07/22/2025

Final Project Discussions

cs148.stanford.edu

# Final Project Discussion

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

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

- Reminder: The final project is worth 40% of your final grade and is usually the deal breaker between a B or an A 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 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 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 (HW4) from scratch
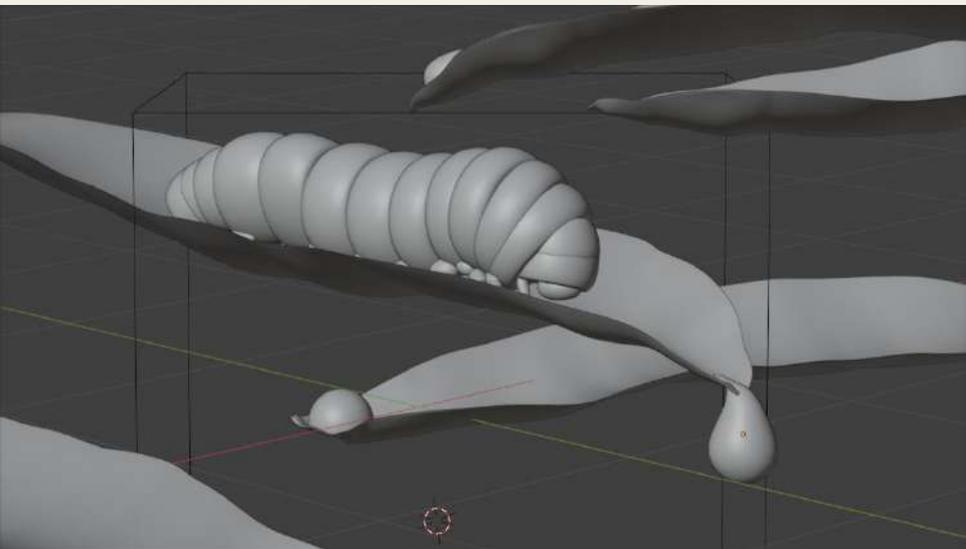
Kate Eselius and Jamie Ullman, Fall 2022

Straightforward Requirements

- You MUST cite your sources in your report!
- In the "Showcase" tab of the website, <u>click on each showcase image</u> to see the reports (some are more detailed than others)!
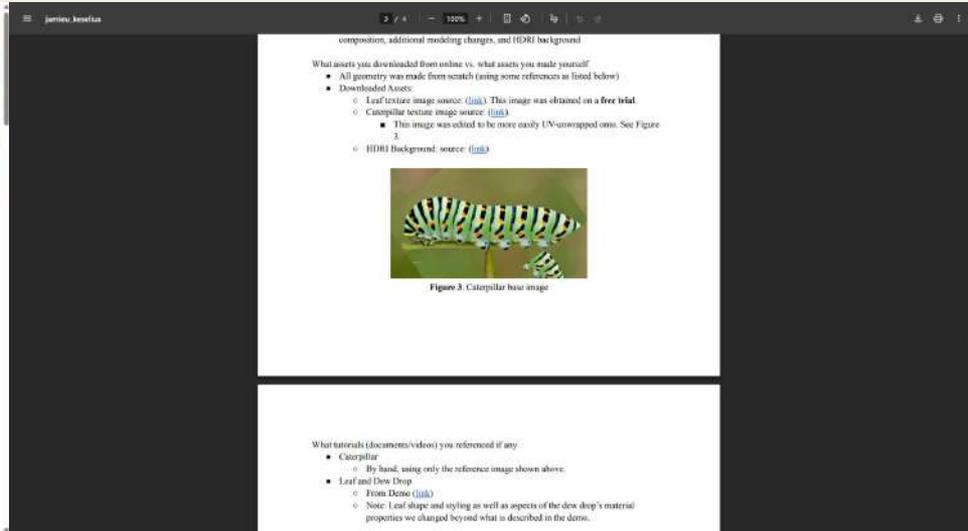
Quick Aside: Simulating Geometry in HW5

- 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!
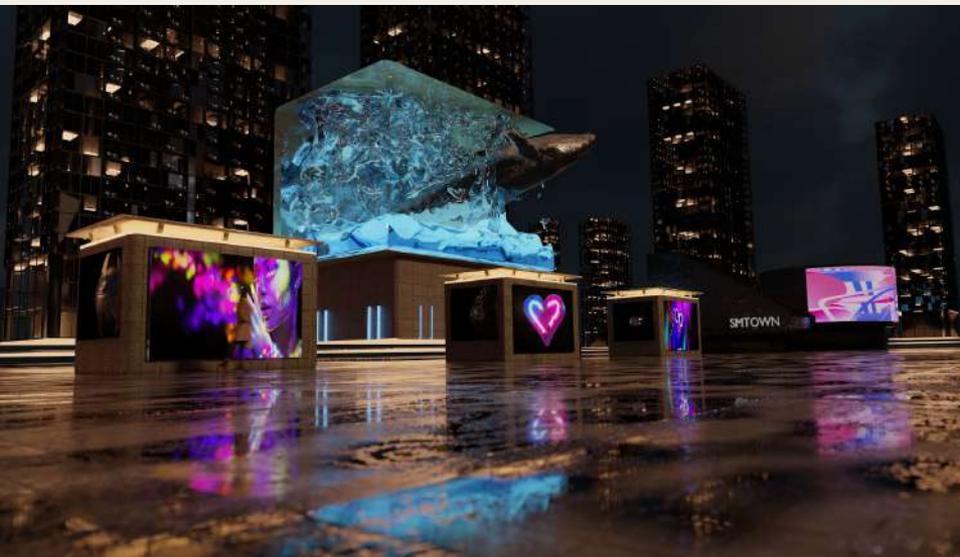
Kelly He and Yiyun Liang, Fall 2020

