SYLLABUS

Creativity: the Convergence of Science, Art, and the Humanities

Instructor: Amy Ione

Using an in-depth and cross-disciplinary approach this course will probe why many people assume that there are old and unsolvable quarrels among the sciences, the arts, and the humanities. Turning to the historical story we will explore various approaches to the questions inscribed within these debates, asking why there appears to be a higher level of communication in periods of intense cross-disciplinary exchange. We will also ask what creativity is and how it fosters the human learning process. Special attention will be given to (1) clarifying how art-making, symbol-making, map-making, and model-making compare, (2) using historical and contemporary case studies to develop a working definition of creativity, and (3) critically analyzing how the various educational alternatives being proposed today actually impact future individual and cultural growth. No previous background in science, mathematics, or art history will be assumed.

Texts

Holton, G. J. (1996). *Einstein, history, and other passions: the rebellion again science at the end of the twentieth century*. Reading, MA: Addison-Wesley Publishing Company.

Osserman, R. (1995). *Poetry of the universe: a mathematical exploration of the cosmos*. New York: Anchor.

Packer, R. and K. Jordan, Eds. (2001). *Multimedia: From Wagner to Virtual Reality*. New York and London, WW Norton & Company.

Rilke, R. M. (1952). *Letters on Cézanne* (Agee, J., Trans.). (2nd ed.). New York: Fromm International Publishing Corporation.

Course Reader

Optional Text

Gombrich, E. H. (1996). *The story of art*. London: Phaidon Press Ltd.

Readings and Weekly Discussion Topics

I. Introduction: Discussion of various ways of defining art, science, literature, mathematics, language, models, myths, metaphors, symbols. Discussion of what correlative thinking, perception, and information are.

No reading assignment due

II. Greek views of nature and the roots of Western ideas about creativity: What do we mean by "Western"? Greeks views of artmaking, techné, humanitas, paideia (culture), and physis (nature). Greek views on illusion and reality. The early Greek scientists: Thales, Anaximander, and the Presocratics. Plato's view of the artist and the scientist.

> Holton: "Understanding the history of science." pp 103-123
> **Reader**:
> Gablik, Progress in Art
> Murdoch, I. The fire and the sun: why Plato banned the artists
> Kline, M. Mathematics in Western culture
> Plato's Allegory of the Cave and selections from Plato's Timaeus

III. Communication, cultural context and critical thinking: What are artmaking and model-making? How art and science define space, time, light, pattern, depth, harmony, aesthetics, perspective, perception, and reality in art and science. Does emotion play a role in art, mathematics, and science. Are our eyes instruments of habit?

> Holton: pp. 125-194
> **Reader**:
> Gordon Onslow-Ford, Inner Realism
> Vincent Van Gogh, Selections from his letters
> Richard Feynman, "The making of a scientist"
> Lorraine Daston, " Fear and loathing of the imagination in science"

IV. Symbols and map-making: What are symbols? Do we create symbols or are symbols pre-existent and archetypal? What are mathematical symbols? What are symbols in art? How do symbols compare with metaphors? Discussion of how people measure the unmeasurable. What are maps? Maps in Dutch art and art as a map. Mercator projections, al-Biruni maps, mapping Euclidean space and non-Euclidean space. How do symbols and metaphors compare with maps? Is the map the territory? Physical maps and cultural maps.

First assignment due

> Osserman: pp. 1 - 60
> **Reader**:
> Selections from Jorge Luis Borges, "The Aleph," "The Circular Ruins," "Limits, "Ars Poetica"
> Alpers, Svetlana, "Art history and its exclusions: the example of Dutch Art."

V. Laws of nature? Discussion of technique, tradition, innovation, and inspiration in art and science. Discussion of how a narrative art and a visual art differ. Discussion of what a quantitative approach to nature is. Discussion of what the observable universe is and historical innovations in art, mathematics, and science. Discussion of how art, mathematics, and science balance visible (optical), invisible (non-optical as compared to subjective), and unknown possibilities.

Osserman: pp. 60 - 100
Reader:
Solso, Robert L., "Perspective and the history of art"

VI. Systems and life: Historical views of the world as a living system. How "physics envy" informed the life sciences. The emergence of the social sciences and statistics. What are static and dynamic models of reality? Can we apply science to society? Nineteenth century Romanticism and the artist as an outsider. Nineteenth century views as compared to those of the twentieth century. Comparing and contrasting emerging ideas in regard to spirit and matter in the arts and sciences.

Osserman: pp. 101 -141
Reader:
Gombrich, "Permanent Revolution" pp. 499 - 533
Immanuel Wallerstein, "Open the Social Sciences"
["Open the Social Sciences" is a summary of a Report by the Gulbenkian Commission on the Restructuring of the Social Sciences. The summary originally appeared in Items, a journal of the Social Science Research Council, Volume 50, Number 1, March 1996. The entire report has been published by Stanford University Press (1996).]

