

# THINK ABOUT THE NATURAL WORLD (USNA)

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## **USNA 211. Einstein, Space and Time. 3 Units.**

This course will explore the profound changes in our conception of space and time brought about by Einstein's theories of special and general relativity. As a University Seminar, it will also integrate writing and discussion about these topics into the class and explore the philosophical and technological context in which the ideas were developed. Prereq: Passing letter grade in a SAGES First Seminar, Academic Inquiry (AIQS) Seminar, or FSTS 100.

## **USNA 220. Suburban Landscapes: Nature, Technology, and Culture. 3 Units.**

This course will examine suburban neighborhoods by focusing on the design of technology and nature in these spaces. The way that people understand and operate in the world is so entangled with values and assumptions that the physical shape of the world cannot be separated from human culture. In this sense, suburban landscapes are not simply neighborhoods but also examples of culture. The form of the land and the technologies in the suburbs are continually reshaped to correspond with the cultures of the people occupying those spaces. By studying suburban landscapes we can see how the ideas in people's heads become part of the physical world in which we live. Prereq: Passing letter grade in a SAGES First Seminar, Academic Inquiry (AIQS) Seminar, or FSTS 100.

## **USNA 226. Evolution of Human Behavior. 3 Units.**

Human behavior is a result of the complex interplay between our genes and the environment, both of which have been shaped by evolutionary forces over millions of years. To what extent does natural selection shape our behavior today? Are humans naturally monogamous? Why do conflicts arise even in our most intimate relationships? Is human behavior ultimately in the service of reproductive success, ensuring that our genes are passed into the next generation? This course reviews the history of evolutionary theories of mind and behavior, as well as current ideas about the ecological and genetic components of behavior. We will examine key principles of neurobiology, sociobiology, and evolutionary psychology to critically evaluate evolutionary interpretations of human behaviors, including those comprising cultural traditions and social institutions. Specific topics to be addressed include human mate choice, parenting strategies, interpersonal conflict, and altruism. The course is structured as a seminar, with emphasis on discussion and formation of logical arguments. Prereq: Passing letter grade in a SAGES First Seminar, Academic Inquiry (AIQS) Seminar, or FSTS 100.

## **USNA 230. ATTENTION! Understanding the Human Attention System. 3 Units.**

You're in a crowded room, in the middle of a heated conversation. Suddenly you hear someone across the room say your name. How were you able to pick out that particular sequence of sounds from all the noise around you? Why did you even notice it, given that you were talking to someone else? This course looks at this phenomenon and others having to do with the human attention system. While much of what we read will be from the fields of psychology and neuroscience, we'll also consider aspects of attention that have to do with literature, the arts, and religion. Prereq: Passing letter grade in a SAGES First Seminar, Academic Inquiry (AIQS) Seminar, or FSTS 100.

## **USNA 240. Technologies of the City. 3 Units.**

Based on the premise that cities are never "finished," and constantly being remade, the University Seminar, Technologies of the City, will look at the technological and cultural history of cities from the ancient world to the present day. Students will explore the history of building materials—wood, brick, steel, concrete, and glass—used in the construction of cities. We will also trace the development of city infrastructure such as electricity, water and sewage systems, streets bridges, and subways. Technological innovations, such as the automobile, will receive special consideration. We will move both geographically and temporally to visit the world's great cities, studying examples of significant building projects, such as the Brooklyn Bridge, the Chicago World's Fair, and Cleveland's first skyscraper, the Rockefeller Building. The course will cover the history of the professions—engineering, architecture, and urban planning—that have contributed to the construction of cities, and will review the works of these practitioners, as well as that of artists, reformers, and utopians that have imagined new directions for the city. Prereq: Passing letter grade in a SAGES First Seminar, Academic Inquiry (AIQS) Seminar, or FSTS 100.

## **USNA 258. Designing Urban Green Space. 3 Units.**

In this course, we will investigate the history, theory and practical design of green space in cities. We will focus on types of green space and their community function, relationship to commerce, aesthetics, recreation, ecology, and health in particular. Students will engage in group projects where they locate all underused space in Cleveland (vacant space, gray or brown fields) and will propose a new use for it as green space of some kind. Individual research projects will be related to that site. Lively class discussion and frequent reading responses required. Mandatory field trip to sites in downtown Cleveland. Prereq: Passing letter grade in a SAGES First Seminar, Academic Inquiry (AIQS) Seminar, or FSTS 100.

## **USNA 265. Thinking National Parks. 3 Units.**

This seminar provides students an opportunity to explore U.S. national parks and their history of displaying both nature and culture. This discussion-based, writing- and research-focused class requires students to examine a park system that is both extraordinarily popular and rife with controversy. We begin with several recurring questions: Where did the national parks idea come from? How has the park mission evolved and adapted? Can parks be "read" as texts, and if so, how does our point of view determine what we see? How do parks arrange displays of cultural and natural worlds, and how do they display interactions therein? How can changing park philosophies be reflected in their physical apparatus and infrastructure? Students will participate in regular class discussions, occasionally lead these same discussions, complete formal writing assignments, and develop a final research project. The course readings will alternate between historical and present-day selections, so that we explore the history of U.S. national parks while simultaneously considering challenges and controversies that matter very much today. Early readings will include John Muir and Gifford Pinchot; current trends will be explored in the writings of William Cronon, Alfred Runte, and Jennifer Price, among many others. We will view significant portions of Ken Burns' recent PBS series *The National Parks: America's Best Idea*. The ultimate "text" for the class, however, is an actual national park. Each student will choose a national park as the basis for their semester-long project. Students will begin with description and history of their park, and then they will explore controversies or other issues in the park, developing their own argument. Next, students will have a chance to play architect/landscaper/park-superintendent, as they propose a change to the park that would address an existing problem or enhance the visitors' experience. Finally, students will gather these pieces into a single coherent project, submitting a 10-15 page final essay as well as producing an engaging class presentation. Prereq: Passing letter grade in a SAGES First Seminar, Academic Inquiry (AIQS) Seminar, or FSTS 100.