Bogdan Burlacu, Fall 2021

Straightforward Requirements

- One Blender Cycles advanced feature: depth of field, motion blur, volumetrics (e.g. fog/steam), etc – we'll do some in HW5
- Youtube tutorials your best friend for more complex phenomena!
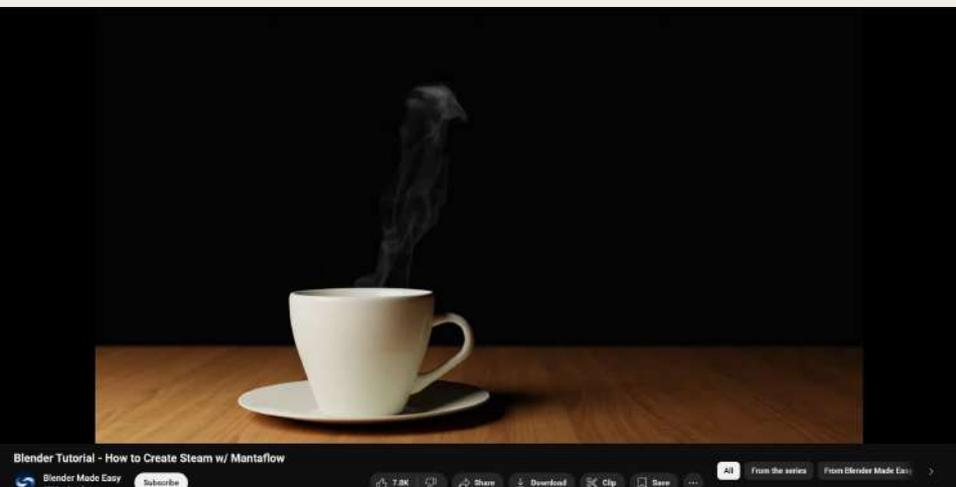
Luna Yang and Xuelin Yang, Fall 2021

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

Questions?

Ray Tracing 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 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?
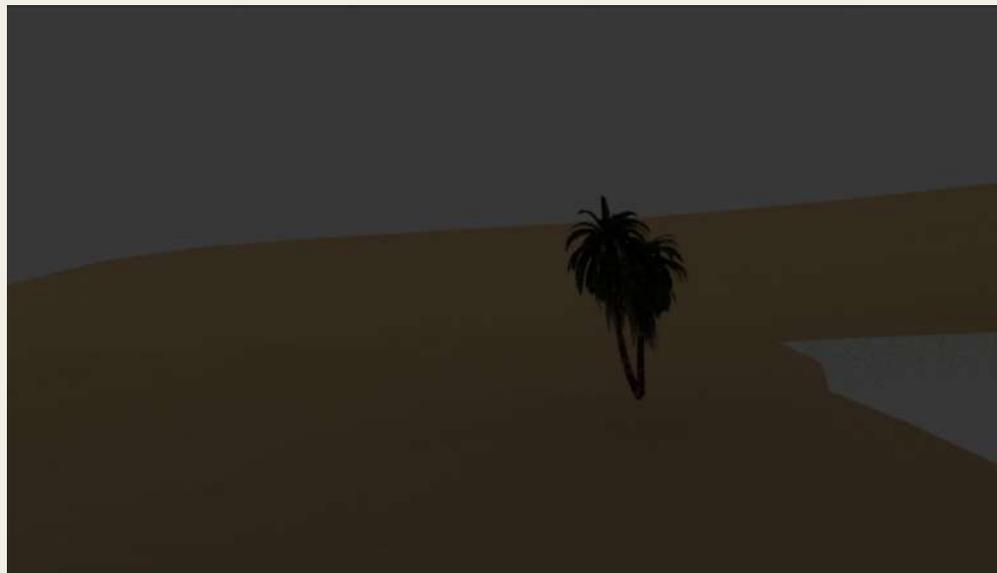
Ray Tracing Requirements – what not to do…

- The following is from a past student rendered in Blender **<u>Cycles</u>**
- 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!
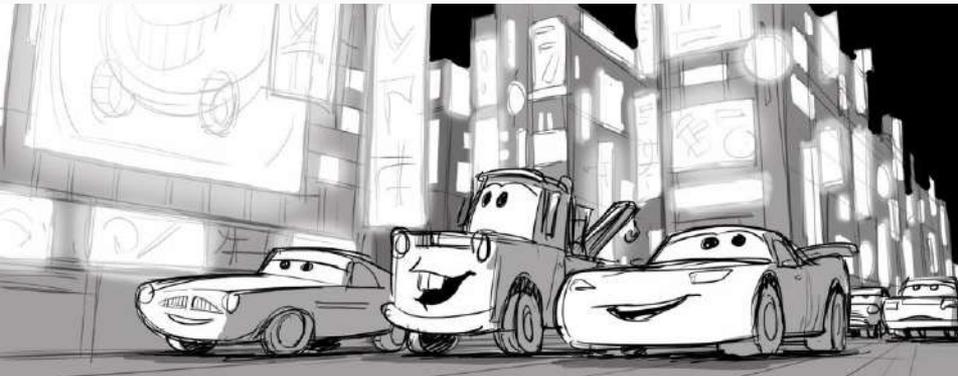
(1) Sketch - (2) Geometry - (3) Materials & Textures - **(4) Lighting & Ray Tracing**

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 (we'll cover some later)

- 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!

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

Yifan Wang
Fall 2020

Photorealistic Lighting is NEEDED!

