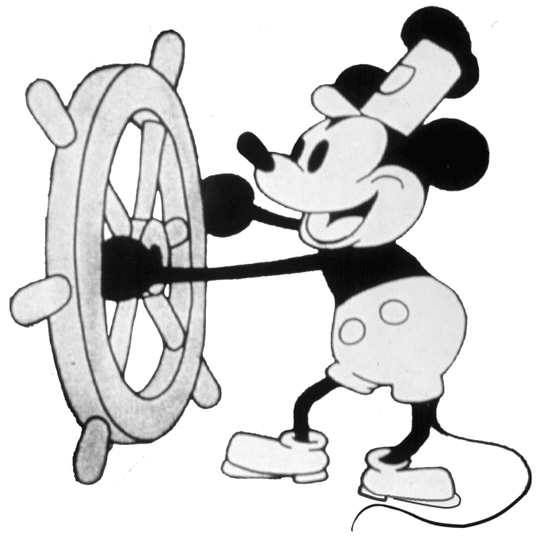

CSCI 461: Computer Graphics

Middlebury College, Spring 2025

Lecture 01: Pixels

Goals for today:

- Introductions!
- The main goal of computer graphics.
- What will we do in this course?

Visit go/cs461, click on **reactions** tab, then click one of the emojis - use this any time! (during class)

What is Computer Graphics about?

Computer graphics is about developing computer programs to create visual information.

Your job is to develop the graphics technology that artists might need.

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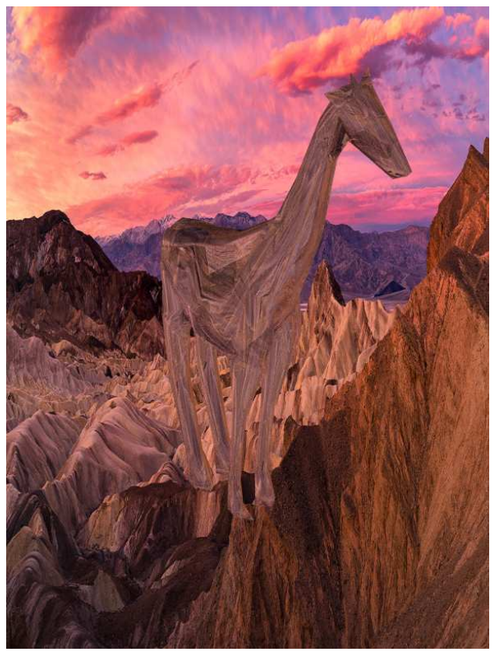
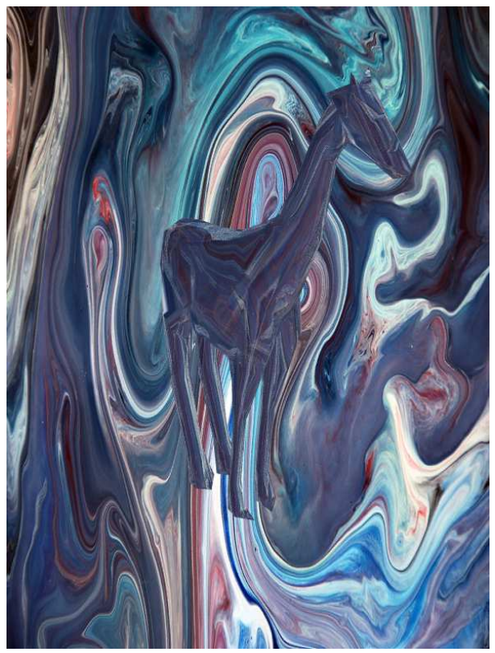
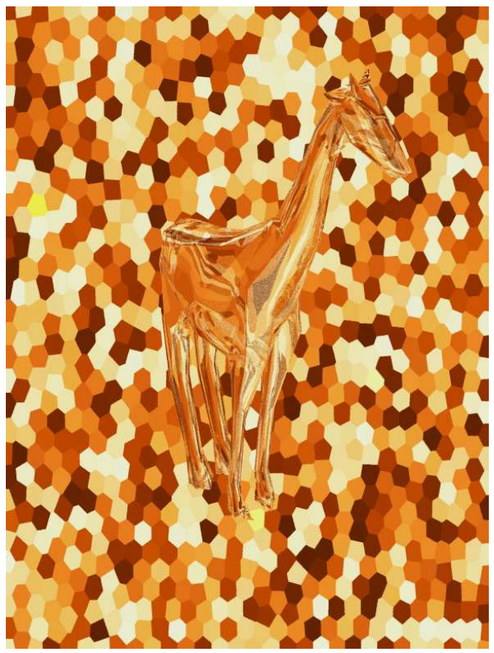
By the end of the course you will:

- develop your own ray tracer to render complex scenes and materials,
- display and manipulate three-dimensional models using rasterization techniques (with `WebGL`),
- animate three-dimensional objects and physical systems.

