

Initial Assignments
Flow Visualization: The Physics and Art of Fluid Flow
Fall 2019

Due Friday 8/30, start of class:

1. **Copyright Agreement Form** signed hardcopy due in class.
2. **Syllabus Agreement Form** signed hardcopy due in class.
3. **FlowVis.org** login. You will receive an invitation to join as a contributor at your CU email address. **CHECK YOUR SPAM FOLDER.** Use this to set your password. Go to <http://flowvis.org/wp-admin> to log in. Contact Behruz (bera7205@colorado.edu) if you have any trouble.
4. **Join Slack:** Watch for an email from Canvas for this [join link](#):

Due Weds 9/4, start of class

5. **Best of Web.** For this assignment, choose an online image or video that you feel exemplifies the best art/science flow visualization, and write a few sentences about what you appreciate in both the science and art. This will be due as a post in flowvis.org. Look over course materials, and previous years' images and reports. Explore the links page, Youtube, etc. too, but remember we are looking for a balance of aesthetics and science. You need to know what has been done in order to push the boundaries of new work. One caveat: **your submission must include attribution to the original authors of the image or video.** A link to something that has been reposted is NOT sufficient. If you can't find out who the original author is, you must choose a different work. You will be asked to vote on your classmates' choices (and they will vote on yours). Note, if you are posting a Youtube link, append **?rel=0** to the end of the link. This will suppress the often inappropriate 'related' videos that show up at the end.
6. **CATME survey:** This survey will be used to place you on teams based on your schedule but aimed to mix backgrounds, skills and equipment. Again, you will receive a link at your CU email address.

Due Weds 9/18

7. **Vote** on 'Best of Web'. Read all the posts in the 2018Sp Best of Web category, and use the comment feature to state 'First Prize' 'Second Prize' and 'Third Prize'. Again, a short statement about why you have made this choice should be included.

Due Weds 9/11 by 4 PM:

8. **Image Assignment 1: Get Wet.**

The purpose of this assignment is to "get your feet wet". Make a picture or video of fluids (air or water, gas and/or liquid, any fluid, any combination of fluids) that both (1) demonstrates the phenomenon being observed and (2) is a good picture. Use any imaging technique you are familiar with, analog or digital, still or video, black and white or color, flash or available light, etc. Make the clearest, sharpest, cleanest, most interesting picture/vid possible.

This means you will probably need to set up a situation, control your variables, do it once, observe the results and do it again once you know what works and what doesn't. **Keep notes** on what you've done for your write-up, including photographing the packaging for food dye, etc. You should expect to spend 20 hours on this assignment, including the write-up.

You are welcome to work in teams to create the image you want, but you are individually responsible for your own final image. Formal teams and more elaborate projects will be set up for later assignments.

Everyone's images will be displayed and critiqued in class beginning Wednesday 9/12. **You will be expected to bring your laptop and enter comments on everyone's images.** We will spend 3 class sessions going over all the images. **Come prepared to talk** about how you made your image, and what you think is going on. Take notes on the feedback you get in class, and use this info to write **your** report which will be due Weds 9/26.

See the [Report Guidelines document on Flowvis.org](#) for info.

GET WET POSTING INSTRUCTIONS: These are fussy, but required!

8.A Post Image or Video on FlowVis.org

- **Images:** First, upload your image to the Media Library in Flowvis.org, and set the Media Category to 2018SpGetWet. Best to make a version of the image for upload: no more than 1300 px wide, no more than 900 px tall. If your image is portrait orientation, pad the sides with dark gray to make it landscape shaped. Next make a new post **with your name as the title**. In the body put a short sentence describing the flow. **Select your image as the 'featured image'** in the menu bar on the right in the post editor. Also in the right menu, select the 2018Spring and 2018Spring Get Wet categories. **Do not select any other categories at this time.** Don't forget to hit the 'publish' button.
If your post is not ready when you are called on for critique you will be publicly shamed. Sorry, that's what happens. Everybody in class will be searching for your post.
- **Videos:**
 - a) Your video can be up to 2 minutes long. It must include a title with author information. Do consider adding music; it can really make a video great, but **you can only use music to which you have rights**. A list of volunteer musicians will be provided if you'd like to collaborate with a musician on original music for your video. Acquiring rights to other music via stock libraries is easy and inexpensive. You will be expected to **provide documentation of your music rights in your report**.
 - b) Upload your video to Vimeo or Youtube. **DO NOT UPLOAD YOUR VIDEO TO FLOWVIS.ORG**. Make yourself a login if you don't have one. CU campus wireless provides awesome upload speeds, so best to do the upload on campus. Choose a good thumbnail frame. Copy the simple link to your video: <https://vimeo.com/yournumber>.
 - c) Next make a new post at FlowVis.org with your name for the title. Put the Vimeo or Youtube link as the first text in the post; make sure it is plain text, not a functional link. Then add a one-sentence description of the flow. In the menu bar on the right side of the post editor, select Format > Video. Further down the right menu, select the 2018Fall and 2018Fall Get Wet categories. **Do not select any other categories.** Do not select a video thumbnail or featured image; these will be added automatically when you publish the post.

