

Reduction, Emergence, and Essence

The most famously successful strategy of the natural sciences has been “divide and conquer”: reduce or split a system up into its component parts in order to understand how it works.

The past thirty years have seen a resurgence of interest in the subject of “emergence,” roughly defined as the idea that a natural whole is greater than the sum of its parts. The subject seems to inspire more questions than answers. What’s all the furor about? What is emergence, and why do so many scientists and philosophers think it important?

Emergentists talk of wholes as exercising “downward causation” that can’t be explained by the simple interactions of the parts. Is it all mystical babble, or a sort of “God of the gaps” explanation? Or is there a kernel of truth in the irrational-sounding talk?

To bolster their case, today’s emergentists cite examples such as the human mind, organisms, non-equilibrium thermodynamic systems, and complex systems. Do these defy reductionistic analysis? If so, how? If not, how do they disguise themselves as examples of “emergence”?

Was emergence known before modern times? If not, how was modern analysis a prerequisite? Where and how did emergence talk originate? How does that original conception compare to today’s?

The wholeness signified by emergence is reminiscent of the classical conception of stable, relatively independent wholes whose “whatness” was comprehended in the notion of essence or form. But are emergence and essence synonymous? Does the success of reduction disprove the reality of essences? Are essences vindicated by emergence? Or is the relationship between the ideas more subtle?

Is “essence” more mystical babble? But isn’t science’s talk about things “essence talk”? Exactly what *sort* of causal powers did the ancients and medievals attribute to essences? Was it separate from the powers of the parts? But can it ever make sense to speak of an activity of a whole that does not involve its parts?

And after all this controversy, the question remains: what exactly does emergence *mean* anyway?

The Institute for the Study of Nature invites you to join us in a Summer Seminar the week of June 15th, 2009, on the campus of MIT to begin considering these challenging questions with the care they deserve. A tentative schedule follows (p. 5), with more logistical details (p. 3) and an application form (p. 10). Follow the application directions at the end to apply. (We will soon be sending out more detailed information about the related academic conference that will begin at the end of the seminar on Friday, June 19th and continue on Saturday the 20th. We encourage students to plan to stay for that conference.) The initial deadline for applications is February 23rd, see below for details.

Honor Scholarships

Three Honor Scholarships will be awarded that include full tuition, room, and board. The scholarship application consists of the standard Seminar application package, plus a basic five-paragraph-style essay, not to exceed three pages in length, addressing the following questions:

Why is analysis into parts such a successful strategy for understanding natural things? What are the limits of this strategy?

The essays will be judged on clarity and thoroughness of reasoning, not on the particular conclusion reached.

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What

Four days of study and dialog to explore questions of science, natural philosophy, and their intersection: the efficacy of reductionism, the draw of emergentism, and the necessity for essentialism. The course spans from the beginnings of science in the ancient Greeks, through the early moderns like Newton and Descartes to more recent modern results that have signaled a rebirth of interest in the notion of emergence.

In order to maximize the value of the week, students will be expected to read and assimilate approximately 250 pages of materials from scientific, philosophical sources, both modern and classical in the months leading up to the Summer Seminar. Those readings will be available on our website by March 2, 2009. Careful reading of the materials in advance will vastly increase the value and quality of the Seminar for all concerned.

Who

Approximately 20-40 graduate and advanced undergraduate students currently studying within a modern scientific discipline or related fields will join the Seminar as ISN Summer Fellows. Post-docs and young (at heart) scientists are also welcome. Applications from students in other disciplines with a deep interest in science, history and philosophy of science, and/or natural philosophy will be seriously considered.

Tutors

ISN Fellows Michael Augros, Lee Perlman, Joseph Audie, James Barham, John Keck, Mark Ryland, and Bernhardt Trout, as well as James Navarro; other lecturers and guest speakers TBA.

When

The Summer Seminar begins on Monday afternoon, June 15th, at 3:00pm, and ends on Friday afternoon at 3:30 pm. Students are encouraged to stay and participate in the Summer Conference, which will bring together a number of scientists and philosophers around a theme related to the Seminar. The Conference begins Friday afternoon and ends Saturday evening, and the Seminar board fee covers food through Saturday. The initial deadline for applications is February 23rd.

