13 Final Projects

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CS5625 Spring 2019

Final project ground rules

Group size: 2 to 5 students

- choose your own groups
- expected scope is larger with more people

Basic charter: make a simple 3D game with cool graphics

- game play should be simple—not the emphasis here
- graphics has to tackle significant challenges
- flexible—talk to me if you have cool ideas that are not 3D or not games

Deliverables

- project proposal, a week after break
- milestone presentation, near end of classes
- final project presentation, during final exam time

What makes for interesting graphics?

Rendering

- fancy materials
- translucency
- procedural textures
- environment illumination

Animation

- good use of skinning + morph targets
- collision detection, physics based animation
- particle system smoke, fire, explosions
- procedurally animated water, wind, etc.

What makes for interesting graphics?

Modeling

- subdivision surfaces
- voxelized terrain
- procedural models (plants, terrain, cities, …)

Imaging

- bloom, lens flare (camera or eye)
- HDR tone mapping

Complexity management

- frustum culling, occlusion culling
- level-of-detail management

Overlap with other projects

In general, it's OK with me to build on your own earlier or concurrent work

- but you need to talk to me about it!

You have to disclose overlaps

- work that comes from projects you did for other courses (e.g. in 4620)
- work that comes from personal projects you did before this course
- work shared with concurrent projects for other courses (e.g. co-projects with 4152 or 5643)
  - in this case need to talk with **both** instructors!
- submitting overlapping work without saying anything is dishonest

Final Project Proposal

2-page description of game

- the “story board” equivalent
- say what constitutes the technical “meat”
- tentative schedule with allocation of team-members to tasks

Major areas of focus

- one primary, one secondary; larger groups: 2 primary, 2 secondary
- e.g. primary rendering, secondary animation or modeling

Project requirements

Must go significantly beyond PAs

- combine multiple techniques in interesting ways
- implement significant new techniques not in PAs

Quality product expected:

- nicely polished imagery
- principled methods
- correct implementations (with test results to prove it!)
- how you achieve results is as important as the results themselves

Code Base

Pick whatever code base you want

- Build on codebase from 5625 or 4620 (recommended)
- Start from scratch in raw OpenGL (probably bad idea)
- Pyglet, WebGL, … (for the indepenent-minded)
- OK to use graphics libraries (three.js, GLWrap, …)
- no game engines (Unity, Blender, …)
    - talk to me about the line between graphics library and game engine

Resources

Get models off the web

- do not spend all your time trying to model 1 person or 1 object.

