2014 Seminar Descriptions
January 2014

Artificial Intelligence*
Raghuram Ramanujan, Mathematics, Davidson College

The nature of human intelligence, and the question of the extent to which human thought processes can be automated, has occupied the minds of many great thinkers down the ages, including the likes of Aristotle, Leonardo da Vinci, Thomas Hobbes, and Gottfried Leibniz. However, the technological realities of their days meant that the field of Artificial Intelligence (AI) only began to take shape following the invention of the digital computer in the mid-20th century. Alan Turing, one of the first scientists to truly appreciate the universality of computation, set the agenda for AI research in a landmark paper titled "Computing Machinery and Intelligence". Sixty years on, we are finally beginning to see early signs of success in the pursuit of Turing's dream.

This seminar will introduce participants to mathematical and algorithmic ideas from four major AI sub-fields:

1) Learning: How do we design systems that "learn" from experience? You have probably already encountered some of these systems in your everyday life --- Netflix, for example, makes movie recommendations based on your viewing history. Google seems to be able to read your mind, when it offers its "Did you mean?" corrections to your mistyped search queries. How are these systems predicting your intents based on their knowledge of your preferences?

2) Reasoning and planning: How do we build systems that can think strategically and construct complex plans of action to win a game of Chess, or help a robot navigate a room?

3) Understanding language: How do we design systems that can interact with humans using "natural" languages such as English or Spanish? How did IBM's Watson system defeat Ken Jennings at Jeopardy, and how does Apple's Siri understand your voice commands?

4) Creativity: Can a computer tell a joke? Solve a New York Times crossword puzzle? Compose music? Construct novel scientific theories? (Short answer: yes, to varying degrees of success). We will explore the problem of computational (and human!) creativity, connecting it to the deepest open question in all of mathematics today: does $P = NP$?

Note that no computer science or programming background is necessary to participate in this seminar.

The Global Energy Challenge*
Durwin Striplin, Chemistry, Davidson College

The development of modern civilization has been perceived to be a story about the influences of religions and emperors, wars and invasions, and science and art, but it also can be a tale about the availability of practical energy resources and the ingenious technologies we have devised to extract and use it. Our advancements, especially in the areas of health and longevity of life, correlate directly with our energy use, but our growing global addiction to energy has lead to a query about what it has cost us in terms of the world's atmosphere and climate.

This leads us to pertinent questions centered on the topic of energy that could be explored:

1. What is energy? What are the different flavors and forms of energy? What are the typical ways we produce it and transport it?

2. What is the history of energy use and the connections to history and the humanities?

3. What are the projected energy needs of the planet in the future? This discussion will necessitate studying the economic and energy patterns of not just the US but all countries. How can we project the scale of such need so that our students can understand the sheer scale of the energy we may require in the future? Is there an energy crisis on the horizon?

4. What technologies are available now and will be available in the near future that can scale to meet the future global energy requirements? This will involve exploring the science behind the technology, the present and future fuel resources needed to feed the technology, the real economic costs of scaling the technology, taking a hard look at the thermodynamic and efficiency limitations of the technology, and exploring the environmental impacts and sustainability of the tech. Is it possible and/or even feasible to provide all of our energy needs with just sustainable technologies alone?
5. What is the real impact of energy conservation?
6. What does our energy future look like? What societal changes are possible? What would an energy policy need to look like for the US now so we can be insured of adequate energy in the future? How will we define quality of life as we move towards a planet that might contain 9 billion people, all vying for the planet's energy resources?

Metamorphosis: Transformative Experiences*
Amy Ringwood, Biology, UNC Charlotte
     One of my favorite phrases is "Ontogeny recapitulates phylogeny". The conservation of larval forms across diverse species is amazing, and provides important keys for phylogenetic groupings and evolutionary processes. Tadpole-like larvae are not just an amphibian form, but occur in an unlikely group, the tunicates (or sea squirts), linking tunicates to vertebrate lineage.
     Learning about different larval forms and their biology (functional morphology, how they move, what they eat, etc.) is incredibly fascinating. But what is even more amazing is their metamorphosis, as this process transforms very similar looking larvae into very different adult species. This is a topic that can be investigated at a variety of different levels, from basic biological phenomena to more advanced perspectives (e.g. biological triggers, gene expression changes).   In this seminar, fundamental processes of the life cycles of different invertebrates from aquatic and terrestrial habitat can be studied and compared. There will also be opportunities to work with living organisms associated with the "World Alive" Exhibits at Discovery Place (e.g. corals, jellyfish, frogs, etc.), as well as organisms collected from local and coastal habitats (insects, crustaceans, sea urchins, bivalves, etc.). It is also a topic that has literary and art connections - from Greek Mythology in Roman Poet Ovid's "Metamorphoses" and his tales of human transformation into mythological forms that inspired Chaucer and Shakespeare, to Kafka's somewhat dark novella "The Metamorphosis", as well as numerous legends and works of art.

