Human Population 2018
Lecture 1
My Worldview
Imagine a stranger strikes up a conversation with you. They say:

“Consider the following…”
Global population is growing exponentially!
Cities are overcrowded
Oceans are overfished
Fertile farmland is disappearing
the climate is changing
we are in a mass extinction event

everything points to disaster
And, no one seems to be paying attention!
How will it all end? Disease?

Anybody still listening?
War?
Famine?
How do you react?
Choose one.
1. Continue eating and ignore him.
2. Look at watch. Make excuse. Get out of there as fast as possible.
3. Reassure them politely that population is not a problem.
4. Engage in an animated conversation about the-end-of-life-as-we-know-it.
Is discussing population taboo?

• Absent in news.
• Absent in education.
• Absent in scientific research.
• Absent in policy making.
• Absent or misrepresented in economics.
Lecture 1
My Worldview
What is a worldview?

- Science
- Engineering
- Social
  - Political
  - Economic
- Local
- Global
- Religious
My psychological worldview

Musical Dissonance -- an uncomfortable feeling when notes or rhythms do not fall neatly into the current tonality.

Cognitive Dissonance -- an uncomfortable feeling when discussing data that does not fall neatly into current beliefs.
Is there a psychology of dissonance?

<table>
<thead>
<tr>
<th>Level of Dissonance</th>
<th>...in Music</th>
<th>...in Science</th>
<th>Reaction...</th>
</tr>
</thead>
<tbody>
<tr>
<td>low</td>
<td>row row row your boat</td>
<td>what is 2 + 2?</td>
<td>just accept it.</td>
</tr>
<tr>
<td>medium</td>
<td>Bach tocatta</td>
<td>how does calcium cross the cell membrane?</td>
<td>study it.</td>
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<tr>
<td>high</td>
<td>Schönberg 12-tone row &quot;music&quot;</td>
<td>how do we solve the overpopulation problem?</td>
<td>flee.</td>
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</tbody>
</table>
Repeat your opinion with light, or no, dissonance.
Reasoning

input data with moderate dissonance

your opinion
Blocking

no opinion

input data with heavy dissonance
Discussing population political issue

outside of the mainstream

personal time investment

personal isolation

irresolvable

reproductive instincts

reproductive austerity

conflicts with

leads to
decreases

inhibits

perceived as

perceived as

perceived as

inhibits

personal investment

other time investments

guilt trip

Careful consideration of population may lead to blocking!
What do we reason about?

More thoughts are focused at local concerns, both in time and in relationship.

dots represent "concern density".

The Limits to Growth, 2nd Ed. (1972) Meadows et al,
Reasoning makes opinions convergence

If a proposition is true, then anyone who inquires ‘into the nature of reality’ (well enough and long enough) is fated to believe it.

And of a proposition is false, then anyone who inquires.. is fated to disbelieve it.

Given that knowledge is "justified, true belief" [Plato], then science leads to common knowledge. Common knowledge is a form of agreement. Agreement leads to peace.

Misak, Cheryl, ed. The Cambridge Companion to Peirce. Cambridge University Press, 2004. Ch.5 p 133. by Christopher Hookway
What is science?
• **Science** (from Latin scientia, meaning "knowledge") is a systematic enterprise that builds and organizes knowledge in the form of testable explanations and predictions about *the universe*.

- **completeness**
- **science is a process**
- **hypothesis driven**
- **science applies to anything, anywhere**
- **science results in models**
Data, information (or cited sources).
Models, explanations, analysis.
Projections given status quo.
Recommendations. Actions.

Note: A given statement may mix tasks. For example, “there are 7-billion people on the planet, so let’s stop breeding.” mixes Descriptive and Active tasks.
Science is a stepwise process...

- Descriptive ➔ Interpretive ➔ Predictive ➔ Active

Not proceeding methodically is called “Jumping to conclusions”
Descriptive task

• Comprised of
  • data
  • and/or
  • cited data, model, or prediction.

  e.g. If someone publishes a model, it is a interpretive task in the context of that publication, but it is considered data in the context of any publication that cites it.

• Marked by "is" statements. Tables. Graphs. Cited works.
Interpretive task

- Based on the data or descriptions of prior work.
- Result of Interpretive task is a "model".
- Models are simpler than data.
- Uses knowledge of system behavior (which is a type of data)
- In writing, marked by any kind of "what this means" statement.
Predictive task

- based on the "model" (result of Interpretive task).
- predicts unseen data.
- results are "hypotheses."
- hypotheses may be validated by getting more data (i.e. by experimenting)
- Are generally future tense, "will" statements.
Active task

• based on predictions (results of Predictive task).
• invokes values, interests, desires.
• results are actions (i.e. experiments).
• may generate new data.
• Can be "would/should/could" statements. Recommendations for action.

New cycle starts here!
Science is a feedback process...

- Descriptive → Interpretive → Predictive → Active

new experiment
My chemistry worldview

The global carbon cycle

Life catalyzes the oxidation/reduction of carbon.
My chemistry worldview

The Earth is a closed, non-adiabatic system.
Zoom out.
Me

- **My psychological worldview** -- The brain is *not* wired for logic. (You have to train it to do that.)

- **My process worldview** -- Science is a step-wise cyclical process. (No jumping to conclusions.)

- **My chemistry worldview** -- The world is a closed non-adiabatic carbon cycle, catalyzed by life. (Zoom out to see the big picture.)
Not my worldview:

- Economics
- Religion
- Politics
Course contents

• Here's what you signed up for...
<table>
<thead>
<tr>
<th>Syllabus</th>
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<tbody>
<tr>
<td><strong>Class meeting</strong></td>
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<td>28</td>
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**Final exam**
Grading

Essay/talk : 20%
Homework : 20%
Debates : 20%
Bring a question to class: 20%
Term project : 20%
Course web page
www.bioinfo.rpi.edu/bystrc/courses/biol4961
Debates

Format: Karl Popper-style: Pro/Con

• **1 week prior**: Get your assignment. Meet in groups, research the topic, come up with a strategy for defending your position.

