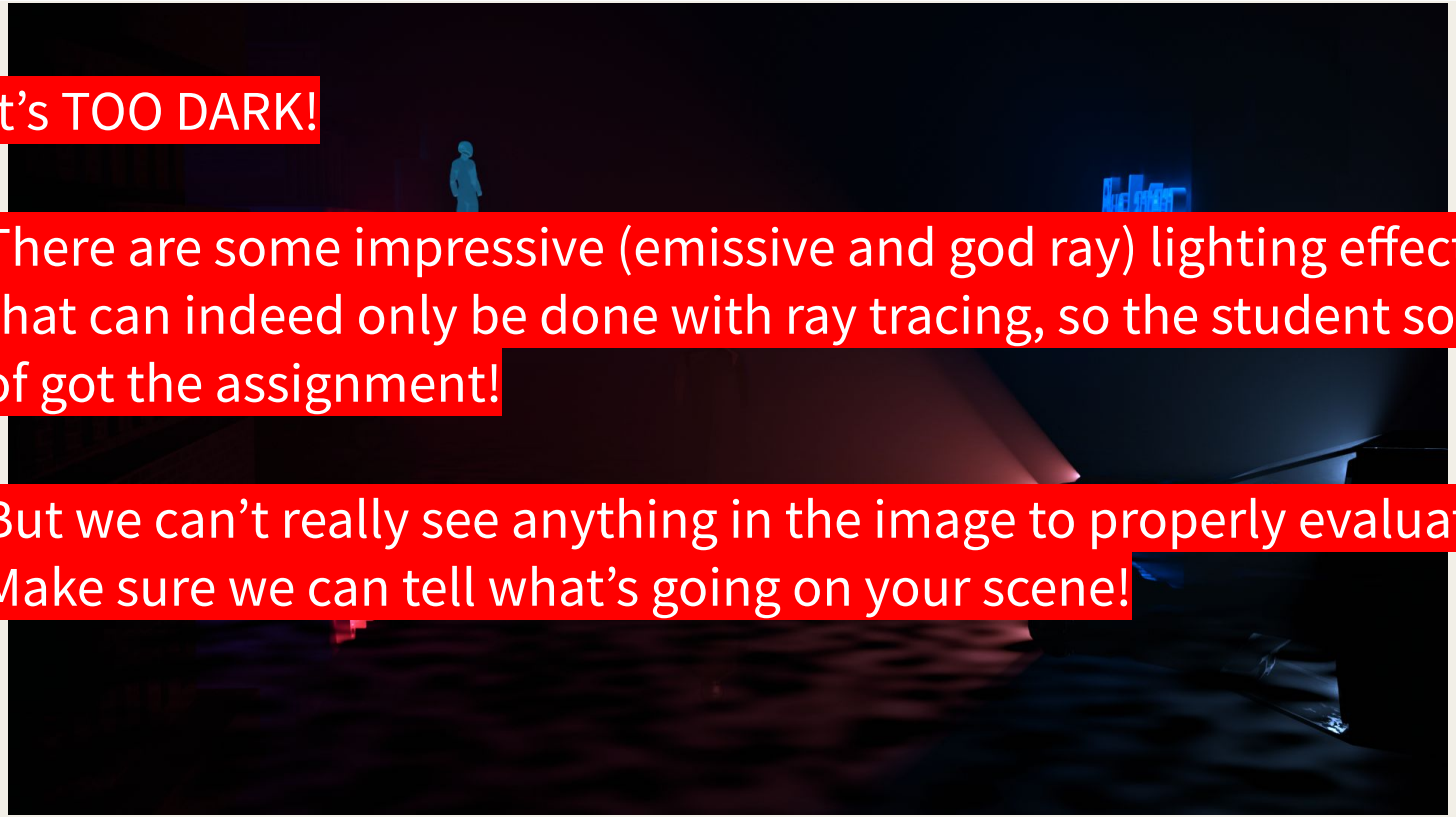
- Common trap: Using background images or HDRIs without including actual light sources to mimic the lighting that the background would create in real life.

  One solution: add "fake" lights into your scene that normally wouldn't exist in their locations in real life, but help produce the lighting you would expect from your background!

A Past Student Project – Good or Bad?



A Past Student Project – ~~Good~~ or Bad



- It's TOO DARK!
- There are some impressive (emissive and god ray) lighting effects that can indeed only be done with ray tracing, so the student sort of got the assignment!
- But we can't really see anything in the image to properly evaluate it! Make sure we can tell what's going on your scene!

A Past Student Project – Good or Bad?