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

- 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!

- <u>Iterate with us in OH!</u> 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

Remember: You'll be Presenting your Project!

CS 148:
Introduction to Computer Graphics and Imaging

Home   Lectures   Assignments   Showcase

Schedule

Lecture schedule is subject to change. Slides will be published here before the start of each lecture. Until then, all the links below will be broken.

|		Tuesday		Thursday	Homework due (Thursday)
Week 1	6/24	**Introduction**	6/26	**Geometry and Transformations**	Installation and Setup (Soft Deadline)
Week 2	7/1	**Rasterization and Shading**	7/3	**Color, Images, and Cameras**	Geometry & Transformations
Week 3	7/8	**Light and Optics**	7/10	**Raytracing I**	Shading & Cameras
Week 4	7/15	Raytracing II [PDF] [PPT]	7/17	**Sampling and Texturing**	Raytracing
Week 5	7/22	**Final Project Expectations**	7/24	Animation Guest Lecture	Lighting & Texturing Project Proposal
Week 6	7/29	**Simulation I**	7/31	Simulation II Guest Lecture	Sampling & Advanced Rendering
Week 7	8/5	**Advanced Topics**	8/7	Final Project Workshop	
Week 8	8/12	**Art of Images**	8/14	**Next Steps in Graphics**	Project Submission

Final Project Symposium: Saturday, August 16th at 8:30 AM

Supplemental Readings and Reference Materials
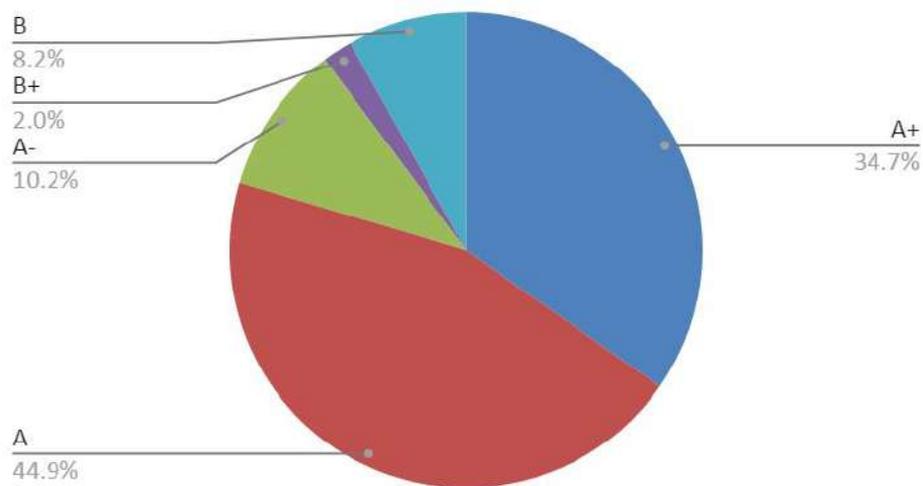
Final Project Grading & Curve

- 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 Summer offering:

Summer 2023 - Project Buckets

10 — 12.5%
9 — 22.9%
8 — 25.0%
7 — 22.9%
6 — 8.3%
5 — 4.2%
4 — 4.2%
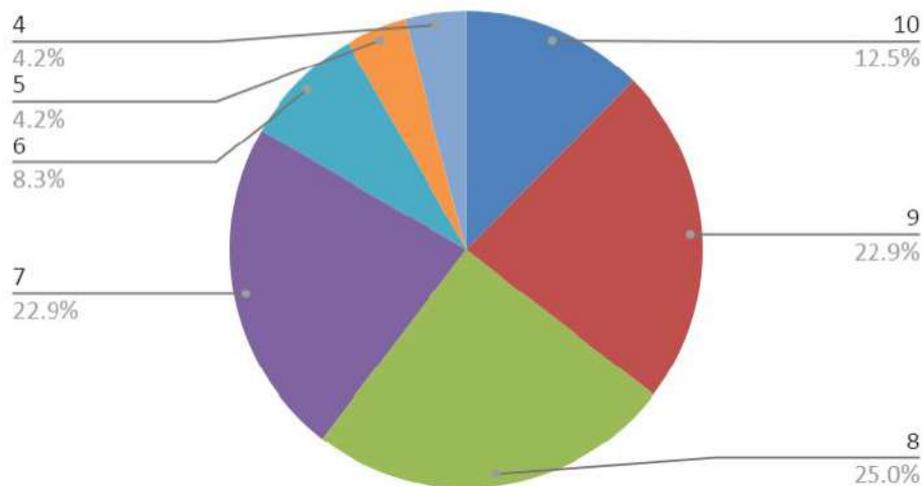
Summer 2023 - Final Grades

