

Science in Literature v1.0

a pilot
inter-domain
gen ed course



from Hickman and Pitarra, *The Manhattan Projects*

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Overview

1. Introductions
2. Background
3. Course structure
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5. Examples of assignments and student responses
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Background

Our crazy dream and how, in actual fact, **we got to do it!**

The original idea: a chronological creative/cultural analysis of “**the scientist.**”

Course structure: our process

1. Selecting texts
2. Selecting science topics
3. Spinning a thread
4. Accommodating team teaching
5. Setting high expectations for student participation
6. Aligning assignments with pedagogical priorities

(We **wrote the learning objectives last**, after content and structure were final.)

	At the meeting on	we will have a discussion about	after we have prepared by reading
1	Tue 10 Jan	Introduction	
2	Thu 12 Jan	"The response was cold: it was also negative."	<i>The Two Cultures</i>
3	Tue 17 Jan	Basic physics, chemistry, and biology	(material provided on Canvas)
4	Thu 19 Jan	"Busy, busy, busy."	<i>Cat's Cradle</i>
5	Tue 24 Jan	The atom	(material provided on Canvas)
6	Thu 26 Jan	"Is he MAN or MONSTER or... is he BOTH?"	<i>The Incredible Hulk</i> and the texts provided
7	Tue 31 Jan	The atom and mutation	(material provided on Canvas)
8	Thu 02 Feb	"Science. Bad."	<i>Manhattan Projects</i>
9	Tue 07 Feb	DNA, genes, and genomes	(material provided on Canvas)
10	Thu 09 Feb	"They didn't stop to think if they should."	<i>Jurassic Park</i>
11	Tue 14 Feb	Deep time	(material provided on Canvas)
12	Thu 16 Feb	"Doubt of the real facts is inevitable."	<i>At The Mountains of Madness</i>
13	Tue 21 Feb	Evolution	(material provided on Canvas)
14	Thu 23 Feb	"Now, indeed, I seemed in a worse case than before."	<i>The Time Machine, On The Origin of Species</i> (selections)
15	Tue 28 Feb	DNA manipulation and biotechnology (part I)	(material provided on Canvas)
16	Thu 02 Mar	"Let us get rid of the chaos."	<i>Oryx and Crake</i>
	Tue 07 Mar	SPRING BREAK: NO CLASS	
	Thu 09 Mar		
17	Tue 14 Mar	DNA manipulation and biotechnology (part II)	(material provided on Canvas)
18	Thu 16 Mar	"The pigeons of his childhood hadn't lacked heads."	<i>Oryx and Crake</i>
19	Tue 21 Mar	Pathogens and infectious disease	(material provided on Canvas)
20	Thu 23 Mar	"It was the blood. There was something in the blood."	<i>28 Days Later</i>
21	Tue 28 Mar	Neuropharmacology	(material provided on Canvas)
22	Thu 30 Mar	"Ah, how mistaken I was about this world!"	<i>The Futurological Congress</i>
23	Tue 04 Apr	Climate change	(material provided on Canvas)
24	Thu 06 Apr	"The worst thing is that we saw it coming decades ago."	<i>Not Dark Yet</i>
25	Tue 11 Apr	A step back for some analysis	(material provided on Canvas)
26	Thu 13 Apr	"Seriously unthinkable: not available to think with."	Selections from <i>Staying with the Trouble</i>
27	Tue 18 Apr	Student presentations	Selections as provided by the groups
28	Thu 20 Apr	Student presentations	Selections as provided by the groups
29	Tue 25 Apr	Student presentations	Selections as provided by the groups
30	Thu 27 Apr	Course wrap-up	

Course structure: Selecting texts Selecting science topics Spinning a thread

We started with texts, and fit the science topics to the literary themes.

But which science topics?

And how to make it all hold together?

Examples: connecting H.G. Wells and Charles Darwin
 discussing Vonnegut and Ice-Nine **first**

Course structure: Accommodating team teaching

How do we **divide the labor** in a *interdomain*, *interdisciplinary* course?

Our solution was:

One text assigned per week . . .

