SCIENTIFIC ILLUSTRATION
Core F Course Proposal ART 3##
4 units: Spring 2017
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COURSE DESCRIPTION

This class provides an introduction to Scientific Illustration starting from fundamental drawing techniques such as chiaroscuro, shading techniques, and contour drawing as well as digital techniques and conceptual models. Students will use graphite, ink, and watercolor to draw from subjects. They will research and write about the history of the field with special attention to the scientific revolution when art and science were particularly intertwined through innovations such as dissection, understanding of anatomy, experimentation, realism and direct observation. Field trip to the Academy of Sciences.

CORE F LEARNING OUTCOMES

Goals:

1. Critically examine issues surrounding visual observation and evidence as it relates to the scientific method.
2. Demonstrate a range of methods for rendering scientific specimens.
3. Identify relevant structures in rendered specimens.
4. Demonstrate techniques of measurement and accuracy in image production.
5. Be familiar with historical figures in scientific illustration.

Learning Outcomes:

1. Demonstrate an understanding of the broad historical and theoretical foundations of an area of the Performing Arts: Dance, Music, and Theater; Fine Arts; Art History; Architecture or Design; through an examination of specific cultural, social, economic and political contexts. Topics should be ones that consider the field of study with depth and breadth.

This course begins by covering fundamental techniques as taught in a studio drawing class. Students will work through exercises in contour drawing, chiaroscuro shading, and texture vs. sfumato, as well as how to work with tools-of-the-trade such as graphite, water color, and digital media. Students will then employ these skills throughout the course as they address scientific specimens.
This class will reveal the visual constructions that shape our knowledge; the visual observations and records that helped establish new paradigms of science; and the reliance on direct observation in scientific practice. Early scientific illustration suffered from a lack of observation. Albrecht Dürer’s “rhinoceros” was drawn from accumulated hearsay. Robert Hooke’s flea was notoriously copied, repeatedly, losing detail with each iteration. Yet the existence of such drawings reflects an urge to understand the natural world through images and the appealing ability of such drawings to communicate.

Concurrent developments in the scientific method and artistic observation (anatomy and perspective) beginning during the 16th century track a changing world view that values observation, testing, and measurement. As William Harvey (scientist) was documenting his observations of the circulation of blood through the body, Leonardo da Vinci (artist) was dissecting cadavers to better depict the human body. Both Galileo (scientist) drew the phases of the moon and JMW Turner (painter) drew cloud formations – from direct observation. Whether the intent was to depict or predict the world, this idea of making use of outward observation was revolutionary, and heretical for the time.

Scientific illustration also has a dark history. Phrenology illustrations were intended to codify psychological diagnostic criteria based on the comparison of skull protrusions. The drawings and specimen preservation of the “Hottentot Venus,” Sarah Baartman, objectified and exploited a group of women from South Africa, building a foundation for scientific racism. Natural history museum display has the effect of validating authorship of the scientific enterprise. This course will address how culturally narrow that validation has been.

2. **Demonstrate orally, in writing, or through production, an understanding of critical approaches to evaluating key works in the respective area and the specific movements and periods associated with it.**

Through slide lectures, individual research, drawing exercises, and class discussions students will see examples of and practice evaluative norms applied within the context of professional and popular science. Class discussions of course readings will include the foundations of image-based evidence gathering and experimentation, display of natural history specimens, and socio-political issues with objectification. Drawing exercises will guide students through the processes necessary to depict specimens. Students will research the shifting philosophies of science and representation through and beyond the Scientific Revolution and Enlightenment.
3. Develop technical and conceptual skills related to the area by engaging in individual and/or collaborative classroom activities.

By discussing course readings and practicing drawing techniques students will employ critical approaches to scientific illustration and critique key works by scientists and artists. Through the practice of drawing techniques and the presentation of research, students will learn to identify the requirements of accuracy and labeling in scientific representation.

4. Demonstrate a broader, critical understanding of specific communities of makers and users by attending presentations related to the subject art (lectures, performances, and museum or other exhibits.)