VII. Visions of reality in twentieth century art and science: Introduction to non-optical technologies. Comparing images: fractals, attractors, curved space, Feynman diagrams, particle tracks and bubble-chamber photographs, abstract art, conceptual art, futurism, surrealism, cubism etc.

Osserman: pp. 143-170
Holton: 3-57
Reader:
Excerpts from Kevles

VIII. The public and private process: Discussion of what creativity is and implies. Galileo Galilei (1564-1642), Renaissance astronomer, mathematician, writer, and painter. Paul Cézanne (1839-1906), the Father of Modern art. Robert R. Wilson (b. 1914), a twentieth century physicist and sculptor.

Second assignment due

Reader:
Articles on Robert R. Wilson
Holton: pp. 78 - 121, pp. 194-207
Begin Rilke (Cézanne)
Review Galileo reading

IX. Imaginative and applied technologies: Discussion on what creativity is and implies continued. Innovations and applications. How scientific innovations have changed artmaking (e.g., chemical innovations that enhance the quality and flexibility of materials, better equipment, etc.). Photography: art, science, or both? Technology and problem-solving as art and science. Using conservation techniques to preserve historical art. Biomedical imaging and visual science.

Finish Rilke
Holton: pp. 58-77
Reader:
Articles on conservation
Feynman, "He fixes radios by thinking"
Beck, "The Future of Imaging Science"

X. Globalization: the East, the West, modern, premodern, and indigenous visions: What do we mean by "Western" revisited. Discussion of what nature and reality are in art, science, and culture.

Reader:
Benjamin, Walter, The Work of Art in the Age of Mechanical Reporduction
Gombrich, E. H."Eastern inventions and western response"
Chuan, C. The mustard seed manual of painting
Articles on new cave painting discoveries in France

XI. Conclusion: art, science, and mathematics in a multicultural world: What is discovery in art, science, and mathematics? How are images, works, and logic related? Why do some suggest that the motivations behind art and science represent conflicting impulses, while others see the two approaches as integrally related? How have artistic, scientific, and mathematical innovations been instrumental in building and redefining individual and cultural assumptions? Final paper due

Reader:

Briggs, J. Fire in the Crucible

Assignments and Grading

Each student will be required to submit two short essays and a final paper. The essays (3-5 pages) are to be based on the readings and class discussion. Essay questions will be handed out in class.

Each essay is worth 20% of your overall grade. The first essay is due the fourth week of class. The second essay is due the eighth week. The intention of these minipapers is to demonstrate your understanding of the readings and the topics discussed in class.

The final paper (10-12 pages) accounts for 50% of the overall grade. This is to be a research paper, complete with references, on a topic of your choice. It is due the last day of class. Please draft a one page outline of the paper by the ninth week so that I can approve your topic and project design. This will also allow me to give you feedback and help you organize your research. It is acceptable for your final paper to be an expansion of one of your earlier essays.

General classroom participation, attendance/attitude will make up the remaining 10%.

Letter grade.

A = Comprehensive and insightful papers.

B = Well-written and critically probing papers.

C = An adequate presentation of basic concepts and evidence of an effort to grasp the course material.

Note:
Class attendance is important. Students are advised that more than one absence will adversely effect the course grade.

Books of Special Interest

Abbott, E. A. (1963). *Flatland*. New York: Dover Publications, Inc.

Alpers, S. (1983). *The art of describing: Dutch art in the seventeenth century*. Chicago: The University of Chicago Press.

Arieti, S. (1976). *Creativity: the magic synthesis*. New York: Basic Books, Inc., Publishers.

Baxandall, M. (1985). *Patterns of intention*. New Haven and London: Yale University Press.

Baxandall, M. (1995). *Shadows and enlightenment*. New Haven and London: Yale University Press.

Beck, R. N. (1994). "The Future of Imaging Science." In T. S. a. J. Umiker-Sebeok (Ed.), *Advances in Visual Semiotics – The Semiotic Web* (pp. 609-642). Berline: Walter de Gruyter, Mouton Publications.

Borges, J. L. (1971). *The Aleph and other stories 1933-1969* (di Giovanni, Norman Thomas, Trans.). New York: Bantam Books.

Brennan , P. (1994). *The camera obscura and Greenwich*. Greenwich: National Maritime Museum.

Briggs, J. (1990). *Fire in the crucible: the self-creation of creativity and genius*. Los Angeles: Jeremy P. Tarcher, Inc.

Clark, T. J. (1985). *The painting of modern life: Paris in the art of Manet and his followers*. New York: Knopf.

Coomaraswamy, A. K. (1934). *The transformation of nature in art*. New York: Dover Publications.

Csikszentmihalyi, M. (1966). *Creativity: flow and the psychology of discovery and invention*. New York: HarperCollins.

Einstein, A. (1973). *Ideas and opinions*. New York: Dell.

Fermi National Accelerator Laboratory. (1979). *Aesthetics and Science*. Proceedings of the International Symposium in honor of Robert R. Wilson, April 27, 1979. Batavia Illinois.

