JOHN von NEUMANN
THE BIRTH of the COMPUTER, ATOMIC BOMBS and GAME THEORY
FALL 2003

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Appointments should be made by email.

COURSE OBJECTIVES: This course is offered to celebrate the centenary of the birth of John von Neumann. Neumann is considered a genius. He was one of the famous Hungarian scientists ("the Martians"), who came to the U.S between the two world wars and contributed very much to the success of science and technology in this country. Neumann was a brilliant mathematician, and worked on different fields of 'pure' mathematics, In addition, he was strongly interested in 'applied math.' He invented the basic architecture of computers, founded game theory and the theory cellular automata, was involved with the Manhattan project, wrote a fundamental book on quantum mechanics, and participated in the movement of cybernetics. Also, he established the basis of the theory of self-reproducing automata and computer simulations and he wrote fundamental papers on meteorology. "The Computer and the Brain" is his posthumous book. Neumann is labeled as THE intellectual ancestor of the science of complexity.

The class will discuss Neumann's life in historical context. You will increase your knowledge of - the intellectual life in Central Europe around the turn of the last century. - the scientific and technological development during the second world war - the "cold war" period. - the history of some basic physical and mathematical problems in the first half of the twentieth century - elements of game theory - the discovery of the atomic bomb - the construction of the first stored-program computer.

COURSE STRUCTURE: Each week a different topic will be discussed. All required texts should be read by the Monday classes. The discussion in class (which is the basis of the whole course) will be based on your new knowledge obtained from your readings. Weekly essays of various types will be assigned as well as some other less formal assignments. Also, most classes will include some critique and discussion of your writing. Be prepared to see your writing shown (anonymously) to the whole class for discussion. If there is any writing you wish not to be shown you must say that on your essay when it is handed in.

READINGS: The readings will be taken from the books for the class which you can buy in the bookstore. We have copied out the selected chapters from the books by Asprey and Macrae which can be bought in the bookstore. URLs of websites are also given. You are encouraged, however, to find more readings on the web!


**ATTENDANCE AND PARTICIPATION:** Attendance is obligatory. Two absences are permitted. Excused absences should be clearly justified and documented.

Participation in other College Events is strongly encouraged:

- **October 6, 8pm:** George Kampis (Dept. History and Philosophy of Science, Eötvös University, Budapest):
- **October 13, 8pm:** Robert Kozma (Institute for Intelligent Systems, The University of Memphis):

**HOMEWORK ASSIGNMENTS:** You will be requested to write short essays weekly, and one long essay due at the end of the ninth week. Essays should be typed. Students are expected to abide by the Honor Code of Kalamazoo College. For this seminar this means that any information taken from any source (human, web, print, etc.) must be clearly acknowledged.

**GRADES:** class discussion: 50%, essays: 50%.

**DISABILITIES:** Any student with a disability who needs an accommodation or other assistance in this course should make an appointment to speak with us as soon as possible.

**FIRST-YEARS FORUMS:** First-Year Forums are intended to help entering students learn the history and tradition of our College, consider important issues, and continue their academic and personal growth. Forums are built around the Dimensions of a education: intercultural understanding, leadership, social responsibility, career readiness, lifelong learning. First-year students choose five Forums to attend during fall term. If a student does not attend five, the final grade in the Seminar will be lowered 2% for each Forum missed.

**DATES TO KEEP IN MIND:**
- Sept 26, Library Session
- Sept 29, Video: Jon von Neumann (63 minutes)
- October 31, Portfolio Day
- October 6: Kampis's talk
- October 13: Kozma's talk
- October 17: no class
- November 21: final essay due

**WEEKLY SCHEDULE and READING:**
1. John von Neumann (1903-1957): an overview
   Links:
   - [http://lcweb2.loc.gov/cgi-bin/query/r?faid/faid:@field(DCID+ms996003)#FAMILY](http://lcweb2.loc.gov/cgi-bin/query/r?faid/faid:@field(DCID+ms996003)#FAMILY)
   - [http://ei.cs.vt.edu/~history/VonNeumann.html](http://ei.cs.vt.edu/~history/VonNeumann.html)
September 26 Friday, Library Day

2. "The Martians"

Monday, September 29th: we shall watch the video "John von Neumann"

   [http://www.kfki.hu/fszemle/archivum/fsz9905/papp.html](http://www.kfki.hu/fszemle/archivum/fsz9905/papp.html)
   Macrae pp. 61-84.
   [http://www.kfki.hu/~cheminfo/polanyi/9601/calling.html](http://www.kfki.hu/~cheminfo/polanyi/9601/calling.html) [see Tradition and Innovation]

4. Early years: logic, foundation of mathematics, quantum physics
   Macrae 85-99.
   Macrae pp. 129-144.

5. Game Theory
   Poundstone pp. 37-64. Nash:
   [Harsányi: another Hungarian Nobel for the Lutheran Gymnasium](http://www.kfki.hu/~cheminfo/polanyi/9601/calling.html)

6. The Manhattan Project
   Poundstone: pp. 65-81

   Student conferences.
   October 31, Portfolio Day

7. Other Martians: Szilard, Teller, Wigner
   [Leo Szilard Online](http://turnbull.mcs.st-and.ac.uk/~history/Mathematicians/Von_Neumann.html)
   [Interview with Edward Teller](http://www.suite101.com/article.cfm/biographies_scientists/85307)
Teller has no apologies for his Cold War role
http://www.achievement.org/autodoc/page/tel0bio-1
Wigner biography
View Dr. Strangelove movie.

8. Princeton: The Institute for Advanced Studies and the Computer I

9. Princeton: The Institute for Advanced Studies and the Computer II.
The Computer and the Brain
Macrae pp. 297-326.
Aspray: pp. 173-212

10. What we learned, where we are?
Recommended readings:
http://www.hunmagyar.org/hungary/history/hcontrib.htm
http://www.unm.edu/~vygotsky/hungary.pdf
http://soucc.southern.cc.oh.us/home/jdavidso/Math/ErdosPaper.html
http://www.kfki.hu/~cheminfo/polanyi/9702/frank2.html