



VISUALIZING SCIENCE

ZOO 5890-4

Fall 18' | Wednesdays | BC 217
9-10:50 AM

Open to all science disciplines
Instructor: Bethann Garramon Merkle, MFA
bmerkle@uwyo.edu

BASICS

- 2 credits | S/U assessment
- Instructor: Bethann Garramon Merkle, MFA | bmerkle@uwyo.edu | BioSciences 16
- Office hours: once/week, time/day TBD with students: _____
Respond to the office hours scheduling poll here: bit.ly/VisSci18_OfficeHoursPoll.

INTRODUCTION

Graduate students in this studio-style course will focus on communicating about science in visual formats, with emphasis on non-specialist audiences. Skills developed in this course will also be useful for academic outlets.

This course is predicated upon a widely held (though not unanimous) interpretation of the social contract scientists have with society – that is, that we as scientists have an obligation to engage with (not just talk at) those beyond our discipline. Collaboration and engagement through visual, written, and oral communication is how we learn about, connect with, and inform change in the world. Whether or not your ultimate goals are to work in an academics, or even research, engaging people inside and outside of your field, and listening to people inside and outside of your field, is critical to professional and civic success. Visualizing Science will give you first-hand experience visually communicating science inside and outside your discipline.



In Visualizing Science, you will continuously create, interpret, and share your writing, research, and thinking about how your science impacts what we think, what we do, and

how we do it. Throughout the course, you will push the boundaries of your creativity and critical thinking; assets for any professional, any citizen.

INCLUSIVE LEARNING COMMUNITY







In order to support your efforts, this course, including affiliated online spaces, supports an inclusive environment that respects the dignity of every person regardless of faith, heritage, sexual orientation or other expression of human identity and difference. In this learning community, we will welcome discourse and intellectual critique but reject harassment in all of its forms. *If you have questions about how this works, how to contribute as a student to this approach to a learning community, etc., do feel free to reach out to me. I am happy to share what I know of for resources, etc.*

COURSE OBJECTIVES





-  Learn about and practice essential skills of effective visual science communication
-  Learn about and practice best practices for how to develop visuals for a range of audiences so your research can inspire and educate

Anticipated Outcomes

Skills

-  Experience with graphic design software and online apps
-  Foundational illustration skills
-  Experience refining science message/story for specific target audiences
-  Experience dealing with image curation and ethics of using images for scicomm
-  Blog writing experience
-  Experience integrating best practices in graphic design into figure plotting in R

Knowledge & Experience

-  Awareness of how public-facing design can enhance scientific figures and presentations;
-  Awareness of best practices in graphic design, including designing for accessibility; and
-  Graphics which will serve both communication/publication purposes and as portfolio pieces to show potential employers, collaborators, and funders;
-  Conduct the visual equivalent of a lit review by researching and identifying visualizations that inspire and inform your own.

COURSE SCHEDULE

Some of the semester is pre-arranged. The rest we will determine collaboratively.

Everything in this schedule is subject to change. I will provide as much notice as possible if anything changes.

Course readings, assignments, and contents will be adjusted to your needs as we move through this together. Such changes may include guest speakers as relevant and possible.

Course Calendar in Brief

A detailed course calendar, with assignment specifics, will be available via the assignments and syllabus functions on WyoCourses.






Week 1 – 29 Aug	Overview & Introductory Exercises
Weeks 2-6 5 Sept-3 Oct	Concept Visualization and Visualization Skills Toolkit Product: a refined visual of a key concept, principle, or result from your research
Weeks 7-11 10 Oct-11 Nov	Spatial Visualization Product: a refined visual of a place, space, structure, relationship, or network
Weeks 12-16 14 Nov-12 Dec	Independent Project: Applications of Science Visualizations; product – an individually motivated visual, along with a plan for utilizing it
Week 16 – finals week	Presentations (3-minute)

COURSE OVERVIEW

Grading

This is a pass/fail (S/U), 2-credit course. See pages 5-8 for major assignment details.