GPU Gems 1, 2, 3 for ideas

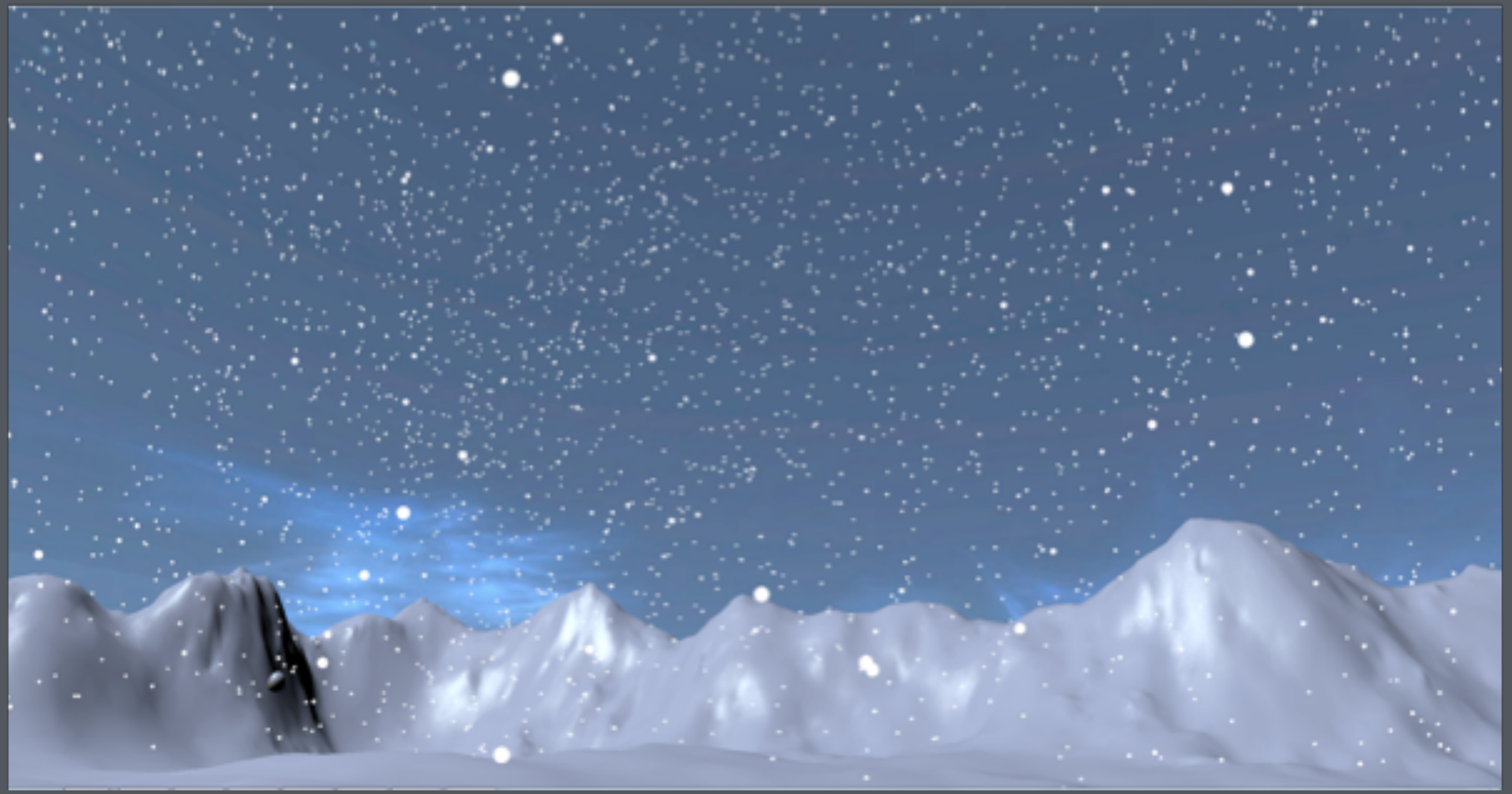
- these are on NVidia developer pages

Articles referenced in lecture

Akenine-Möller et al.