8.B Post Reports on Flowvis.org, due 9/27:

Add your report to your image post by the Get Wet report deadline, Friday 9/27. You can put the text and any additional images (sketches etc) right in the post, or you can upload it as a pdf into

the Media Library and link to that in your post. Do not post .doc files to Flowvis.org, but you must post .doc on Canvas.

8.C Canvas Version. You have to do these also.

Next, please provide the following, in the Get Wet *Canvas assignments* at <http://cuboulder.instructure.com>.

- a) **Final image:** the best resolution file you have of your final image or clip, for future large format prints and presentations. TIFF, png or Photoshop formats preferred; jpg and raw formats are ok for unedited images. Use the best resolution setting that you can. If your camera only takes jpgs, use the largest file, finest jpg setting. **If you edit the file (and you should at least crop appropriately and set the contrast) DO NOT SAVE AS A JPG.** Save as TIFF, PNG or some other lossless format instead. PNG seems to work better than TIFF, or PSD, but all three are acceptable.
Or Final Video: Your video should include a title with your name as author. Submit a high-resolution copy of your video to Canvas. This can be slow, so be sure to use a location with a fast upload speed, such as on campus.
- b) **Original:** Whatever your original (still) camera file is. Raw, CR2, NEF, jpg, whatever. If you are shooting video, unedited video clips are required only if your video processing includes color shifts or distortions. Send your straight-from-the-camera file, NOT a png version. Only the straight-from-the-camera file has the necessary metadata.
- c) **Reports** must be submitted **BOTH** in the appropriate Canvas Assignment and to Flowvis.org (in your GW image post, see above) by the deadline on 9/27. **See the Report Guidelines** document at Flowvis.org>Course Info for details.
- d) A **Word document** of your report, in the Canvas Get Wet Report assignment. Please use Word. If you don't use Word, convert your file to .doc however you can. Do not post pdfs to Canvas. However, if your report is done as text and images in your image post, just put the link to the post in Canvas.
- e) **SAF:** A completed image Self-Assessment Form (SAF) in the Canvas report assignment, on the same date that your report is turned in. The SAF form is available under Course Info at Flowvis.org.
- f) **In Depth Critiques:** You will be assigned critiques of two classmates for each report, in Canvas. Look in the upper right hand corner, after you have submitted your report.

Image assignments are due 4 pm two days before critique begins, so I have time to put the slideshow together before class.

Please include your last name, assignment name and year as part of each file name. If Canvas is a problem, give me a USB memory stick in class (yes I'll give it back if labeled). **Submitting via Canvas is much preferred.**

Hints for Get Wet:

- Using the built in flash on your camera usually results in ugly images. Use something like white cardboard, foil, or tissue to 1) bounce the light so it comes from a different direction and 2) diffuse the light to soften the shadows. A variety of strobes, lights, backdrops, and light tents are available for checkout.

- Avoid distracting backgrounds, such as woodgrain surfaces. Tabletop photo tents and seamless backdrops are available for checkout. Plain bedsheets or tablecloths work fine too.
- If you image a drinking glass or bottle, make sure **no** distracting text or logos are visible on the glass.
- If you use a fish tank or other glass enclosure, be careful about where the flash reflects off the glass (to become a distracting white hole in your photo).
- Automatic focus systems often have trouble with fluid images, which have no sharp lines to lock on to. If your camera has a 'focus lock' feature (try pressing the shutter button halfway), lock onto a ruler or other sharp-edged object held in the desired focus plane before you make the image, or use manual focus.
- Almost any deficiency in color balance, contrast, etc., can be adjusted in Photoshop or Gimp, but this requires a working familiarity and access to the program. There are instructional videos available at Lynda.com/Linked In Learning: <https://www.lynda.com/signin/organization> . Log in with your identikey. Some instruction will be given in class.
- Video editing can be done on ITLL computers using DaVinci Resolve 16 (<https://www.blackmagicdesign.com/products/davinciresolve/>). You can also download it for free for personal use.