Course outcomes will be assessed through the following mechanisms:

-  Participation (35%)
-  Concept Visualization (15%)
-  Spatial Visualization (15%)
-  Individual Project (20%)
-  Written reflection about one of your visualizations (15%)

Participation

Your participation in class exercises and discussion is critical to the quality of your experience in the course and the success of your fellow students. Make every effort to attend and actively participate in each class meeting. However, you are free to choose not to attend a class meeting if the circumstances warrant. You are responsible for classes you miss. If low attendance becomes a persistent issue, a more restrictive policy may be put in place. If you anticipate being absent, please plan ahead to turn in assignments, etc. I reserve the right to lower your course grade for poor attendance or routinely late work.

Course Format

This course will operate like an art studio course or a writing workshop, in that most of our time in class will be spent creating and/or discussing our work. There will be workshops based on core skills, but few, if any, standard, one-way lectures. Further, you will have opportunities to learn from (and possibly collaborate) with local artists, graphic designers, consultants, and faculty from several units on campus within and beyond the sciences.

You are expected to come to class ready to discuss and work to visualize key concepts or results from your discipline and/or your own research. Through hands-on, project-based

coursework, you will create images that convey these concepts to specific, non-specialist audiences. See separate Resources handout for a list of types of visualizations you and your peers may produce.

Risk-Taking & Safe Learning Environment

Authentic learning requires that we take risks, make mistakes, and learn from our experiences. Learning also requires flexibility, repetition, and exploration on our way to mastering skills and knowledge. In this class, we will all strive to contribute to a positive, productive, and safe learning environment for one another. This includes respecting and actively engaging with the people, ideas, topics, and issues in our course. See Inclusive Learning Community statement (page 2) for details.

Course Websites

1. WyoCourses (uwyo.instructure.com/courses/513082)

I will use WyoCourses to post announcements, assignments, resources, and other course materials. To that end, be sure to check all your settings within WyoCourses, and adjust them to ensure you receive updates (via announcements, assignment postings, etc.) from within the course system. After the first week of classes, all announcements and assignments will be distributed via WyoCourses, not via emails.

2. Engage Laramie Science (engagelaramiescience.weebly.com/)

This public-facing site is for sharing your work and practicing public/popular image curation and writing, etc. See syllabus pages 8-9 for details.

REQUIRED MATERIALS

You!

Every day, you will be responsible for engaging in class discussion as an informed, thoughtful, and respectful classmate. In order to get the most out of class, and to be a valuable addition to your classmates' experiences, please arrive in class having engaged with the material assigned. Most importantly, strive to bring your enthusiasm, curiosity, and good will to class every day. But, I get it – life happens. We'll work together to mitigate.

Course texts

All course texts will be provided via WyoCourses. If you wish to use e-versions of course readings, you may use personal technology in class.

Assigned "texts" will include a mix of peer-reviewed and popular writings, as well as multimedia (videos, podcasts, etc.). Brief written or visual reflections on the texts will often be integrated into assignments, to stimulate your own metacognitive thinking about how you are applying the material.

Note-taking/drafting

Some research suggests that writing notes on paper helps you learn and study better. But if you have a need or preference to use a digital device, that's fine. Out of respect for



everyone's privacy, audio or video recording in class is prohibited unless prior authorization is granted. A sketchbook or notebook with blank pages or gridded pages (vs lined pages) would be a great idea but is not required for notes and image drafting and production (see next section for more on materials).



red-shafted flicker feather

Image production

You will choose the materials you use to create visuals in this class. Possibilities include traditional media (including pencils, pens, markers, crayons, colored pencils, and various types of paints, 3D medias including clay, etc.) and new media (including digital tablets, digital drawing software, online design apps, video, coding programs, etc.). We will discuss materials options in more detail as assignments warrant. Further, I am always happy to chat about materials, should you have questions or ideas. I will support your skill development in your selected media to the extent of my expertise, and I will work with you to identify others on campus who can also mentor you.

Technology

You will need consistent access to a working computer and printer for this course. Contact me well in advance if you need to trouble-shoot this. You will submit digital versions of your work for assignments. Clear photographs of your work done by hand will usually suffice. For 2D work, scanning may result in better-looking versions, which will also enable you to access the image in software such as Photoshop or GIMP, should you want to make hybrid visuals. You are welcome to bring your computer/tablet to do, and display, class-related work.