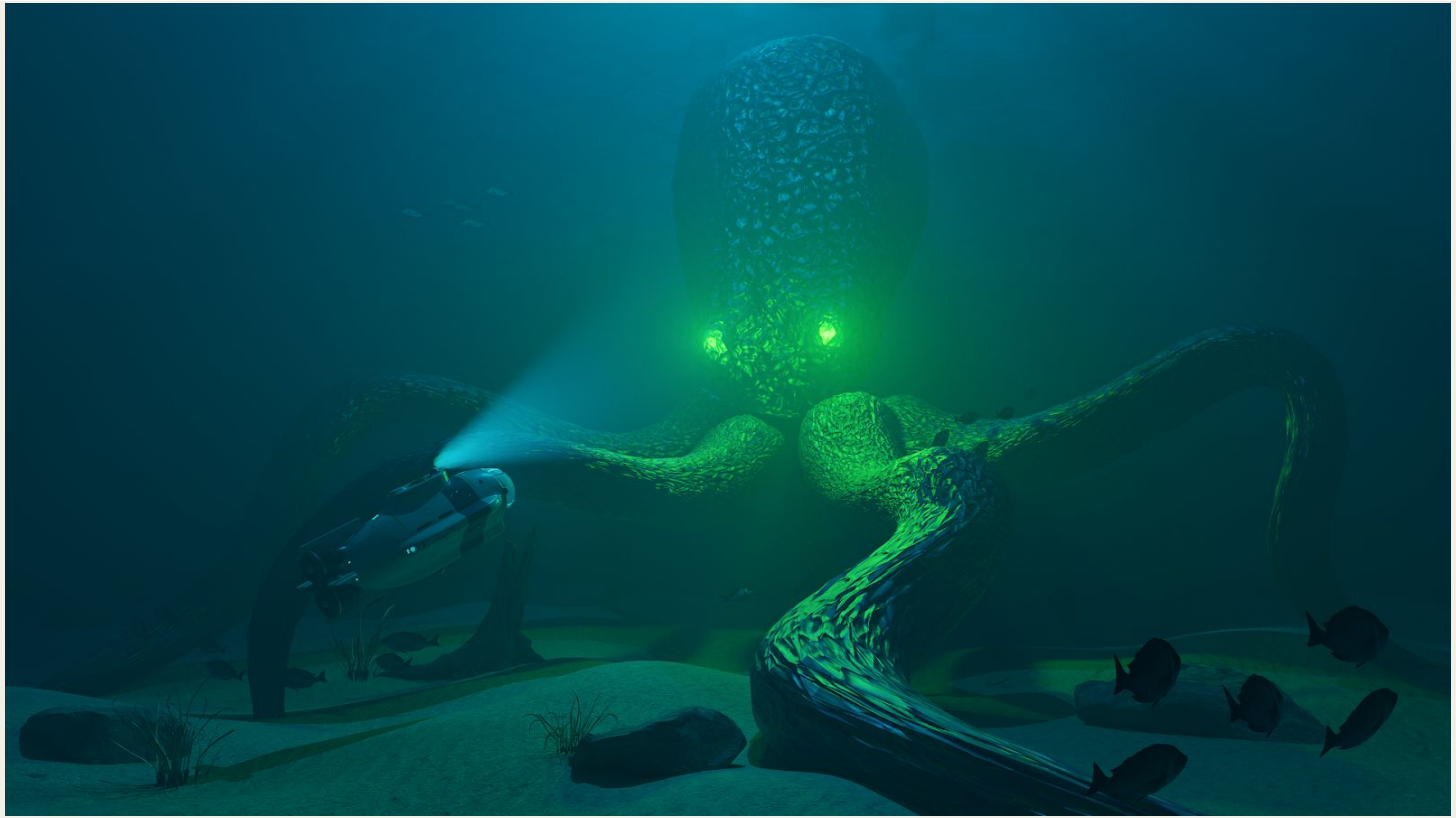
A Past Student Project – Good or ~~Bad~~?

- Here, we can clearly tell what the objects in shadows are meant to be!
- Moral of the story: dark scenes are fine, but you need to be purposeful with what you let the viewer see vs not see!



