

SYLLABUS: RECURSION AND SELF-CONSISTENCY

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What do Einstein's theory of general relativity and evolutionary biology have in common? Almost nothing, but at least I've got your attention. In this class, we'll discuss the idea of complex systems which are hard to produce, but are internally consistent once you have them (if this sounds confusing, that's OK—there will be lots of examples to illustrate the point). Mostly, it will be an excuse to talk about a lot of cool things, as outlined below. The emphasis will be on getting the general scientific ideas across, and not necessarily on getting bogged down in details (though I reserve the right to talk about somewhat complicated topics).

Though this class is not for the faint of heart, the only real requirement is to be able to think clearly about subtle ideas; all necessary background will be provided in class or in handouts (for example, you don't need to have taken a tough physics course to understand the relativity lecture, but knowing what force and velocity are is good). I'm perfectly willing to adjust to the needs of the class—if almost everyone has already seen something before, I'll make a handout instead of taking up 20 minutes explaining it; likewise, if I need to explain something more to get the point across, I will. My goal is to teach as many interesting, intellectually inspiring ideas as possible.

Other details: there will be weekly homework in the form of questions to prepare for the next week's class, as well as review questions to make sure you absorbed the previous week's. They won't be collected, but effort on the homework will probably be directly correlated to how well you understand the material every week. I'll also pass out information on a (very) optional paper assignment later in the course.

Week 1: Introduction: the chicken and the egg; self-fulfilling prophecies

Week 2: Time travel, predestination paradoxes

Week 3: P vs. NP: how hard is it to find a solution to a problem?

Week 4: General relativity and warp drive

Week 5: Axiom of Choice, Banach-Tarski

Week 6: Evolution of complex structures

Week 7: Protein folding

Week 8: To be determined; possibly a movie