• **3 days prior**: Publish your arguments, one argument per debater. Work on cross-examination and rebuttals.

• **Debate day**: Present arguments. Present rebuttals. All are timed.

• Take questions from "Panel" (everyone else).

• Panel draws Argument Diagrams.
Debates

Sign up for two (2) Debate Days. Select Affirmative for one date, Negative for the other. Topics and roles are to-be-determined. Look for the debate description on the course web page.

Created by: CB Chris Bystroff

<table>
<thead>
<tr>
<th>Date</th>
<th>Available Slot</th>
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<tbody>
<tr>
<td>02/02/2018 (Fri.)</td>
<td>Affirmative Team (4)</td>
<td>Sign Up</td>
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<tr>
<td></td>
<td>Negative Team (4)</td>
<td>Sign Up</td>
</tr>
<tr>
<td>02/16/2018 (Fri.)</td>
<td>Affirmative Team (3)</td>
<td>Sign Up</td>
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<tr>
<td></td>
<td>Negative Team (3)</td>
<td>Sign Up</td>
</tr>
<tr>
<td>03/06/2018 (Tue.)</td>
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<td>Sign Up</td>
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<td></td>
<td>Negative Team (3)</td>
<td>Sign Up</td>
</tr>
<tr>
<td>03/27/2018 (Tue.)</td>
<td>Affirmative Team (3)</td>
<td>Sign Up</td>
</tr>
<tr>
<td></td>
<td>Negative Team (3)</td>
<td>Sign Up</td>
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</tbody>
</table>
Most class meetings have a reading, mostly from Limits to Growth. **Set aside 1-2 hours for readings.** When you have finished, write a question for class discussion. Upload the question to the course web page.
Bring a Question to Class most days.

- If there is a reading for the day, ask a question.

- Question should be based on the reading. (If you don't submit a question, I assume you didn't read the assignment!)

- No need to make it a "hard" or "profound" question.

- Keep it a reasonable length.

- At the beginning of each class on Question days, read someone else's question and attempt to answer it.

- We will proceed pseudo-randomly until question time is exhausted.

- 20% of your grade is how many questions you upload.
The Book


Supplementary material (available on web site)


Film: David Attenborough “How Many People Can Live on Planet Earth” (2011) (47 min) https://www.youtube.com/watch?v=1oi9z1aZXBQ


Sign up for **podium presentations** using Sign-up Genius (http://www.signupgenius.com/). No slides allowed. Talks should be 7 minutes with up to 5 minutes of questions/answers. Seven minutes is approximately 800 words or about three pages of text. Topics can be anything relating to human population. Present and attribute your data, construct an explanatory model, and predict future data, events or outcomes. Finish with a well-justified recommendation for future actions, such as studies, policies or experiments.

Essays will be graded on **clarity** and **content**. Clarity will be assessed by (1) correct **word usage**, (2) correct **sentence structure**, (3) correct **paragraph structure**, and (4) correct **essay structure**. Content will be assessed by (1) **logical progression** of statements, (2) **evidential support** of statements, (3) **correct attribution** of evidence, (4) **balance** of scientific "tasks".

Essays are text only, with citations and bibliography, in **Word** or **Pages** format.

Students are encouraged to visit the **Center for Communication Practices** in the Folsom Library to improve their skills in writing.

Sign-up for **two** 7-minute science presentations on Sign-up Genius (see email invite). One early, one late.
Course contents

Homework: systems dynamics models

1. Insight1: Zombies. (Jan 23)
2. Insight2: Demographic transition theory (Feb 6)
3. Insight3: Human Development Index (Feb 23)
4. Insight4: Ecological Footprint (Mar 9)
5. Insight5: IPAT (Mar 30)

*Make InsightMaker account today!! Send me your username. You will be added to "Human Population at RPI" InsightMaker group
Term Projects

Connect population to a specific current event using a systems dynamics model. Present your work with slides. Predict the future! Design experiments or propose actions. Work in groups of 2.
Course rules
Academic honesty

Confirmed plagierism, defined as unattributed use of published material, whether egregious or unintentional, will result in penalties as follows: First time "F" on assignment, 2nd time "F" in course.

_Dual submission_: Copying is a form of plagierism. The first incidence of confirmed copying will result in a "F" on the assignment for both parties. A second incidence will results in an “F” in the course. (Does not apply when working in groups and all authors names are on the paper.)
Unexcused absences:

This is a participatory course. Attendance is required. Each unexcused absence will result in a 3% grade reduction. Documentation for excused absences is processed by the Student Experience Office, 4th floor Academy Hall, x8022, se@rpi.edu.
Avoid semantic arguments

Science requires that things be defined. We use words to define things. Words should have unique definitions to the extent possible. The alternative is confusion.
This course deals with a sensitive subject for some religions and other ideologies. Students will not be graded on their religious views, political leanings or opinions in general. Religion and politics may be discussed where it is relevant to the course, but every attempt should be made to ensure that religious topics and political views are treated with respect, objectivity and non-judgement. Any student who uses this course as an opportunity to judge any religious doctrine or ideology will be warned and possibly graded down. Any student who uses non-falsifiable statements tied to ideology will be gently warned and may be graded down.
Office hours

• Fridays 10-12am
• J-Rowl 3c07
• or **by appointment**
• Send email! I always answer. Or call x3185.
For next time:

- Read the assignment
- Submit a question
- Make an account on InsightMaker
- Bring a laptop computer to class.