

	ARCH 515P	Philosophy of Technology
Spring 2005		

Credits:	3
Type of Course:	Elective Seminar
Class Meetings:	Thursdays, 10:00 am - 1:00 pm
Location:	Rm 310, HHS
Prerequisites:	None
Instructor:	John Lobell, JohnLobellPratt@aol.com 212-679-1935

COURSE OVERVIEW

From nanotechnology to terra forming and Dyson Spheres (reengineering the solar system); from information theory to Quantum loop gravity, we are in a new age of understanding and control of nature. Nineteenth/Twentieth Century architecture grew out of classical physics and mechanics, and industrial technology. Future architecture will grow out of our new post-industrial knowledge base and technologies.

- Developments in quantum theory are leading to quantum computers that gain their prodigious power through harnessing their siblings throughout the multiverse.
- Biotech, bioinformatics, and genetic engineering are bringing about new species and the alteration of homo sapiens.
- Materials engineering and nanotechnology are altering the substances we use.
- Cosmologists place us in ever expanding infinities of multiple universes.
- Computation, simulation, and robotics are altering the way we interact with nature.
- And developments in information theory and communications technologies promise that eventually everything will be connected to everything at all times.

Through books, movies, and web sites, this course explores cutting edge technologies that are changing our selves, our environment, and architecture.

LEARNING OBJECTIVES

- To become familiar with cutting edge technologies
- To see these technologies in historical, cultural and human contexts
- To learn to use the web for research and keeping up on developments
- To be able to think about and relate disparate information
- To relate technology to changes in self, culture, environment, and architecture

COURSE REQUIREMENTS

- **Attend all classes** (if you miss a class, see me after the next class to review what you missed)
- **Do required reading**
- **Research and report on a web site**
- **Read and report on a book**
- **Report on a movie**
- **Monitor several web sites for technological new updates**
- **Take class notes**
- **Participate in class**
- **Assemble all course material in a course notebook**

GRADING CRITERIA

- Quizzes on required reading – 10%
- Report on a web site – 10%
- Report on a book – 10%
- Report on a movie – 10%
- Monitor several web sites for technological new updates – 10%
- Class notes (see course notebook)
- Participate in class – 5%
- Course notebook – 5%
- Final Exam: an in-class essay – 40%

REQUIRED BOOKS

Understanding Media: The Extensions of Man

By Marshall McLuhan

The Third Wave

By Alvin Toffler

SCHEDULE

1. 1/20 **Introduction**
2. 1/27 **Review course requirements**
(Repeat Intro slides for later registrerees)
3. 2/3 **McLuhan: Technology as Extensions**
 - **Quiz:** McLuhan, Understanding Media, Part I: Intro & ch 1. Part II: Chs 8, 9, 10, 13, 18, 22, 27, 31, 33
 - Present in writing choice of Web Site, Movie, Technology, and Book on which to report
4. 2/10 **The Third Wave: Impacts of new technologies**
 - **Quiz:** Toffler, Third Wave, Chs 1, 2, 11, 12, 15, 16, 17
5. 2/17 **Universal Machine Conference**
No class. Instead, attend the **Universal Machine Conference** and **Wolfram** lecture. Design classes canceled.
6. 2/24 **Computational Architecture discussion**
Review: Journal of Computational Architecture at CompArch.org
 - **Paper** on Universal Machine Conference and Wolfram lecture due
 - **Quiz:** Cultural Concerns in Computational Architecture. See: <http://johnlobell.com/publications/comparchculture.htm>
7. 3/3 **Nanotechnology (material science)**
 - **Paper** on Universal Machine Conference and Wolfram lecture due
 - **Quiz:** Cultural Concerns in Computational Architecture
 - Movie report due
8. 3/10 **Information theory and AI (artificial intelligence)**
 - Web report due
9. 3/17 **DNA and Biotech**

3/24 *No class. Spring break*
10. 3/31 **Post Humanism / Post Human**
 - Book report due
11. 4/7 **Technology, pro and con**
 - **Quiz:**
 - Worldly Wealth, by Michael Lind: <http://www.newamerica.net/index.cfm?pg=article&DocID=1869>
 - Why the Future Doesn't Need Us, by Bill Joy: <http://www.wired.com/wired/archive/8.04/joy.html>
12. 4/14 **Discussion**

- 13.** 4/21 **FINAL – In Class Essay**
- Bring course notebook for review
- (continued)

SCHEDULE (continued)

- 4/28 *No class, Jury Week*
14. 5/5 Discussion

More on Course Requirements

CHOOSE A BOOK

- Do an oral report to the class on the book
- Do a paper, approx. three pages, addressing the following issues
 - What is this book about?
 - What are its implications for self/community/environment?
 - What are its implications for architecture?
 - What is your evaluation of the book?

FORMAT:

Typed on computer, Times font, 12 pt., 1 1/2 space, ample margins. Use a title page that has the title of your paper one third down, centered, and in the lower right put:

Your name
ARCH 515P
Philosophy of Technology
John Lobell
Semester 200X

Do not use a cover of any kind. Just staple your paper with one staple in the upper left corner.

Length: Your paper should be between 1,500 and 2,500 words.

Usage: Diana Hacker, *Rules for Writers*, Bedford/St. Martin's, 2000 (Fourth Edition) This is the Pratt handbook for writing style.

(see next page for list of books)

Here are the books:

(Note: these books vary in length and difficulty. For example, Wolfram's A New Kind of Science is massive. Once you have made a choice, we can discuss reading less than all of the book. If you are interested in a book not on this list, check with me.)

- Architecture and Science, by Giuseppa Di Cristina
 A New Kind of Science, by Stephen Wolfram
 Age of Spiritual Machines, by Ray Kurzweil
 Being Digital, by Nicholas Negroponte,
 Biocosm, by James N. Gardner
 Brave New Unwired World, by Alex Lightman
 Computationalism: New Directions, by Matthias Scheutz (Editor)
 Cyberspace : First Steps, by Michael L. Benedikt (Editor)
 Engines of Creation: The Coming Era of Nanotechnology, by Eric Drexler
 The Diamond Age, by Neal Stephenson
 The Fabric of the Cosmos: Space, Time, and the Texture of Reality, by Brian Greene
 The Fabric of Reality: The Science of Parallel Universes-And Its Implications, by David Deutsch
 Flesh and Machines, by Rodney Allen Brooks
 Future Shock, by Alvin Toffler
 The Future and Its Enemies: The Growing Conflict Over Creativity, Enterprise, and Progress, by Virginia Postrel
 The Gifts of Athena, by Joel Mokyr
 How We Became Posthuman: Virtual Bodies in Cybernetics, Literature, and Informatics, by N. Katherine Hayles
 Limits to Growth, by by Donella H. Meadows; and The Next Two Hundred Years, by Herman Kahn
 Machines Who Think: A Personal Inquiry into the History and Prospects of Artificial Intelligence, by Pamela McCorduck (2004 edition)
 Microcosm, by George Gilder
 Natural Born Cyborgs: Minds, Technologies, and the Future, by Andy Clark
 The New Humanists: Science at the Edge, by John Brockman
 Prey, by Michael Crichton
 Profiles of the Future, by Arthur C. Clark
 Quantum Reality: Beyond the New Physics, by Nick Herbert
 The Quest for a Quantum Computer by Julian R. Brown
 The Reconfigured Eye: Visual Truth in the Post-Photographic Era, by William J. Mitchell
 Simulacra and Simulation, by Jean Baudrillard
 Snow Crash, by Neal Stephenson
 Soft Edge, by Paul Levenson
 Telecosm, by George Gilder
 Turing's Man: Western Culture in the Computer Age, by J. David Bolter

CHOOSE A MOVIE

- Do an oral report to the class on the movie
- Do a paper, approx. three pages, addressing the following issues
 - What is this movie about?
 - What are the established critical comments on the movie?
 - What are its implications for self/community/environment?
 - What are its implications for architecture?
 - What is your evaluation of the movie?

