“Welcome to guerrilla physics.”

- David MacKay, *Sustainable Energy without the Hot Air*

“What you can measure, you can address”

- Saadia Zahidi, *World Economic Forum*

1. INTRODUCTION TO THE INTENSIVE SEMINAR:

The developed world’s impact on the earth’s environment has moved from a purely local effect shared with many species to potentially transformational effects on a global scale. The seminar is an introduction, with readings, discussion, and critical analysis, to the physical basis of energy, thermodynamics, and climate change. Through measurement and simple model building the course develops methods to study impacts of human activity from a global perspective. Introducing tools to assess environmental impact, including carbon and ecological footprint analysis, allows the seminar members to use global considerations to inform local projects. A focus of the semester is to apply global thinking to local solutions through foundational, whole-system principles. The seminar finishes with a close look into the energy needs and a model for a renewable energy solution for the Adirondack Park and an analysis of the footprint of the Hamilton Adirondack Program.

2. TEXT:

The texts for the course come from a variety of sources. For the energy and thermodynamics portion of the course we will largely draw from a free online OpenStax [College Physics](http://openstax.org/details/books/college-physics) text and from Bloomfield’s *How Things Work*, now in its 4th edition (all editions but the first are similar). A couple copies of *How Things Work* are available in the Mountain House library collection.

We draw from a number of other books and sources including:

- Tom Murphy – [Do the Math](http://tommurphy.squarespace.com) blog
- David MacKay – *Sustainable Energy - without the Hot Air* (also free online)
- Jerry Jenkins – *Climate Change in the Adirondacks: The Path to Sustainability*
- Mike Berners-Lee – *How Bad are Bananas? The Carbon Footprint of Everything*
- Williams Rees and Mathis Wackernagel – *Our Ecological Footprint: Reducing Human Impact on the Earth*
- The Intergovernmental Panel on Climate Change (IPCC) – *Climate Change 2007: The Physical Science Basis*
- Bill McKibben – *eaearth*
- Al Gore – *An Inconvenient Truth*
- D. Meadows et. al. *Limits to Growth*
- and others...

3. SCHEDULE:

We have the regular lecture-discussion classes on Monday and Wednesday mornings. In addition Fridays are reserved for more hands on activities - labs. We play with what it means to measure, with
concepts introduced in the seminar, and with building ‘houses’\(^1\) to test our ability to build and model high efficiency ‘homes’.

4. Guest speakers:

We have (so far) two visits scheduled from folks from afar. The plenary speaker Tom Murphy from UC San Deigo will be visiting October 8-10 and will deliver a plenary lecture to the ADK community on Sunday October 9. The second visit is by Gene Bazan and Tania Slawecki who have thought, gardened, and lived a life immersed in an ecological perspective. They will be here after the gardening season winds down, November 3-5 and are great resources not only for us in the seminar but also for individual capstone projects.

5. Goals:

(1) Appreciate where there is complexity but also where there is simplicity.
(2) Develop a system-wide type approach to global issues.
(3) Be number savvy: Develop ability to deal with claims involving numbers and exotic units.
(4) Understand well (including that which is solid and that which is less so) a back of the envelope model of climate change.
(5) Explore local solutions to global problems.

6. Grades:

There are 4 parts to the grade:

(1) Seminar participation (25 %): Presentations, contribution to discussion and general engagement. After fall break I will ask you to will self-assess your participation and I will offer my thoughts on your participation. If all goes well I expect that these grade will be high.
(2) Problem sets (40 %): Week assignments will be posted and distributed a week prior to the due date. If you have no idea of this format of work, just ask me about them and I will give more of an introduction and some examples. I encourage you to work together you but you should write up your own solutions. If you received a significant idea from someone else or another source, cite them completely.

   The problem set average is computed by total points during the semester. Another way to put this is the problem set average is weighted by the number of points assigned in each set.
(3) Mid-term: (15 %) The exam will be Wednesday, October 12.
(4) Final (20 %): In this 3 to 5 hour block of time you will work through problems and prepare a carbon footprint analysis.

7. Accommodation:

Hamilton College makes reasonable accommodations for students with properly documented disabilities. If you are eligible to receive an accommodation(s) and would like to make a formal request for this course, please discuss it with me during the first three weeks of class. You will need to provide Allen Harrison, Associate Dean of Students (Elihu Root House; ext. 4021) with appropriate documentation.

8. Weekly Schedule

This is approximately what we accomplished in the fall 2016 semester.

“HTW” is How Things Work, “SE” is Sustainable Energy, “HBAB” is How Bad are Bananas?, “OEF” is Our Ecological Footprint, and “CCA” Climate Change in the Adirondacks

Enjoy!

\(^1\)Given their size, they may be best suited for mice.
<table>
<thead>
<tr>
<th>Week</th>
<th>Topic</th>
<th>Reading</th>
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<tbody>
<tr>
<td>25 August</td>
<td>Rio 2016 footprint</td>
<td>Rio report</td>
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<tr>
<td>1 September</td>
<td>Force, Work, Energy</td>
<td>HTW Ch 1</td>
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<tr>
<td>8 September</td>
<td>Power, Heat &amp; Temperature</td>
<td>HTW Ch 2, 3, 7</td>
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<td>15 September</td>
<td>Energy use, and spectra</td>
<td>HTW Ch 7,8 SE Ch 2</td>
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<td>22 September</td>
<td>Entropy and the 2nd Law</td>
<td>HTW Ch 8, 14, DOE hydro study</td>
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<td>29 September</td>
<td>Climate change on an envelope</td>
<td>Murphy’s Climate Change Recipe Reese 15.11</td>
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<td>6 October</td>
<td>Climate change continued</td>
<td>SE Ch 8</td>
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<tr>
<td>13 October</td>
<td><strong>Fall break</strong></td>
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<tr>
<td>20 October</td>
<td>Energy sources</td>
<td>SE 2,4,6,10,16</td>
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<td>27 October</td>
<td>Energy sources &amp; Mid-term</td>
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<tr>
<td>3 November</td>
<td>Alternative energy</td>
<td>SE Ch 3,5,7,9,11</td>
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<td>10 November</td>
<td>Footprint analysis</td>
<td>SE Ch 13,15,17, 30 HBAB selections</td>
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<tr>
<td>17 November</td>
<td>Footprint analysis</td>
<td>HBAB selections</td>
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<td>1 December</td>
<td>The impact of our choices</td>
<td>HBAB selections, OEF Ch 1,2</td>
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<td>8 December</td>
<td>ADK climate change</td>
<td>OEF Ch 3, CCA</td>
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<td>19 December</td>
<td><strong>Final</strong></td>
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