**USNA 266. Life After the Death of Print. 3 Units.**

Around 1439, Johannes Gutenberg invented the moveable type printing press, a technological development that altered the world by ushering in an era of mass, reproducible communication. For nearly 500 years, print technologies have dominated communications. Scholars have shown that print's ability to disseminate information led to revolutions in art, science and politics. In short, print technologies have largely defined what it means to be a thinking and communicating human being. The emergence of digital technologies has altered communications in ways that are only now being understood. This course examines how developments in digital technologies impact communication practices by threatening print's historic stronghold. Consequently, the course also explores what impact new technologies have on human identity. We will consider the historical development of display technologies (printed materials and digital screens) to understand what is at stake in the move from print to digital communication. We will then investigate current phenomena associated with Web 2.0, including blogs and social networks, in order to understand how our communication choices construct and allow for our public and private identities. Additionally, the course will examine new display technologies, such as iPhones and Kindles, that allow for the possibly constant dissemination of those identities. Finally, we will hypothesize about how digital technologies force us to conceive of human identity differently from the ways that print invites. Prereq: Passing letter grade in a SAGES First Seminar, Academic Inquiry (AIQS) Seminar, or FSTS 100.

**USNA 271. Gene, Environment and Behavior. 3 Units.**

The goal of this course is to encourage students to be well informed and critical consumers of the media reports about the influence of genes and environment on human behavior. This course involves the book by Matt Ridley titled, "Genome: The autobiography of a species in 23 chapters." Ridley has a Ph.D. in zoology, worked as a journalist, science editor, and national newspaper columnist. The book devotes a chapter to each pair of human chromosomes. Each chapter focuses on the role of a gene. Ridley's book was published in 1999; therefore, students will conduct their own research to update each of the chapters in Ridley's book. The first few weeks of class will be used to provide a background on genetics research through field trips and guest lectures from CWRU genetic researchers. We will have several writing workshops spread throughout the semester to offer "Just in Time" tips needed to write critical evaluations and literature reviews. Each student will present twice during the semester. The first oral presentation will revolve around a summary, critical evaluation, and an update of the human trait presented in the Ridley book on their assigned chromosome. The presentation will be about 15 minutes with 5 minutes left for questions. Students not presenting will be assigned one of the three chromosomes (chapters) covered that day and they will each write a seminar question to pose to the class. In addition, each student will also serve as a reviewer for one of the presentations to provide constructive feedback to the presenter. The second presentation will consist of new material found by each student about genes on their chromosome. They must find another trait on their chromosome and present the most current information available on that trait. In place of a final exam, each student will turn in a research paper on their assigned chromosome. We will build these papers throughout the semester with a series of graded "checkpoint" assignments. Prereq: Passing letter grade in a SAGES First Seminar, Academic Inquiry (AIQS) Seminar, or FSTS 100.

**USNA 285. The Science of Madness: An Historical Investigation of Mental Illness. 3 Units.**

Since antiquity the western world's understanding of mental illness has continued to evolve. This course will examine the trajectory of that evolution, looking at the medical theories that have influenced assumptions about the causes and treatments of mental illness from the early modern era through the twenty-first century. Examples of questions we will investigate include: How we have defined the normal and the pathological in human mental behavior over time? How do we explain the centuries-old correlation that medicine has made between creativity and mental illness? Which past and present psychiatric treatments have been beneficial and which harmful? How did Darwin's theory of evolution affect theories of mental illness (and how does it continue to do so with the advent of evolutionary psychology)? How have changing philosophies of science affected the research and practice of psychology? How and why do the sciences of the mind—psychiatry, psychoanalysis, clinical psychology, psychopharmacology, the cognitive neurosciences—claim so much scientific authority and exert influence over our lives today? As a frame work for this inquiry, the class will use the concept of paradigm shifts as Thomas Kuhn defines in his classic work, the Structure of Scientific Revolutions. Prereq: Passing letter grade in a SAGES First Seminar, Academic Inquiry (AIQS) Seminar, or FSTS 100.

**USNA 287C. Animals and Humans: Making Sense of the Human-Animal Bond. 3 Units.**

Humans have an incredibly complex relationship with (non-human) animals. We eat some animals and consider other animals members of our family. We worship some animals and vilify others. This class examines the complexities of our relationship with (non-human) animals. Through exploring human emotional, practical, and epistemological ties with animals, this course examines what it means to be animal as well as what it means to be human. We analyze the following questions. How do we come to know and understand animals? What are the issues surrounding the use of animals in scientific speculation, classification and experimentation, such as vivisection, cloning and the human-animal relationship in technoscience? Do some non-human animals possess material culture, social morality, and emotions such as grief and sadness? Why do animals populate our popular culture and art? Prereq: Passing letter grade in a SAGES First Seminar, Academic Inquiry (AIQS) Seminar, or FSTS 100.

**USNA 287D. Native American Environmentalism: Sustainability and Contemporary Energy. 3 Units.**

This seminar course will focus on three main areas of Native American environmentalism. First, we will learn about Native Cosmologies and historical connections to the land while exposing the controversial relationship of Native Americans to land and wildlife within the myth of the "ecological Indian." Second, we will examine how Native Americans have responded to toxic pollution of indigenous lands as a result of manufacturing and uranium mining, which some refer to as "environmental racism." We will also learn about tribes who choose to host nuclear waste facilities as an exercise of their sovereignty and as an avenue of economic development. Finally, we will investigate initiatives by tribes and coalitions in land and water stewardship, investment in "new" energies and technologies, sustainability of lands (prairie and forest restoration), reclamation of waterways (dam removal), and wildlife management, to name a few. Students will inform their critical thinking about Native American environmentalism with a variety of texts and websites of scholarly and public opinion, scientific data, native knowledge, and historic fact. The seminar will include collaborative learning and presentation projects in which students will pursue research topics related to energy development, stewardship and sustainability, or wildlife management and harvesting. Prereq: Passing letter grade in a SAGES First Seminar, Academic Inquiry (AIQS) Seminar, or FSTS 100.