FORMAT:

Same as for Books, above

Here are the movies to choose from. (If you want to choose a movie not on the list, check with me.)

Metropolis	Blade Runner
Things to Come	The Stepford Wives (1975)
Frankenstein	Videodrome
Forbidden Planet	The Road Warrior
THX 1138	Solaris (1972 Tarkovsky)
2001	Terminator 2
Sleeper	The Truman Show
The Planet of the Apes	The Matrix
The Man Who Fell to Earth	Final Fantasy
Star Wars (& sequels, any combination)	The Cell
Close Encounters of the Third Kind	AI
Alien (& sequels, any combination)	Metropolis (2002) (Japanese anime)

For John Ebert's Comments on some of these movies:

See: <http://cinemadiscourse.com/resources/classic-movies.html>

- **2001: A Space Odyssey**
- **Star Wars**
- **Close Encounters of the Third Kind**
- **Alien**
- **Raiders of the Lost Ark**
- **Blade Runner**
- **Videodrome**
- **The Road Warrior**
- **Solaris** (1972 Tarkovsky version)

CHOOSE A WEB SITE

- Do an oral report to the class on the web site
- Do a paper, approx. three pages, addressing the following issues
 - What is this web site about?
 - What are its implications for self/community/environment?
 - What are its implications for architecture?
 - What is your evaluation of the web site?

Here are the web sites. (If you want to choose a movie not on the list, check with me.)

KurzweilAI

<http://www.kurzweilai.net/index.html?flash=1>

(Note: this site has both daily updated news and posted major position papers.

This assignment focuses on the posted major position papers.)

World Transhumanist Association

<http://www.transhumanism.org/>

Extropy Institute

<http://www.extropy.org/>

Stuart Hameroff, Quantum consciousness

<http://quantum-mind.org/intro/intro.html>

Edward Fredkin: Digital Philosophy

<http://www.digitalphilosophy.org/>

Betterhumans

<http://betterhumans.com/>

Singularity Watch

<http://www.singularitywatch.com/index.html>

Foresight Institute (Nanotechnology Institute)

<http://www.foresight.org/>

Nanotechnology (Ralph Merkle's site)

<http://www.zyvex.com/nano/>

Eric Drexler's Web Site

<http://e-drexler.com/>

Edge (Note: this is a huge site, so you will want to look a just parts of it)

<http://www.edge.org/>

Quantum Computing

<http://www.qubit.org/people/david/>

<http://www.qubit.org/>

<http://www.cs.caltech.edu/~westside/quantum-intro.html>

(check google for more)

Timeship

<http://timeship.org/> (Also I' Arca and New Yorker)

Architecture and computation

<http://comparch.org/> (check if this is up)

WEEKLY REPORT ON TECH NEWS

- Choose one or more topics
- Monitor all of the following web sites:
- Report to the class each week on what the sites are saying on your topic, and your thoughts on the implications of this news for self/community/environment/architecture
- Submit your notes for your report, keep copies for your notebook

Here are the web sites to monitor:

(note: these are news sites, and should be monitored daily)

SciTech Daily

<http://www.scitechdaily.com/>

Science Daily -

<http://www.sciencedaily.com/>

Arts and Letters Daily

<http://aldaily.com/>

Wired

<http://www.wired.com/>

KurzweilAI -

<http://www.kurzweilai.net/index.html?flash=1>

(Note: This is by far the most important site for this course. This site has both daily updated news and posted major position papers. This assignment focuses on the daily updated news.)

Here are the topics:

(If you would like to follow another topic, check with me)

- | | |
|--|---|
| 1. Artificial intelligence | 7. Digital imagery and display and CGI |
| 2. Biotech | 8. Human/technological interface (implanting chips in the body, etc.) |
| 3. Communication / Information technology / Information theory | 9. Nanotechnology |
| 4. Computer technology: chips, storage, etc. | 10. Quantum computing |
| 5. Consciousness | 11. Radical life extension |
| 6. Contemporary physics (quantum theory, strings, branes, etc) | 12. Robotics |
| | 13. Simulation |
| | 14. War and military technology |

COURSE NOTEBOOK

You are required to keep a notebook with the material from this course. Get a three ring notebook and by the end of the semester place in it the material listed below. You must bring the notebook to the last class on December 2. Include:

- This course outline
- Your notes from the classes
- Copies of all of your work:
 - Book report
 - Movie report
 - Web site report
 - Weekly technology reports
 - Clippings from the Web you find of interest

Neatness counts. Imagine you were preparing this notebook as a report to give to a client.

NOTE ON CHEATING AND PLAGIARISM:

Students are reminded that cheating and plagiarism are not permitted, and can lead to serious consequences.

Pratt Institute holds issues of academic integrity in the highest regard. So do we. Instances of cheating, plagiarism, and misappropriation of intellectual property will not be tolerated and will be handled in the following manner:

- We are required to report the incident to the registrar, and it will be recorded in your file.
- More than one report to the registrar during your entire time at Pratt will result in a hearing before the Academic Integrity Board, at which time appropriate sanctions will be decided. These may include dismissal from the Institute.
- We will determine the nature and severity of the infraction and apply appropriate sanctions that can range from asking you to repeat the assignment, failing you for the assignment, failing you for the course and/or referring the case to the Academic Integrity Board.

For more details about these procedures please see the *Student Handbook*, the Pratt Bulletins, and the *Judicial Procedures at Pratt* pamphlet.

CHEATING

If you are using dishonest methods to fulfill course requirements, you are cheating. Examples of this include, but are not limited to:

- Obtaining or offering copies of exams or information about the content of exams in advance.
- Bringing notes in any form to a closed book exam.
- Looking at another student's paper during an exam.
- Receiving or communicating any information from or to another student during an exam.

PLAGIARISM

Plagiarism is a bit more complicated, but the rules of documentation and citation are very specific and are tailored to different academic disciplines. Types of plagiarism include:

- Including any material from any source other than yourself in a paper without proper attribution. This includes material from the Internet, books, papers from other students, and from any other source.
- The extensive use of the ideas of others in your paper, even if in your own words, without proper attribution.
- Turning in work as your own that was done by another person.

Please remember that all written work must be in your own words or cited and documented appropriately. If you do not understand how to do this properly, it is your responsibility to ask.

ARCH 515P: PHILOSOPHY OF TECHNOLOGY
Misc. Lecture Notes

1. 1/20 Introduction

See: <http://comparch.org/backgrounds/technology/>

We are today in the midst of a technological upheaval greater than any we have seen in human history. To put it simply, we are now beginning to be able to control matter (or should we say reality) on the most fundamental particle levels. And, if David Deutsch is right, our ability to manipulate quantum phenomena gives us windows into parallel universes.

These technology fields are so vast that there is now way even to outline them, so for now we will list some major sources of information on cutting edge technologies, and in the future we will provide links to material that addresses the implications of these technologies for architecture.