Assignments

In-class work will depend upon the design, drafting, writing, revision, research, and other project development work you do outside of class. With this in mind, please come to class with assigned work completed. We will use YOUR work every day for full-class workshops, small-group discussions, peer review, and individual revision. Always bring a current draft of your work-in-progress to class in a format you will be able to share with a partner or in a small group. I.e., written work should be printed and brought to class. Visuals can be printed or displayed in their analog or digital form.

COURSEWORK

Thinking and communicating go hand-in-hand, and thus revision is an essential aspect of the composition and design process. Most assignments will involve a combination of drafts, peer reviews, and instructor feedback. Demonstrated engagement in this process



will be a key component of how your work is graded. You will receive rubrics and explanations of specific expectations, along with brainstorming, research, drafting, and revision assignments, at appropriate stages of each assignment.

Images ~ Citations

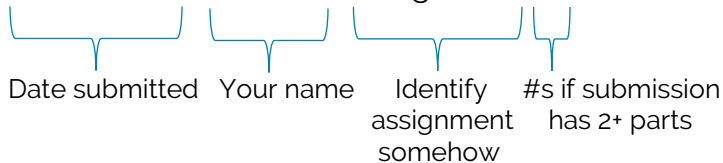
For each assignment, you will submit 3+ images serving as inspiration or resources, along with commentary or captions about how they are informing your work. Consider these images as references. Cite/treat them as you would text references from your discipline's literature. Doing this research, and thinking about how other visualizations work and were created, will enhance your visual literacy and inform your own approach to making visuals. Learning from others' visualizations is fundamental to graphic design and art traditions, just as learning from prior research is a key part of science. With that in mind, all visuals in this syllabus are by me, unless otherwise noted.

Deadlines & Submitting Assignments

I understand that life happens, and I am happy to be flexible in consideration of that. However, regular failure to complete assignments (informal or formal) and/or low investment/participation in class will be considered when assigning final grades. You are expected to turn in drafts of assignments on the dates they are due. Failure to submit assignments on time can result in a reduction in your grade on that assignment and/or in your final course grade. In extreme circumstances, failure to turn in assignments and/or participate in class can result in failure of the course. If you anticipate needing a deadline extension, please make such arrangements at least one week prior to the due date.

Deadlines will typically be Mondays at 5:00 p.m. This time/date provides time for me to review your submission before our next class. It also respects that you have other things to do with your time in the evenings.

Submit files to WyoCourses as .doc, .docx, or .PDF files using the following naming style: YYYYMMDD_FirstLast_Assignment_1.



MAJOR ASSIGNMENTS

Additional, detailed assignment prompts will be provided, via WyoCourses, for individual assignments that scaffold up to completing these major assignments.

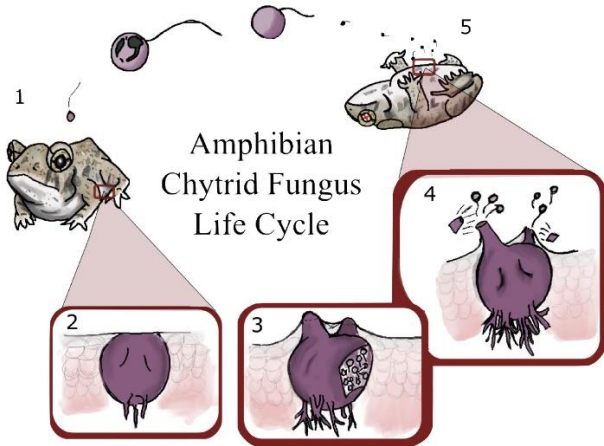
1. Participation (35% of final grade)

Every Wednesday, and when you participate in office hours, you will be responsible for engaging in discussion as an informed, thoughtful, and respectful classmate. In order to get the most out of class, and to be a valuable addition to your classmates' experiences, please arrive in class having engaged with the material assigned. Much of your in-class work will depend upon the design, drafting, writing, revision, research, and other project

development work you do outside of class. Thus, please come to class with completed assignments.