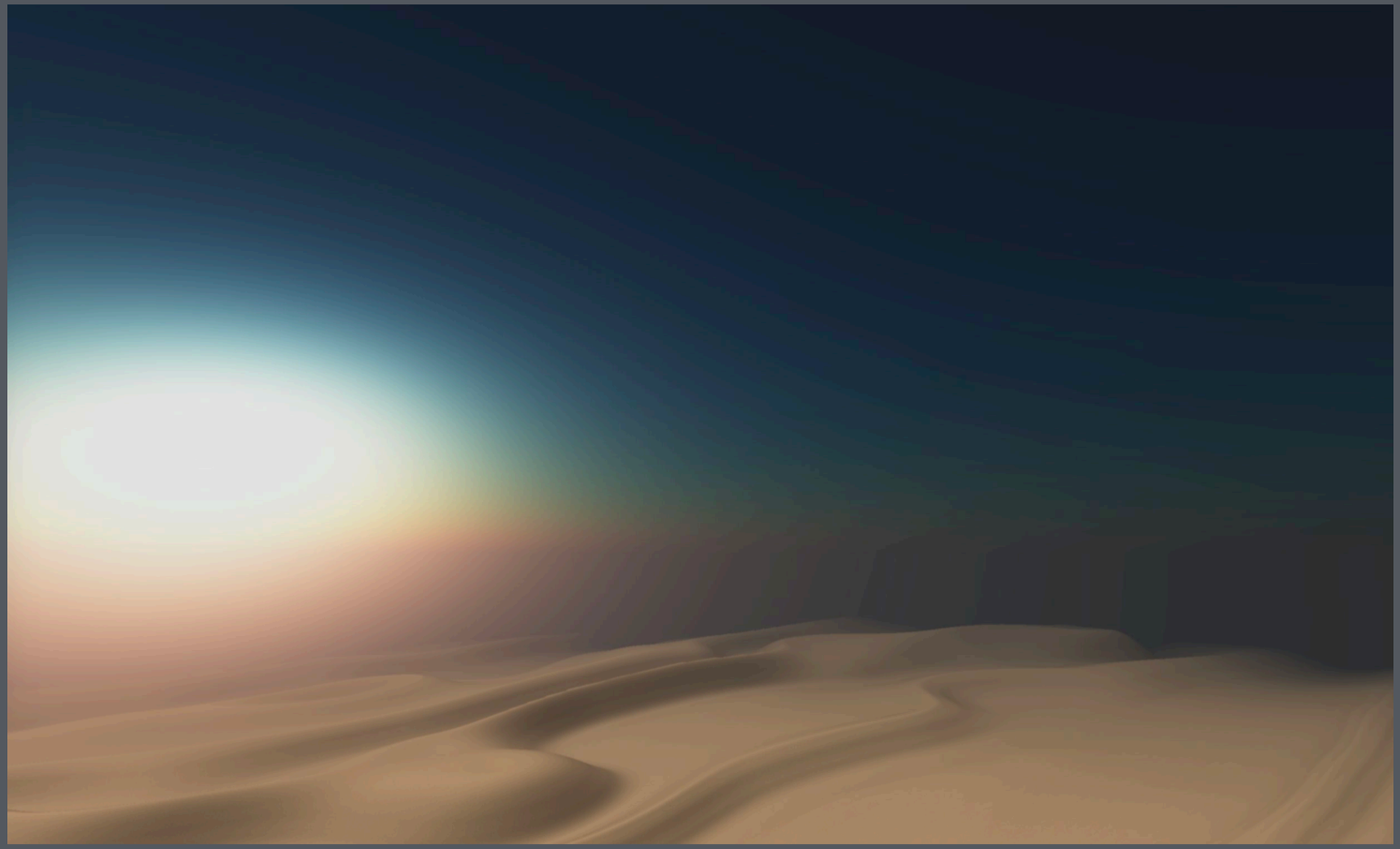
NVidia and AMD demos and examples

Examples

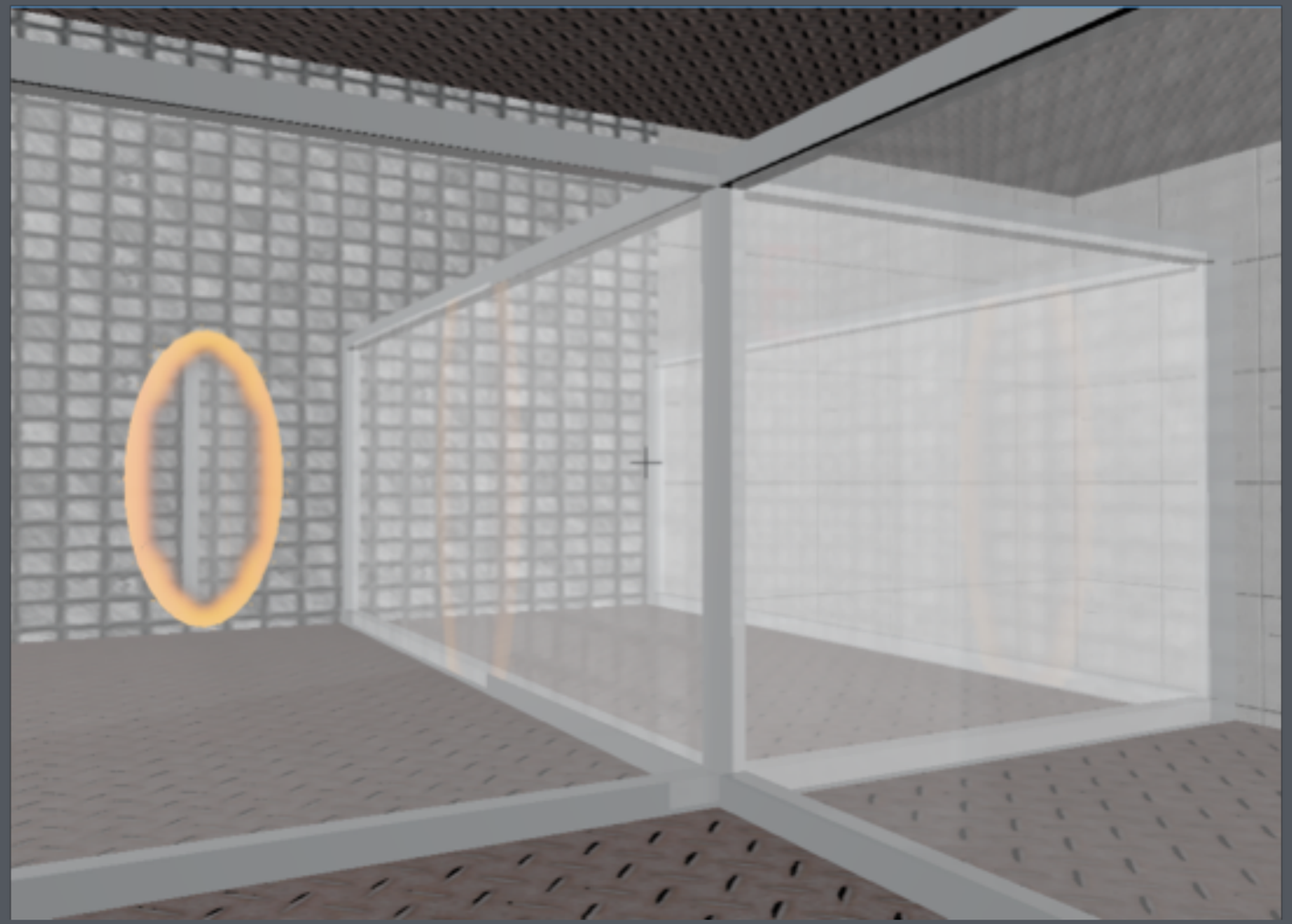


Victoria Dye, Joshua Reichler | *White-Out 2k17: The Snowening*

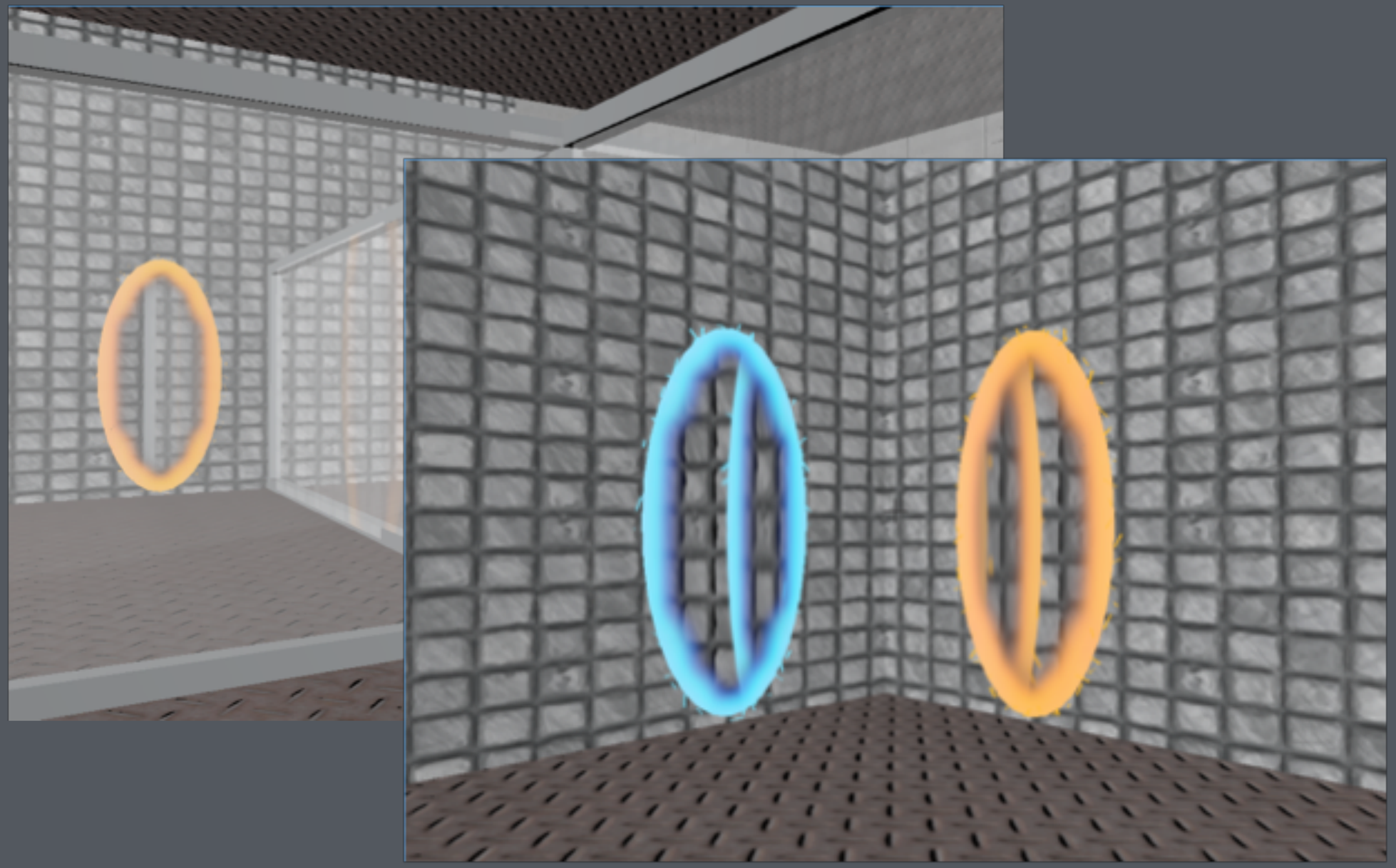
Emily Donahue and Grant Mulitz | *Batting Practice* (lens flare effect)