2. 1/27 Review course requirements

3. 2/3 McLuhan: Technology as Extensions

We usually think of technology as exterior to the human being. We see an automobile on the street, and we see its presence in and impact on the environment. We may go further and see its impact on the formation of urban patterns. But that automobile also changes use internally. In *Understanding Media*, McLuhan shows how technologies become extensions of our consciousness. This notion, taken in conjunction with Merleau Ponty's phenomenology, shows us how different technologies change our very existence.

4. 2/10 The Third Wave: Impacts of new technologies

5. 2/17 Universal Machines Symposium

This symposium explores the relationship between architecture and computing with a specific focus on the theme of universality. Universality implies the unprecedented ability of computers to emulate divergent and multivalent processes that are not possible given the fixed parameters of classical machines. The symposium will attempt to open up futures in computing and architecture that have been stalled by the singular proliferation of narrow formalist tropes. Beyond "blobs" computing offers architecture an unprecedented opportunity to invent new forms and practices beyond any single ideology. The Symposium will be a daylong event concluded with a lecture by the distinguished physicist Dr. Steven Wolfram.

6. 2/24 Computational Architecture discussion

See: <http://comparch.org/resources/people/>

See: <http://comparch.org/resources/software/>

7. 3/3 **Nanotechnology (material science)**

From: http://en.wikipedia.org/wiki/Molecular_nanotechnology

Molecular nanotechnology

From Wikipedia, the free encyclopedia.

Molecular Nanotechnology (MNT) is nanotechnology using "molecular manufacturing", an anticipated technology based on positionally-controlled mechanosynthesis guided by molecular machine systems. It involves combining physical principles demonstrated by chemistry, other nanotechnologies, and the molecular machinery of life with the systems engineering principles found in modern macroscale factories. Its most well-known exposition is in the books by K. Eric Drexler.

Ralph Merkle has compared today's chemistry (in contrast to mechanosynthesis) to an attempt to build interesting Lego brick constructions while wearing boxing gloves. Because conventional chemistry has no tools that allow us to place a particular molecule in a particular place (so that it bonds in a predictable way), we must work with randomly moving molecules. As a result, when we cause a particular chemical reaction, we frequently get a mix of several different product species. We must often follow up after the reaction with a physical filtering process to extract the species we actually wanted, with the other species discarded as waste. Nanotechnology could therefore offer much cleaner manufacturing processes than today's bulk technology offers.

The film depicts an animated view of a nanofactory and demonstrates key steps in a process that converts simple molecules into a billion-CPU laptop computer.

We anticipate the animation to be complete in early 2005. For a preview of the animation click on the links below:

Slide show:

<http://www.foresight.org/lizardfire/nanofactorySS.html>

Animated clip:

http://www.foresight.org/animation_challenge/nanofactory_360x240copyright_sor3.mov

8. 3/10 **Information theory and AI (artificial intelligence)**

See: <http://comparch.org/backgrounds/information/>

In other words, we now understand Information to cover a very wide range of concepts. Perhaps most important in understanding information is context. If you wander into the wrong classroom and the instructor is talking about Hilbert Space and putting equations on the blackboard, and you know nothing about advanced mathematics, no information is conveyed. But actually that is not correct. You now know that the instructor is alive, that they speak English, and that you are probably in a math class. All of which is already a lot of information, and most of which has to do with context.

See: http://comparch.org/articles/zero_energy/

Toward a Zero Energy Architecture

By John Lobell

The most pervasive principle in modern physics is described in the Second Law of Thermodynamics; the principle that all systems (including the universe as a whole) tend to run down

9. 3/17 DNA and Biotech

3/24 No class. Spring break

10. 3/31 Post Humanism / Post Human

See: <http://comparch.org/backgrounds/posthuman/>

First, we need to distinguish between post humanism and post human. Post humanism refers to a change in culture, along the lines of the change from the Middle Ages to the Renaissance, or from the Baroque to the Enlightenment. Post human, on the other hand refers to the possibility that, due to new technologies, we are on the verge of becoming no longer human, that is a different species. Among the things we see underdevelopment are:

- Genetic engineering, in which we can alter genes in sperm and ova before fertilization, affecting future individuals
- Genetic therapy, in which we can introduce new genes into even adult individuals through virus vectors
- Cloning, in which we can select a natural or altered human cell and coax it to develop into becoming a (post) human
- Chip implantation, in which chips planted into the brain or nervous system can interact with the nervous system and communicate in unique ways with the environment
- Extreme life extension, in which we can approach practical immortality
- The development of artificial intelligence
- Nanotechnology, which may make it possible to integrate tinny machines into our bodies.

11. 4/7 Technology, pro and con

Worldly Wealth, by Michael Lind:

<http://www.newamerica.net/index.cfm?pg=article&DocID=1869>

Why the Future Doesn't Need Us, by Bill Joy:

<http://www.wired.com/wired/archive/8.04/joy.html>

12. 4/14 Discussion

13. 4/21 FINAL – In Class Essay

4/28 No class, Jury Week

14. 5/5 Discussion

Notes on Books

(these are in no particular order. Text is from Amazon or other sources as indicated.)

The Diamond Age

by Neal Stephenson

[http://www.amazon.com/exec/obidos/tg/detail/-/0553380966/qid=1091631260/sr=1-](http://www.amazon.com/exec/obidos/tg/detail/-/0553380966/qid=1091631260/sr=1-1/ref=sr_1_1/104-8236623-3612726?v=glance&s=books)

[1/ref=sr_1_1/104-8236623-3612726?v=glance&s=books](http://www.amazon.com/exec/obidos/tg/detail/-/0553380966/qid=1091631260/sr=1-1/ref=sr_1_1/104-8236623-3612726?v=glance&s=books)

From Amazon: "John Percival Hackworth is a nanotech engineer on the rise when he steals a copy of "A Young Lady's Illustrated Primer" for his daughter Fiona. The primer is actually a super computer built with nanotechnology that was designed to educate Lord Finkle-McGraw's daughter and to teach her how to think for herself in the stifling neo-Victorian society. But Hackworth loses the primer before he can give it to Fiona, and now the "book" has fallen into the hands of young Nell, an underprivileged girl whose life is about to change."

Snow Crash

by NEAL STEPHENSON

[http://www.amazon.com/exec/obidos/tg/detail/-/0553380958/qid=1091631590/sr=1-](http://www.amazon.com/exec/obidos/tg/detail/-/0553380958/qid=1091631590/sr=1-5/ref=sr_1_5/104-8236623-3612726?v=glance&s=books)

[5/ref=sr_1_5/104-8236623-3612726?v=glance&s=books](http://www.amazon.com/exec/obidos/tg/detail/-/0553380958/qid=1091631590/sr=1-5/ref=sr_1_5/104-8236623-3612726?v=glance&s=books)

Amazon.com

"From the opening line of his breakthrough cyberpunk novel Snow Crash, Neal Stephenson plunges the reader into a not-too-distant future. It is a world where the Mafia controls pizza delivery, the United States exists as a patchwork of corporate-franchise city-states, and the Internet--incarnate as the Metaverse--looks something like last year's hype would lead you to believe it should. Enter Hiro Protagonist--hacker, samurai swordsman, and pizza-delivery driver. When his best friend fries his brain on a new designer drug called Snow Crash and his beautiful, brainy ex-girlfriend asks for his help, what's a guy with a name like that to do? He rushes to the rescue. A breakneck-paced 21st-century novel, Snow Crash interweaves everything from Sumerian myth to visions of a postmodern civilization on the brink of collapse. Faster than the speed of television and a whole lot more fun, Snow Crash is the

portrayal of a future that is bizarre enough to be plausible."