2. Concept Visualization (15% of final grade)

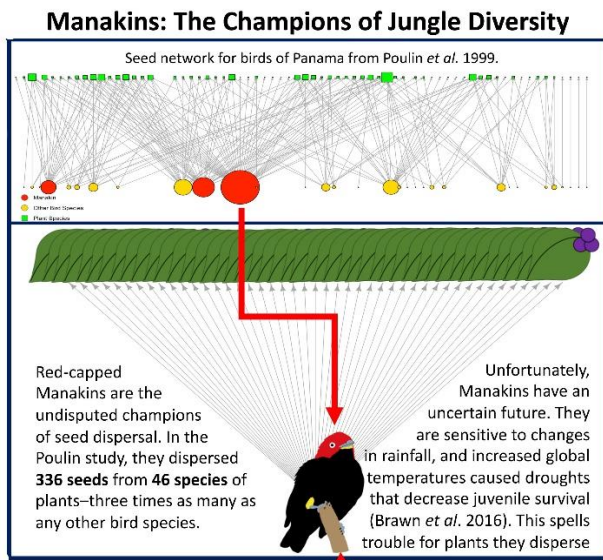
In Unit 1, weeks 2-6, you will draft, refine, and finalize multiple iterations and versions, leading to a visualization of a key concept or process in your discipline, research, or results. Your final visual may be one of myriad possible visualization types. See separate Resources doc (also posted on WyoCourses) for a list of some of these possibilities. Through assignments and in-class work, you will establish a foundational toolkit of visualization skills, both analog and digital.



Amphibian Chytrid Fungus Life Cycle
 Digital illustration
 Melanie Torres, ZOO 5890-4, Fall 2017
 Reproduced with permission

3. Spatial Visualization (15% of final grade)

In Unit 2, weeks 7-11, you will you will draft, refine, and finalize multiple iterations and versions, leading to a spatial* visualization relevant to your discipline, research, or results. Your final visual will depict a place, space, structure, relationship, or network. Through assignments and in-class work, you will practice your toolkit of visualization skills. *If spatial visualizations are not at all relevant to your work, we can identify an alternative assignment focus.



Manakins: The Champions of Jungle Diversity
 Mixed media: Network analysis and digital illustration
 Dan Albrecht-Malinger, ZOO 5890-4, Fall 2017
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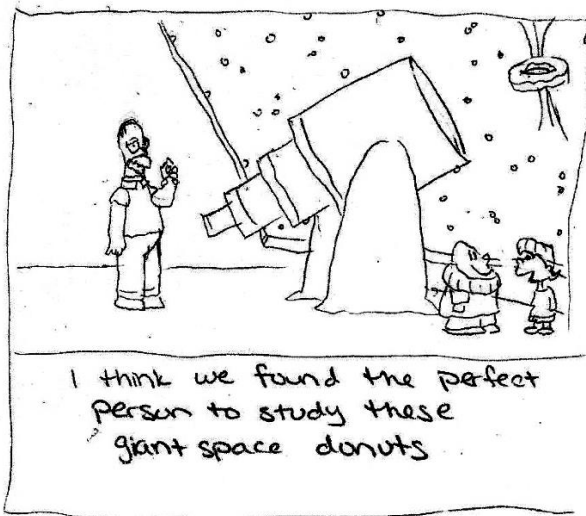
4. Individual Project: Application of Science Visualization Techniques (20% of final grade)

In Unit 3, weeks 12-16, you will research and develop a project proposal and visualization (or series) that meets your own objectives. You will create this project by selecting a skill and/or product you'd like to develop to communicate about your research and a specific target audience. E.g., you might draw a set of comics, produce a short video, design a video game, develop an interactive website, create artwork or music, write lesson plans, draft a grant proposal, or make one or more of the visualization types listed on the separate Resources doc (also posted on WyoCourses) for a list of some of these possibilities.

You should expect to invest significant time to all phases of this project. There will be scheduled check-in/update sessions in class, and there will be time to work on your project in class. However, your project will be self-directed, and you should plan to work on it outside of class, as well.

During finals week, you will present your project to the class and invited viewers from within and beyond the department. You will prepare a 3-minute presentation introducing your project, goals, and self-assessment. While the project you present may be a work-in-progress, you should treat this presentation seriously. Practice, and be prepared for a brief Q&A. Ideally, you will select a target audience for your project which exists in Laramie, so that you can invite people from that audience to your final presentation.

While the project you propose may be longer, these final presentations must take no longer than 5 minutes to watch, listen to, or interact with to a meaningful level. If time allows, we will plan on a panel-type discussion following presentations. I will arrange for refreshments and will certainly arrange for a bigger space than our regular classroom if necessary.