A+ — 34.7%
A — 44.9%
A- — 10.2%
B+ — 2.0%
B — 8.2%

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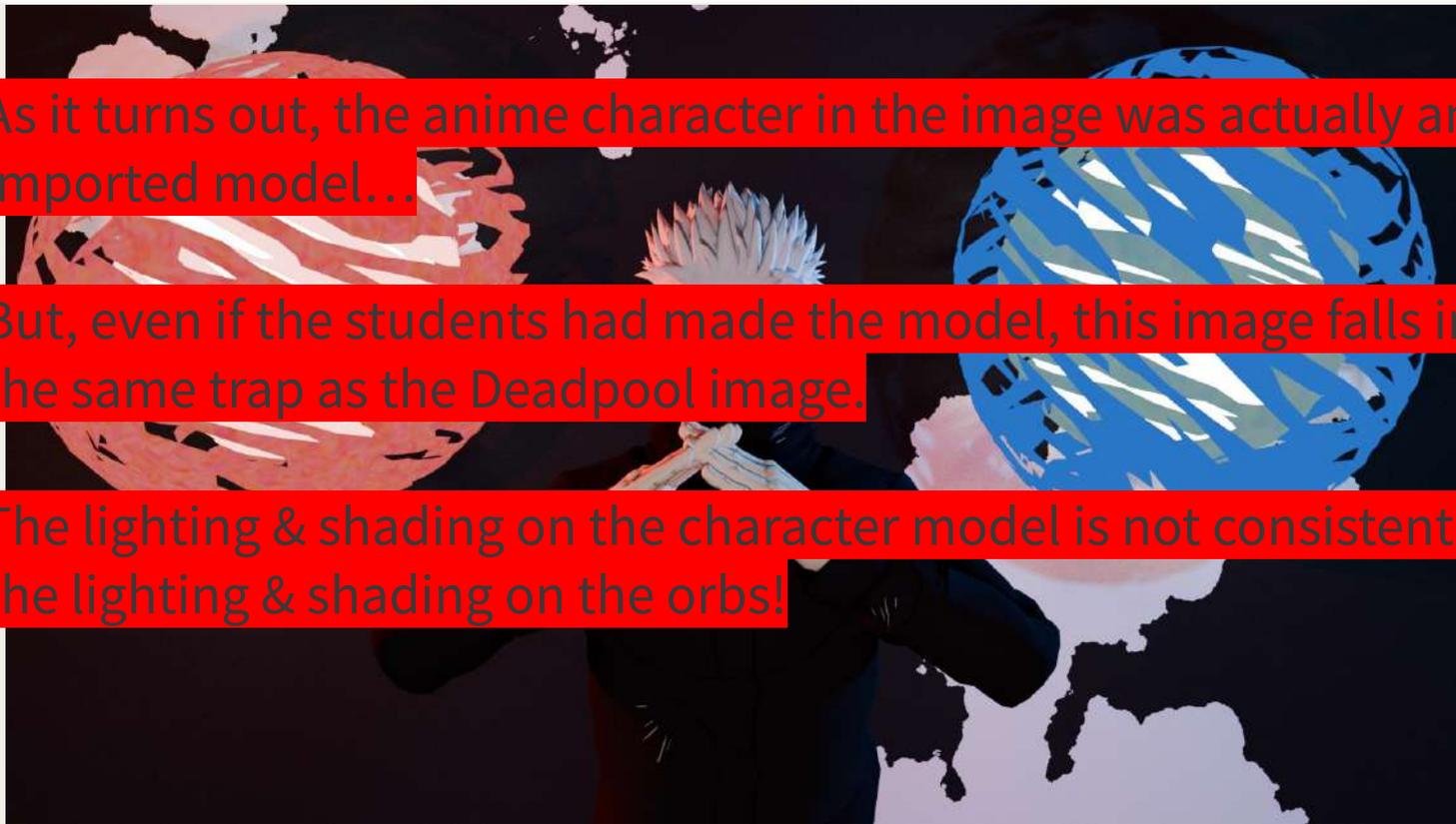
A Past Student Project – ~~Good~~ or **Bad**

- The student made an impressive model of Marvel's Deadpool, but the lighting has a lot to be desired…

- 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!
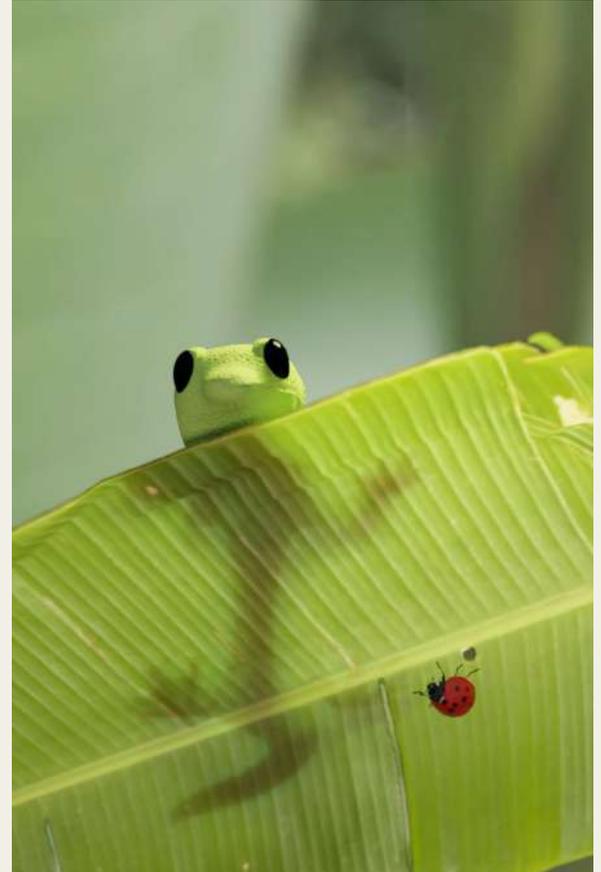
Nova Halavins, Summer 2022