. . . framed with science on Tuesday

. . . discussed as a literary text on Thursday

(sometimes followed by a written “Short Response” due Friday)

Course structure: Setting high expectations

... for student participation

Course structure: Aligning assignments and priorities

Class participation	Your contributions to the discussions during class meetings.	200
Incidental writing	Very brief written responses to prompts during class meetings. 100–150 words (10 × 20 points)	200
Short responses	Short reflective analyses written outside of class. 250–300 words (4 × 50 points)	200
Term paper	A longer reflective analysis of one topic of your choice. 1,500 words, due in class Thursday March 7 CORRECTION: March 2	200
Group presentation	A fifteen-minute analysis of a text you choose as teams of three. (Your group assignments will be announced after the add/drop period ends.)	200
TOTAL		1000

Learning objectives

Taken directly from [the new gen ed guidelines](#)*

* <https://gened.psu.edu/updated-learning-objectives-and-foundation-and-domain-criteria>

(each course will have 2-4 per senate implementation report March 15, 2016)

1. **EFFECTIVE COMMUNICATION** – the ability to exchange information and ideas in oral, written, and visual form in ways that allow for informed and persuasive discourse that builds trust and respect among those engaged in that exchange, and helps create environments where creative ideas and problem-solving flourish.
2. **KEY LITERACIES** – the ability to identify, interpret, create, communicate and compute using materials in a variety of media and contexts. Literacy acquired in multiple areas, such as textual, quantitative, information/technology, health, intercultural, historical, aesthetic, linguistic (world languages), and scientific, enables individuals to achieve their goals, to develop their knowledge and potential, to lead healthy and productive lives, and to participate fully in their community and wider society.
3. **CRITICAL AND ANALYTICAL THINKING** – the habit of mind characterized by comprehensive exploration of issues, ideas, artifacts, and events before accepting or formulating a conclusion. It is the intellectually disciplined process of conceptualizing, applying, analyzing, synthesizing, and/or evaluating information gathered from, or generated by, observation, experience, reflection, reasoning, or communication, as a guide to belief and action.
4. **INTEGRATIVE THINKING** – the ability to synthesize knowledge across multiple domains, modes of inquiry, historical periods, and perspectives, as well as the ability to identify linkages between existing knowledge and new information. Individuals who engage in integrative thinking are able to transfer knowledge within and beyond their current contexts.
5. **CREATIVE THINKING** – the capacity to synthesize existing ideas, images, or expertise in original ways and the experience of performing, making, thinking, or acting in an imaginative way that may be characterized by innovation, divergent thinking, and intellectual risk taking.
6. **GLOBAL LEARNING** – the intellectually disciplined abilities to analyze similarities and differences among cultures; evaluate natural, physical, social, cultural, historical, and economic legacies and hierarchies; and engage as community members and leaders who will continue to deal with the intricacies of an ever-changing world. Individuals should acquire the ability to analyze power; identify and critique interdependent global, regional, and local cultures and systems; and evaluate the implications for people's lives.
7. **SOCIAL RESPONSIBILITY AND ETHICAL REASONING** – the ability to assess one's own values within the social context of problems, recognize ethical issues in a variety of settings, describe how different perspectives might be applied to ethical dilemmas, and consider the ramifications of alternative actions. Individuals should acquire the self-knowledge and leadership skills needed to play a role in creating and maintaining healthy, civil, safe, and thriving communities.

Our selected learning objectives

Effective communication. We will conduct integrated discussion of scientific ideas and their cultural and social reflection in literature. You will write short responses at the end of these discussions from time to time, and you will explore these ideas in more detail in writing and in a group presentation.

Key literacies. Our texts range over novels, short stories and novellas, graphic novels, films, poetry, memoir, scientific journalism, and science textbooks. You will thus develop textual, visual, health, scientific, aesthetic, and historical literacies in this course.

Critical and analytical thinking. By evaluating competing scientific, ethical, and literary/cultural viewpoints over a range of topics, you will develop critical and analytical thinking.

Integrative thinking. You will synthesize knowledge encompassing scientific and cultural ideas, across multiple historical periods, and grapple with extrapolating these analyses to the near and far future.

Social responsibility and ethical reasoning. You will articulate and critique your own values with respect to the ethical issues raised by our discussion topics as illuminated by our literary texts.

Examples of student responses to assignments

“ incidental writings ”	during class meetings
“ short responses ”	outside class meetings

Not shown: term papers
 group presentations
 class participation

Incidental writing re: Vonnegut and the Second Law

What is **plausible** about Ice Nine?
(What is implausible?)