**USNA 287E. Evolution and the Modern World. 3 Units.**

Modern evolutionary theory has influenced all aspects of biology and the clinical sciences. It has, moreover, resulted in novel ways to think about many of the social sciences. This class will focus on how the concept of evolution has dramatically altered the way we view human anatomy, physiology, and behavior. Prereq: Passing letter grade in a SAGES First Seminar, Academic Inquiry (AIQS) Seminar, or FSTS 100.

**USNA 287G. Genes, Genomes and Society. 3 Units.**

2013 marks the 60th anniversary of the discovery of the double helix of DNA and the 10th anniversary of the sequencing of the first human genome. Advances in genetics (the study of individual genes), and genomics (the study of an entire genome) have fundamentally altered our understanding of biology. In this seminar, we will focus on topics covered by the mainstream press. We will explore the science behind the news and discuss the philosophical, ethical and societal concerns raised by these scientific advances. Topics will include: the dangers and benefits of genetically modified crops; genetics and the conservation of endangered species; learning about human biology and disease from yeast, flies, worms and fish; the use and potential misuse of genetic fingerprinting by government agencies; genetic testing; personalized medicine; and issues of genetic privacy. Prereq: Passing letter grade in a SAGES First Seminar, Academic Inquiry (AIQS) Seminar, or FSTS 100.

**USNA 287H. Plants in Medicine. 3 Units.**

Plants have always been the basis of medicinal treatments, and as they continue to be essential to modern forms of medicine, alternative and traditional alike. In this course, we will consider the history of how humans have used particular plants for medicinal purposes, such as the cinchona tree (*Cinchona officinalis*) for quinine, willow bark (*Salix*) for aspirin, and the yew tree (*Taxus baccata*) for the cancer medication paclitaxel. By investigating how a plant is used medicinally through time, we will also come to understand the culture that used it and how they conceived of health in relationship to nature. We will read texts that show how a plant's medicinal uses can be tied to colonialism and global exploration. For example, the first botanical gardens were collections of medicinal plants cultivated for use and experimentation, often containing non-native plant-based cures discovered through colonial contact. While this is not a course in botany per se, we will be discussing basic plant biology, cultivation practices, and the contemporary science of using plants as the basis for pharmaceutical cures. Students should be active course participants in class discussion and on field trips. Writing instruction will focus on research-based argument, and students will complete a researched essay focusing on a medicinal plant of their choice. Prereq: Passing letter grade in a SAGES First Seminar, Academic Inquiry (AIQS) Seminar, or FSTS 100.

**USNA 287J. Transportation in American Life. 3 Units.**

We will explore the critical role of transportation in the development of our cities, regions, states, and nation. The course will consider the historic role of transportation, its current role, and what role it might play in the future. Transportation will be viewed in the context of national policies, overall political will, and our culture at large. Since colonial times, transportation, in its many forms, has been the subject of intense debate, governmental policies, as well as the subject of public and private investment. We will see how certain individuals and groups used ego, power, and wealth to use transportation for shaping the nation's commerce, travel patterns, and physical appearance. We'll also see the evolution of government and business in transportation decisions and funding. Finally, because of transportation's daily impact, we will look at current issues as part of every class. We will especially focus on the transportation issues of northeast Ohio, a microcosm of national transportation issues. Some of these issues include funding, decision-making, land use, "suburban sprawl," and economic development. We'll also look at transportation issues specific to the University Circle area such as the Health Line and the proposed "Opportunity Corridor." Prereq: Passing letter grade in a SAGES First Seminar, Academic Inquiry (AIQS) Seminar, or FSTS 100.

**USNA 287K. Human Research Ethics: Scientific Truth vs. Cultural Belief. 3 Units.**

Scientific breakthroughs in genetics, neuroscience, and behavioral psychology have allowed us to learn more about ourselves than ever before. But how much do we really want to know - and who gets to decide? Is DNA our destiny? Should the quest for scientific knowledge trump cultural belief? How does society balance risk to a few in the face of the needs of the many? Using a blend of historical documents and literary examples, we will examine the evolution of the ethical standards that govern how doctors experiment on their patients. We will also debate the hard choices that medical researchers make when the quest for scientific truth intersects with cultural belief. Finally, we will apply what we have learned to find solutions to real-world ethical problems in medical research. Prereq: Passing letter grade in a SAGES First Seminar, Academic Inquiry (AIQS) Seminar, or FSTS 100.

**USNA 287P. Women and Science: Changing Paradigms. 3 Units.**

Is science objectively neutral in that true scientific knowledge would be independent of the discoverer? In this view, the scientific discoverer is more like a midwife that brings forth pre-existing knowledge to the world. Or - is scientific knowledge guided and shaped by the people who practice science, in which case it is influenced by the social context in which it occurs, making the scientist more like a sculptor who creates something new using the tools that are currently available. In this course we will examine this second question by looking specifically at the relationship of gender to science through several lenses. One approach we will use is make case studies of the lives of major women scientists and the way that their gender impacted their work, from the type of scientific research they pursued, the kind of support and encouragement that they obtained as they proceeded in their careers, to the rewards and recognition (or the lack of them) that their work received from their peers. Using a more conjectural line of inquiry, we will also consider the role that gender might have played in developing scientific theories and whether there can be such categories as "masculinist" and "feminist" science. We will conclude this part of our inquiry with an analysis of the current state of science and how well these approaches reflect the way science is pursued today. A third issue involves looking at the relationship of gender and science but from the opposite direction. In other words, we will consider how science has influenced our understanding of gender, rather than how gender has influenced science. Over time, scientific ideas about the physiological and intellectual differences between males and females have changed dramatically several times with major political and sociological ramifications. Consequently, we will examine the science of gender in its cultural and political context from antiquity through the twentieth century. In order to explore these interweaving threads, we will be taking an interdisciplinary approach that will draw on the history and philosophy of science (particularly Thomas Kuhn's *The Revolution of Scientific Ideas*), as well as on anthropology and cultural theory. By the conclusion of the course we will have examined the scientific evidence that has supported assumptions about gender in various philosophical paradigms, including humanism, rationalism (i.e., Enlightenment philosophy), nineteenth century moralism, modernism, and postmodernism. Prereq: Passing letter grade in a SAGES First Seminar, Academic Inquiry (AIQS) Seminar, or FSTS 100.