Comic draft about super-massive black holes
Graphite
Michelle Mason, ZOO 5890-4, Fall 2017
Reproduced with permission

Caption:
"I think we found the perfect person to study these giant space donuts."

5. Written meta-analysis of one of your visualizations (15% of final grade):

Assignment: Sometime in the semester, you will write a meta-analysis of one of your visualizations. It will be *at least* 250 words, and will be a reflection or self-assessment of: 1) what you intended to make (and how you did on that goal), 2) target audience, 3) design

considerations you incorporated, 4) 3+ reference visuals that inspired or otherwise informed your visualization, and 5) what you would change if you were to revise or continue working on the visual.

Outlet: This meta-analysis will be published on the public-facing course website/blog: engagelaramiescience.weebly.com/. This website hosts public-facing, regular updates from course activities, including projects in-progress, social media posts, reflections, plans, struggles, celebrations, etc.

You will always have the option to indicate that you do not want your material (submitted homework) to be shared publicly/published on the blog *or used as an example in class*. Please indicate this in the file or in a message accompanying your submission to WyoCourses. That will ensure that note stays with the material through and beyond the semester.

If you want to learn about the back end of using a website, let me know! We can arrange for you to do that part, too.

Scheduling: One or two students per week will have their meta-analysis due and featured. You can choose any visual, in any stage of progress. We will establish the schedule via this poll: bit.ly/VisSci18_CourseBlogSignUp. The poll provides sign-up opportunities for two students each week, starting the second week of class.

Submit your reflection via the established assignment page on WyoCourses when you have it completed, which should be no later than the date you selected, but can certainly be earlier.

Assessment: Depending on the stage of the writing process your reflection is in when you submit it, 2) it may be directly posted to the course website or 2) I will collaborate with you to edit and refine it into a single-authored, polished piece which you can include in the Popular Publications section of your CV.

Component of Complete Blog Post	Complete
Image & image credit/attribution	√
Alt text for image	√
Text to accompany image 100-300 words	√
Social media post sharing blog post	√
Byline (author attribution)	√

ACADEMIC INTEGRITY

Participating regularly in discussions and staying up to date on coursework is an important aspect of academic integrity. In addition, you must also follow UW's Academic Honesty Code (UW Regulation 2-114; bit.ly/uwyoreg-2-114), which prohibits acts of plagiarism. For the purposes of this course, plagiarism is presenting the writing, images, or other intellectual property of others as one's own without appropriate permission, attribution and/or citation. Just as you cite written sources, you are expected to attribute images with the same diligence. If you have questions about how to credit and/or cite sources and images in your work, please do not hesitate to seek my assistance.

SUPPORT

Disability Statement

If you have a physical, learning, sensory or psychological disability and require accommodations, please let us know as soon as possible. You will need to register with, and provide documentation of your disability to, University Disability Support Services (UDSS) in SEO, room 330, Knight Hall.

Email, Staying in Touch, and Instructor Support

University of Wyoming data indicates students who seek additional support for their coursework tend to do better.

I will be actively engaged in your work throughout the course, in class and in response to assignments. We will meet throughout the semester during one-on-one meetings dedicated to discussing your work as you progress through the course. I am also available for additional meetings during office hours or by appointment. I will provide regular feedback on your work, and I will bring in resources, suggest additional readings, etc., as I think you may find them useful.

I am willing to help if you're having any difficulty within or beyond the course, so please don't hesitate to schedule an extended meeting if you have questions, concerns, or difficulties with the class or beyond. I check email regularly weekdays from 9AM-5PM. Still, there are times when it may take a day or more to reply to your messages, so plan accordingly. Please check your e-mail daily so you can stay abreast of any ZOO 5980-4 course updates.

RESOURCES

See separate handout, also posted on WyoCourses, for:

- Types of visualizations (not an exhaustive list);
- On-campus resources including the EcolInfo Working Group drop-in, the WySCI SciComm Support Drop-In, the UW Writing Center, and the UW Oral Communication Center; and
- Useful reference books and websites (not an exhaustive list).



The many ideas we can
consider & visualize together!

(also, yucca seeds)