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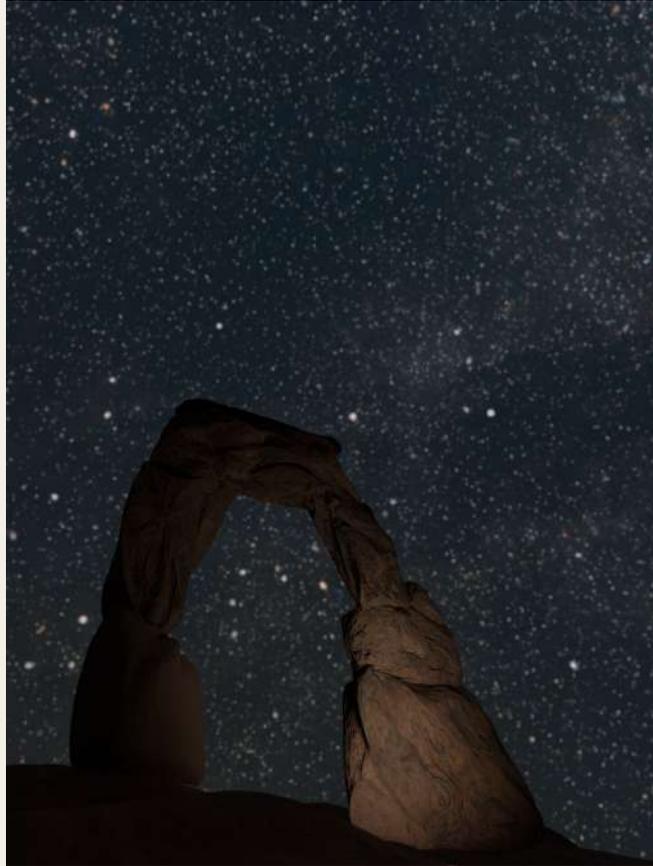
A Past Student Project – ~~Good~~ or **Bad**

- 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!
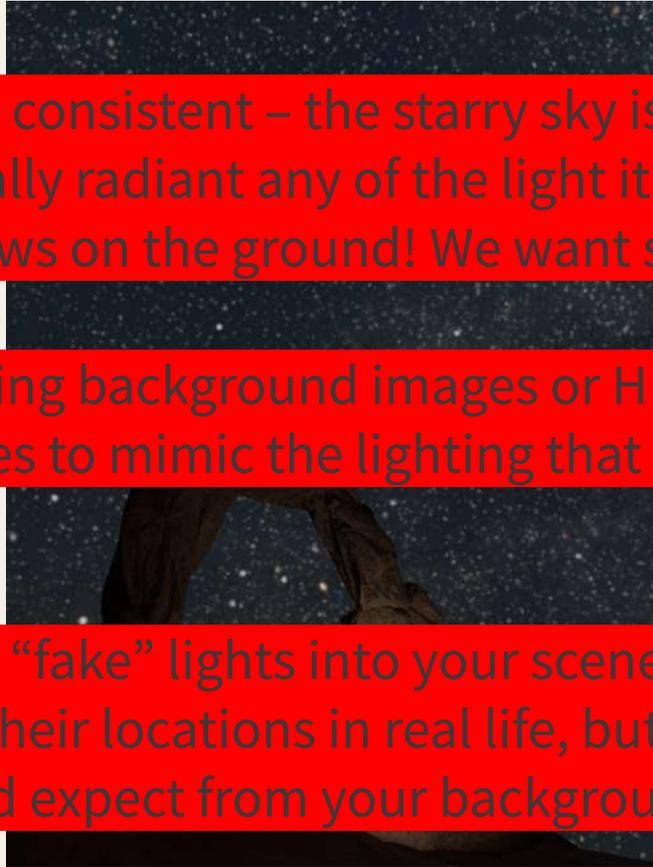
A Past Student Project – Good or Bad?
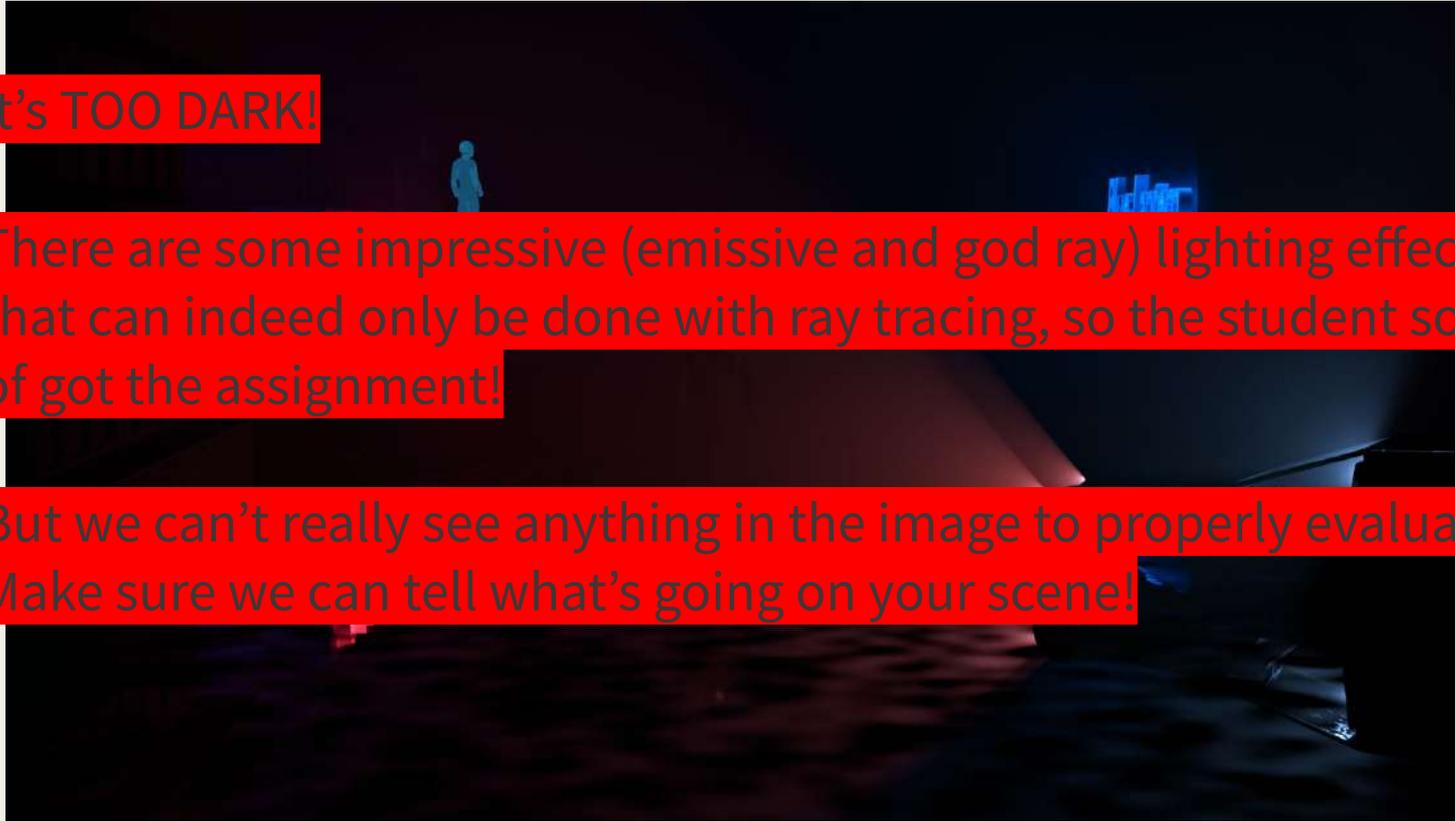
A Past Student Project – ~~Good~~ or **Bad**