**USNA 287S. Society and Natural Resources. 3 Units.**

The relationship between humans and the natural world can be defined in large part by how societies manage natural resources. In this seminar, students will analyze how society-environment interactions have undergone substantial shifts over time...from John Locke's Labor Theory of Value and the rise of utilitarian conservation to more recent approaches based on ecosystem management that emphasize ecological integrity and stakeholder collaboration. Course readings will challenge students to think critically about how humans conceptualize and impact the environment. Class time will be spent discussing the evolution of effective human-ecological systems interactions as outlined in the readings, as well as reviewing student reflection papers that connect course concepts to real world scenarios. Prereq: Passing letter grade in a SAGES First Seminar, Academic Inquiry (AIQS) Seminar, or FSTS 100.

**USNA 287T. Conflicts and Controversies in American Science and Technology. 3 Units.**

How do changes in science and technology affect American life? How do cultural ideas shape scientific practice? Is technological progress inevitable, or do we get to decide what changes we want and which ones we don't? How do we make ethical choices about science and technology in a world with inherent power imbalances? This course provides an introduction to thinking through these questions by presenting works by historians, anthropologists, political scientists, philosophers, journalists, and others to explore a range of social issues in modern science and technology. After two weeks of introduction, the course is divided into four sections: (a) Biology, Biotech, and Biomedicine; (b) Science Policy and the Politics of Science; (c) Problems in Social Science; and (d) Computers and Other Thinking Machines. While the course's content is arranged around these topics, its main purposes are to develop critical thinking skills around ubiquitous and contentious subjects of science, technology, power, culture, and values as well as to hone skills in reading, speaking, research, and essay writing. Prereq: Passing letter grade in a SAGES First Seminar, Academic Inquiry (AIQS) Seminar, or FSTS 100.

**USNA 288B. The Green Energy Transformation in Germany. 3 Units.**

This seminar introduces students to the development and successes of green technologies in Germany. We will examine the proactive development of renewable energy and energy conservation technologies, commonly referred to as *Energiewende*, that was started by the German Green movement and promoted by Germany's innovative renewable energy policies. We will consider such questions as: What are the implications of this German success story, both for the US and the rest of the world? What lessons can be applied to other situations? What factors might limit the utility of those lessons? In the process of our investigation, we will examine such important issues as globalization, resource finiteness, and sustainability challenges, including economic crises, climate change, energy insecurity, and global competition. Prereq: Passing letter grade in a SAGES First Seminar, Academic Inquiry (AIQS) Seminar, or FSTS 100.

**USNA 288C. Physics for Future Innovators & World Leaders. 3 Units.**

We live in an increasingly technological society. Advances in technology improve our lives in countless ways, but they sometimes produce problems and challenges that are so complex that the average business or political leader may not understand them--and therefore cannot make effective decisions to address them. Whether the problem is what to do about climate change, deciding on which sources of energy are worthy of investment, updating the electrical grid, or how to deal with terrorist threats, we will be able to find the best solutions only if our leaders have an adequate understanding of the underlying physical principles (e.g., energy, force, space, radiation, electricity, and exponential growth), and where to find credible information that will assist in answering key questions. This course is designed to equip students with that knowledge. We will also explore various "conversation" that pertain to the above issues with the goal of gaining a better understanding of differing points of view (e.g., reporter, scientist, business person, politician, parent, student, people from different cultures), and how rudimentary understanding of the science behind some of our most pressing technological problems can affect a person's stance or actions. This seminar is appropriate for undergraduates of any major. Prereq: Passing letter grade in a SAGES First Seminar, Academic Inquiry (AIQS) Seminar, or FSTS 100.



**USNA 288I. Beyond Silicon Valley: Growing Entrepreneurship in Transitioning Economies. 3 Units.**

The path for entrepreneurs to grow their companies outside of well-developed entrepreneurial ecosystems like Silicon Valley is challenging. Most markets around the world do not look like Silicon Valley and they never will. But there are other models to support new businesses. In transitioning markets (where entrepreneurs do not have much access to private sector financing), government officials, donors, and business leaders are experimenting with creative approaches to support the growth of entrepreneurs. Cleveland is one such place exploring innovative approaches to support new businesses. For over ten years, there has been a massive intervention of government and donor resources to cultivate this entrepreneurial ecosystem. Has this intervention worked in Cleveland? How should success be measured? How does Cleveland's approach differ from approaches elsewhere around the world? In an unusual twist for a SAGES seminar, the regular classroom discussions will be complemented by your enrollment in a massive open online course (MOOC) that I developed for CWRU. The MOOC is called "Beyond Silicon Valley: Growing Entrepreneurship in Transitioning Economies" and examines the Cleveland case study in depth. The course has attracted over 44,000 students from 190 countries since its launch in April 2014. So, not only will you explore how communities around the world support entrepreneurship, you will also learn about the rapidly developing field of online learning and MOOCs. Prereq: Passing letter grade in a SAGES First Seminar, Academic Inquiry (AIQS) Seminar, or FSTS 100.

**USNA 288K. Burn, Baby, Burn! 3 Units.**

In the title of his novel Fahrenheit 451, Ray Bradbury was referring to the autoignition temperature for paper. But why does cellulose burn at 451 degrees and not some other temperature? Why do other materials ignite at other temperatures? What exactly happens when materials burn? How can we apply an understanding of the chemistry of combustion to various engineering and social challenges? For example, how does one test flammability? How can we use this knowledge to reduce fire accidents, for example by producing less flammable materials? To inform our investigation, we will read about the history of fire and society, experiment with the basics of materials combustion and testing, and observe how this knowledge is applied at a flammability testing facility. Prereq: Passing letter grade in a SAGES First Seminar, Academic Inquiry (AIQS) Seminar, or FSTS 100.