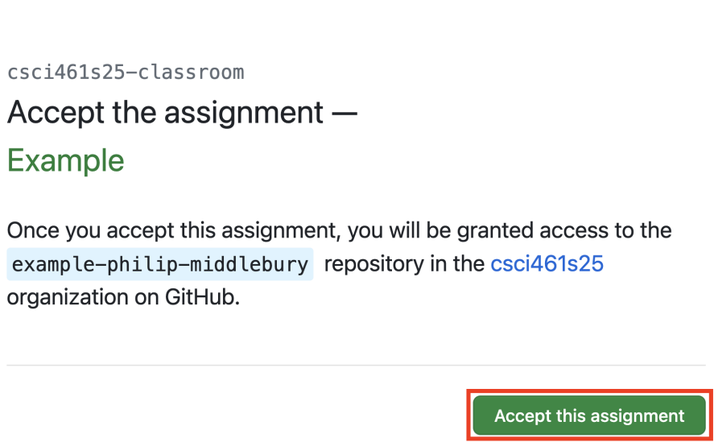
We will use a form of *specification grading*.

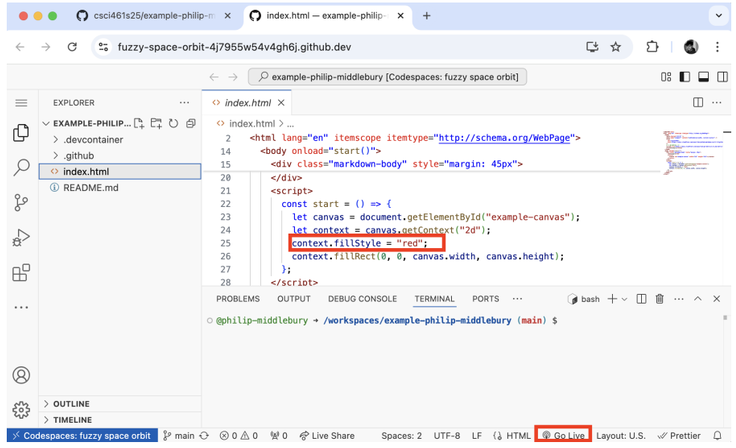
- 12 assignments in total: 11 Labs + 1 Final Rendering
- Labs evaluated using CRN model (similar to EMRN you may have seen before):
  - (N)ot assessable: little to no modification to initial template.
  - (R)evisions required: error or bug.
  - (C)omplete: submission implements all required components.
- Final Rendering is open-ended rendering of any scene you want.
  - Might be an extension of something we did in a lab.
  - Sketch (Proposal) due in Week 9.
  - Images due in Week 12 and will be displayed in CS poster session.

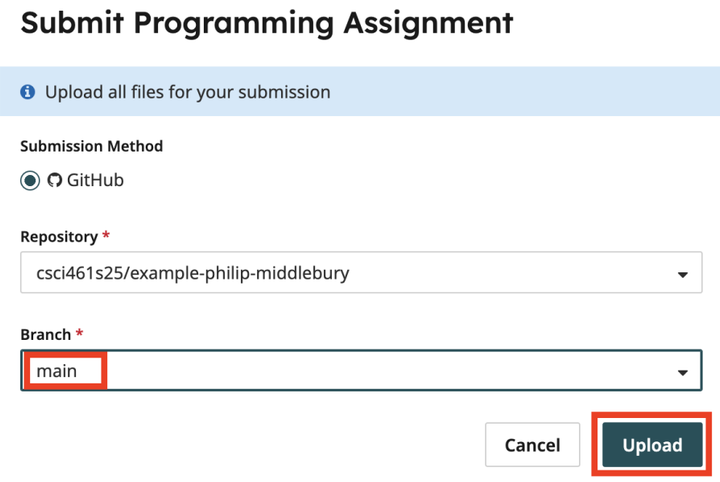




We will use an Ed discussion board and GitHub.