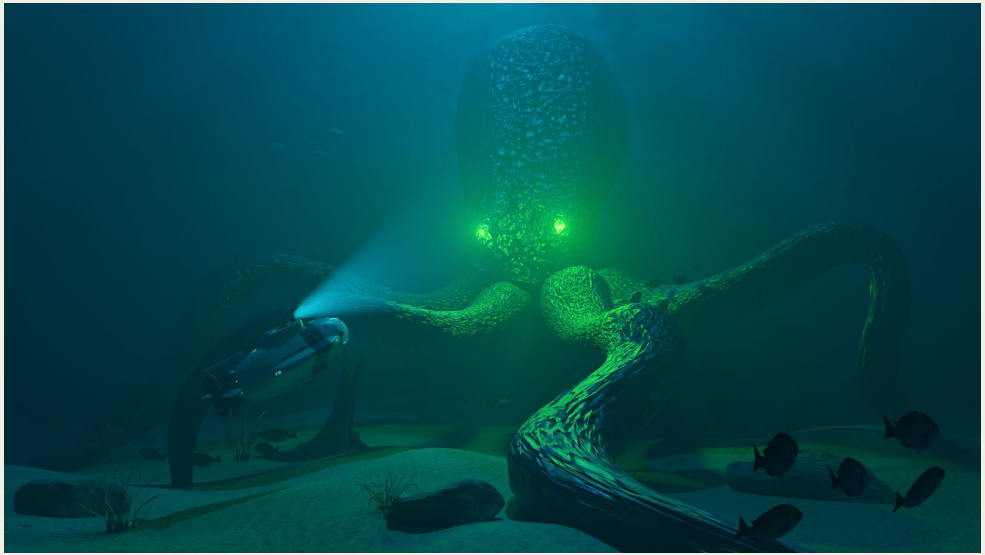
Hannah Norman, Fall 2023

A Past Student Project – Good or Bad?



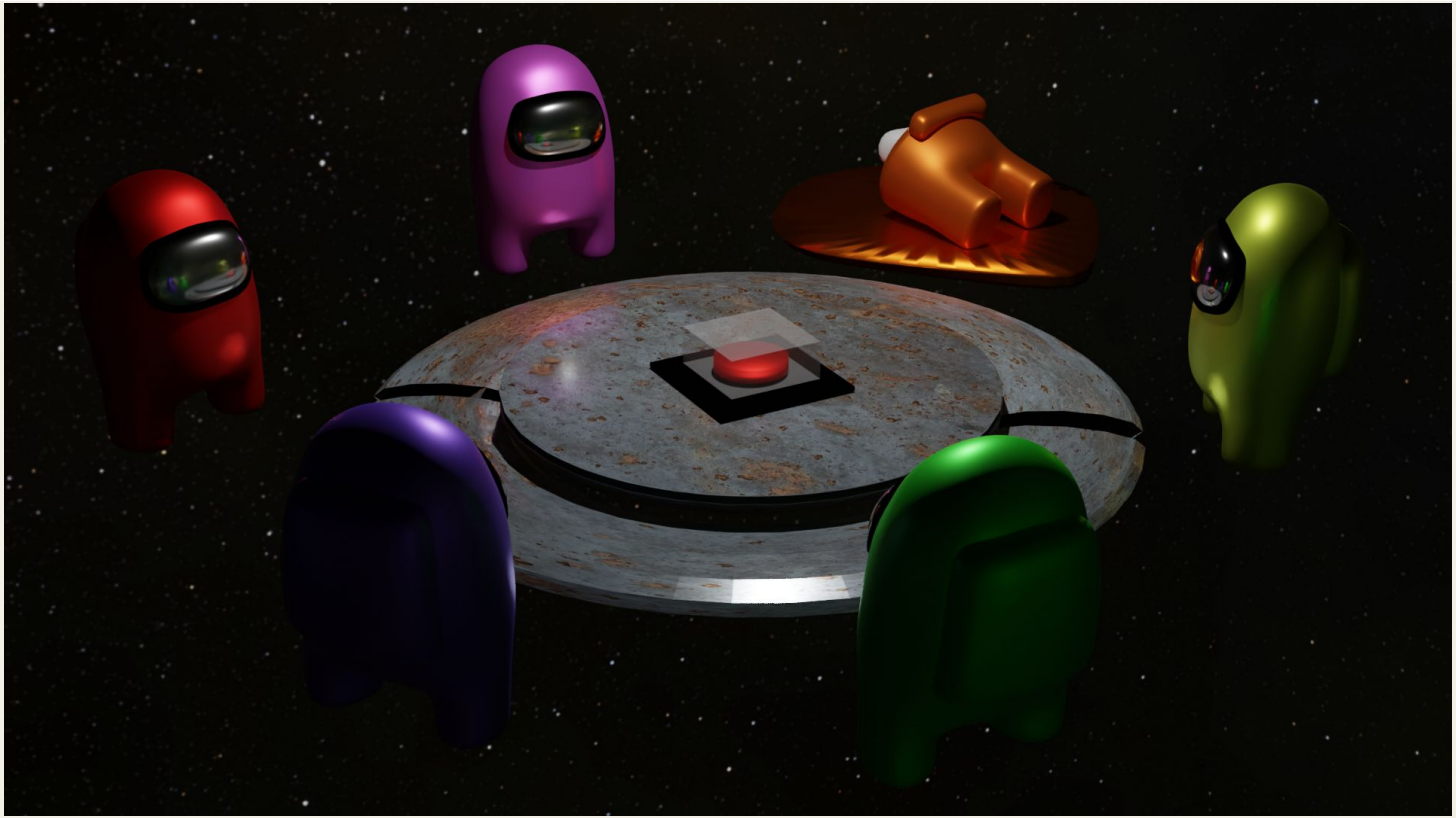
A Past Student Project – Good or ~~Bad~~?

- Good use of emissive materials (on the eyes of octopus) and a combination of a spotlight + volume rendering!
- Those two simple lighting choices add enough light to this dark scene!