**USNA 288N. Engineering Water. 3 Units.**

The systems that deliver fresh, clean water and take away dirty water are marvels of engineering. The advancement of societies and improvement in the human condition is intricately linked to our ability to engineer water. Will there be enough drinkable water to satisfy future needs? What is the state of water treatment and delivery, and is it secure? What are the political and social implications of water scarcity? This course will explore the history of water supply, developments in infrastructure, and emerging technologies to meet water needs. Prereq: Passing letter grade in a SAGES First Seminar, Academic Inquiry (AIQS) Seminar, or FSTS 100.

**USNA 288O. Our Perplexing Universe: From Pluto to Cosmology. 3 Units.**

Varied and extensive observations over the past century have dramatically changed our understanding of the universe and led to the current era of precision cosmology. Despite the immense progress, several key puzzles about the nature and makeup of the universe remain. How do we make sense of our universe? Why do these questions persist, even with our continued efforts and advanced technologies? In this course, we will consider many of the "big questions" about the cosmos, how our views of it have evolved, and speculate on some of the outstanding problems in modern cosmology. Our inquiry will range from Pluto's planetary status to the Big Bang model and the evidence for dark matter and dark energy, with a special emphasis on the challenge of elucidating these complex phenomena to a wide audience. Prereq: Passing letter grade in a SAGES First Seminar, Academic Inquiry (AIQS) Seminar, or FSTS 100.

**USNA 288R. Data Acquisition and the Internet of Things. 3 Units.**

The Internet of Things (IoT) is the network of physical objects or "things" embedded with electronics, software, sensors, and network connectivity, which enable these objects to collect and exchange data. Example objects include garage door openers that send texts when we have forgotten to close them or cars that report driving habits to insurance companies. This class proposes to explore the question "What is involved in creating an 'Internet of Things' device and what might the future of the IoT look like?" Virtually everyone benefits from the Internet of Things, but for most individuals the IoT is little understood. The goal here is to demystify the IoT by engaging students in a guided hands-on IoT project that begins with data acquisition and concludes in a working device. Through the project, readings, and discussion, students will be challenged to consider a future world that is even more connected than today and to consider the practical, societal and ethical issues that the IoT creates. Prereq: Passing letter grade in a SAGES First Seminar, Academic Inquiry (AIQS) Seminar, or FSTS 100.

**USNA 288W. Medieval Sciences and Human Difference: How Did Medieval Peoples Define Humanity?. 3 Units.**

Since the beginning of recorded history, humans have employed different approaches to defining themselves in relation to the natural world. Along with folklore, religion and philosophy, science has been an important means to define concepts we now refer to as race/ethnicity, dis/ability, sexuality, and gender. However, what constituted science and scientific inquiry varied widely based on culture and historical context. Most recently, our advancing understanding of genetics has produced ever more nuanced definitions of human difference, even as we have come to recognize that such explanations often compete with theories that are grounded in social and cultural values, rather than scientific observation. How did people explain human diversity in the 1000 years before the Scientific Revolution unfolded in Europe? In this seminar, we will investigate how different medieval cultures explained humanity and human diversity by sampling examples of medical observation, philosophy, theories about the natural world, cultural prejudice, and religious belief. In particular, we will consider how Greek, Roman, Chinese, Indian, Islamic, and early European theories of human difference shaped justifications for conquest as, gender roles and sexuality, often in surprising ways. Questions we will ask include: How did medieval people differentiate humans from animals? Did they use the same categories of race, gender, and sexuality that we use? How did scientific thinking evolve to construct these taxonomies of difference? How were ideas shared cross-culturally? To explore these questions, we will read primary texts in translation from the medieval period. Through our discussions, we will consider not only what other approaches to defining human differences can teach us, but how they provide historical insight into frameworks and assumptions about diversity today. Prereq: Passing letter grade in a SAGES First Seminar, Academic Inquiry (AIQS) Seminar, or FSTS 100.

**USNA 289A. Antibiotics: From Miracle Drugs to Superbugs. 3 Units.**

Since the discovery of penicillin in 1928, antibiotics have become an essential drug in the treatment and prevention of bacterial infections. They are used to cure sexually transmitted diseases, to ward off complications after surgery, and to boost the yield and safety of our food supply. This widespread use has created a significant problem: antibiotic-resistant "superbugs" are emerging at an alarming rate. It has been estimated that the useful lifetime of an antibiotic is only eight years. What can physicians, patients, policy-makers, corporations, and consumers do to address this trend? In this seminar, we will examine the science and history of antibiotics, some of the reasons for their overuse, and possible solutions to the problem of antibiotic resistance. Prereq: Passing letter grade in a SAGES First Seminar, Academic Inquiry (AIQS) Seminar, or FSTS 100.

**USNA 289C. Gender and Technology. 3 Units.**

Technology has become an essential part of our daily life—the way we experience the world and think about it—and, as such, is also central to how we understand our identities and status. This seminar will explore the ways in which gender and technology define and redefine each other, considering both how gender shapes technology and the technological professions, and how technology itself produces ideas and practices of gender and sexuality. While the course will focus on gender and sexuality, we will also examine how they intersect with other categories such as class, race, and ethnicity. How does technology offer possibilities for new social relations? What role have women played in the development of technology? How does technology both challenge and maintain gender, race, and class hierarchies? How does technology shape our understanding of sexuality and gender roles? Why are there so few women in STEM? What is the impact of feminism on technological innovations and can we create a feminist technology? The course will examine these questions through a focus on three thematic units: Gender of Technology, Gender in Technology, and the Technology of Gender, looking at historical and contemporary developments from the nineteenth century to the present. Prereq: Passing letter grade in a SAGES First Seminar, Academic Inquiry (AIQS) Seminar, or FSTS 100.