- Join Ed discussion board: https://edstem.org/us/join/ZjaSAQ
- See setup instructions on course website: https://philipclaude.github.io/csci461s25/setup





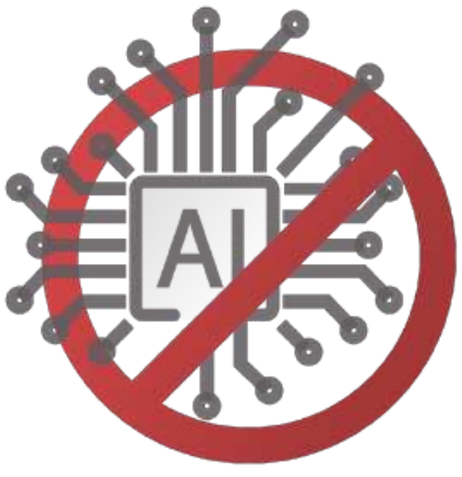


What to expect in this course...

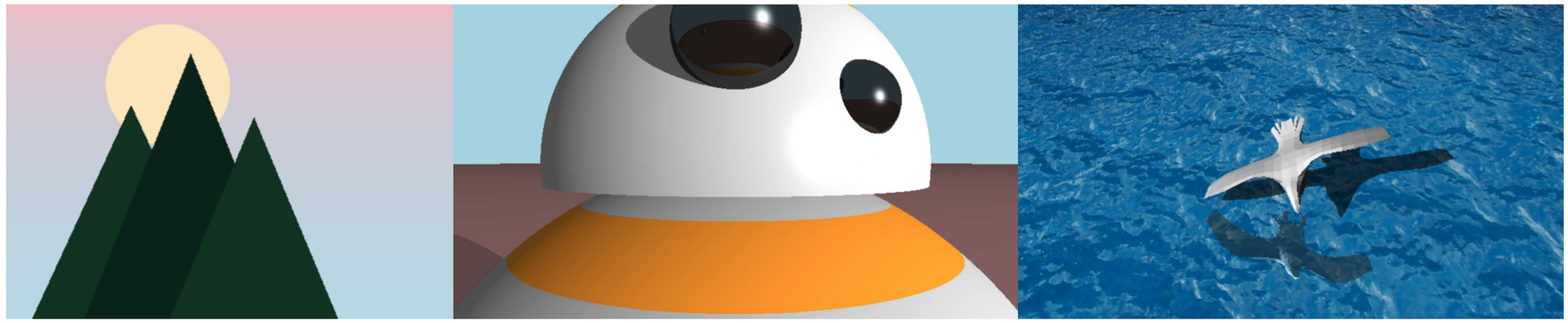
- Lectures and exercises on Tuesdays.
- Please read the notes after class on Tuesday and before the lab on Thursday.
- Labs on Thursdays, submitted 1 week after lab period.
- Feedback on current lab status (CRN), then edit and resubmit.
- A LOT of debugging!
- Have fun :)

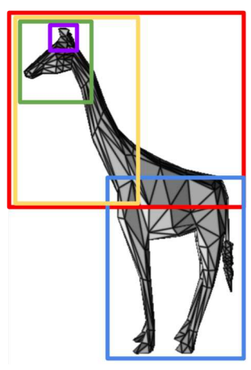
Honor Code and AI policy.

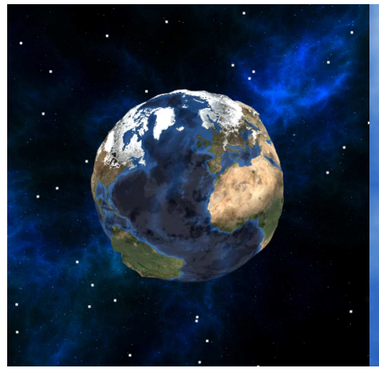
- Labs will be submitted individually, but you are encouraged to work in groups of 2-3 during the lab period on Thursdays.
- You can look at each other's code as you implement the lab and look for bugs.
- Final Rendering will be submitted in groups of 2 - 3.
- You cannot write code for someone else, or let someone else write code for you, or send/receive code in an email or text message.
- AI cannot be used to develop ANY code for you.
- AI can only be used to help you understand theoretical concepts.