Where

The Massachusetts Institute of Technology, Cambridge, Massachusetts

How

The fee for the Summer Seminar and Conference is \$200. Board will cost \$175 and includes lunch and dinner for the week and at least one special group dinner at a nearby restaurant. Room rates are set by MIT and have not yet been posted. They are expected to approximate last year's rates, which means six nights in a single room will cost about \$336, and in a double about \$234.

The fee and room and board costs can be reduced or waived on show of need. Students are expected to cover their own travel expenses, but exceptions will be considered on a case-by-case basis. Additionally, there are...

Scholarships

Three competitive Honor Scholarships will be awarded that cover full tuition, room, and board, as detailed above (p. 2).

Neighboring airports:

Airport	Code	Distance (miles)
Logan International Airport, Boston	BOS	4.8
Manchester, NH	MHT [*]	54
Providence, RI	PVD [†]	62
Portland, Maine	PWM	106

We recommend taking the subway ("the T") to campus (Red Line, Kendall Square). For more information about getting to the campus, please follow this link: web.mit.edu/visit/get-around.html.

On the following page is the application form (in PDF), which you can also download from the ISN website in MS-Word format. Please complete the application and send it to us by email (preferred and easiest in Word), mail, or fax. The final deadline for applications is Monday, March 16th, 2009. A discount of \$50 off tuition for applications received by the initial deadline of Monday, February 23rd.

	<p>seminars@isnature.org 1718 M Street, NW, #312 Washington, DC 20036-4504 202-640-2720 (voice) 202-640-2715 (fax)</p>
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^{*} A shuttle, free to ticketed passengers, runs every two hours between Manchester and Logan: www.flymanchester.com.

[†] About 11 miles from Boston commuter rail.

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Institute for the Study of Nature

*Summer Seminar
June 15–19, 2009*

*Massachusetts Institute of Technology,
Cambridge, Massachusetts*

Seminar Schedule (Tentative)

Please see Notes on Session Format, following the schedule (p. 8).

Monday, June 15th

3:00-3:30pm Preliminary Discussion (tea)

3:30-4:30pm WELCOME AND INTRODUCTION by John Keck:
*Overview and Plan of the Summer Seminar:
What Is Reductionism? What is Emergentism?*

READING: Aristotle, *Metaphysics* VIII.6.1045a8-10;
Aristotle, *Parts of Animals* I.1.641a5-10;
Collins, “That it is nothing else but *Argumentum ad Ignorantiam*” (1707).

4:30-5:00pm Break

5:00-6:20pm SESSION 1, LECTURE by Michael Augros:

The Classical Background to the Controversy

READING: Aristotle, *Physics* I.1;
selections from Thales, Pythagoras, Democritus, Heraclitus, Empedocles,
Anaxagoras, Leucippus;
Aristotle, selections from *Physics* and *Metaphysics*.

7:00pm DINNER gathering for fellowship and discussion in location TBA.

Tuesday, June 16th

9:00-10:20am SESSION 2, LECTURE by James Navarro:

The Modern Background to the Controversy

READING: J. Locke, *Essay Concerning Human Understanding* (1690), Bk II selections;
Julien Offray de La Mettrie, "Man a Machine" (1748);
I. Kant, *Critique of Judgement* (1790), nn. 80-82;
Herbert Spencer, *First Principles* (1867), §§93-97.

10:20-10:40am Break

10:40am-12:00n SESSION 3, PANEL-LED DISCUSSION with Michael Augros and Lee Perlman:

Views of Nature, Ancient and Modern

READING: TBA

12:00n-3:00pm Lunch and study break

3:00-3:30pm Pre-session discussion (tea)

3:30-4:50pm SESSION 4, SEMINAR led by Lee Perlman:

Early Thinking on Emergence

READING: J.S. Mill, "Of the Composition of Causes," ch. 6 of *System of Logic* (1859);
G.H. Lewes, "Resultants and Emergents" from *Problems of Life and Mind*, v. 2
(1875).

5:00-7:00pm Dinner break and unstructured discussions

Wednesday, June 17th

9:00-10:20am SESSION 5, LECTURE-SEMINAR introduced and led by James Barham:

The British Emergentists

READING: C. Lloyd Morgan, "Emergence," from *Emergent Evolution*;
Broad, "Mechanism and its Alternatives," from *Mind & Its Place in Nature*

10:20-10:40am Break

10:40am-12:00n SESSION 6, LECTURE-SEMINAR introduced and led by James Navarro:

Early 20th-Century Concepts of Emergence

READING: A.N. Whitehead, "Nature Alive" from *Nature and Life* (1934);

Bertalanffy, "An Outline of a General System Theory" (1950).