What is **possible** about Ice Nine?
(What is impossible?)

Student response (a humanities major)

What is plausible about Ice Nine? (What is implausible?)

It is certainly plausible to develop the structures of Ice Nine under different conditions, such as temperature and pressure. ✓

What is implausible is the scale at which the scene portrays and depicts. The energy released out from the phase change would create an exponential amount of heat, and therefore melt the Ice-9. ✓ yes!

What is possible about Ice Nine? (What is impossible?)

It is possible to create similar structures of Ice-Nine under specific conditions, where you can control temperature and pressure.

What is impossible is the energy released or heat released would melt the solid Ice-Nine and the oceans that freeze over in Cats Cradle. ✓

Student response (a science major)

What is plausible about Ice Nine? (What is implausible?)

It is thermodynamically plausible for Ice 9 to form the crystals, but because of the energy released from forming the crystals (in the form of heat) the crystals would melt.
BOOM

What is possible about Ice Nine? (What is impossible?)

It is possible for Ice 9 to cause a phase change that would effectively freeze the water at a certain temperature and pressure, but not under the conditions on earth like stated in the text.

BOOM

Incidental writing re: diffusion demonstration

Consider the diffusion of food coloring in hot and cold water. What observations do you make? **What molecular explanation can you give for these observations?**

Student response (a humanities major)

Consider the diffusion of food coloring in hot and cold water. What observations do you make?
What molecular explanation can you give for these observations?

Each drop within the individual glasses of water have different expanding properties. The glass on the left appears to be distributing the food coloring amongst the ^{molecules} ~~particles~~ in the water, whereas ~~on the~~ the glass on the right appears to be containing or keeping the ~~water~~ food coloring close together. ✓

BUT WHY?

Student response (an arts major)

Consider the diffusion of food coloring in hot and cold water. What observations do you make?
What molecular explanation can you give for these observations?

On a molecular level, it would appear that the dye on the left is able to move more freely through the network of the water. The converse can be said for the dye on the right. I see that the dye on the left has spread through the whole cup while the dye on the right never reached the full area of the glass. I believe that, in both glasses, the water molecules are bigger than the molecules of the dye. This creates a tension of movement in the space provided.

Umm... not really...
but good thinking
It's all about average VELOCITY of molecules

Student response (a science major)

Consider the diffusion of food coloring in hot and cold water. What observations do you make?
What molecular explanation can you give for these observations?

Hot water - the food coloring spreads quickly

Cold water - food coloring spreads slowly

molecules are moving more quickly in hot water,
facilitating the spread

(increased Brownian motion)

thermal energy
= kinetic
energy

Incidental writing for Atwood, *Oryx and Crake*

When Jimmy first visits Crake's office at RejoovenEsense he notices that "Crake still had a collection of fridge magnets, but they were different ones. No more science quips" (300). Among the new slogans is "We understand more than we know." Later, when Jimmy confronts Crake at the airlock, that same slogan flashes through his mind: "All the hairs on his arms were standing up. We understand more than we know" (328). Clearly, Atwood wants the reader to think about this particular statement, to unpack its potential meanings.

In the space below,

1. **brainstorm possible ways to interpret the statement and its significance;**
2. **consider the statement in the context of C. P. Snow's idea of the two cultures.**

Brainstorm possible ways to interpret the statement and its significance.

I think the tendency to thrust yourself into the mindset of true understanding can often overshoot into the realm of blind faith. Too much confidence in something--enough to the point where Crake was willing to fundamentally change the genetic structure of humanity--can atrophy self-criticism. Skepticism is the big difference between the two cultures--one is willing to believe in the science to the point of action and the other is still not convinced.

Consider the statement in the context of C. P. Snow's idea of the two cultures.

... the statement goes to show most of us (in context to both this novel and Snow's lecture, "words people") have general understanding of certain subjects or concepts more than we have specific and "specialized" knowledge of certain subjects or concepts. This specialization is something Snow remarks on numerous times in his lecture and he sees it as an issue in our education. In Atwood's novel, Snowman/Jimmy alludes to the separation of "words people" and "numbers people."

Incidental writing: making final connections

1. What might be some practical or ideological implications of creating and/or consuming so many narratives across different media that show science as a dangerous enterprise?
2. Thinking back over all our assigned texts this semester, can you designate any overarching issues or themes that we might consider in class discussion?