**USNA 289D. The Practice of Environmental Justice. 3 Units.**

More than 50 years ago, Rachel Carson published her groundbreaking work *Silent Spring*, which helped to sound the alarm about the dangers of using certain kinds of petrochemical pesticides on our farms, gardens, and public lands. She showed that the physical environment, far from being a pristine wilderness isolated from human activity, is actually a sphere we need to monitor with care. If we fail to do so, we risk poisoning ourselves. In this class, we use Carson as an introduction to the field of environmental justice, defined as the convergence of social justice and environmental movements. Environmental justice exists today in three broad areas: social and political activism in local and international communities; legal and policy structures and initiatives; and academic contributions across many disciplines. Students will read articles from these perspectives, and we will encounter difficult ethical problems, including the fact that poor and minority communities are disproportionately exposed to toxic sites. Students will collaborate with peers in researching an environmental justice site or problem, and everyone will produce an independently written and researched argument that makes a specific proposal for change. We will use the environment of Cleveland and northeast Ohio as our starting point for studying pollution, recovery, and the many ways that environmental justice might help communities to thrive. Prereq: Passing letter grade in a SAGES First Seminar, Academic Inquiry (AIQS) Seminar, or FSTS 100.

**USNA 289E. Medieval Robots. 3 Units.**

The medieval world had robots. Some were housed in medieval churches where altarpieces with angels could move, ascending and descending during celebrations. Others appeared in travel narratives like those of Marco Polo. During his visit to the Mongols, the merchant and explorer described gold peacocks whose wings flapped and mechanical drinking fountains. Still others are detailed in literature. Authors of romances have Arthur's knights fighting automaton warriors to gain entry into castles and receiving gifts like teleporting brass horses. While machines in the medieval period were not as ubiquitous as they are in our modern lives, they posed many of the same questions and concerns that we have about our own technology. Writers frequently incorporated robots into travel narratives and poetry to identify exotic or foreign cultures, and such details can tell us much about racial and political identity in the period. Further, automatons and machines could be used as examples of dangerous luxury or viewed as marvels of engineering that challenged the boundaries between what was created by human hands and by God. This class will use a variety of texts and artifacts—medieval literature, blueprints, and art alongside current writings about the ethics of AI—to think about the role of machines in the medieval world and in our own modern lives. In addition to talking and writing about examples of medieval machines and technology, students will also build their own machines using think[box]. Prereq: Passing letter grade in a SAGES First Seminar, Academic Inquiry (AIQS) Seminar, or FSTS 100.

**USNA 289F. Biology of Sleep and Dreams. 3 Units.**

Sleep is a fundamental to human survival, yet the physical and emotional components of sleep are only partially understood. In this seminar, students will investigate unanswered questions about the biology of sleep and dreams, including how sleep impacts and is impacted by wakefulness. We will read about and discuss the meaning of consciousness and the changes that occur in the body during wakefulness, sleep, and dreaming. And we will examine these states primarily from the biological perspective, with attention to the psychological and social influences and effects as well. In applying these perspectives, students will develop familiarity with approaches used to study sleep physiology, including the use of objective measures of altered states of consciousness, as well as narrative descriptions of individuals' experiences when normal sleep patterns are disrupted. In addition, students will investigate their own sleep and dreams. Prereq: Passing letter grade in a SAGES First Seminar, Academic Inquiry (AIQS) Seminar, or FSTS 100.

**USNA 289G. Exploring the Drivers of FinTech. 3 Units.**

The field of finance has experienced a burst of technological advances that have disrupted and transformed the traditional methods of accessing, allocating, and transferring capital. Understanding the evolution of traditional finance methods is increasingly important for meaningfully distinguishing the advantages and disadvantages of traditional versus emerging methods and models. Unfortunately, many people's exposure to this revolution is limited to two ideas that are prevalent in the media: crypto-currencies and disruption. While these are key pieces of FinTech, to really appreciate the change it is necessary to understand the three pillars of innovation that are driving it. This course will provide the forum to gain an understanding of those three pillars of FinTech innovation: the Internet of Things, Artificial Intelligence, and Blockchain. Armed with this understanding we will explore how they are changing finance broadly, how that may impact the need for regulation, how it is driving change in social acceptance of conducting financial transactions, and how it raises possible concerns in new areas like the need for privacy and security. More technology may not always be the right answer. Prereq: Passing letter grade in a SAGES First Seminar, Academic Inquiry (AIQS) Seminar, or FSTS 100.

**USNA 289H. You Are What You Eat. 3 Units.**

The atoms from the foods that you eat are used to build your body, from your skin and hair to your blood, nerves, muscles, bones, and organs, you are literally—as the saying goes—what you eat. We know how food affects the health of individuals, but we can also use scientific techniques to determine the diet of groups of people past and present. This understanding allows us to explore a variety of important questions. How has diet affected human evolution? Why is diet so important for defining a culture? How are current dietary habits changing who we are and how we live? This class reviews what food humans evolved to eat in terms of biological need, but also explores how adaptive diets allow us to navigate a changing environment. We will also examine how diet continues to affect the creation of our individual and collective identities. Using key principles from anthropology, public health, and evolutionary medicine, we will analyze the ways we reconstruct, judge, and intervene in human diets. Prereq: Passing letter grade in a SAGES First Seminar, Academic Inquiry (AIQS) Seminar, or FSTS 100.