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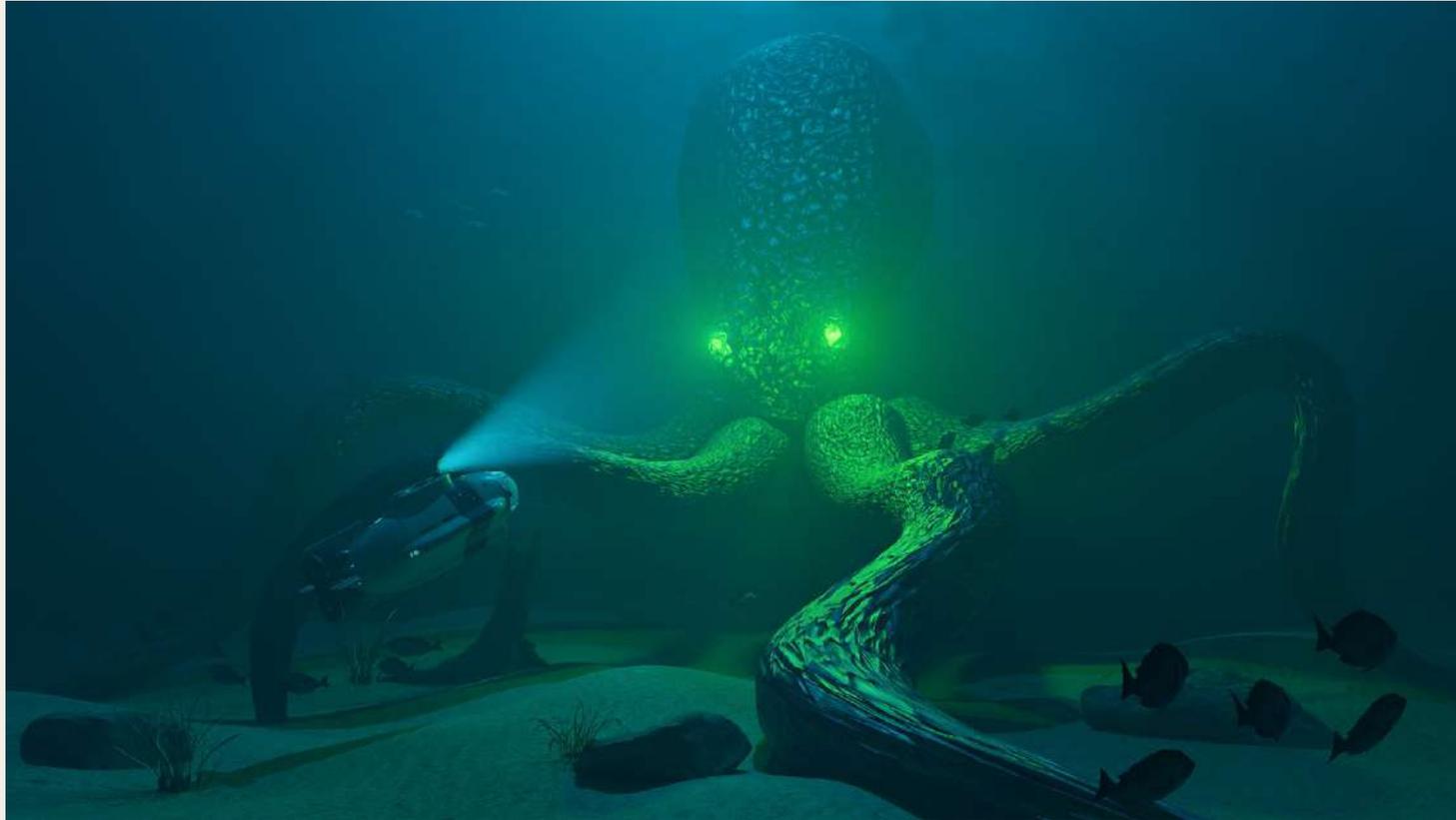
A Past Student Project – **Good** or ~~Bad~~?