Students will view works of scientific illustration and draw from specimens at the Exploratorium, Conservatory of Flowers in Golden Gate Park. Field trips to view subject art will be selected from the Rare Book Collection at Gleeson Library, the Achenbach Print Collection at the Legion of Honor, and the Asian Art Museum.

Learning outcomes will be assessed through:

1. Research Presentation: Students will present midterm research based on individual research, course readings, and slide lecture. They will use these notes and write critical reflections on the topics covered in class.

2. Participation in Discussion: Students will be asked to take notes on slide lectures and assigned readings to help shape discussion. Students will be assessed on their contributions to weekly class discussions and group critiques of assigned drawings.

3. Drawings: Students will be assessed on illustrations produced from specimens available in class and independently collected throughout the course.

COURSE READINGS


FIELD TRIPS
Academy of Sciences
Asian Art Museum
Conservatory of Flowers
Rare Book Collection, Gleeson Library
Achenbach Print Collection at the Legion of Honor

SUPPLIES
- Toolbox
- Graphite pencils: 2B, 4B, 6B
- Pencil sharpener (portable)
- Erasers: kneaded, vinyl, and automatic micro
- Blending stumps
- Ruler, 12"
- Calipers
- Sketchbooks: 8x10 and small one sized for field notes
- Technical drawing pens in a range of nib or point sizes.
- Water color set (portable) with brush, water container
- Colored pencils
- Bristol board for assignment work
- Specimens for work outside the classroom

ASSIGNMENTS & ASSESSMENT

<table>
<thead>
<tr>
<th>Assignment</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Participation (discussion and critique)</td>
<td>30%</td>
</tr>
<tr>
<td>Research Presentation</td>
<td>20%</td>
</tr>
<tr>
<td>Drawings</td>
<td>50%</td>
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</tbody>
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‘A’ or Outstanding Students

‘C’ or Average Students
Ability (Talent)
… have special aptitude, motivation, or a combination of both. This talent may include either or both creativity and organizational skills.
… vary greatly in aptitude. Some are quite talented but their success is limited by a lack of organizational skills or motivation. Others are motivated but lack special aptitude.

2. Attendance (Commitment)
… never miss class. Their commitment to the class resembles that of their professor. Attending class is their highest priority.
… periodically miss class and/or are often late. They either place other priorities, such as a job, ahead of class or have illness/family problems that limit their success.

3. Attitude (Dedication)
… show initiative. Their desire to excel makes them do more work than is required.
… seldom show initiative. They never do more than required and sometimes do less.

4. Communication Skills
… write well and speak confidently and clearly. Their communication work is well-organized, covers all relevant points, and is easy to listen to/read.
… do not write or speak particularly well. Their thought processes lack organization and clarity. Their written work may require a second reading by the professor to comprehend its meaning.

5. Curiosity
… are visibly interested during class and display interest in the subject matter through their questions.
… participate in class without enthusiasm, with indifference, or even boredom. They show little, if any, interest in the subject matter.

6. Performance
… obtain the highest scores in the class. They exhibit test-taking skills such as an ability to budget their time and to deal with test anxiety. They often volunteer thoughtful comments and ask interesting questions.
… obtain mediocre or inconsistent scores. They often do not budget their time well on exams and may not deal well with test anxiety. They rarely say much during class discussion and their answers indicate a cursory understanding rather than mastery of material.

NOTE: Performance is a joint function of a student’s native ability and motivation. Punctuality, attendance, attitude, curiosity, effort or time commitment, and preparation all indicate motivation.

7. Preparation
… are always prepared for class. They always respond when called on. Their attention to detail sometimes results in catching text or teacher errors.
… are not always prepared for class. They may not have fully completed the assignment, have completed it in a careless manner, or hand in their assignments late.

8. Retention
… learn concepts rather than memorize details so that they are better able to connect past learning with present material.
… memorize details rather than learn concepts. Since they usually cram for tests, they perform relatively better on short quizzes than on more comprehensive tests such as the final exam.