Intersections of Science, Technology and Culture*
Alan Rauch, English, UNC Charlotte
     The premise of this seminar is that science and the arts are not polar opposites, but rather intersecting modes of making the knowledge we call "culture." The seminar will explore the rhetorical structures we use to communicate ideas that have "scientific" or "technical" significance. But our understanding of the world is not simply drawn from "science" and "technology"! Literature, poetry, art, dance, and music are all forms of intellectual inquiry as well. They influence and shape science and technology, just as they are shaped by scientific knowledge. Our students—trained both by cultural attitudes and pedagogical practices—are seemingly committed to identifying themselves as science-driven or humanities driven, which is paradoxically the very dichotomy that the "Liberal Arts" originally tried to eliminate. What's more, none of our students can afford to be ignorant of (or even resistant to) the fundamental issues that meld science, technology, and the arts. What we will try to do over the course of the seminar is explore what John Berger originally called "ways of seeing" and by doing so, we will look for ways to dismantle the silos of educational thought and replace that approach with an spectral (panoramic) view that is intellectually rather than disciplinarily driven. In taking this road, we will consider all intellectual expressions of ideas—whether its music, literature, art, biology, medicine, statistics, philosophy, physics, etc.
The texts that we'll look at --ranging from Mary Shelley's novel Frankenstein (1818) to Tom Stoppard's play, Arcadia (1993) to The Immortal Life of Henrietta Lacks (2011) to How Images Think (2004).

Human Agency
Meghan Griffith, Philosophy, Davidson College
    Human persons are unique in many ways. But perhaps one of the most important ways in which we are distinguished from our animal brethren is through our capacity for intentional action: we are able to set goals, evaluate them, deliberate, formulate intentions, make decisions, and follow through with behavior. One of the consequences of having such abilities is that it then seems appropriate, if the conditions are right, to hold each other morally responsible for these actions.

    There are a number of complex philosophical issues that arise in the context of human action. Many are questions about 'free will': what causes my actions (my reasons? My desires? Environmental triggers? Some combination? A long chain of causes? Nothing?)? If my actions are caused, am I still free with respect to them (in other words, if my action resulted from a long chain of causes beginning well before my birth, how can it have been up to me to perform it or not perform it)? But if my actions are not caused, then aren't they just random and not under my control? Has modern science and/or psychology ruled out the idea of free will in any case (e.g., the famous experiments undertaken by neuroscientist Benjamin Libet, supposedly showing that we start down the path of performing an action before we even realize we are doing so; psychology experiments that purport to show that our feelings of control over our actions are just illusory; psychology experiments that purport to show that our decisions are all caused by unconscious environmental stimuli)?

    Related questions center on moral responsibility: If I am not free, can I ever be morally praised or blamed for what I do? Are there any other kinds of excusing conditions, like ignorance (e.g., Oedipus didn't know it was his mother so perhaps he's not blameworthy for committing incest)? Or coercion? Can I be morally praised or blamed even if I could not have done otherwise than to do what I did? Am I, as the existentialists assert, always morally responsible because I must always choose, regardless of what else is true? How (and when) does one become a moral agent?

    Other issues that arise concerning agency include (but are not limited to) the following: must I always act on my strongest motive? What role do decisions play in the formation of *who I am*? Is there such a thing as weakness of will (can we really ever act against what we *think* is the best thing to do at the time)? Can I really perform an action for no reason? What is an intention? What is an action? What is a decision?

    As indicated above, there are a number of ways to approach the broad topic of human agency and a number of reasons that one might be interested in studying it. Some might be interested in understanding the philosophical implications of our latest scientific theories and experiments (from quantum physics to neuroscience and psychology). Some might be interested in thinking about the implications for science-fictional possibilities, such as time travel. Those who study literature may be interested in analyzing characters and story in light of philosophical theorizing about agency and responsibility (from children's literature like *Harry Potter*, to Sophocles, Shakespeare, and many others).

    In general, I think there are many benefits in presenting such issues to students of all levels. Thinking about these questions not only sharpens their critical thinking skills, it also causes them to reflect on their own behavior, motivations, and judgments of others. In a culture that is at once too willing to blame and to excuse (usually others and oneself respectively), it seems worth analyzing and evaluating our intuitions about the conditions of agency and responsibility. Furthermore, thinking about issues of agency provides insight into what it means to be a human person.