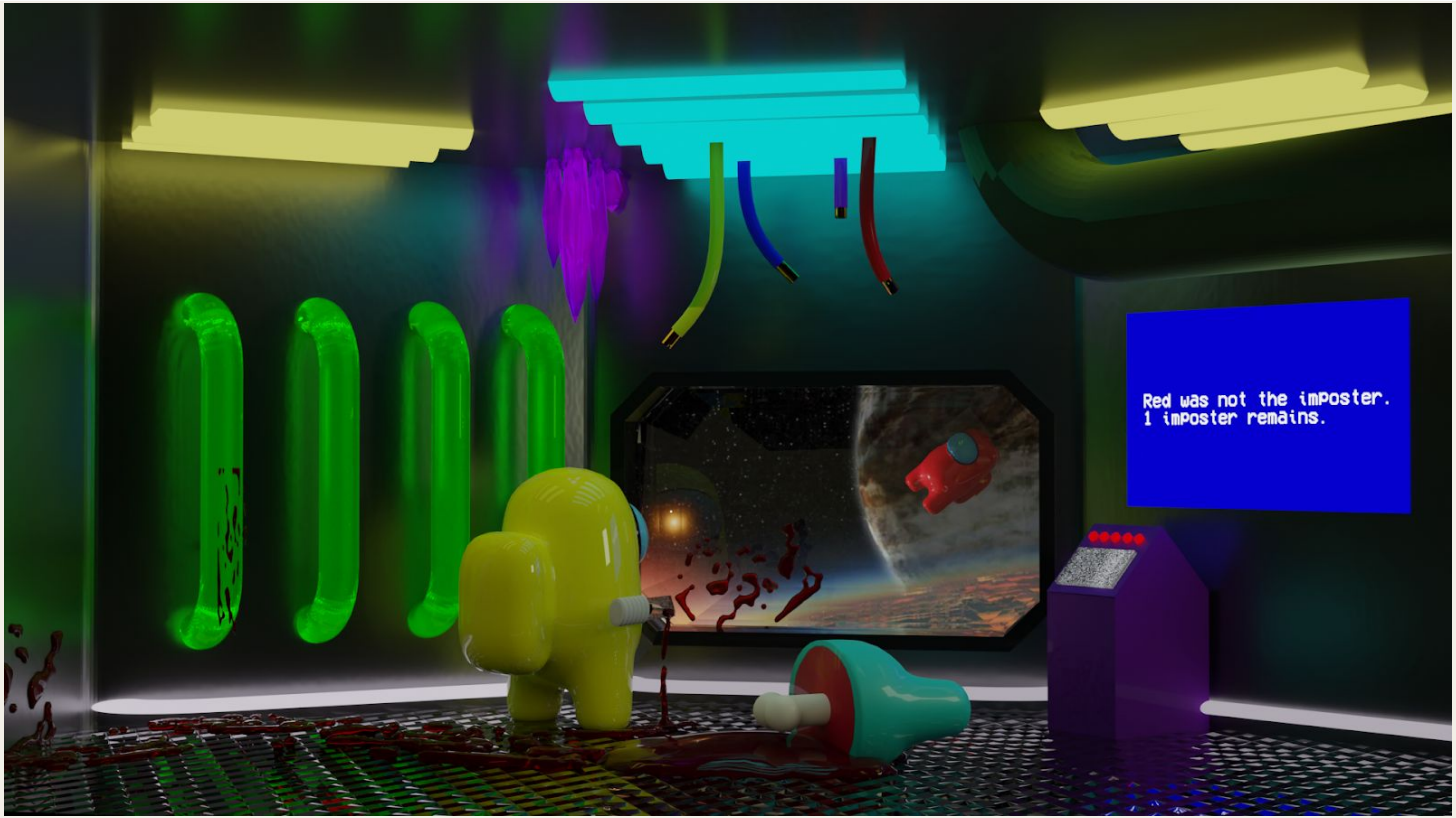


Bradford Lin and Wilson Liang, Fall 2021

A Past Student Project – Good or Bad?



A Past Student Project – Good or Bad?



A Past Student Project – Good or Bad?

- Left: Similar issues to the images with Deadpool and the starry night
- A project on “Among Us” might seem easy given the simplicity of the characters, but it might take effort to make a dynamic enough scene!