Engines of Creation

The Fabric of Reality: The Science of Parallel Universes-And Its Implications
by David Deutsch

[http://www.amazon.com/exec/obidos/tg/detail/-/014027541X/qid=1089583528/sr=1-](http://www.amazon.com/exec/obidos/tg/detail/-/014027541X/qid=1089583528/sr=1-1/ref=sr_1_1/103-8818865-0551829?v=glance&s=books)

[1/ref=sr_1_1/103-8818865-0551829?v=glance&s=books](http://www.amazon.com/exec/obidos/tg/detail/-/014027541X/qid=1089583528/sr=1-1/ref=sr_1_1/103-8818865-0551829?v=glance&s=books)

From Amazon: "Our best theories are not only truer than common sense, they make more sense than common sense," writes physicist David Deutsch. In *The Fabric of Reality*, Deutsch traces what he considers the four main strands of scientific explanation: quantum theory, evolution, computation, and the theory of knowledge. "The four of them taken together form a coherent explanatory structure that is so far-reaching, and has come to encompass so much of our understanding of the world, that in my view it may already properly be called the first Theory of Everything." Deutsch covers some difficult material with unusual clarity. Each chapter ends with a summary and definitions of important terms, which makes the work an invaluable sourcebook.

Computationalism: New Directions

by Matthias Scheutz (Editor)

[http://www.amazon.com/exec/obidos/tg/detail/-/0262194783/qid=1089583673/sr=1-](http://www.amazon.com/exec/obidos/tg/detail/-/0262194783/qid=1089583673/sr=1-1/ref=sr_1_1/103-8818865-0551829?v=glance&s=books)

[1/ref=sr_1_1/103-8818865-0551829?v=glance&s=books](http://www.amazon.com/exec/obidos/tg/detail/-/0262194783/qid=1089583673/sr=1-1/ref=sr_1_1/103-8818865-0551829?v=glance&s=books)

From the dust jacket: "Classical computationalism—the view that mental states are computational states—has come under attack in recent years. Critics claim that in defining computation solely in abstract, syntactic terms, computationalism neglects the real-time, embodied, real-world constraints with which cognitive systems must cope. Instead of abandoning computationalism altogether, however, some researchers are reconsidering it, recognizing

that real-world computers, like minds, must deal with issues of embodiment, interaction, physical implementation, and semantics. This book lays the foundation for a successor notion of computationalism. It covers a broad intellectual range, discussing historic developments of the notions of computation and mechanism in the computationalist model, the role of Turing machines and computational practice in artificial intelligence research, different views of computation and their role in the computational theory of mind, the nature of intentionality, and the origin of language.”

Turing's Man: Western Culture in the Computer Age

by J. David Bolter

http://www.amazon.com/exec/obidos/tg/detail/-/0807841080/qid=1089600137/sr=1-1/ref=sr_1_1/103-8818865-0551829?v=glance&s=books

From Amazon, by Ivan Askwith: “Although Turing's Man is a little bit dated -- it was published in 1984, before the internet had even taken on a significant presence in modern life, it suggests and foreshadows a number of themes which have become more prominent since the text was printed. Beginning with an overview and survey of technological evolution, from the Ancient World right up through the present, Bolter does a fine job of articulating the complex process through which technology changes and is changed by the society into which it is introduced.”

Age of Spiritual Machines

by Ray Kurzweil

<http://search.barnesandnoble.com/booksearch/isbnInquiry.asp?userid=pT8LKae9ao&isbn=0140282025&itm=1>

From Barns and Noble: “After establishing that technology is growing exponentially, Kurzweil forecasts that computers will exceed the memory capacity and computing speed of the human brain by 2020, with the other attributes of human intelligence not far behind.”

From Amazon: “How much do we humans enjoy our current status as the most intelligent

beings on earth? Enough to try to stop our own inventions from surpassing us in smarts? If so, we'd better pull the plug right now, because if Ray Kurzweil is right we've only got until about 2020 before computers outpace the human brain in computational power. Kurzweil, artificial intelligence expert and author of The Age of Intelligent Machines, shows that technological evolution moves at an exponential pace. Further, he asserts, in a sort of swirling postulate, time speeds up as order increases, and vice versa. He calls this the "Law of Time and Chaos," and it means that although entropy is slowing the stream of time down for the universe overall, and thus vastly increasing the amount of time between major events, in the eddy of technological evolution the exact opposite is happening, and events will soon be coming faster and more furiously. This means that we'd better figure out how to deal with conscious machines as soon as possible--they'll soon not only be able to beat us at chess, but also likely demand civil rights, and might at last realize the very human dream of immortality.

The Age of Spiritual Machines is compelling and accessible, and not necessarily best read from front to back--it's less heavily historical if you jump around (Kurzweil encourages this). Much of the content of the book lays the groundwork to justify Kurzweil's timeline, providing an engaging primer on the philosophical and technological ideas behind the study of consciousness. Instead of being a gee-whiz futurist manifesto, Spiritual Machines reads like a history of the future, without too much science fiction dystopianism. Instead, Kurzweil shows us the logical outgrowths of current trends, with all their attendant possibilities. This is the book we'll turn to when our computers first say "hello." --Therese Littleton”

Machines Who Think: A Personal Inquiry into the History and Prospects of Artificial Intelligence

by Pamela McCorduck

http://www.amazon.com/exec/obidos/tg/detail/-/1568812051/qid=1089600595/sr=1-1/ref=sr_1_1/103-8818865-0551829?v=glance&s=books

From Amazon, from Scientific American: “The enormous, if stealthy, influence of AI bears out many of the wonders foretold 25 years ago in *Machines Who Think*, Pamela McCorduck’s groundbreaking survey of the history and prospects of the field. A novelist at the time (she has since gone on to write and consult widely on the intellectual impact of computing), McCorduck got to the founders of the field while they were still feeling their way into a new science.”

A New Kind of Science

by Stephen Wolfram

http://www.amazon.com/exec/obidos/ASIN/1579550088/qid=1089575171/sr=2-1/ref=sr_2_1/103-8818865-0551829

From Library Journal

In brief, Stephen Wolfram contends that Newton made a mistake when he caught to understand the universe through mathematics—numbers. Instead, Wolfram contends that we should understand the universe through rules like those in computer programs, particularly cellular automata programs.

From Amazon: “Galileo proclaimed that nature is written in the language of mathematics, but Wolfram would argue that it is written in the language of programs and, remarkably, simple ones at that. A scientific prodigy who earned a doctorate from Caltech at age 20, Wolfram became a Nobel-caliber researcher in the emerging field of complexity shortly thereafter only to abscond from academe and establish his own software company (which published this book). In secrecy, for over ten years, he experimented with computer graphics called cellular automata, which produce shaded images on grid patterns according to programmatic rules (973 images are reproduced here). Wolfram went on to discover that the same vastly complex images could be produced by even very simple sets of rules and argues here that dynamic and complex systems throughout nature are triggered by simple programs. Mathematical science can describe and in some cases predict phenomena but cannot truly explain why what happens happens. Underscoring his point that simplicity begets complexity, Wolfram wrote this book in

mostly nontechnical language. Any informed, motivated reader can, with some effort, follow from chapter to chapter, but the work as a whole and its implications are probably understood fully by the author alone. Had this been written by a lesser scientist, many academics might have dismissed it as the work of a crank. Given its source, though, it will merit discussion for years to come. Essential for all academic libraries. [This tome is a surprise best seller on Amazon. Ed.] Gregg Sapp, Science Lib., SUNY at Alban.” Negative comments on Wolfram’s book are now surfacing, claiming that much of what he says is not new, and that he does not adequately credit others. The bottom line is that you should read the book. It is a fantastic education in all of contemporary science, physics, computation, and information theory.