- 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?
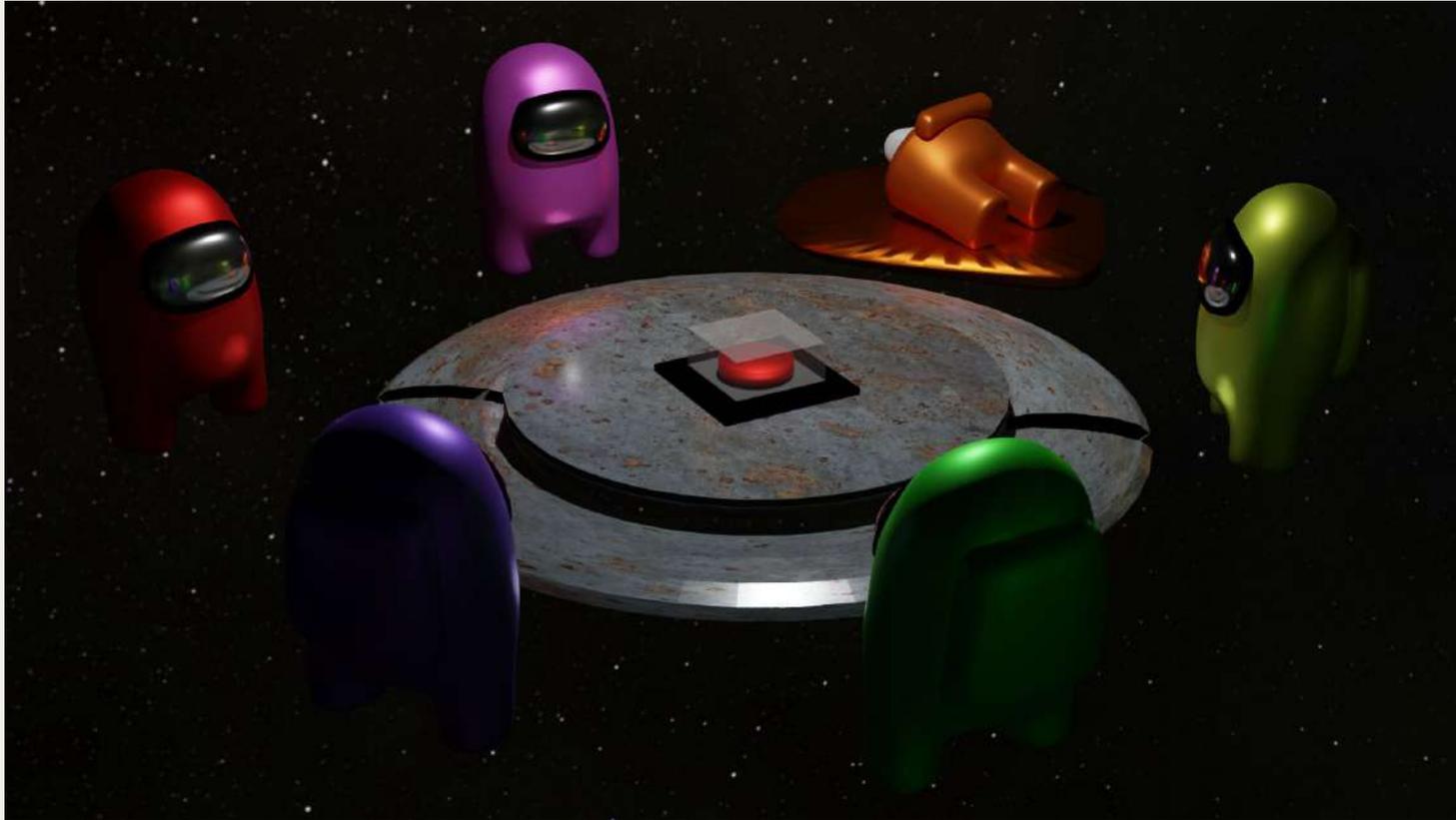
A Past Student Project – Good or Bad?