9. Time Commitment (Effort)
… maintain a fixed study schedule. They regularly prepare for each class no matter what the assignment. They average 3-4 hours of study for every hour in class.
… study only under pressure. When no assignment is due, they do not review or study ahead. They average no more than 2 hours of study for every hour in class. They tend to cram for exams.

ACADEMIC INTEGRITY
Students are expected to comply with the USF Student Academic Policy. Refer to the policy at http://www.usfca.edu/acadserv/catalog/policies_honesty.html and contact the instructor if you have any questions or concerns. Academic Dishonesty includes, but is not limited to:

- Plagiarism; intentionally or unintentionally representing the words of another person as your own; failure to properly cite references; manufacturing references.
- Working with another person when independent work is required.
- Submission of the same artwork or paper in more than one course.
- Submitting an artwork or paper written by another person or obtained from the internet. The penalties for violation of the policy may include a failing grade on the assignment, a failing grade in the course, and/or a referral to the Dean and the Committee on Student Academic Honesty. In addition, a letter will be sent to the Associate Dean for Student Academic Services; the letter will remain in your file for two years after you graduate, after which you may petition for its removal.

LEARNING DISABILITIES

If you have a disability for which you are or may be requesting an accommodation, you are encouraged to contact both your instructor and Student Disability Services, (SDS) (x2613) as early as possible in the semester.

Students must provide written documentation of the disability in the first two weeks of the course, or provide any changes in due diligence during the semester with a signature from the SDS office.
## CALENDAR

### WEEK 1:  **Shape, accuracy and symmetry**  
Assignment: Contour line drawing, long bones & branches

### WEEK 2:  **Chiaroscuro, texture, shading, observation vs. plagiarism in early scientific illustration**  
Assigned readings: “Instruments and Techniques” (p64-79), *The Story of Measurement*  
Assignment: Shaded skull drawing  
Observation as inquiry, response paper

### WEEK 3:  **Field Trip, Rare Book Collection**

### WEEK 4:  **Underlying Structures, golden ratio, fractals**  
Assigned readings: “Models of Branching” (p107-131), *Patterns in Nature*  
Assignment: Pine Cone Structure  
Leaf specimen collection

### WEEK 5:  **Color Theory**  
Assigned reading: “Herbs, herbals and the birth of botany” (p82-108), *Images of Science*  
Assignment: Leaf

### WEEK 6:  **Insect Morphology & Field Notes**  
Assigned reading: “First find your insect” (p11-36), “Insect anatomy for the artist” (p37-78), *Drawing and Painting Insects*  
Assignment: Insect morphology drawing

### WEEK 7:  **Collecting Specimens in the Age of Empire**  
Assigned readings: “Painting as Exploration” (p79-122), *Visible Empire; Botanical Expeditions and Visual Culture in the Hispanic Enlightenment*; “Objects of Ethnography” (p386-443), *Exhibiting Cultures; The Poetics and Politics of Museum Display*  
Assignment: Presentation of scientific illustrator  
Collecting specimens and culture within the Empire, response paper

### WEEK 8:  **Field Trip, Academy of Sciences**
| WEEK 9: | **Chemistry, Apparatus, and Laboratory**  
Assigned reading: “Illustrating Chemistry” (p135-163), *Picturing Knowledge; Historical and Philosophical Problems Concerning the Use of Art in Science*  
Assignment: Molecules |
| WEEK 10: | **Presentations** |
| WEEK 11: | **Digital Techniques, Photoshop**  
Assignment: Digital illustration |
| WEEK 12: | **Digital Techniques, online resources for collage, Protein Data Bank**  
Assigned reading: “Surgical Illustration” (p59-90), *The Digital Biomedical Illustration Handbook* |
| WEEK 13: | **Models, Diagrams, and Metaphors**  
Assigned readings: “The Gilded Age of Evolutionary Trees” (p113-133), *Aristotle’s Ladder, Darwin’s Tree: The Evolution of Visual Metaphors for Biological Order*  
Assignment: 3-Dimensional Clay model |
| WEEK 14: | **Field Trip, Asian Art Museum or Conservatory of Flowers** |
| WEEK 15: | **Final Project Critique** |