How We Became Posthuman Virtual Bodies in Cybernetics, Literature, and Informatics

by N. Katherine Hayles

<http://www.press.uchicago.edu/Misc/Chicago/321460.html>

You are alone in the room, except for two computer terminals flickering in the dim light. You use the terminals to communicate with two entities in another room, whom you cannot see. Relying solely on their responses to your questions, you must decide which is the man, which the woman. Or, in another version of the famous “imitation game” proposed by Alan Turing in his classic 1950 paper “Computer Machinery and Intelligence,” you use the responses to decide which is the human, which the machine.¹ One of the entities wants to help you guess correctly. His/her/its best strategy, Turing suggested, may be to answer your questions truthfully. The other entity wants to mislead you. He/she/it will try to reproduce through the words that appear on your terminal the characteristics of the other entity. Your job is to pose questions that can distinguish verbal performance from embodied reality. If you cannot tell the intelligent machine from the intelligent human, your failure proves, Turing argued, that machines can think.

Understanding Media

by Marshal McLuhan

McLuhan is associated with the phrase, "The medium is the message." By this he means that the importance of any medium (by which he means not only print and television, but just about any technology including the automobile) is not in its content, but in the medium itself. Thus trains will stop infrequently and lead to distinct town, while automobile can stop anywhere, leading to sprawl independent of what they carry. McLuhan shows how each new medium rebalances the senses and thereby how we perceive. Just as exercising a muscle will cause it to grow and strengthen, so exercising (for example) the part of the visual cortex used in reading will cause it to grow, strengthen, dominate other functions, and change the way we experience everything. Long ignored following the boom of the late 70s (when 'media ecology departments sprang up in universities like mushrooms and many PhD thesis were based on single paragraphs from McLuhan's book), McLuhan is again back in fashion as an avatar of the Internet age. Now if some people would actually read the books ...

The Fabric of Reality

by David Deutsch

This just might be the single most important book of the 21 st Century (although it was published in 1997.) In it Deutsch, a pioneer in quantum computing at Oxford University, presents a fundamentally new view of reality that takes seriously four fundamental ideas of science that are fully accepted, but whose implications are widely ignored. These are: quantum theory, evolution, computation, and the theory of knowledge. Taken together, these four theories not only present us with the multiverse (the idea in quantum theory that when a particle has to make a decision to take one of two paths, it in fact takes both, and the universe splits at that moment into two parallel universes. This happens ad infinitum. One of Deutsch's proofs of this is that harnessing its siblings in infinite parallel universes is the only workable explanation for the inordinate power of quantum computers.

The Quest for a Quantum Computer

by Julian R. Brown

Quantum computing will be the hot topic of the next decade or so, and this book provides the best introduction. But just as important, it brings us up to date on information theory, which has taken major leaps in the past twenty years. Ideas that I held about Maxwell's Demon, the relationship of energy and information, etc. have been updated, and Brown's book is a great source for getting caught up. In this sense it updates Singh's Great Ideas in Information Theory, Language and Cybernetics. It is also a great introduction to Deutsch's Fabric of Reality.

The Future and Its Enemies: The Growing Conflict Over Creativity, Enterprise, and Progress

by Virginia Postrel

http://www.amazon.com/exec/obidos/ASIN/0684862697/qid=1091061678/sr=ka-1/ref=pd_ka_1/103-8818865-0551829

From Amazon: Virginia Postrel smashes conventional political boundaries in this libertarian manifesto. World-views should be defined not by how they view the present, she says, but the future. Do they aim to control it, as many conservative reactionaries and liberal planners want to do? Or do they embrace it, even though they can't know what lies ahead? Postrel (editor of Reason magazine) firmly places herself in this latter category--the dynamists, she calls her happy tribe--and urges the rest of us to sign up. The future of economic prosperity, technological progress, and cultural innovation depends upon embracing principles of choice and competition. The downside of this philosophy, Postrel readily notes, is that it doesn't allow us to manage tomorrow by acting today. And that's exactly the point: we shouldn't want to. A future constructed by an infinite number of individual decisions, made privately, is one she believes we should encourage. The Future and Its Enemies is at once intellectually sweeping and reader-friendly; it has the potential to join a pantheon of books about freedom that includes works by Friedrich Hayek and Milton Friedman. --John J. Miller -

-This text refers to an out of print or unavailable edition of this title.

From Library Journal

Postrel, editor of Reason magazine, believes that conflict between stasists (who urge control and favor the status quo) and dynamists will shape the future. In her opinion, the greatest threats to the future are efforts to shape it in advance. She believes in minimal controls, those necessary to create a framework for cooperation in which private property is respected. The topics she covers include technology, the environment, and urban planning. Postrel criticizes those who strive to re-create... read more --This text refers to an out of print or unavailable edition of this title.

Book Description

Today we have greater wealth, health, opportunity, and choice than at any time in history. Yet a chorus of intellectuals and politicians laments our current condition -- as slaves to technology, coarsened by popular culture, and insecure in the face of economic change. The future, they tell us, is dangerously out of control, and unless we precisely govern the forces of change, we risk disaster.

In *The Future and Its Enemies*, Virginia Postrel explodes the myths behind these claims. Using examples that range from medicine to fashion, she explores how progress truly occurs and demonstrates that human betterment depends not on conformity to one central vision but on creativity and decentralized, open-ended trial and error. She argues that these two opposing world-views -- "stasis" vs. "dynamism" -- are replacing "left" and "right" to define our cultural and political debate as we enter the next century.

In this bold exploration of how civilizations learn, Postrel heralds a fundamental shift in the way we view politics, culture, technology, and society as we face an unknown -- and invigorating -- future.

Flesh and Machines: How Robots Will Change Us

by Rodney Allen Brooks

<http://www.amazon.com/exec/obidos/tg/detail/-/0375420797/qid=1093100253/sr=1->

[1/ref=sr_1_1/104-1544635-](http://www.amazon.com/exec/obidos/ASIN/00179157?v=glance&s=books)

[0179157?v=glance&s=books](http://www.amazon.com/exec/obidos/ASIN/00179157?v=glance&s=books)

From Amazon: The world of HAL and Data, of sentient machines, is fast approaching. Indeed, in some ways it has already arrived, as humans incorporate bionic technology and as humanlike machines increasingly take on the work of humans.

Rodney Brooks, a professor of engineering at MIT, has been involved in this transformation for decades. He has helped design robots that reason, at least after a fashion. The machines are as yet primitive, but, Brooks writes, in five years the boundary between what is now fantasy and fact will be breached, and intelligent machines will come into their own. With them will come a host of ethical problems, as we wrestle with the implications of Asimov's laws of robotics and with the very real possibility that we have created a new kind of slave. There's no way of getting around this future, it would seem, and, adds Brooks, our species will change in the bargain: "With all these trends we will become a merger between flesh and machines."