**USNA 289N. The Mind's Essential Tension. 3 Units.**

The idea that the mind is fundamentally divided has been around from ancient to modern times. Sometimes this division is explicitly claimed to be a critical feature of human nature; other times it is expressed as different ways of being-in or experiencing the world; in yet other cases the focus is on contrasting domains that the mind either apprehends or creates. Examples include: yin vs. yang, spiritual vs material, numinous vs. mundane, masculine vs. feminine, mind vs. body/matter, theoretical vs. practical reason, science vs. arts/humanities, reason vs. passion, normative vs descriptive, fact vs. value, poetry vs. prose, to have vs. to be, doing vs. being, left brain vs. right brain, empathizing vs. systemizing, thinking fast vs. slow. There can be no doubt that the notion of a divided mind has proven intuitively appealing to many. However, to what degree is such an idea supported by careful and rigorous scholarship? Each of the claimed divisions listed above has been critiqued, often ferociously and with good reason. However, there is also a compelling case to be made for the presence of a division. Strong examples come from numerous disciplines: from philosophy, work on ethics and aesthetics, in the Continental tradition, and on the problems of consciousness and free will; from psychology, work on decision making (prospect theory) and thinking styles; from neuroscience, work on the network structure of the brain. In this class, we will be focused on asking the following questions: Is there a fundamental division in the mind? If so, what is the nature of the division? Why is it helpful to claim a division—what work does it do? How is it unhelpful? To what degree are apparent divisions products of culture and context, vs. biology? How might a scientific account of the division transform our understanding of historically influential divisions? How might historical and/or philosophical work inform current scientific research? Prereq: Passing letter grade in a SAGES First Seminar, Academic Inquiry (AIQS) Seminar, or FSTS 100.

**USNA 289Q. Unsustainable Fashion: The Environmental Impact of Plastics in Textiles. 3 Units.**

The emergence of the plastics industry in the 20th century revolutionized textile fabrication. Rayon and Nylon became inexpensive alternatives to silk. Polyester helped keep clothes wrinkle-free and easy to care for. Performance fleece and faux fur provided alternatives to materials harvested from animals. At the same time, however, textile manufacturing is one of the most important polluting industries in the world, producing toxic chemicals that contaminate water, soil, and the plants and animals that we eat. Therefore, the modern fashion industry is unsustainable and is the 2nd largest water-polluting industry and is responsible for 10% of the carbon footprint in the world. Sustainable fashion is a philosophy that involves creating a strategy to make a change in different levels from textile fabrication to design, production of fashion items and consumers' attitude. What would it take to make fashion more sustainable? Is it possible to re-think textile fabrication and fashion design? Can fashion be "plastic-free?" What role can marketing and consumer behavior play in a more sustainable fashion of the future? In this seminar, we will investigate the history of fashion and textile fabrication, especially how the emergence of plastics revolutionized the industry. We will also examine the social and environmental impacts of the plastics-based fashion industry, considering sustainable solutions, as well as the challenges they face. Prereq: Passing letter grade in a SAGES First Seminar, Academic Inquiry (AIQS) Seminar, or FSTS 100.

**USNA 289R. Science on Trial. 3 Units.**

Universities, laboratories, and scientific journals are not the only places where questions of science are debated and settled; in the modern era, they are often decided in courts of law as well. In this seminar, we will focus on a range of examples in which scientific questions have been adjudicated in the courtroom. Questions to be considered are: How are judges or juries supposed to evaluate questions of science? Who decides what counts as science, or what counts as scientific consensus? What counts as expertise, and what counts as evidence when it comes to deciding a case that hinges on questions of science? Are legal facts ever different from scientific facts? By the end of the course, students will have a new understanding of the role of science in the modern world and the complicated intersections between science, society, and the law. Prereq: Passing letter grade in a SAGES First Seminar, Academic Inquiry (AIQS) Seminar, or FSTS 100.

**USNA 289T. Community Problem Solving: Applications of Design Thinking. 3 Units.**

In this seminar, we will evaluate design thinking, a systematic process for developing creative, human-centered solutions. To test our thinking, we will also seek a solution to a real problem in the CWRU/Cleveland community. Design thinking has been embraced by leading tech companies and universities around the world. The inventors of the first Apple mouse and the first e-book, for instance, used design thinking to develop these innovative products. The many proponents of design thinking claim that it can be applied to problems in any field: medicine, politics, the arts. You can even use it to build a well-lived, joyful life! Design thinking also has critics who argue that design thinking is merely a repackaging of old ideas in modern techno-speak. Clearly, human creativity and problem solving existed long before we even had the words "design thinking." Why do we even need a systematic process for something that people do on their own every day? We will examine the theory and practice of design thinking, not only by critiquing the arguments pro and con, but also by applying it to a real-world problem ourselves. Working in teams, we will use a variety of CWRU resources, including faculty and staff expertise, think[box], and other labs, to identify, test, and implement a solution integrating technology and the human experience. Along the way, we will also critically evaluate the design thinking process itself. Does design thinking always lead to the best available solution? If not, why not? What other approaches might work as well or better? Prereq: Passing letter grade in a SAGES First Seminar, Academic Inquiry (AIQS) Seminar, or FSTS 100.

**USNA 289U. Pipes, Potholes, and Pathogens: Infrastructure Issues in the USA. 3 Units.**

The poor condition of the nation's infrastructure—its roads, railways, bridges, tunnels, drinking water systems, wastewater systems, and more—has been widely reported. In fact, the infrastructure is so bad that fixing it offers a rare opportunity for bipartisanship. And yet, as the grades given by the American Society of Civil Engineers in its quadrennial Report Card indicate, conditions remain dismal. In this seminar, we will study the structures and systems that constitute national infrastructure, the tools used to evaluate its condition, and the challenges of monitoring, maintaining, and repairing it. What metrics are used to grade various infrastructure categories? Do these metrics accurately describe conditions in a meaningful way? What does it mean to say that the condition of bridges, for example, is a "C" or a "D?" How should government agencies use this information when prioritizing spending? Is it better to repair or replace? Are some categories more important than others? Is it better, for example, to address drinking water before dams, or sewers before roads? How should spending be distributed geographically and socially? Should spending be spread evenly, or is it better to target urban, suburban, or rural settings? To answer these questions, we will investigate examples from Northeast Ohio. Prereq: Passing letter grade in a SAGES First Seminar, Academic Inquiry (AIQS) Seminar, or FSTS 100.