Henry Chen, Olivia Dowd, Linda Liu, Tianqi Yu | Atmospheric scattering



Natalie Diebold, Hani Altwaijry | *Portal-ish*



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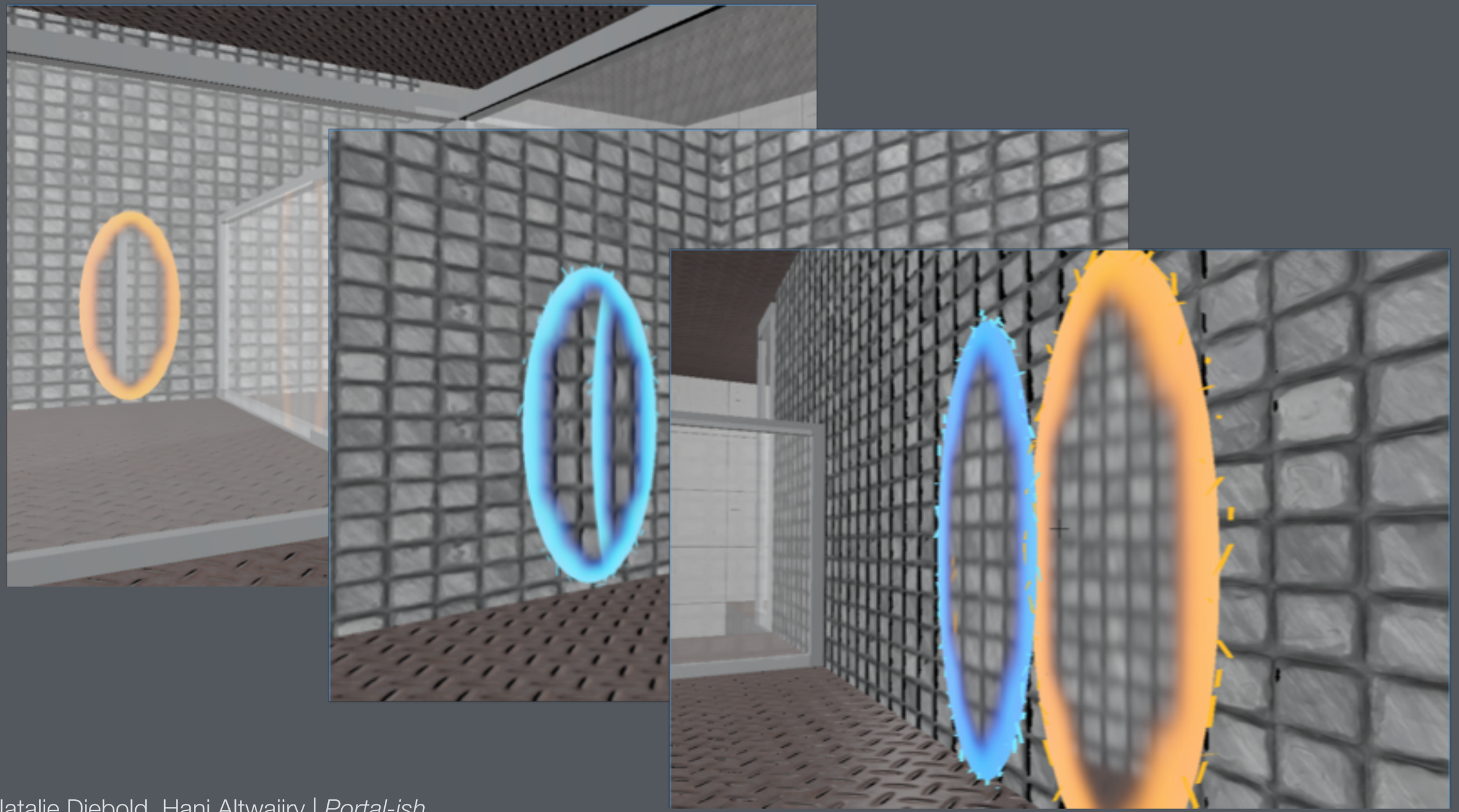