Antitechnologists may shudder at the story line, but readers interested in the gee-whiz possibilities of the digital age will be fascinated by Brooks's vision of what is and what will be. --Gregory McNamee

Prey

by Michael Crichton

http://www.amazon.com/exec/obidos/ASIN/0061015725/qid=1093100090/sr=ka-1/ref=pd_ka_1/104-1544635-0179157

From Amazon: In *Prey*, bestselling author Michael Crichton introduces bad guys that are too small to be seen with the naked eye but no less deadly or intriguing than the runaway dinosaurs that made 1990's *Jurassic Park* such a blockbuster success.

High-tech whistle-blower Jack Forman used to specialize in programming computers to solve problems by mimicking the behavior of efficient wild animals--swarming bees or hunting hyena packs, for example. Now he's unemployed and is finally starting to enjoy his new role as stay-at-home dad. All would be domestic bliss if it were not for Jack's suspicions that his wife, who's been behaving

strangely and working long hours at the top-secret research labs of Xymos Technology, is having an affair. When he's called in to help with her hush-hush project, it seems like the perfect opportunity to see what his wife's been doing, but Jack quickly finds there's a lot more going on in the lab than an illicit affair. Within hours of his arrival at the remote testing center, Jack discovers his wife's firm has created self-replicating nanotechnology--a literal swarm of microscopic machines. Originally meant to serve as a military eye in the sky, the swarm has now escaped into the environment and is seemingly intent on killing the scientists trapped in the facility. The reader realizes early, however, that Jack, his wife, and fellow scientists have more to fear from the hidden dangers within the lab than from the predators without.

Brave New Unwired World

by Alex Lightman

http://www.amazon.com/exec/obidos/tg/detail/-/B00006CXMN/qid=1093103217/sr=1-1/ref=sr_1_1/104-1544635-0179157?v=glance&s=books

From Amazon: We're on the verge of ubiquitous connectivity, says technowizard Alex Lightman. His *Brave New Unwired World: The Digital Big Bang and the Infinite Internet* might read like science fiction, but smart money is betting on his predictions of wearable computing devices and cheap-as-water wireless bandwidth coming true. Even those who don't stand to make a gigabuck or two off fourth-generation wireless tech will race through Lightman's prose with abandon. He makes the future sound fun. While he can't promise personal jetpacks, his descriptions of simple, elegant communicators will make every red-blooded nerd drool.

Brave New Unwired World is more than just next year's Sharper Image catalog, though. Lightman has been watching trends in commerce, government, and technical research, and points out things to watch for in the first decade of the 21st century. American dollars, European regulators, and Asian factories, he predicts, will combine to change the world yet again. It's a fair bet that Aldous Huxley didn't see *Brave New Unwired World*

coming, but we can be thankful that Dr. Lightman did. --Rob Lightner

The Soft Edge:

A Natural History and Future of the Information Revolution

by Paul Levinson

http://www.amazon.com/exec/obidos/tg/detail/-/0415197724/qid=1093211232/sr=1-1/ref=sr_1_1/104-1544635-0179157?v=glance&s=books

From Amazon. According to Paul Levinson, it would be improper to portray information technology as the cause of change in our world. However, Levinson clarifies that its role in enabling change can hardly be overestimated. He also points out--through riveting examples--that inventions have unintended consequences and uses. Why is it, for example, that the move from polytheism to monotheism failed when attempted by the pharaoh Ikhnaton, yet took solid root among the Hebrews who were taken out of Egypt by Moses only about 150 years later? Levinson argues that communication technology played a key role: The awkward Egyptian hieroglyphics failed to carry the ideology as well as the Hebrew alphabetic system. From there, Levinson examines the early social changes that became possible because of what the author calls "the first digital medium"--the alphabet. He considers how the Reformation, economic and political movements, and the scientific revolution were largely enabled by the printing press. He then discusses the influence of photographic communications and electronic technology such as the telegraph, the telephone, and broadcasting. Levinson devotes the second half of the book to our present digital revolution, from word processing to the Internet and beyond. One of his key points is that new technology doesn't necessarily displace the old so much as it expands it. Therefore, he doesn't see any end to using paper anytime soon. However, he sees great need for changes in the way we view creative rights. He proposes what he calls an "electronic watermark" for intellectual property--a universal patent number that will be embedded in intellectual property and will notify users in any medium of the property's creators. Levinson puts forth his ideas in a

manner that is both formal and engaging. He has a knack for making his reader feel intelligent and respected--and never more so than when he looks at issues of ethics and a speculative future.

The Reconfigured Eye: Visual Truth in the Post-Photographic Era

by William J. Mitchell

http://www.amazon.com/exec/obidos/ASIN/0262631601/qid=1093532423/sr=ka-1/ref=pd_ka_1/104-1544635-0179157

From Amazon. From Library Journal. In this first comprehensive and scholarly discussion of the topic, Mitchell (dean, School of Architecture and Planning, MIT) analyzes the ethical and legal implications of digital imaging technology, the aesthetic potential of the computer medium, the loss of the supposed veracity of the photographic image, and the future of photography as we know it. Warning that the certainties of camera-recorded fact must be left behind as we enter the "post-photographic era," the author predicts the end of traditional film-based photography and its replacement by computer-captured and/or constructed images. His explanations of the technology involved are necessarily technical but are made fully accessible to lay readers through a discussion that is both readable and engaging. The two- and three-way juxtaposition of images show how meaning is affected in the altered version (e.g., imagine the appearance of Rambo at Yalta through the effective blending of images). High-quality illustrations and examples are taken from historical photographs and paintings, photojournalism, architecture, and collage art. Highly recommended.

- Kathleen Collins, New York Transit Museum Archives, Brooklyn
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Cyberspace: First Steps

by Michael L. Benedikt (Editor)

<http://www.amazon.com/exec/obidos/tg/detail/-/0262521776/qid=1093534455/sr=1->

[1/ref=sr_1_1/104-1544635-0179157?v=glance&s=books](http://www.amazon.com/exec/obidos/tg/detail/-/0679762906/qid=1093534429/sr=1-1/ref=sr_1_1/104-1544635-0179157?v=glance&s=books)

From Amazon: Editorial Reviews. Ingram. Cyberspace has been defined as "an infinite artificial world where humans navigate in information-based space" and as "the ultimate computer-human interface." These original contributions take up the philosophical basis for cyberspace in virtual realities, basic communications principles, ramifications of cyberspace for future workplaces, and more.

Being Digital

by Nicholas Negroponte

http://www.amazon.com/exec/obidos/tg/detail/-/0679762906/qid=1093534429/sr=1-1/ref=sr_1_1/104-1544635-0179157?v=glance&s=books

From Amazon. As the founder of MIT's Media Lab and a popular columnist for Wired, Nicholas Negroponte has amassed a following of dedicated readers. Negroponte's fans will want to get a copy of Being Digital, which is an edited version of the 18 articles he wrote for Wired about "being digital." Negroponte's text is mostly a history of media technology rather than a set of predictions for future technologies. In the beginning, he describes the evolution of CD-ROMs, multimedia, hypermedia, HDTV (high-definition television), and more. The section on interfaces is informative, offering an up-to-date history on visual interfaces, graphics, virtual reality (VR), holograms, teleconferencing hardware, the mouse and touch-sensitive interfaces, and speech recognition.