What might be some practical or ideological implications of creating and/or consuming so many narratives across different media that show science as a dangerous enterprise?

Showing science as a dangerous enterprise may have the effect of making people distrust or fear scientists and all of science as a whole. More productively, it makes people aware of very real dangers so that we proceed more cautiously with scientific innovation so that we don't end up with disastrous or unforeseen results. Fiction can work as a self-preventing prophecy.

Even just saying "show science as a dangerous enterprise" indicates bias in interpretation

→ must always recognize danger in this

Thinking back over all our assigned texts this semester, can you designate any overarching issues or themes that we might consider in class discussion?

One of the big overarching themes in most of the works that we've gone over is the idea that science is not inherently evil. In stories like *The Incredible Hulk*, *Oryx and Crake*, *The Manhattan Projects*, and *Cat's Cradle*, science acts only as a tool, not an inevitable cause. In *The Incredible Hulk*, the bomb is made and tested at the request of a military leader. And in *Oryx and Crake*, science is just the victim of rampant capitalism. In all these stories, science is also seen as doing good, so it seems that the role of science as an amoral tool is a common theme to much of our material.

Thinking back over all our assigned texts this semester, can you designate any overarching issues or themes that we might consider in class discussion?

There has always been a fear of the unknown with science and that fear has gained substantial ground because the people with the genius, the scientists, are seen as these emotionless, broken, and misguided humans that pursue science without taking into consideration any ethical implications related to the outcomes. The breed of humans attracted to science are known to be superficial or lacking a humane side unlike their non-science and/or not-as-successful counterparts.

Short responses: one of Smith's

In "The Two Cultures" C.P. Snow writes that "technology is the branch of human experience that people can learn with predictable results" (p. 47). In turn, Snow suggests that within the culture of science and technology, scientists behave and work in similarly predictable and efficient ways: "Without thinking about it, they respond alike" (p. 11).

How does Vonnegut in *Cat's Cradle* challenge and/or confirm this view of science in the mid-twentieth century?

Student response (a humanities major)

Paper View

Vonnegut both challenges this idea and confirms this idea, because predictability in a traditional sense isn't really anywhere in the novel. The idea that a passing conversation, like the one about the fact marines no longer wish to fight in the mud, could actually strike something than the really is no predictability for scientists like Felix. However, Felix is quite the caricature of a traditional 'mad scientist': low empathy, fixation to apathy, over-specialization. But the very idea of science compared with art, and the artists we see, is that science affects us all but theoretically only has two outcomes: it either works or it doesn't. There's a wrong answer in science, but there's no real answer in art. And maybe that's the distinction that both Cat's Cradle and Snow bring up, there's no real answer in anything but we give meaning to everything. Life is, at a base level, meaningless but there's stuff that we create to have 'meaning' and to keep living.


Efficiency is a different question all together, as we discussed in class. There's this idea that efficient equals betterment which equals helping people. But looking at what the scientists in this novel do, to themselves and to others, it's almost the folly of that idea. The idea of machine like efficiency seems to destroy more than help and is the cause of it's own downfall. Ice nine is, from a scientific standpoint, at the same level of efficiency or maybe even more than cyanide, which is a cruel type of efficiency. The bombs are efficient, but inhumane. There's a lack of humanity in matters of efficiency that I think Vonnegut comments on but not in the sense that all progress is apathetic and inhumane, but that progress and it's uses are left up to those who create and wield that progress.

Submitted: Jan 19 at 4:02pm

Assessment

Grade: 47 out of 50




Assignment Comments

 You make good use of "efficiency" as an anchoring concept for your response. I also like your early point that "predictability in a traditional sense isn't really anywhere in the novel." The movement of Hoenikker's research (from turtles to mass-extinction weapons) and the ways in which Ice-Nine sees actual use is indeed unpredictable.

At the same time, I would like to see more direct engagement in your response with Snow's idea that technology can be learned (and used) "with predictable results." You do address that optimism implicitly but a full response would do so more directly.