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Fight your way through the zombie fairies to rescue Orin!

Ari Karo, Christopher Yu, Jonathan Behrens, Jeremy Cytryn | *Subterranean Arsonism*

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High-Level Game Ideas

- Adventure Game
  - Maze-like setting
  - Might require collision detection
- Pinball
- 2D game behavior with 3D graphics is OK

slide courtesy of Kavita Bala, Cornell University

High-Level Game Ideas

- **Terrain games**
  - Requires real-time terrain mesh that supports deformations
  - Projectile/explosion animation
- **Role-playing Game**
  - An action-oriented RPG might be interesting.
  - Visually interesting scenery, spells, etc.
- **Space Flight Simulator**
  - May require some view-culling
  - Ample opportunities to use particle systems

slide adapted from Kavita Bala, Cornell University

High-Level Game Ideas

- **First Person Shooter**
  - Some spatial hierarchy (BSP), collision detection…
- Other feature ideas
  - Feel free to implement wild and crazy effects, as long as you can explain to us why the effect on screen is the intended result and not a bug!

slide adapted from Kavita Bala, Cornell University

Game Mechanics (Slides by Walker White)

Actions

- What the player does
- Examples:
  - Move
  - Jump
  - Shoot
- Should NOT be your focus

Interactions

- What the state of the world is
- Examples:
  - Collisions
  - Restitution/Destruction
  - Visibility
- Should be your focus

Goal: Take a principle from computer graphics and implement a **single** interesting game mechanic

Other Game Design Concepts (Slides by Walker White)

Objectives

- What the player wants to do
- Examples:
  - Reach an exit door
  - Kill/tag an enemy
  - Outrace/outlast an enemy
- Keep this simple!
  - Reach an exit
  - Tag a (dumb) opponent

Challenges

- Makes the objective difficult
- Examples:
  - Maze environments
  - Enemy speed
  - Enemy AI
- Also keep this simple!
  - Keep AI to simple visibility
  - Well designed mazes with a timer can be fun

Game Ideas
(Slides by Walker White)

- Stealth games
  - Simple visibility
  - Shadows (“visibility” = speed * shadows)
- Maze games
  - Reflection to swap between worlds
  - Shadows and lighting change geometry
  - Particle systems as moving hazards
  - Finite element modeling for destructible terrain
- Tag/Chase games are maze+enemy