In the last chapter and the epilogue, Negroponte offers visionary insight on what "being digital" means for our future. Negroponte praises computers for their educational value but recognizes certain dangers of technological advances, such as increased software and data piracy and huge shifts in our job market that will require workers to transfer their skills to the digital medium. Overall, Being Digital provides an informative history of the rise of technology and some interesting predictions for its future.

Architecture and Science

by Giuseppa Di Cristina (Editor)

[http://www.amazon.com/exec/obidos/tg/detail/-/0471497223/qid=1093534125/sr=1-](http://www.amazon.com/exec/obidos/tg/detail/-/0471497223/qid=1093534125/sr=1-1/ref=sr_1_1/104-1544635-0179157?v=glance&s=books)

[1/ref=sr_1_1/104-1544635-](http://www.amazon.com/exec/obidos/tg/detail/-/0471497223/qid=1093534125/sr=1-1/ref=sr_1_1/104-1544635-0179157?v=glance&s=books)

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From Amazon: Inside Flap Copy. A topological turn is developing within architecture as a result of intertwining scientific and architectural thought. Topology, which is one of the branches of geometry or modern mathematics, proves useful for architecture as a conceptual resource and as an operative technique.

Architectural topology means the dynamic variation of form, and is a tendency which is facilitated by the growing presence of computer-based technologies. When employed in practice, it leads to pliant, undulated and twisted architectures which are more and more astonishing. The trend of curved and bent design is also founded on new concepts of architectural form and building, so it is possible to speak of a topological tendency in architects at both the theoretical and practical levels.

This volume brings together essays and projects by leading thinkers and practitioners of architecture concerning, directly or indirectly, the topological approach.

Complementing these articles, which have been selected from issues of the influential cutting-edge journal *Architectural Design*, is a new introductory essay by Giuseppa Di Cristina. This book presents the full range of contemporary discussion about theoretical problems related to the topologising of form, as well as the associated new design processes and, above all, spatial exploration.

As an alternative to the traditional concept of the metric, quantitative and homogeneous space of Euclidean and Cartesian geometry, architects are growing ever more interested in the dynamic, heterogeneous nature of topological space. This book aims to satisfy the increasing thirst for information and opinion on this radical new area of design.

The New Humanists: Science at the Edge

by John Brockman

[http://www.amazon.com/exec/obidos/tg/detail/-/0760745293/qid=1093871961/sr=1-](http://www.amazon.com/exec/obidos/tg/detail/-/0760745293/qid=1093871961/sr=1-1/ref=sr_1_1/104-1544635-0179157?v=glance&s=books#product-details)

[1/ref=sr_1_1/104-1544635-](http://www.amazon.com/exec/obidos/tg/detail/-/0760745293/qid=1093871961/sr=1-1/ref=sr_1_1/104-1544635-0179157?v=glance&s=books#product-details)

[0179157?v=glance&s=books#product-details](http://www.amazon.com/exec/obidos/tg/detail/-/0760745293/qid=1093871961/sr=1-1/ref=sr_1_1/104-1544635-0179157?v=glance&s=books#product-details)

From Amazon: From Booklist

Brockman, whose books include *The Next Fifty Years: Science in the First Half of the Twenty-first Century* (2002), founded the intellectual forum EDGE in 1988 (now on the Web at <http://www.edge.org>) to encourage scientists and humanities scholars to present work that exemplifies the growing synergy between what has for too long, and to society's detriment, been viewed as two separate, incompatible realms. Brockman now presents the fruits of his advocacy for the necessary intermeshing of the humanities and science in a lively, mind-expanding anthology of essays by EDGE participants. The need to separate science from politics and simplistic political correctness is avidly discussed amid compelling accounts of new questions raised and answers postulated in evolutionary biology, cosmology, cognition, and computer science by such rigorous thinkers as Jared Diamond, Steven Pinker, Daniel Dennett, Lee Smolin, and Seth Lloyd. As Brockman asserts, the work of humanistic scientists affects "the lives of everybody on the planet," and every reader should be well versed in their methodology, arguments, and conclusions. Donna Seaman
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Book Description

In his essay, Brockman noted that the American intellectual had become proudly or defiantly ignorant of major scientific accomplishments. According to Brockman, intellectual thought was becoming trapped in a "swelling spiral of commentary," and often ignored the real world. Citing C.P. Snow's theory of two cultures: the literary intellectual and the scientist, Brockman predicted an "emerging third culture" where scientists and other empirical thinkers, through their work and writing, would redefine who and what we are.

In *The New Humanists: Science At the Edge*, Brockman has assembled some of the top scientists of today: Jared Diamond, Steven Pinker, Daniel Dennett, Marvin Minsky, Lee Smolin, and others, and has them discuss the

unique contributions each of them is making to the development of modern thought. Some of these thinkers are in sync, others in dissent, but what emerges in *The New Humanists* is a dialogue that serves as a support to Brockman's theory and an introduction to some of the best scientific minds of the 21st century.

Web Sites

(These are in no particular order. Text is from the sites.)

Singularity Watch

“Singularity Watch produces a free newsletter helpful to understanding and managing continuous accelerating change. We also promote scientific investigation, critical analysis, social foresight, and careful, informed speculation about the phenomenon known in internet circles as the coming technological singularity. We host monthly singularity-aware futurist reading groups (in Los Angeles, San Francisco, and Las Vegas), highlight other conferences relevant to thinking about accelerating change (the majority are not yet singularity-aware), outline the multi-disciplinary topic of singularity studies, list degree programs where students may broadly investigate accelerating change, a small publications archive, selected articles, a few developmental futures scenarios and technologies, and select critiques of singularity concepts.”
<http://www.singularitywatch.com/index.html>

World Transhumanist Association

Transhumanism is an interdisciplinary approach to understanding and evaluating the possibilities for overcoming biological limitations through technological progress. Transhumanists seek to expand technological opportunities for people to live longer and healthier lives and to enhance their intellectual, physical, and emotional capacities. The World Transhumanist Association is a nonprofit membership organization which works to promote discussion of the possibilities for radical improvement of human capacities using genetic, cybernetic and nano technologies.
<http://www.transhumanism.org/>

Betterhumans

Connecting people to the future so that they can create it, we explore and advocate the use of science and technology for furthering human progress.... Betterhumans doesn't just cover science and technology. Rather, we

explore and advocate the use of science and technology for advancing humanity and continuing human progress. Our philosophy revolves around our goal of helping people understand, anticipate and create the future. We're dedicated to having the best information, analysis and opinion on the impact of advancing science and technology.
<http://betterhumans.com/>

Extropy Institute

Extropy Institute sees enormous potential in advanced decision making and strategic thinking, coupled with emerging sciences and technologies, to quicken humanity's resolution of these fundamental problems. We aim to gradually but firmly change the rules of the game called "being human". In pursuit of our mission, Extropy Institute assembles individuals from diverse domains of expertise. We gather these ambitious, daring minds to combine creative and executive approaches to expose the fundamental roots of our problems. We see this advanced, multi-faceted solution-seeking as the best way to create a radically better future. We need not remain slaves to our cultural and evolutionary history. For centuries, cultures around the world saw human slavery as part of the natural order, until they were shown irrefutably otherwise. Likewise today, many of us passively accept or stridently defend the inevitability of human stupidity, malice, conflict, aging, and death. We invite you to participate in our mission to connect and cultivate the ingenious and intrepid shapers of the future.
<http://www.extropy.org/>

Singularity Institute for Artificial Intelligence

“The Singularity Institute is a 501(c)(3) nonprofit organization for the pursuit of Friendly AI and responsible intelligence enhancement – a mission of immense potential and consequence. Because intelligence determines how well problems

are solved, the responsible enhancement of intelligence – a safe Singularity – will make difficult problems, such as the prevention and treatment of Alzheimer's and AIDS, much easier to solve. If intelligence is improved greatly, every humanitarian problem will be more amenable to solution. Because AI is positioned as the first technology to enhance intelligence significantly, the Singularity Institute concentrates on the research and development of humane AI. By solely pursuing a beneficial Singularity, we present the rare opportunity for rational altruism. We help provide forums for discussion of the Singularity, coordinate Singularity-related efforts, and publish introductory material and research papers on the Singularity. Above all, our long-term mission is direct research into Singularity technologies, specifically Friendly AI, and the direct implementation of the Singularity.