Scott Smith, Jan 25 at 8:32pm

Add a Comment

Student response (a science major)

Paper View

Rather than acting in a linear, predictable manner, the scientists in Vonnegut's *Cat's Cradle* act erratically and whimsically. Felix Hoenikker, the novel's principal scientist, demonstrates this best. Jonah, while visiting the General Forge and Foundry Company in Ilium, takes a detour with Miss Faust to visit the late Dr. Hoenikker's laboratory. He finds the workspace strewn with cheap toys: "a paper kite with a broken spine... a toy gyroscope, wound with string... a top... a bubble pipe" (56). For Hoenikker, science was not about making noble humanitarian strides. It seemed instead to be a pastime equivalent to a gyroscope or a bubble pipe – a source of meaningless, empty play. Indeed, the focus and efforts of his fascination could be shifted as easily as those of a toddler: by taking away his turtles, for example.


Compounding the association of science with volatility, the scientists in *Cat's Cradle* have no control over where their work ends up. The final destination for scientific inventions is unmitigated global catastrophe (the direct antithesis of improved human efficiency and quality of life). Asa Breed's son laments the futility of science—as Marvin Breed recounts, "He was all set up to be a heap-big re-search scientist, and then they dropped the bomb on Hiroshima and the kid quit, and he got drunk, and he came out here, and he told me he wanted to go to work cutting stone" (71). The ice-nine disaster is similarly unavoidable. Presented with "Papa" and Dr. Von Koenigswald's crystalline bodies, Frank Hoenikker sees a simple solution—"Listen, we've got to clean up this mess" (241). Despite his logical, well-planned efforts, the world becomes an uninhabitable wasteland in a matter of minutes.

Submitted: Jan 20 at 4:40pm

Assessment

Grade: 49 out of 50




Assignment Comments

 You do a great job including specific examples and passages from the novel to illustrate your points.

You also make an excellent point about the scientists having little idea or control over the application of their research in the novel. The way in which Ice-Nine falls into the ocean is so absurd and ridiculous that it gives lie to any notion of predictability.

Scott Smith, Jan 24 at 9:06pm

Add a Comment

Short responses: one of Howell's

Set aside the engineering and personnel blunders made by billionaire John Hammond and his team in setting up a wildlife refuge filled with dinosaurs. **Assume the park is in fact safe for visitors.**

Also ignore the rather implausible reliance on amphibian DNA leading to sex-switching and breeding. **Assume dinosaurs** (as well as other animals and plants) **are cloned healthy and sterile** (unable to breed).

In ethical and scientific terms, what problems still remain? **What else could go wrong?**

Student response (a humanities major)

Paper View

Although the park is presumably safe and the animals are cloned to be healthy and sterile, the complications could include issues involving climate/environment, and also the fact that these animals/plants are being bred in the modern era. One might not necessarily think of the era as a problem, but the world/environment they initially inhabited was obviously different. Even though Isla Nublar is essentially isolated, there is no way of monitoring some of the organisms that decide to inhabit it, such as small migratory birds or insects. This may seem like a small issue, but it is a microcosm of the big picture. Even though there is a seemingly decent set-up of a food chain of some sorts, there are certain things that are out of Hammond and his team's hands. The modern animals that may decide to inhabit Jurassic Park could essentially damage the island slowly, therefore could lead to the demise of the park. Also, the climate the dinosaurs lived in millions of years ago had to have been different, it certainly has not remained the same over all these years and the living conditions are incredibly different. Yes, the animals have been bred into this new environment but their genetic makeup may not actually allow them to flourish or live healthy lives.

The island itself is presumably large as well, but the fact that the animals are still confined to this small area as opposed to what they had originally inhabited, it poses the same problem that many zoos still face today. Ethically, for the health of the animals, just like a zoo, confining these large animals to this space will probably pose a problem in the future. Yes, they can always "create" more dinosaurs to replace those that die, but that could eventually become costly and perhaps reach a point where the expenses might not be worth it. Ethically, even though the park is safe for visitors, for the sake of the animals and other organisms, the future could perhaps hold a lot of mishaps and accidents due to how the animals deal with the climate and other things that are in their environments. The environment could even include issues regarding the hunting instincts the animals possess; the carnivores and omnivores probably will be fed with things OTHER than other dinosaurs, but if some are meant to hunt, it's not like those instincts will not be prevalent in their genes, as you cannot pick and choose certain genes/tendencies.

Submitted: Feb 10 at 1:46pm

Assessment

Grade 49 out of 50

Assignment Comments

All great ideas!