The Art of Fiction: Close Analysis, Style and the Novel
Maria Fackler, English, Davidson College
    Novelist and critic David Lodge contends that fiction is "an essentially rhetorical art—that is to say, the novelist or short story-writer *persuades* us to share a certain view of the world for the duration of the reading experience, effecting, when successful, that rapt immersion in an imagined reality that Van Gogh caught so well in his painting 'The Novel Reader.'" Proceeding from both Lodge's working definition and illustrations drawn from classic and modern texts, seminar participants will explore strategies of textual analysis and broach some of the key concepts and theories that accompany—and structure—the practice of close reading. If content is the arbiter of form, we will consider how novelists have responded to new content by undertaking experiments in fiction. We will also unpack novelist Martin Amis's assertion that "style is morality" to discover how literary innovation can respond to ethical questions and imperatives. Authors under consideration may include Jane

Austen, David Lodge, Virginia Woolf, Martin Amis, Muriel Spark, Ali Smith, Ian McEwan, Alison Bechdel, and Vladimir Nabokov.

Visual Storytelling in Children's and Young Adult Literature at the Harvey B. Gantt Center for African-American Arts + Culture
Paula Connolly, English, UNC Charlotte

Visual storytelling for children and young adult audiences comprises an impressively broad range of texts—from picturebooks, pop-up books, and movies to graphic novels and documentary fictions. French illustrator Claude Lapointe has called visual storytelling "image narratives" to acknowledge the ways in which visual images tell stories with or without the accompaniment of words. In this class we will study a range of image narratives related to children and young adults. For example, we will examine elements of picturebooks—how colors, shapes, scale, and event fonts tell a story of their own. Not merely simple texts, picturebooks also often depict difficult issues such as U.S. slavery and violence, and we will explore the role of visual images in presenting such topics to the youngest of our children. Image narratives are an important element of storytelling for young adults as well, and we will discuss how graphic novels and illustrated texts offer sophisticated narratives for older readers. Meeting at the Harvey B. Gantt Center for African-American Arts + Culture, we will be working in a rich visual environment. We will have opportunities to explore the concept of the visual narrative through discussions that dissect the works of art on view in the museum's current exhibitions. We will also explore artwork created by children, and have the opportunity to create our own visual tales in order to fully consider how image narratives continue to tell important stories. The semester's discussions will include Disney's *Snow White and the Seven Dwarfs*, Deborah Wiles's *Countdown,* and Jeanette Winter's *Follow the Drinking Gourd.*

Heroes, Rebels and Rock Stars: Cultural Icons in Modern Europe
Heather Perry, History, UNC Charlotte

Many American students may be familiar with Edvard Munch's iconic painting entitled, *The Scream*, and others might recognize the opening notes of Ludwig von Beethoven's 5th Symphony. Nearly everyone has heard of Frankenstein, the monster in Mary Shelley's 1818 novel. But, can they explain why these pieces of culture were so fundamentally tied to certain eras in European history? Or how they reflect important changes in European society, technology, and even politics? Popular ideas and opinions about immigration, nationalism, and the boundaries between science and religion are tied to each of these cultural products. This CTI Seminar examines the history Europe since 1760 through cultural icons: celebrities, art, music, and literature.

Art is eternal – or so the saying goes. Long after military leaders or governmental figures have departed from the planet, cultural images and sounds continue to ripple through the ages. Rather than focus on political leaders or military generals, in this seminar participants will analyze how various iconic cultural pieces and events can be employed in the classroom for 1) deepening student understanding of important political and social events in European history and 2) honing analytical and writing skills in student learning. From Mary Shelley's *Frankenstein* to the British band, The Clash, participants will spend the first third of the seminar examining how cultural products reflect the significant moments in Europe's history since the Enlightenment. In the second third of the seminar, participants will identify those figures or pieces – paintings, buildings, songs, poems, or even scandalous events – which might best interest their particular students and serve as useful bridges to the past in their own courses. Using both scholarly and media resources they will learn strategies for using these icons in the classroom both to impart knowledge but also to help students analyze how these cultural products are fundamentally reflective of "bigger" historical events. In the final third of the seminar, participants will work up lesson plans which combine well-known cultural icons with short readings and analytical exercises which are designed to help students get beyond simply "judging the culture of the past as good or bad" and closer to understanding why it took the forms and shapes that it did. Topics include: *Frankenstein*, punk music, Impressionism, Realism, poetry, opera, theatre, Munch, Nietzsche, physics, Romanticism, imperialism, Freud, architecture, anti-semitism, political cartoons, painting, philosophy, sculpture, Communism, and film.

***Indicates seminar will take place at Discovery Place in Uptown Charlotte**