Safety considerations: If you want to work with **flames**, you must follow the combustion guidelines posted on the website. When working with household materials, you are pretty safe if you stick to personal hygiene (i.e. soaps and shampoos) and food products. If you are working with cleaning or medical products, or lab chemicals, you must discuss them with me first, and you may be required to submit a safety proposal.

Due Friday October 11, 4 pm.

- 9. The Photography of Clouds.** There will be two Cloud assignments, with Clouds First due **Monday October 8**, and Clouds Second due Friday November 16, just before break. This is to give plenty of opportunity to observe a variety of atmospheric conditions. *Images made before August 26 2019 will not be acceptable for the Cloud First assignment, and images made before October 11 will not be acceptable for the Cloud Second assignment.* Exceptional images made prior to this course cannot be submitted for credit in this course, but I encourage you to share them on the web, such as in the Flow Vis Facebook Group.

Cloud image submission is similar to the Get Wet submission, with a few important differences:

Changes for Posting Cloud Assignments:

- a) Post on flowvis.com of your edited image (video requirements are the same as for the GW assignment) as the Featured Image. **Edit the publish date of your post to match the date and time that your image was taken.**
- b) In your post, include the appropriate Skew-T diagram (will be covered in lecture) and
- c) a short statement of cloud type and whether the atmosphere was stable or unstable. Not a document, just a short note, to be used as your post title. You will be expected to discuss this in class during your critique.
- d) In Canvas, submit your edited image and your original (unedited) image on October 11.

e) Reports on your Clouds First image/vid will be due Weds Oct 30, both to Flowvis.org and Canvas, along with an assessment (SAF) form, same as for all the other images/vids. Your report should also include the appropriate Skew-T diagram. See the Report Guidelines document at Flowvis.org>Course Info for details. Other submission details are the same as for the Get Wet report.

Photograph a cloud. In fact, photograph clouds as often as possible, and start as soon as possible. You will soon discover that it is not easy to do but that it is a very pleasant diversion from everything else that you do.

Do keep track of where, when, and how the image was made, including what direction you were facing, and what was going on elsewhere in the sky (take some extra photos). **Your report must include atmospheric sounding data** (e.g. a Skew-T diagram; we'll cover how to download the data in class from <http://weather.uwyo.edu/upperair/sounding.html>) and discuss the physics revealed. There will be a series of lectures on cloud physics to help you interpret your images. The most common problem is selecting the wrong date/time for the sounding data. The morning data is taken with a 12Z time, with the correct date. Evening data will have a 00Z timestamp *for the next day*. The Report Guidelines document includes information for your cloud reports.

You can get the altitude of Boulder clouds from the ceilometer at <https://skywatch.colorado.edu/>.

The most famous "cloud" photographs were made in black and white by the legendary early twentieth century New York art dealer, photographer, and husband of Georgia O'Keefe, Alfred Steiglitz. He called them "equivalents" and considered them to be music.

Sunrise and sunset are sometimes quite colorful or even extraordinary, but may be difficult to capture in a satisfying way. During the day, individual clouds can be extremely interesting. In the course of this assignment you will discover what the English writer and amateur photographer George Bernard Shaw once said about the photographer: "The photographer is like the cod (fish) who lays a million eggs so that one may hatch." So, keep looking up and keep pressing the button. And, if you have access to an extreme wide angle lens as well as a telephoto lens, use them as needed and as often as possible. Also consider making a short time lapse video instead of, or in addition to a single image. Most camera phones can automate this process. Also try photographing clouds at night. Many new cameras are sensitive enough to accomplish this now, depending on the phase of the moon, but a tripod will be needed (these are available for checkout).

Clouds require that you think outside the box.

Additional hints:

- Perhaps you have seen the absolute black skies of Ansel Adams, with brilliant picturesque white clouds. If not, do look him up; all photographers should know about him. This trick is accomplished using a red or orange filter with black and white settings. A circular polarizing filter can be used to heighten contrast in color images, but they are pricey and may cause color shifts. This can also be simulated in Photoshop afterwards, at least to some extent.
- Good cloud images can be acquired from airplanes. Be sure your window is clean, and sit in front of the wing if possible, on the side towards the sun.

- Again, many cameras have difficulty focusing on clouds. A manual setting for infinite focus distance is best. You might be able to do a focus lock on a distant hilltop.
- Avoid foreground objects like trees or buildings unless you specifically want them in the image. Parking lots and structures often have good sky views, but streetlight poles can be a problem.