James Howell, Feb 10 at 2:32pm

Add a Comment

Submit

Student response (a science major)

The screenshot displays a student's assignment submission interface. On the left, the 'Paper View' section shows a student's response to a prompt about creating a new ecosystem. The text discusses the potential effects of introducing new plants and animals, the role of microflora, and the ethical implications of recreating a Jurassic Park-like environment. On the right, the 'Assignment' section shows the submission date (Feb 11 at 8:09am) and the score (50 out of 50). Below this, the 'Assignment Comments' section shows two comments from James Howell, dated Feb 13 at 4:38pm and 4:39pm. The first comment says 'Great ideas.' and the second says 'I gave you a perfect score because you thought of an idea I had not!'. At the bottom right, there is a 'Submit' button.

Paper View

Submitted: Feb 11 at 8:09am

Assessment

Grade 50 out of 50

Assignment Comments

Great ideas. James Howell, Feb 13 at 4:38pm

I gave you a perfect score because you thought of an idea I had not! James Howell, Feb 13 at 4:39pm

Add a Comment

Submit

Discussion strategies

We primed discussions with a variety of preliminary exercises:

1. **Open questions** at the start of class
with our written summaries and drawn connections on the chalkboard
2. **Incidental writings** at the start of class (instead of at the end)
3. **Small group discussions** at the start of class
4. **Preliminary passages** at the start of class
modeling close reading and analysis (Smith's technique)

Distinguish, as you understand them now, the facts of evolution from the theory of evolution.

Facts

- Evolution is not linear
- All life began from one source
 - ↳ single cells
- Appearance changes over time
- Speciation can occur
 - ↳ mating becomes more difficult
- Apes and humans share a common ancestor
- Relation to others in species

Theory

- All humans share a common ancestor
- numerous missing links
- Speciation takes ~~years~~ ^{thousands of years} to occur
- natural selection

As you understand it now, how does evolution work? What are the mechanisms by which new species descend from old species?

Evolution works as a means for a living being to adapt to its climate or habitat. It is a slow process that works by reproducing of a species over a period of time as that species' world changes around it. This happens through the interchanging of genes and DNA. Passed on from the paternal and maternal figure

Distinguish, as you understand them now, the facts of evolution from the theory of evolution.

FACTS:

- fossils, skeletons of change.
- organisms do adapt.
- DNA sequences show relatedness
- dinosaurs are real.
- dinosaurs (some) evolved to birds
- racist
- etc

THEORY:

- all humans came from apes
- apes came from lesser species
- from fish
- from amoebas
- mitosis can somehow produce new cells
- carbon dating is accurate
- timeline

As you understand it now, how does evolution work? What are the mechanisms by which new species descend from old species?

evolution is the process of adaptation to a new environment. Species can develop resistances to certain dangers. They do that by altering their ~~etc~~ DNA somehow, leading, eventually, to a new species altogether. This process is called natural selection.

A mommy sheep and a daddy sheep love each other very much. ♥♥ They put their bodies very close to one another and make a baby sheep. ♥♥

- ♥ How does this sort of reproduction work—in terms of DNA, cells, maternal anatomy and physiology, and embryonic development?
 - ♥ What is the relationship between the DNA of Mommy, Daddy, and Baby?
- a sperm and egg find each other in the mom's fallopian tubes, producing a zygote. The cells start dividing in the uterus and attach to the uterine lining. Eventually a fetus will develop along with a placenta.
 - a baby is 50% from each parent

A hairless ape in a white lab coat has a state of the art molecular genetics lab and veterinary fertility clinic, a mommy sheep, and another female sheep named Fluffy. How—in terms of DNA, cells, maternal anatomy and physiology, and embryonic development—can the hairless ape create an exact genetic replica of Fluffy?
(Bonus: What is the relationship between the DNA of Mommy, Fluffy, and Baby Fluffy?)

An exact replica could probably not be created due to the lack of mitochondria from the mother. Unless this is a case in which we discussed about the 3-parent baby, then perhaps it could work but the DNA wouldn't be identical.

