Metapatterns from Quarks to Culture

Advanced Honors Seminar Spring 2016
AHSEM-UA.154 / ENVST-UA.254
Tuesdays 2:00 – 4:35 p.m.

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(OFFICE HOURS: Mon. & Wed., 10:30 AM – 12:15, usually)
take Waverly Building elevators to 11th floor, turn left;
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This class will allow you to develop projects along areas of interest that could aid your career as well as expand your mind. The instructor will introduce the concept of metapatterns: structural/functional patterns in systems, which occur across the levels of the universe, as it built in a series of steps of "combogenesis" from quarks to culture (about 12 main levels), including the emergence of atoms, simplest cells, animal societies, agriculture, the geopolitical state). Examining these steps, we will explore themes such as binaries, borders, emergence, and alphabet-like systems. You will apply these and more (such as systems theory, networks, positive and negative feedbacks) to topics that interest you, from many aspects of environmental issues to, say, physical laws, language, music, biological evolution, cultural evolution, politics, philosophy, or the overall nature of reality (your imagination is the only limit). For a flavor of the material, see the instructor's book "Metapatterns Across Space, Time, and Mind," or the instructor’s papers about metapatterns available from this website (http://metapatterns.wikidot.com/members:tylervolk), or the instructor’s 3 youtube videos on metapatterns (search “professortylevolk” and “metapatterns”). Cross-listed with Environmental Studies as ENVST-UA 254. This course will count towards the major in Environmental Studies.

Tyler Volk is Professor of Biology and Environmental Studies, and a recipient of the University's Distinguished Teaching Award. He is the author of "Metapatterns across Space, Time, and Mind" and of papers that point to common functional principles at different scales. Several relevant papers can be accessed at http://metapatterns.wikidot.com/members:tylervolk. Volk conducts research on the global carbon cycle and Earth’s future and has written books on death-and-life as a scale-transcending pattern and on the integrated systems of our biosphere. He plays lead guitar for The Amygdaloids (http://www.amygdaloids.com).
METAPATTERNS FROM QUARKS TO CULTURE

This course is a study of pattern. It’s an exploration that goes anywhere, into any corner of reality, to pull out examples of patterns to be compared to others. Emphasis during the instructor’s presentations will be on patterns throughout time, on major “steps” during which former relatively independent wholes (or systems) become parts in the coming-into-being of new, larger wholes. The larger wholes on each subsequent “level” are not just larger. They are different. They have new kinds of relations. The larger systems serve, therefore, as levels from which steps were taken to even newer, larger, different wholes with their subsequent new kinds of relations. You will be able to take these concepts into directions of personal interest.

Trying to be consistent with a general, logical template for the analysis and story, I have distinguished 12 or 13 steps:

1. Quarks, gluons, electrons, photons, and other elementals in the grid of the Standard Model of particles physics
2. Protons, neutrons (together called nucleons), as well as other very unstable “hadrons” (quark combinations)
3. Nuclides, the nuclei of atoms
4. Atoms
5. Molecules
6. Prokaryotic cells (simple cells without cell nuclei)
7. Eukaryotic cells (more complex cells with nuclei and other complex, functional components)
8. Multicellular organisms, including plants, animals, fungi, and, it turns out, many other more obscure groups of living things
9. Animal societies, such as bird flocks, ant colonies, and chimpanzee bands
10. Human cultural bands in networks of the Upper Paleolithic, by 30,000 years ago
11. Agro-villages, at the time of the Neolithic Revolution
12. States, starting with ancient civilizations
13 (?) An open question we can explore and discuss. The global mind? Relevance of science as a PVS process?

It is possible to group these 13 levels into 3 basic “realms” of pattern-forming dynamics:

1. Realm of Physical Law (levels 1 – 5)
2. Realm of Biological Evolution (levels 6 – 9)
3. Realm of Cultural Evolution (levels 10 – 12)

**Your work:** This is a project-based course, in which the students are going to be pushed into independent research right from the start. We might use “peer review” for papers (and videos). As noted, there will ongoing classroom presentations, using powerpoint and other media (the board, handouts, etc.). The topics for the projects will, of course, be determined by your interests, but will generally fall into the two
categories of (1) similarities and differences among the evolutionary processes that generate patterns in biology, culture, and cognition, and (2) specific metapatterns that are found throughout the realms of evolutionary processes, such as borders, binaries, and cycles (or others that the students develop) ANTICIPATED FLOW OF WORK: One major project, with several presentations of other projects along the way, on topics that are asked to be “responses” to material being presented and to the readings. These responses involve postings on the Classes website site so others can make formal comments following the classroom discussion. The major project will be the focus of the course from week 8 onward, with several presentations of prior-submitted writing and discussions of the writing and concepts in focus groups and across the class. These focus groups serve as review panels and engaged peers in the topic of metapatterns for the ongoing research of each student. In addition to the final paper, a short “extended abstract” of the paper will be required, for distribution within a packet to the class.

**Week by week topics:**


**Week 2.** Introduction to metapatterns, from physics to psychology (continued), with emphasis on levels of organization and realms that group the levels into larger units that share basic dynamics of pattern formation. Readings: Volk (1995), Volk (2008), Wikipedia on “emergence.”

**Week 3.** The topic of combigenesis. Readings drawn from a work in progress by the instructor, including the chapters 1 (The observation of holarchy), 2 (A proposal for studying across levels and realms), 3 (A model for the process of combigenesis that generates the levels), and 4 (A quest for 3 scales of metapatterns: within-level, across-level, and across-realm). Additional readings as come up during class discussions.