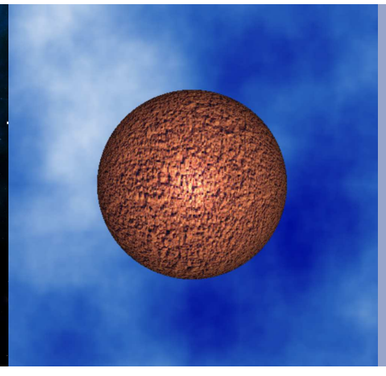


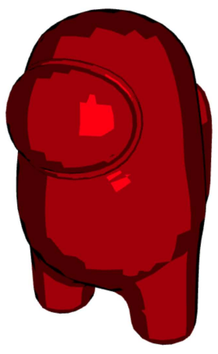
Labs/topics preview.

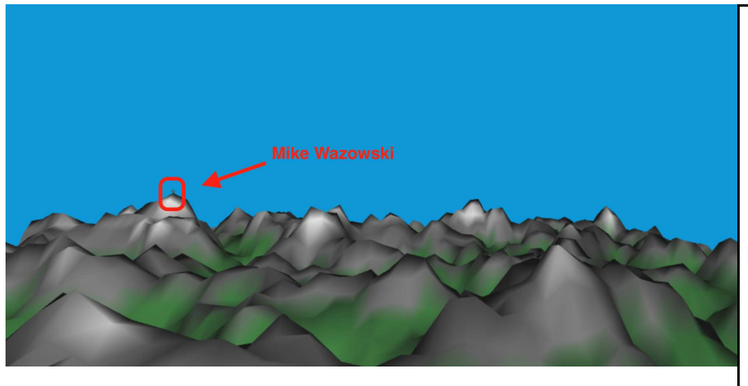










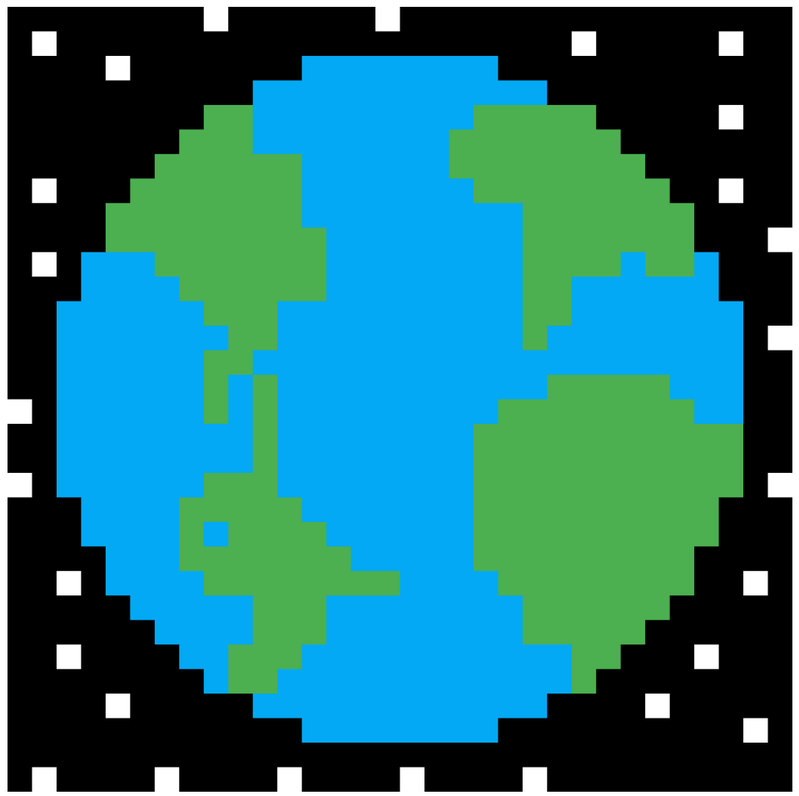


CSCI 461: Lab 10

MIDDLEBURY

Let's talk about pixels!

Our goal: assigning pixel colors.