A mommy sheep and a daddy sheep love each other very much. ♥♥ They put their bodies very close to one another and make a baby sheep. ♥♥

- ♥ How does this sort of reproduction work—in terms of DNA, cells, maternal anatomy and physiology, and embryonic development?
- ♥ What is the relationship between the DNA of Mommy, Daddy, and Baby?

gametes from mother/father allow DNA to recombine
so that embryo has ~ 50% mother DNA + 50% father DNA

Using this genetic material, mother provides nutrients
+ environment for embryo to develop

A hairless ape in a white lab coat has a state of the art molecular genetics lab and veterinary fertility clinic, a mommy sheep, and another female sheep named Fluffy. How—in terms of DNA, cells, maternal anatomy and physiology, and embryonic development—can the hairless ape create an exact genetic replica of Fluffy?
(Bonus: What is the relationship between the DNA of Mommy, Fluffy, and Baby Fluffy?)

Implant embryo in 'mommy' sheep using only
genetic material from Fluffy. Embryo created artificially
→ Fluffy/Baby Fluffy have exact same DNA; while Mommy is only a surrogate with no genetic material

Another entry prompt from Howell

What do you believe about vaccines? [climate change]

Why do you believe it?

It is a fact that you have neighbors and acquaintances with opposite views than your own about vaccines.

[climate change]

Why do you think they believe the opposite of what you believe?

“The Two Cultures,” The New Statesman (1956)

“... the scientific culture is expansive, not restrictive, confident at the roots, the more confident after its bout of Oppenheimerian self-criticism, certain that history is on its side, impatient, intolerant, creative rather than critical, good-natured and brash.”

“The Two Cultures,” The New Statesman (1956)

The young English scientists still “stay pretty resilient: they are swept on by the same social force. Harwell and Windscale have just as much spirit as Los Alamos and Chalk River: the neat petty bourgeois houses, the tough and clever young, the crowds of children: they are symbols, frontier towns. There is a touch of the frontier qualities, in fact, about the whole scientific culture. Its tone is, for example, steadily heterosexual ... About the whole scientific culture, there is an absence – surprising to outsiders – of the feline and oblique.”

Charles Darwin, On the Origin of Species (1859)

As all the living forms of life are the lineal descendants of those which lived before the Silurian epoch, we may feel certain that the ordinary succession by generation has never once been broken, and that no cataclysm has devastated the whole world. Hence we may look with some confidence to a secure future of equally inappreciable length. And as natural selection works solely by and for the good of each being, all corporeal and mental endowments will tend to progress toward perfection.

H. G. Wells, from “Zoological Retrogression” (1891)

Perhaps no scientific theories are more widely discussed or more generally misunderstood among cultivated people than the views held by biologists regarding the past history and future prospects of their province—life. Using their technical phrases and misquoting their authorities in an invincibly optimistic spirit, the educated public has arrived in its own way at a rendering of their results which it finds extremely satisfactory. It has decided that in the past the great scroll of nature has been steadily unfolding to reveal a constantly richer harmony of forms and successively higher grades of being, and it assumes that this “evolution” will continue with increasing velocity under the supervision of its extreme expression—man.

H.P. Lovecraft, “The Call of Cthulhu” (1928)

The most merciful thing in the world, I think, is the inability of the human mind to correlate all its contents. We live on a placid island of ignorance in the midst of black seas of infinity, and it was not meant that we should voyage far. The sciences, each straining in its own direction, have hitherto harmed us little; but some day the piecing together of dissociated knowledge will open up such terrifying vistas of reality, and of our frightful position therein, that we shall either go mad from the revelation or flee from the deadly light into the peace and safety of a new dark age.

Margaret Atwood, "Writing Oryx and Crake" (2003)

Oryx and Crake is a speculative fiction, not a science fiction proper. It contains no intergalactic space travel, no teleportation, no Martians. As with *The Handmaid's Tale*, it invents nothing we haven't already invented or started to invent. Every novel begins with a what if, and then sets forth its axioms. The what if of Oryx and Crake is simply, What if we continue down the road we're already on? How slippery is the slope? What are our saving graces? Who's got the will to stop us?

Making adjustments

Unanticipated, **productive interaction between instructors**

Hard to plan for! Lesson plans cannot be fully scripted.

Students noticeably responded to this dynamic!

Howell made a **major shift from lecture towards discussion** (of science topics), responding to Smith's (humanities, discussion-based) teaching style.

Assessing the course

1. Informal **mid-term written feedback**
2. **Final meeting discussion** (“course wrap-up”)
3. Creamery **focus groups** before finals week
(three meetings: Howell + 3, Howell + 3, Smith + 4)

Strong consensus among these three methods of gathering feedback.