**Week 4.** Biological evolution, including attending the Darwin Day spring lecture in the NYU Center for Genomics and Systems Biology (lecture “Endless Pigeons Most Beautiful”). Focus is on L6. Prokaryotic cells (simple cells without cell nuclei), and L7. Eukaryotic cells (more complex cells with nuclei and other complex, functional components). Several students present short oral “responses” to the overall material and readings, obtain comments from others, then post their responses on the Classes website. Readings: Szathmáry and Smith (1995), selections from Volk (1995, continued) and Lakoff and Johnson (1980).

**Week 5.** Biological evolution (continued). Focus is on L8, Multicellular organisms, including plants, animals, fungi, and, it turns out, many other more obscure groups of living things, and L9, Animal societies, such as bird flocks, ant colonies, and

Week 6. Cultural evolution. PVS as applicable to cultural change (propagate-vary-select). Focus is on L10, Human cultural bands in networks of the Upper Paleolithic, by 30,000 years ago; and L11, Agricultural-villages, at the time of the Neolithic Revolution. Several students present short oral “responses” to the overall material and readings, obtain comments from others, then post their responses on the Classes website. Readings: continued from Week 5, with student suggestions.

Week 7. Cultural evolution (continued), including An Ecology of Mind, video about Gregory Bateson, anthropologist and cybernetician. Focus is on L12. The state, starting with ancient civilizations, and expanding into current times (issues about the expanding circle of environmental ethics and other topics). Several students present short oral “responses” to the overall material and readings, obtain comments from others, then post their responses on the Classes website. Readings from Week 6, with student suggestions.

SPRING BREAK

Week 8-12. During these weeks the seminar is a working seminar, in which students (who volunteer) lead discussions based on what they are reading and thinking about. They are off on their own (or in groups of their design), but then in the twice-weekly class sessions form a cooperative working group (or subgroups, see page 1 on “work”) on the nature of pattern and general evolution across scales. They now have the basics: fundamental readings on biological and cultural evolution, the relationship between math as transdisciplinary and functional principles as transdisciplinary, combigenesis, levels, and realms, and the instructor’s own concept of metapatterns as a specific first list of universal functional patterns (which he hopes the class will debate).

Week 13. Student submissions of papers for the final round of peer review, and their final presentations.

Week 14. Submission of reviews of papers and general discussions about connections among the papers (at least 3 papers will be reviewed by every student)

Finals Week: Submission of final papers due.

Student presentations and due date for first, short paper, which will go through a peer-review process by the class, and then be revised for a final class booklet, with the target topic the examination of the evolutionary process on multiple scales, from biological to cognitive. Discussion that will establish student goals for their research in the remainder of the semester. By this point, the students have a good grasp of
the major paradigm of functional forms being generated on multiple evolutionary scales, as well as many examples of metapatterns that come into being as a result of this generativity. They will have an idea of what they want to work on next, and we will discuss and debate the worthiness of those ideas in the context of our TIMES seminar.

**Grading:**
Course attendance and participation, which includes individual meetings set up with the instructor: 30%
Work done in timely manner: 5%
Short “response”-type presentations and Classes postings, both from self and in reply to others: 20%
Final project, including paper, extended abstract, and reviews of papers in various stages by others: 45%

**Readings:**

**Required, core readings:**


Mesoudi et al. (2006) Toward a unified science of cultural evolution. *Behavioral and Brain Sciences*, 29, 329-383. (selections from; available online from NYU Libraries.)


Volk, Tyler. 2016. *Quarks to Culture* (in progress for Columbia University Press; selections from)


Volk, Tyler. 1995. *Metapatterns Across Space, Time, and Mind*, Columbia University Press, 298p., 1995. (Selected chapters from this book will be handed out; they include Chapter 3 on Borders and Chapter 6 on Layers)

**Additional readings:**
There are a number of other readings that could prove useful to you, and extended lists and suggestions will be provided as the semester progresses. But here is a preliminary list and you are encouraged to look into profession papers of the following researchers.


Morris, Simon Conway (2004) *Life’s Solution: Inevitable Humans in a Lonely Universe*, Cambridge University Press. I am definitely going to have a student or two look at this book and give a report to the seminar, because Conway Morris has documented with unprecedented detail the phenomenon of convergence in the generation of
biological form.

Pinker, Stephen (2008). *The Stuff of Thought*, Penguin. A leading evolutionary theorist about cognition goes “down the rabbit hole” to investigate to look at deep structures in thinking, for example, causality. Good material for my students.


Wilson, David Sloan (2007) *Evolution for Everyone: How Darwin's Theory Can Change the Way We Think About Our Lives*, Delta. This book is a series of engaging essays that promotes the idea that looking at culture from an evolutionary perspective can yield new insights, and Wilson himself is a leader in that effort, having produced insights into the nature of religion (“Darwin's Cathedral”) and patterns in literature “The Literary Animal: Evolution and the Nature of Narrative (Rethinking Theory”) His book is a good introduction to all his ideas, and will be both useful and inspirational to the students.

Zerubavel, Eviatar (1993). *The Fine Line*, University of Chicago Press. This is an excellent work of cognitive sociology, dealing with organizational borders and cultural integrity.

There are many other possible sources of material, for example, works by Gregory Bateson (*Mind and Nature: A Necessary Unity*), Susan Blackmore (*The Meme Machine*), Daniel Dennett (*Darwin's Dangerous Idea*), E. O. Wilson (*Consilience: The Unity of Knowledge*), Teilhard de Chardin (*The Phenomenon of Man*), Douglas Hofstadter (*Gödel, Escher, and Bach*) and more.

You will also be encouraged to suggest and post or share papers you have found relevant. For example, I will note that some will find the paper by Karl Popper on “3 Worlds” important for their projects.