Fromentin, E. ((1875) 1981). *The masters of past time: Dutch and Flemish painting from Van Eyck to Rembrandt*. Oxford: Phaidon Press.

Gablik, S. (1977). *Progress in art*. New York: Rizzoli.

Galilei, G. (1957). *Discoveries and Opinions of Galileo*. Garden City, New York: Doubleday Anchor Books.

Galison, P. L. (1997). *Image and logic: a material culture of microphysics*. Chicago and London: The University of Chicago Press.

Gardner, H. (1982). *Art, mind, and brain*. New York: Basic Books, Inc., Publishers.

Gardner, H. (1997). *Extraordinary minds*. New York: Basic Books.

Ghiselin, B. (Ed.). (1952). *The creative process*. New York: Mentor Books.

Gould, S. J. and R. W. P. (Photographer) (2000). *Crossing Over Where Art and Science Meet*. New York, Random House/Three Rivers Press.

Guillen, M. (1994). *Five equations that changed the world*. New York: Hyperion.

Hall, S. S. (1992). *Mapping the next millennium*. New York: Vintage Books.

Henderson, L. (1983). *The Fourth Dimension and Non-Euclidean Geometry in Modern Art*. Princeton: Princeton.

Hilts, P. J. (1982). *Scientific temperaments*. New York: Simon and Schuster.

Hockney, D. (2001). *Secret Knowledge: Rediscovering the Lost Techniques of the Old Masters*. New York, Viking Studio.

Kaufmann, T. D. (1993). *The mastery of nature: aspects of art, science, and humanism in the Renaissance*. Princeton: Princeton University Press.

Keller, E. F. (1983). *A feeling for the organism*. New York: W.H. Freeman and Company.

Kemp, M. (1990). *The science of art: optical themes in western art from Brunelleschi to Seurat*. New Haven and London: Yale University Press.

Kevles, B. H. (1997). *Naked to the bone: medical imaging in the twentieth century*. New Brunswick, New Jersey: Rutgers University Press.

Kline, M. (1953). *Mathematics in Western culture*. New York: Oxford University Press.

Leshan, L., & Margenau, H. (1982). *Einstein's space and Van Gogh's sky*. New York: Macmillan Publishing Company.

Lippard, L. R. (1990). *Mixed blessings: a new art in a multicultural America*. New York: Pantheon Books.

Lovejoy, M. (1997). Postmodern currents: art and artists in the age of electronic media. Upper Saddle River, NJ, Prentice Hall.

Mitchell, W. J. (1992). The Reconfigured Eye: Visual Truth in the Post-photographic Era. Cambridge, MA and London, England, The MIT Press.

Murdoch, I. (1977). *The fire and the sun: why Plato banned the artists*. Oxford: Oxford University Press.

Onslow-Ford, G. (1978). *Creation*. Basel: Basler Druck-und Verlagsanstalt.

Panofsky, E. (1971). *Early Netherland painting: its origins and character* (vol 1 & 2). New York: Icon.

Panofsky, E. (1991). *Perspective as symbolic form* (Wood, Christopher S., Trans.). New York: Zone Books.

Rhie, M. M., Thurman, Robert A. F. (1991). *Wisdom and Compassion: The Sacred Art of Tibet*. New York: Harry N. Abrams, Inc.

Robin, H. (1992). *The scientific image: from cave to computer*. New York: Hrry N. Abrams, Inc.

Rush, M. (1999). *New Media in Late 20th-Century Art.* London, Thames & Hudson.

Snow, C. P. (1963). *The two cultures and the scientific revolution*. New York: Cambridge University Press.

Solso, R. L. (1994). *Cognition and the visual arts*. Cambridge, MA and London, England: A Bradford Book.

Stafford, B. M. (1994). *Body criticism: imaging the unseen in Enlightenment art and medicine*. Cambridge, MA and London, England: The MIT Press.

Stafford, B. M. (1996). *Good looking: essays on the virtue of images*. Cambridge, MA and London, England: The MIT Press.

Stiles, K., & Selz, P. (Eds.). (1996). *Theories and documents of contemporary art: a sourcebook of artists' writings*. Berkeley and Los Angeles: University of California Press.

Taylor, J. C. (1981). *Learning to look: a handbook for the visual arts*. Chicago and London: The University of Chicago Press.

Vredeman de Vries, J. ((1604) 1968). *Perspective*. New York: Dover Publications, Inc.

Wallerstein, I. (1996). *Open the social sciences: report of the Gulbenkian Commission on the restructuring of the social sciences*. Stanford: Stanford University Press.

Wallace, D. B., & Gruber, H. E. (Eds.). (1989). *Creative people at work: twelve cognitive case studies*. New York and Oxford: Oxford University Press.

Watson, J. D. (1968). *The double helix*. New York: Atheneum.

Wilson, S. (2002). *Information Arts: Intersections of Art, Science, and Technology*. Cambridge, MA and London, England, The MIT Press.

Zajonc, A. (1993). *Catching the light: the entwined history of light and mind*. New York: Oxford University Press.