Student feedback

Possible improvements

- Expand genres to include:
 1. Short stories
 2. More science writing
 3. Journalism (including attention to policy issues)
 4. Television episodes
- Provide more diverse representation of science and science issues
(**less ‘science is bad’**)
- Devote more time to climate change

Student feedback

Possible improvements

- Revision opportunities for term paper
peer review OR instructor feedback on an initial draft
- Provide more time to complete “short response” assignments
- Provide discussion questions prior to literature meetings
- Provide pre-lecture material for science meetings, outlining base concepts
- Less time on the atomic bomb (or, less material generally)

Student feedback

Things that worked

- Range of texts and media
- Starting with C.P. Snow’s “The Two Cultures”
- Small class size was beneficial
- Small group discussions prior to full class discussion
- Incidental writings were productive
- Students appreciated open discussions,
including (especially?) disagreements between instructors

What do you believe about vaccines?

Vaccines are miracles. They have prevented the death of millions of individuals. We have successfully eradicated horrible, debilitating diseases like smallpox in developed countries. Yes, shots suck. But in the end it's worth more not to die from a horrible disease.

Why do you believe it?

My mother is a doctor and I am a scientist who has seen the benefit and power of vaccines to save people. The science behind it is perfectly logical. I had a childhood friend who was severely hospitalized with a totally preventable disease, but her parents refused to vaccinate her.

It is a fact that you have neighbors and acquaintances with opposite views than your own about vaccines.

Why do you think they believe the opposite of what you believe?

Because they are ignorant and stupid and believe in true crap that they hear in the media.

- Biggest misconception is that vaccines are the cause of autism

I do realize that some vaccines come from aborted tissue and that can violate someone's religious views. Also some religions frown upon vaccines.

What do you believe about vaccines?

I believe that vaccines are a necessity, because it allows us to build our immune system, and protect us from diseases that would otherwise kill us. It helps fight and prevent the spreading of diseases.

Why do you believe it?

The reason I believe that vaccines are a must, is because of history. History has proven that vaccines prevent diseases from killing humans & spreading. For instance, the flu use to kill hundreds - thousands of people in one area before a vaccine was created.

It is a fact that you have neighbors and acquaintances with opposite views than your own about vaccines.

Why do you think they believe the opposite of what you believe?

I think others believe the opposite of what I believe because they fear what they don't understand. There is a possibility that vaccines can harm an individual, but there is an even greater chance that a disease will. I think that individuals also feel that they are having their freedom taken from them. And as an individual that has no say in what vaccines I get because of the military, I can understand that.

What did you learn during today's discussion? What questions do you have after today's discussion?

I learned about how little Darwin knew when he made his theory and what he used to back it up. (I already know the rest since I am a biotech major :P)

I would still like to know more about what causes evolution to not occur gradually (Hox gene mutations, catastrophes, etc.)

On the first day of class, we asked you what you hoped to get from this course. Are you getting what you hoped you would get? Give examples.

This class is giving me almost exactly what I hoped for. A set of literature that shows how science was viewed by society and how science has (pardon the pun) evolved over time. The Manhattan Projects and Snow's theory showed society's views while Darwin's work showed how it changed.

Please take a moment to tell us what we are doing well in this course, and what we could do in order to improve this course.

The choice of books and presentations has been great! The only thing I would ask for is for some more modern (21st century) views on science.

We'll get there!

What did you learn during today's discussion? What questions do you have after today's discussion?

- clarification/differentiations between facts, theory, and mechanisms
- that we can observe changes over time: i.e., panda discussion

On the first day of class, we asked you what you hoped to get from this course. Are you getting what you hoped you would get? Give examples.

So far, yes. ~~Important~~ ^{extensive} Some things (the scientific discussions) can be confusing, but they are definitely interesting. I like the class mostly because it applies science to the humanities, making the content more interesting. It's a nice change to be reading science-y related literature as opposed to reading about general topics/branches of English, i.e. 18th c. British lit or American Dystopian fiction.

Please take a moment to tell us what we are doing well in this course, and what we could do in order to improve this course.

The lecturing style is solid, I like how you guys alternate who lectures, it ~~also~~ makes it easier to understand/keep up with what's going on. The participation assignments on canvas seem to be working pretty well too.