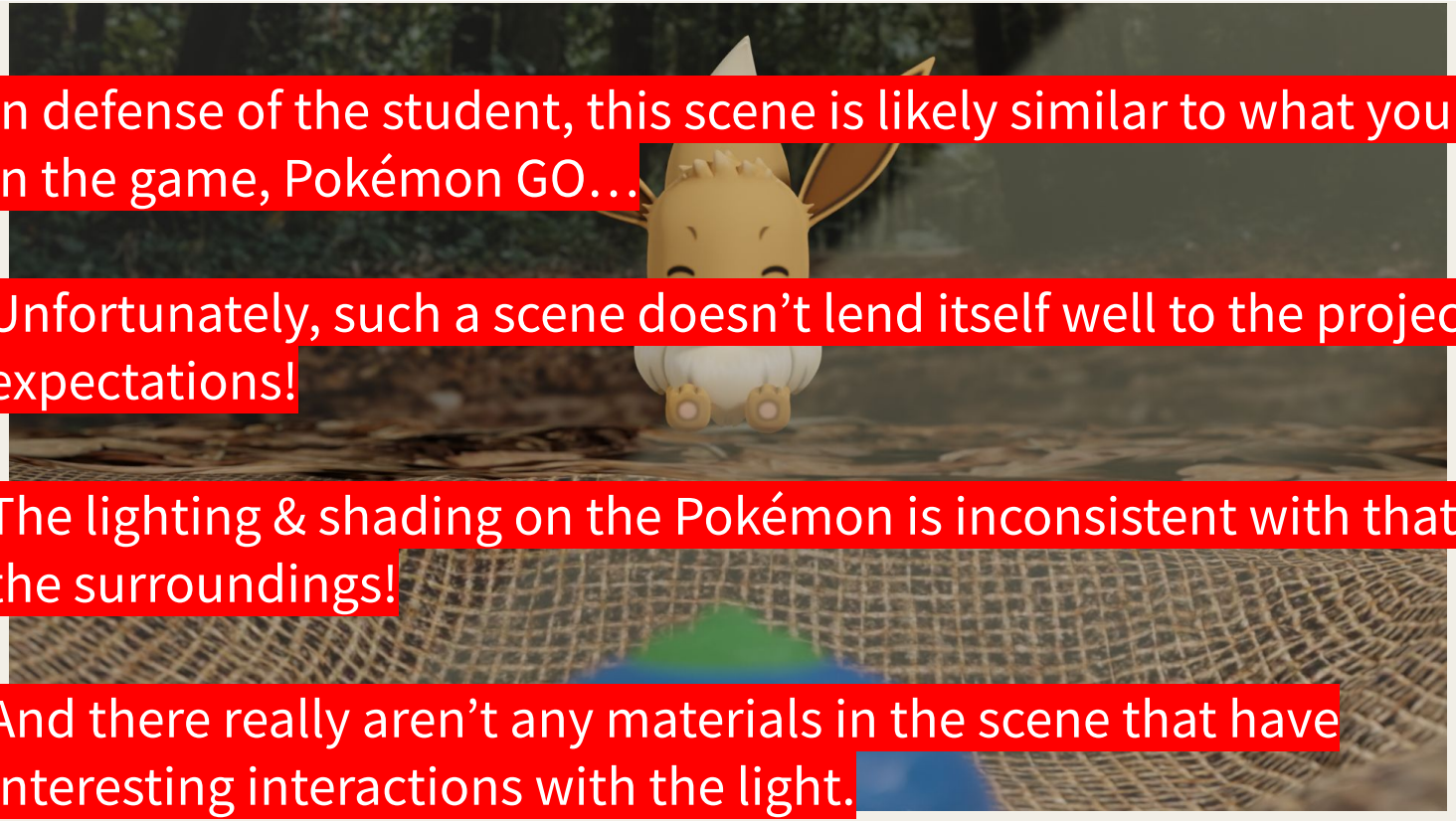


Olivia Loh and Xin-Yi Pan, Fall 2022

A Past Student Project – Good or Bad?



A Past Student Project – ~~Good~~ or Bad



- In defense of the student, this scene is likely similar to what you see in the game, Pokémon GO…
- Unfortunately, such a scene doesn't lend itself well to the project expectations!

The lighting & shading on the Pokémon is inconsistent with that of the surroundings!

And there really aren't any materials in the scene that have interesting interactions with the light.

A Past Student Project – Good or ~~Bad~~?

- In comparison, the following scene does the Pokémon theme better with consistent lighting & shading across the image.
- Moral of the story: be careful when choosing your reference scene!



Aliya Alsafa and Sophie Wu, Fall 2024

A Past Student Project – Good or ~~Bad~~?

- In comparison, the following scene does the Pokémon theme better with consistent lighting & shading across the image.
- Moral of the story: be careful when choosing your reference scene!



Manh Dao and Jodie Meng, Fall 2023

A Past Student Project – Good or ~~Bad~~?

- Minecraft is another popular theme amongst students, but once again, **the simplicity of its models can lead to a deceptively tough project!**
- Moral of the story: be careful when choosing your reference scene!



Defne Genc and Elena Recaldini, Fall 2024

A Past Student Project – Good or ~~Bad~~?

- On the flipside, be careful with choosing a reference scene that might be TOO challenging – you only have a little over 4 weeks!
- PRIORITIZE!

Tangled (2010)



Walker Stewart and Will Coors, Fall 2022



A Past Student Project – Good or ~~Bad~~?