Things to consider:

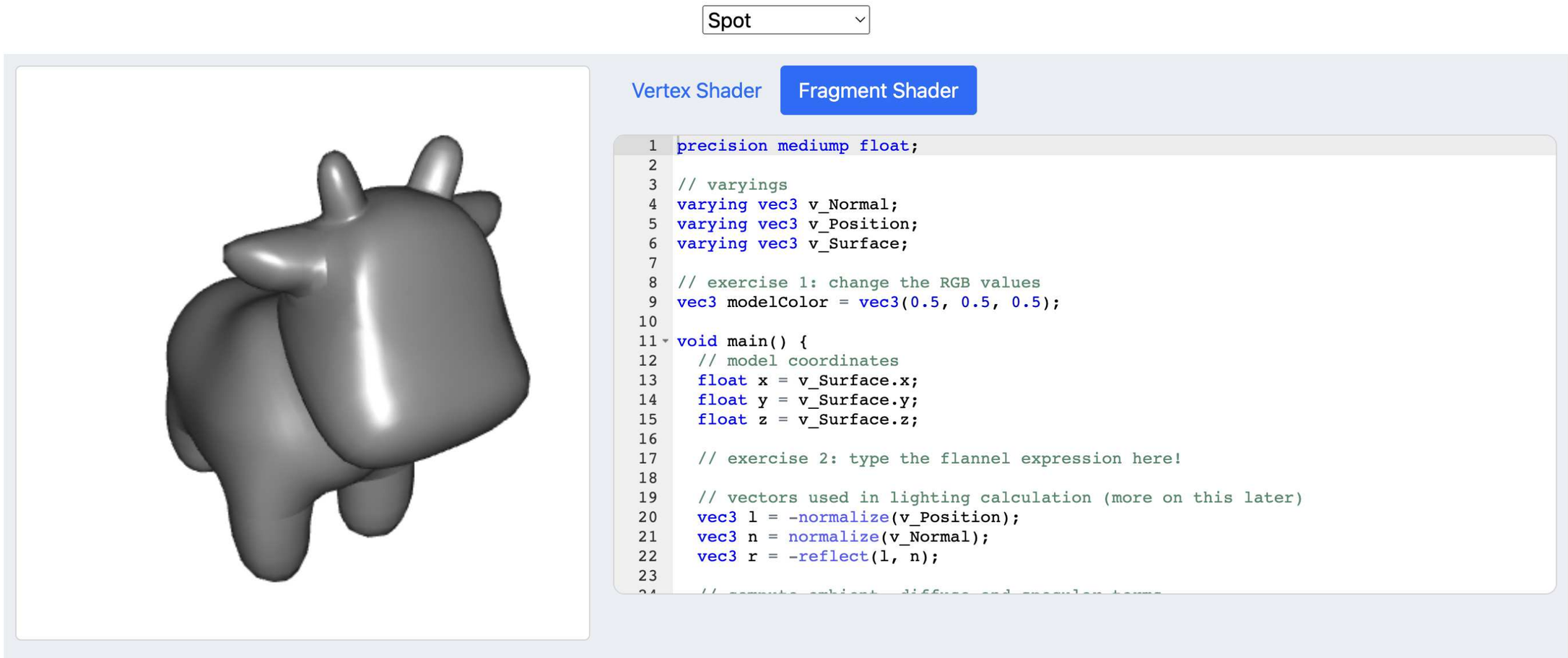
1. What is the **size** of the image?
2. How to represent **color**?
3. What is the **coordinate system** of the image?

We will often represent the color of a pixel using RGB values in between 0 - 1 (sometimes from 0 - 255).

Let's practice with Spot the Cow.