12:00n-3:00pm Lunch and study break

3:00-3:30pm Pre-session discussion (tea)

3:30-4:50pm SESSION 7, LECTURE-SEMINAR introduced and led by James Barham:

The Phenomenological Approach to Emergence

READING: Bergson, selection from *Creative Evolution*;

Hans Jonas, "Lehrbriefe" to Lore Jonas from 1944, *Memoirs*.

5:00-7:00pm Dinner break and unstructured discussions

Thursday, June 18th

9:00-10:20am Session 8, LECTURE by James Barham:

Contemporary Work on Emergence

READING: TBA

10:20-10:40am Break

10:40am-12:00n Session 9, PANEL-LED DISCUSSION with Michael Augros, and James Barham, James Navarro, and Lee Perlman, moderated by John Keck:

Reductionism, Emergentism, and the Classical View of Nature

READING: TBA

12:00n-3:00pm Lunch and study break

3:00-3:30pm Pre-session discussion (tea)

3:30-4:50pm Session 10, LECTURE by Bernhardt Trout:

A Critical Look at Empirical Emergence in Inanimate Nature

READING: TBA

5:00-7:00pm DINNER at local restaurant.

Friday, June 19th

9:00-10:20am Session 11, LECTURE by Joe Audie:

A Critical Look at Empirical Emergence in Living Nature

READING: TBA

10:20-10:40am Break

10:40am-12:00n Session 12, CONCLUSION led by Staff:
Summary, Review, and Discussion

12:00n-1:30pm Lunch and discussion break

1:30-2:50pm EXAM

Notes on Session Format

Lecture - a formal presentation followed by time for questions

Seminar - a round-table discussion of the reading facilitated by the leader; everyone is expected to actively participate in discussion.

Lecture-Seminar - a hybrid of lecture and seminar. The leader speaks at the beginning to give background to the reading (history, structure) and set up the focus of discussion. This form is intended to constrain the space of discussion a bit to allow us to have a productive discussion in a short time.

Panelled discussion - similar to a talking-heads show with audience participation. Perhaps we should describe it as a Socratic dialogue among the leaders, but with the audience (viz., students) also taking part.

Summer Conference Schedule (coarse detail)

(Room TBA)

Friday, June 19th

3:00-3:30pm Registration

3:30-3:50pm OPENING REMARKS by ISN staff

3:50-7:00pm PRESENTATION OF PAPERS 1-2 AND KEYNOTE 1

7:30-9:00pm Informal dinner

Saturday, June 20th

9:00-9:10am INTRODUCTORY REMARKS by ISN staff

9:10am-1:00pm PRESENTATION OF PAPERS 3-5 AND KEYNOTE 2

1:10-1:55 Lunch

2:10-5:30pm PRESENTATION OF PAPERS 6-9

5:30-5:45pm CLOSING REMARKS by ISN staff

6:30-9:30pm CONFERENCE BANQUET at nearby restaurant

The Institute for the Study of Nature
“Reduction, Emergence, and Essence”

June 15th to June 19th, 2009
Massachusetts Institute of Technology

Please type your information directly into this file, save it using your name in the file name, and e-mail it and supporting materials to jkeck@isnature.org.

Name:
E-mail Address:
Phone Number:
Mailing Address (school year):

Alternative Mailing Address (summer):

Alternative Mailing Address (permanent):

Education

What type of degree are you pursuing?
What is your area of concentration or major?
What year are you at school?
What school do you attend?
What are your future educational plans?
What are your future career plans?

Name and e-mail address of your faculty/mentor nominator:

How does he or she know you?

In what capacity does he or she serve at the university?

In addition to this document, kindly send us (in PDF, HTML, or Word .doc format):

- a *curriculum vitae* or resume
- a 250-500 word essay explaining why you wish to attend the seminar
- A letter of nomination from a professor or mentor

Please request your nominator send the letter of recommendation in PDF, HTML, or Word format directly to John Keck.

Final deadline for all application materials to be received by Dr. Keck: March 16th, 2009 (initial tuition discount deadline: February 23rd). You can contact him by email at jkeck@isnature.org or by telephone at: 202-640-2720.