- If you can't recreate the full scene, then get creative!

Tangled (2010)



Romrawin (Jin) Chumpu, Summer 2023



A Past Student Project – Good or ~~Bad~~?

- Scene can be simple as long as the power of ray tracing is clear!
- If you're stuck on coming up with a scene for your project, then going simple is fine – we won't judge!



Sureen Heer, Summer 2025

A Past Student Project – Good or ~~Bad~~?

- Scene can be simple as long as the power of ray tracing is clear!
- If you're stuck on coming up with a scene for your project, then going simple is fine – we won't judge!



Alex Oseguera and Jay Saleh, Fall 2021

A Past Student Project – Good or ~~Bad~~?

- Scene can be simple as long as the power of ray tracing is clear!
- If you're stuck on coming up with a scene for your project, then going simple is fine – we won't judge!



Ang Li,
Fall 2024

A Past Student Project – Good or ~~Bad~~?

- Scene can be simple as long as the power of ray tracing is clear!
- If you're stuck on coming up with a scene for your project, then going simple is fine – we won't judge!



Michael Rybalkin, Summer 2023

A Past Student Project – Good or ~~Bad~~?

- Scene can be simple as long as the power of ray tracing is clear!
- If you're stuck on coming up with a scene for your project, then going simple is fine – we won't judge!



Catherine Huang and Yara Sevilla, Fall 2021

A Past Student Project – Good or ~~Bad~~?

- **Easy way to appeal to ray tracing**: add reflective & transmissive materials like glass/water!
- Careful placement of glasses or bodies of water might be all it takes!



Danielle Tang, Fall 2021

A Past Student Project – Good or ~~Bad~~?

- **Easy way to appeal to ray tracing**: add reflective & transmissive materials like glass/water!
- Careful placement of glasses or bodies of water might be all it takes!



Kathleen Cheng, Summer 2023

A Past Student Project – Good or ~~Bad~~?

- **Easy way to appeal to ray tracing**: add reflective & transmissive materials like glass/water!
- Careful placement of glasses or bodies of water might be all it takes!



Beatriz Freire and Lara Franciulli, Fall 2022

A Past Student Project – Good or ~~Bad~~?

- Easy way to appeal to ray tracing: add reflective & transmissive materials like glass/water!
- **Can even work for low-poly scenes!**



Kevin Phan, Fall 2022

A Past Student Project – Good or ~~Bad~~?

- Easy way to appeal to ray tracing: add reflective & transmissive materials like glass/water!
- Can be as simple as having a window in your scene!



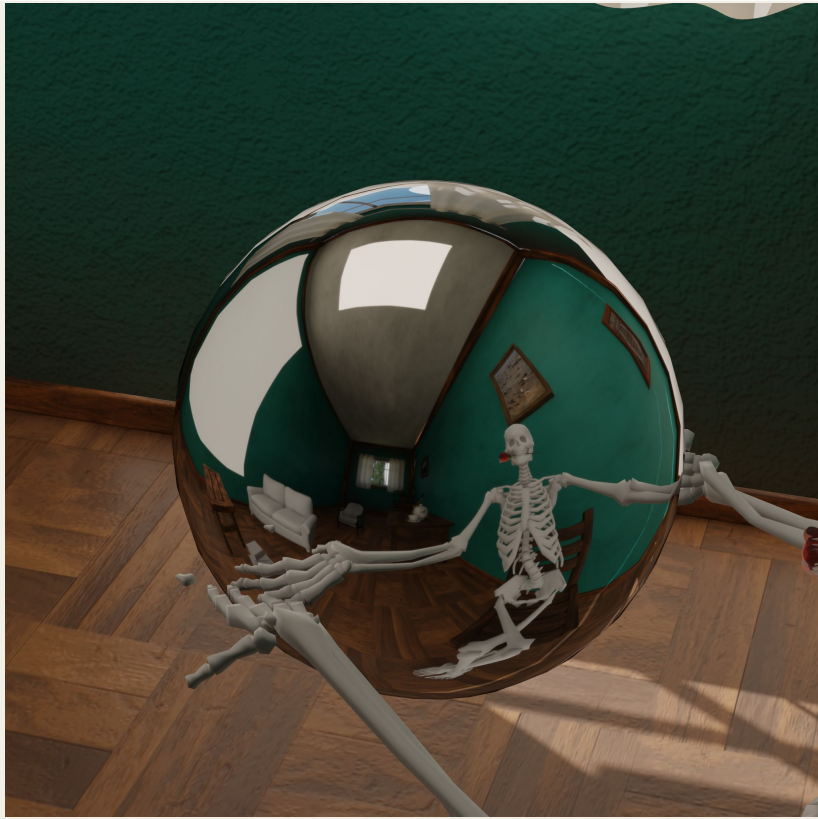
Autumn Warren, Fall 2020

A Past Student Project – Good or ~~Bad~~?