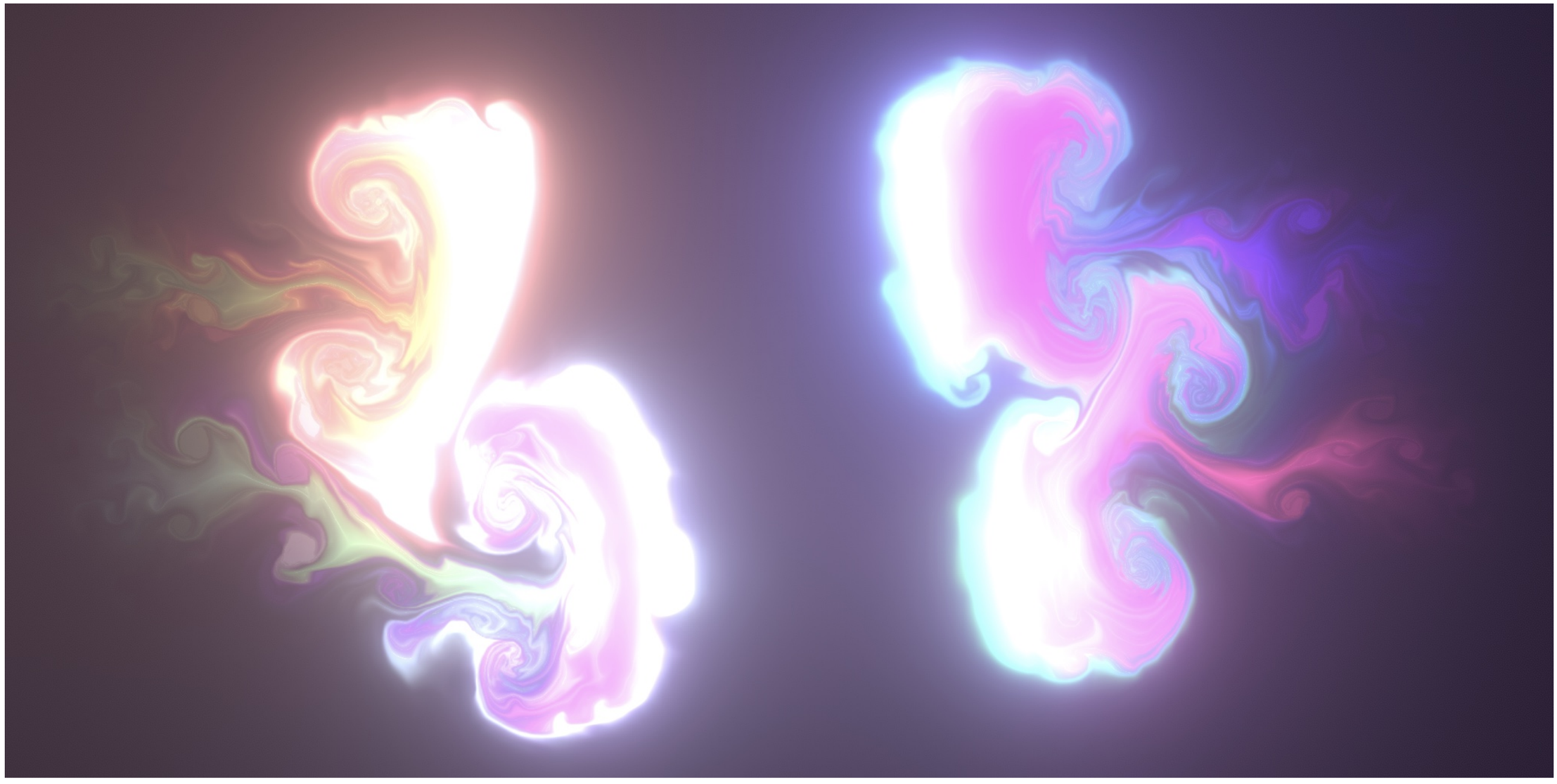
Click to open the shader editor.

(we'll look at **WebGL** and **GLSL** later in the course)



Our goal: assigning pixel colors.

Click to open the WebGL fluids demo.



quickly!

JavaScript in one slide.

```
class Pixel {
  constructor(r, g, b) {
    this.r = r;
    this.g = g;
    this.b = b;
  }

  scale(a) {
    this.r *= a;
    this.g *= a;
    this.b *= a;
  }
}

Pixel.prototype.set = function(r, g, b) {
  this.r = r;
  this.g = g;
  this.b = b;
}

let p = new Pixel(0.5, 0.5, 0.5); // create a Pixel object
p.scale(255);
p.set(1, 0, 0); // set to red

let image = []; // create a 200 x 100 image
for (let i = 0; i < 200; i++) {
  for (let j = 0; j < 100; j++) {
    const r = Math.random();
    const g = Math.random();
    const b = Math.random();
    let p_ij = new Pixel(r, g, b);
    if (i * i + j * j < 50 * 50) {
      p_ij.set(1, 0, 0);
    }
    image.push(p_ij);
  }
}
```

See you on Thursday!

- Please complete Introduction Form.
- Sign up for our Ed discussion board and set notification preferences to receive emails when there is a post.
- Familiarize yourself with syllabus, calendar, notes from today:

  go/cs461
- Go through steps on Setup page on course website.
- Review `JavaScript` (see links in Chapter 1 notes).