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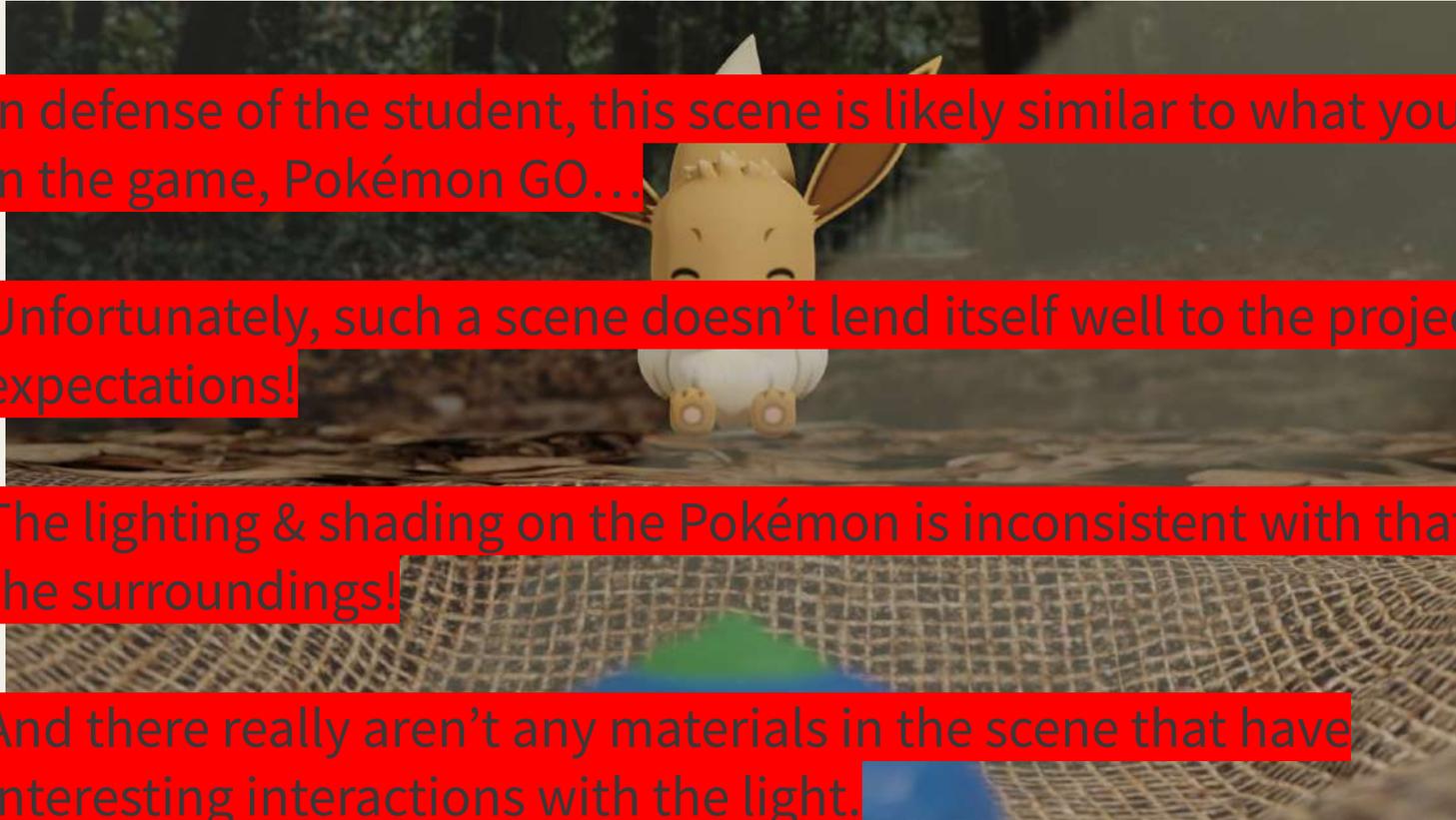
A Past Student Project – **Good** or ~~Bad~~?

- 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 – ==**<u>Good</u>**== 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 3 weeks!

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?

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!

Tracy Cai and Xiaohai Lu, 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!

Alex Oseguera and Jay Saleh, Fall 2021

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

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**Ang Li,
Fall 2024**

A Past Student Project – **<u>Good</u>** or ~~Bad~~?

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Michael Rybalkin, Summer 2023

A Past Student Project – **<mark>Good</mark>** or ~~Bad~~?

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Catherine Huang and Yara Sevilla, Fall 2021

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

- **<u>Easy way to appeal to ray tracing</u>**: 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~~?

- **<u>Easy way to appeal to ray tracing</u>**: 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 – **<u>Good</u>** or ~~Bad~~?

- **<u>Easy way to appeal to ray tracing</u>**: 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 – <mark>**Good**</mark> 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!
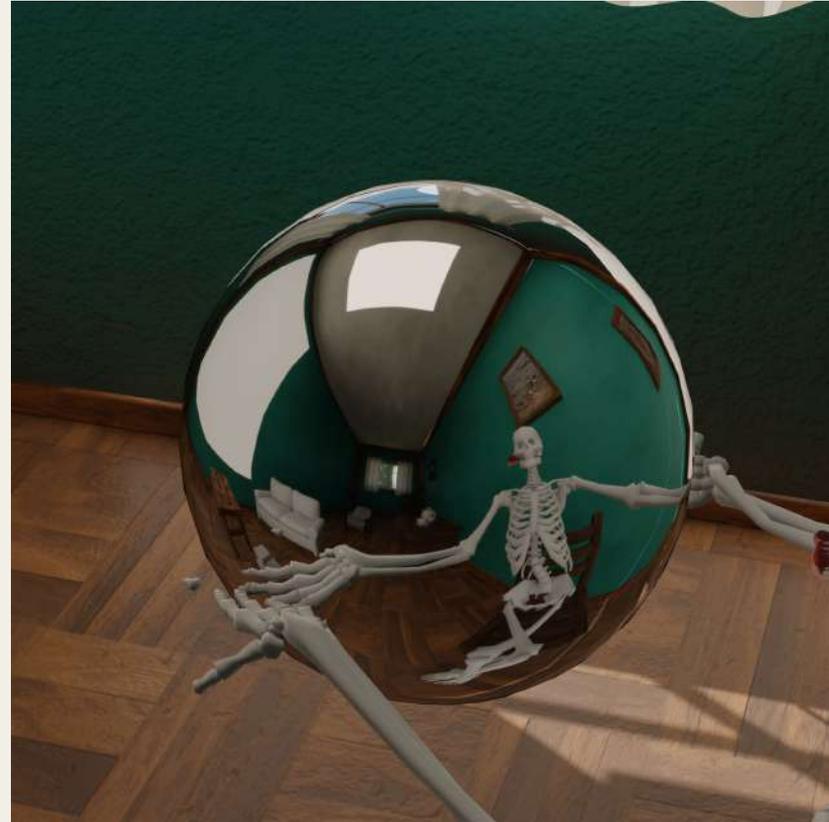
Eliza Huang, Summer 2023

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

Mid-Quarter Feedback:

https://forms.gle/4StgFpidZA9GsiwZ9