- Easy way to appeal to ray tracing: add reflective & transmissive materials like glass/water!

- **Can get creative with how to use e.g. the reflections!**

  This student was having trouble tuning the lighting in the scene, but came up with the idea of mirroring the entire scene on a glass ball!



Eliza Huang, Summer 2023

A Past Student Project – Good or Bad?



A Past Student Project – Good or Bad?



A Past Student Project – Good or Bad?

- Left: Too much motion blur can lead to unrealistic effects!
- When adding motion blur, make it even across the entire scene, or it can look unnatural for e.g. only one object/part to be in motion





Last note:

Most of the CAs were former students!
Ask them about their projects!

Two examples of relatively simple, but amazing CA projects…

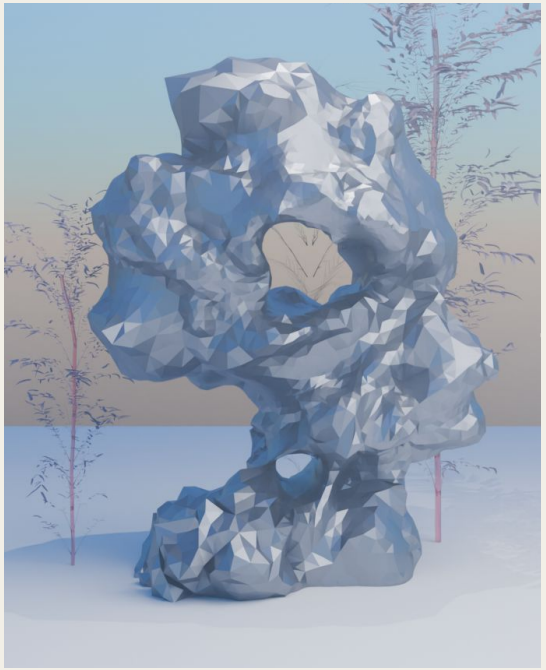
Madison’s Project

- Good example of unique geometries (rock, flowers, leaves)
- Leverages ray tracing through glass and metallic materials on plants and ground



Modeling Process: Rock

- Created with a combination of polygon modeling + sculpting
- **Tip**: Start with polygon modeling to get a rough shape, then move into sculpting to get fine details!
- Useful commands in polygon modeling: extrusion, loop cut and slide, beveling, etc.
- Texture mapping can add a lot to the style you're going for!



Flat shading, no texture mapping

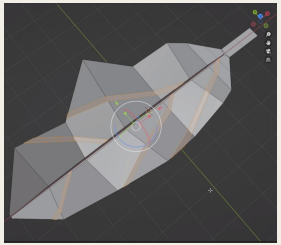


Smooth shading with texture mapping

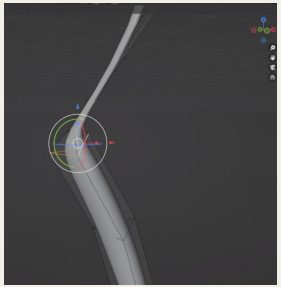
Modeling Process: Flower & leaves

Flowers, leaves and stems were done entirely with polygon modeling + subdivision + smooth shading. See youtube tutorials for how to make plants with polygons!

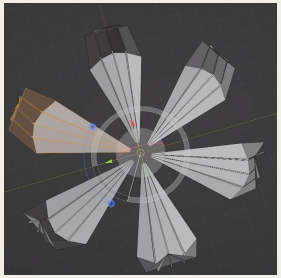




Process picture of a leaf. Each leaf was made from the same geometry, curves, size and proportion were edited individually with rotate and scale tools.

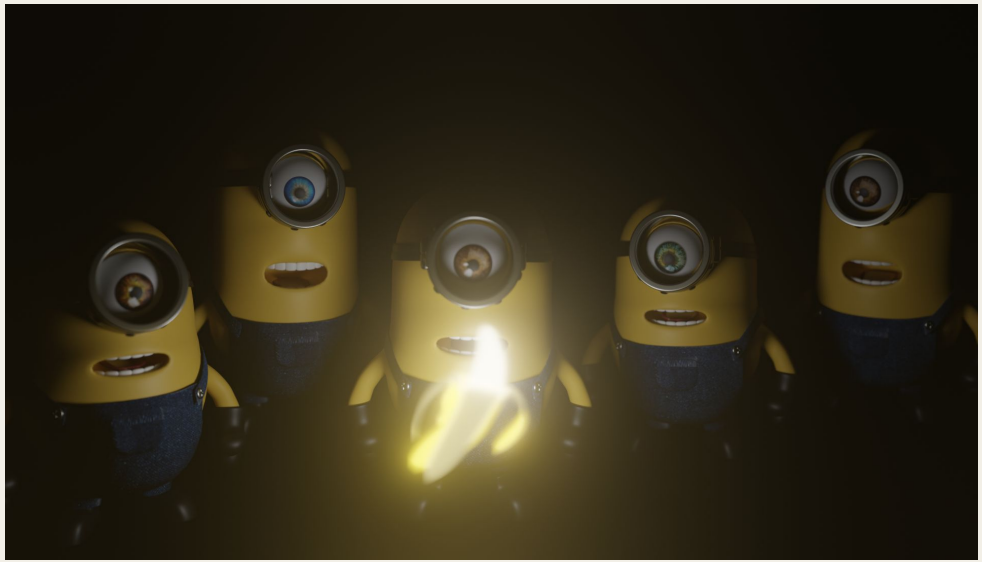


Stems were essentially rounded prisms. You can use extrusion to edit length and rotate tool to make natural looking plant curves