**USNA 289X. Sexual Revolutions. 3 Units.**

Modern American society, from the late nineteenth century on, saw major changes to human behavior and understanding of sexuality, often seen as a "revolution." This course will examine these changes from the late Victorian Period to present day, focusing on the social and technological developments during this time period. In this course, we will explore the rise of sexology as a field of science, the development of reproductive and sexual technologies, as well as the social, cultural, and political forces that shape ideas about sex. By analyzing both primary and secondary documents, we will investigate what is the idea of sexual freedom and how it intersected with categories of race, religion, and class, as well as what constitutes sexual liberation and oppression. By looking at how issues of sexuality were central to political debates during the twentieth century, students will revisit definitions of sex, gender, identities, revolution, and backlash. Prereq: Passing letter grade in a SAGES First Seminar, Academic Inquiry (AIQS) Seminar, or FSTS 100.

**USNA 289Z. Profiles in Biology: Writing About the People Behind the Science. 3 Units.**

Biologists and their research inform many of our everyday decisions. Notably, we relied on biologists to learn about the spread of COVID-19 and what actions might reduce our risk of infection, often without having access to original research or commentary from the scientists themselves. Science journalists and science communicators, then, have the important job of both translating complex biological concepts for their readers and revealing the story behind that research. Who are the biologists engaged in this work? How did they end up in their field of research? What barriers have they faced? When science journalists weave these questions into their articles, podcasts, or blogs, they shape our understanding of what it means to be a biologist and what it means to engage in the research process. How do these journalists reveal the scientific process as credible but still acknowledge that it is marked by human biases and subject to social, political, and economic influences? To what extent is the scientist part of the scientific process? As we explore these questions, we will read both original research written by biologists themselves and journalistic pieces about this research. In the last unit, you will write your own 10-12 page research paper that profiles a local biologist, their research, and what their experiences reveal about the research process. Prereq: Passing letter grade in a SAGES First Seminar, Academic Inquiry (AIQS) Seminar, or FSTS 100.

**USNA 290A. The History of Medical Technology in Twelve Artifacts. 3 Units.**

Drawing upon the Dittrick Medical History Center's artifact collections, this seminar examines the history of medical technology with an emphasis on the complex and increasingly influential role of technology in the U.S. healthcare system during the twentieth century. It explores the development and implementation of new innovations as well as the consequences, both intended and unintended, of our reliance upon such medical devices. Technology (artifacts, techniques, and technical knowledge) is not neutral, it is shaped by society and culture. This class will explore the intersections between medical technology and race, gender, sexuality, and ability and their implications for emerging innovations. In addition to discussing assigned readings, in-class activities will include workshops with Dittrick Museum artifacts and informal individual student presentations. Students will also learn how to write for different audiences by creating exhibit labels, social media content, and exhibition concepts for Dittrick Museum artifacts. Prereq: Passing letter grade in a SAGES First Seminar, Academic Inquiry (AIQS) Seminar, or FSTS 100.

**USNA 290C. Silicon, Applications and Cultural Impact. 3 Units.**

Silicon is the second most abundant element found on the planet. Over the last century, science has taught us to take this common material and create the products on which our modern society depends. Quantum mechanics gave birth to the electronic age and the computer. The absorption, emission, and reflection of quanta of light (photons) underlie solar cells, light emitting diodes, radiation detectors, and optical fibers. The driving forces behind these discoveries are fascinating. The history of the scientific revolution, the conversion of sand into silicon ingots then into transistors and finally computer chips is extraordinary. The advancement of accessories based on silicon technology now enables your smartphone to direct you to the nearest Taco Bell through its connection to a satellite orbiting the Earth. There are basic processing steps that change an ingot of pure silicon into a practical device such as a computer chip or a solar cell. Major topics of this course will include discussion of the history of silicon, from the simple transistor to complex microprocessor, solar cells, and sensors, as well as how the swift changes in computing power and the communications revolution powered by it have impacted our daily modern life. Excellent examples of this silicon-based technology include the use of silicon in solar panels and their place in the green energy revolution, and the expanding role of silicon microsensors as one of the fastest growing areas of technology, especially rapidly expanding area of the Internet of Everything (IOT). Students in this class will have the opportunity to design and construct a simple device on a silicon chip for their group project. This course is designed and intended for students of all disciplines, and each student is expected to participate actively in a group project to make a silicon device in a clean room. Students will spend class time engaging in debates about the impact rapidly evolving silicon-based technology has had on our world, discuss how smart devices are impacting our privacy, present a group 'explainer video' on an innovative silicon device, listen to guest speakers whose research involve silicon, and improve on written communication skills by writing papers on topics ranging from the ethics of driver-less cars to exploring the possibilities of a world where silicon technology developed more slowly. Prereq: Passing letter grade in a SAGES First Seminar, Academic Inquiry (AIQS) Seminar, or FSTS 100.

**USNA 290H. Our Technological Future(s). 3 Units.**

Our current moment, The Anthropocene, is an epoch defined by humanity's unique ability to alter the Earth's climate, landscapes, and ecosystems on a global level. Given that the climate crisis is a direct result of our modern technologies and attitudes, with the most vulnerable disproportionately bearing the brunt of global change, the question now is: are new technocratic solutions the answer to combating climate change? Can these solutions reduce inequality, or are they destined to reproduce the imbalances of our current moment? This seminar will examine new technologies that promise to mitigate the effects of climate change, from the immediate and practical (solar power, carbon reduction) to the more far reaching (terraforming Mars, mining asteroids). We will also read key texts in environmental studies and ecological theory that explore and critique the core ideological assumptions embedded in technocratic solutions. We will explore how our very concept of Nature, and our relationship to said Nature, shapes our thinking when it comes to our possible futures, and we will consider how, historically, new technological solutions have been shaped by, and further solidified, inequalities of race, class, and gender. Alongside the scientific and theoretical texts, the seminar will also include speculative fiction that imaginatively projects far into the future to expand our sense of what is possible. A final research project will revolve around the concept of Cleveland 2072. Students will research and explore a specific challenge currently facing Cleveland or the greater Great Lakes region. Using the concepts from the course, they will explore possible solutions, as well as potential complications, to imagine what our world could be 50 years from now. Prereq: Passing letter grade in a SAGES First Seminar, Academic Inquiry (AIQS) Seminar, or FSTS 100.