Start with one petal, copy and paste to form a circle of them. Use rotate tool to edit petals individually after to make them seem more natural.

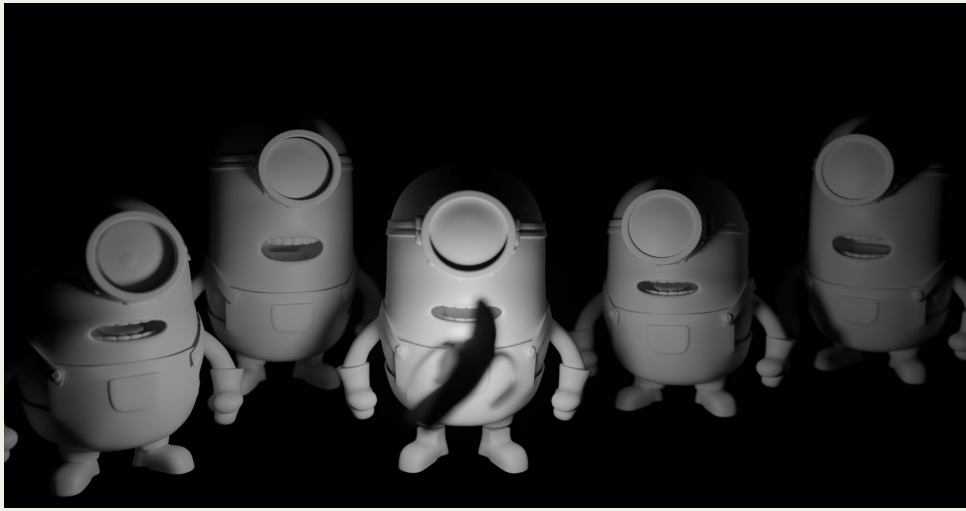
Nicole’s Project

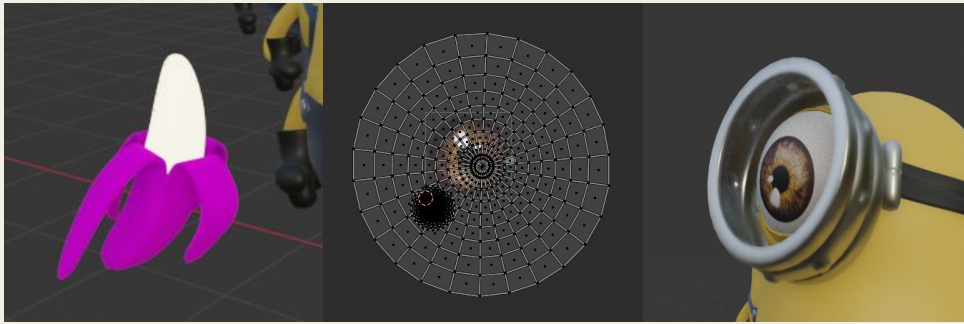


- Creative use of lighting to highlight depth of field
- Interesting geometry and materials used across objects
- Use of UV mapping and unwrapping to generate textures and life-like attributes

Modeling Minions and Banana

- Built minions from simple geometric shapes, adding detailed parts (goggles, clothes, gloves, shoes) with matching materials
    - Varied eye color and body proportions to make each minion unique
- Modeled the banana in two parts, each with distinct textures for realism
- Used texture mapping to enhance both banana and minion accessory materials
- Gave banana's inner peel an emission shader for a bright yellow-white glow





Additional Resources

- Look back at the demo of the strawberry scene from HW1 for starters
- Here's a time lapse from a past student showing their whole scene setup and lighting process from start to finish:



Jerica Liu, Summer 2025

CA Sections & Final Project OH

- **Week 7 Fri (11/6) @ 5 - 6 PM: Final Project Scope** by Kwame
- **Week 8 Fri (11/13) @ 10:30 - 11:30 AM: Geometry Demo** by Renee
- **Week 9 Thurs (11/19) @ 10:30 - 11:30 AM: Texturing Demo** by Renee
- **Week 10 Fri (12/4) @ 10 - 11 AM: Lighting & Camera Demo** by Merritt

- **Jinhyo Final Project OH (Hybrid):** Sundays 3 - 6 PM @ Huang & Zoom

Start working on your Final Project now!