<http://www.singinst.org/>

KurzweilAI.Net

The most comprehensive source for both background and daily news breaks in the technology fields that will be changing our lives. Check in daily for tech news and subscribe to their email newsletter. "KurzweilAI.net features the big thoughts of today's big thinkers examining the confluence of accelerating revolutions that are shaping our future world, and the inside story on new technological and social realities from the pioneers actively working in these arenas. We are witnessing intersecting revolutions in a plethora of fields: biotechnology, nanotechnology, molecular electronics, computation, artificial intelligence, pattern recognition, virtual reality, human brain reverse engineering, brain augmentation, robotics, and many others. The leading visionaries represented on this site examine these transforming trends and their profound impact on economics, the arts, politics, government, warfare, medicine, health, education, disabilities, social mores, and sexuality."

<http://www.kurzweilai.net/index.html?flash=1>

Foresight Institute

This is where Eric Drexler and Ralph Merkle, the pioneers of nanotechnology, hang out. "Foresight Institute's goal is to guide emerging technologies to improve the human condition. Foresight focuses its efforts upon nanotechnology, the coming ability to build products—of any size—with atomic precision."

<http://www.foresight.org/>

Quantum Computing

There are many sites devoted to quantum computing, but for now, we will recommend David Deutsch's:

"Our best theories are not only truer than common sense, they make more sense than common sense." - David Deutsch. Deutsch is a pioneer in quantum computing. He weaves together the four main strands of scientific explanation: quantum theory, evolution, computation, and the theory of knowledge.

<http://www.qubit.org/people/david/David.htm>

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Edge

John Brockman's site.

"To arrive at the edge of the world's knowledge, seek out the most complex and sophisticated minds, put them in a room together, and have them ask each other the questions they are asking themselves."

<http://www.edge.org/>

Stuart Hameroff

Quantum consciousness

Consciousness is one of the most perplexing problems outstanding in science, and one that reflects on our very nature and relation to reality. Most approaches to the problem of consciousness see the brain as a computer, with neurons and synapses acting as basic switches, or "bits". In this approach, consciousness is thought to "emerge" as a novel property of complex computation. However this approach fails to adequately deal with enigmatic features of consciousness and more radical approaches may be necessary.

Quantum mechanics describes the seemingly bizarre behavior of matter and energy at microscopic scales, e.g. that of atoms and subatomic particles. At that level particles may be in two or more places at the same time (quantum superposition), and particles widely separated in distance may nonetheless be intimately connected (quantum entanglement). These properties are used in quantum computation which offers potential solutions to the enigmatic features of consciousness. However quantum computation is disrupted by interactions with the environment ("decoherence"), and neurons and synapses seem too large for delicate quantum effects.

But neurons may be far more complicated than mere switches. If we look inside neurons and other cells, we see highly ordered networks (the "cytoskeleton") comprised of microtubules and other filamentous structures which organize cellular activities..

Microtubules are cylindrical polymers of the protein tubulin arranged in hexagonal lattices comprising the cylinder wall. Cooperative interactions among tubulin subunits within microtubules have been suggested to process information, as in molecular scale "cellular automata". As the states of tubulin are controlled by quantum mechanical internal forces (van der Waals London forces), they may exist in quantum superposition of multiple states ("quantum bits, or "qubits"), and microtubules may be seen as quantum computers involved in cellular organization. <http://quantum-mind.org/intro/intro.html>

Thoughts on Technology, Architecture, and Culture

John Lobell

Mies writes: *Architecture is the real battleground of the spirit. Architecture depends on its time. It is the crystallization of its inner structure, the slow unfolding of its form.* He goes on: *It [technology—meaning industrial technology] is a real historical movement—one of the great movements which shape and represent their epoch. It can be compared only with the Classic discovery of man as a person, the Roman will to power, and the religious movement of the Middle Ages.*

Mies was identifying the impact on architecture of industrial technology which had its roots in the science born with the Renaissance, and which came into focus in the late 1700s, and into full and awesome expression with World War II and the building boom and consumer boom that followed.

But already at the birth of the industrial age were the seeds of its overthrow and replacement by its successor, the electronic/information age.

In the early 1900s Frank Lloyd Wright recognized the impact of this industrial age (he used the term “the machine” in his seminal essay, “The Art and Craft of the Machine”) on the spirit and on architecture, and gave it an aesthetic which we now call the Modern Movement. Before Wright crystallized the abstract rectilinear geometries of the Prairie style house which have been the vocabulary of modern architecture ever since, the forces of the time were at work and could be seen in such projects as Catherine Beacher’s American Woman’s Home (1869).

Today we are in a moment like that in which Wright began his career. The outlines of the new electronic/information age are apparent in both their technological manifestations and their impact on the spirit, but we are still awaiting the creative architect who will crystallize its inner structure and unfold its form.

The manifestations of the new electronic/information age are broad, its impact will be deep, our reactions to it are varied, and the architecture it will produce cannot be predicted, but must come from the creative response of the artist. Joseph Campbell writes: *One cannot predict the next mythology any more than one can predict tonight’s dream; for a mythology is not an ideology.* Architecture, like mythology, is ultimately not ideology. But just as we can know a lot about the situation of the circumstances and the mind of the dreamer before sleep, so we can know a lot about our cultural circumstances that will spawn our next architecture.

Besides to a new structure of the psyche (a structure in large part formed by our new technologies), our new architecture will have to respond to those technologies and the landscape they produce. Such responses already might be grouped into three approaches:

- *Massive large-scale development:* A continuation of “business as usual, with continued development and confidence that environmental consequences will be minimal or manageable.
- *The neo-Neolithic:* The belief that the planet and the human spirit cannot sustain technological development, and that we should return to the peaceful, environmentally sound and simple technologies of the Neolithic period.
- *Dematerialization:* Faith that our newest technologies will allow us to fulfill our needs and desires with less and less material and energy, until the dominant technological forms moves from material, to energy, to information, and finally to human creativity. (As seen in the microchip, which uses less and less material, and less and less energy, while growing more and more powerful and complex until its main ingredient is human enterprise and creativity.)

771b-Architecture, Informatics and the Posthuman

Yale University School of Architecture
Prof. Mike Silver

Spring 2003

This seminar will serve as a broad overview of developments in the history and theory of information technology by considering advances in art, science, mathematics, programming and hardware design. Examining figures as diverse as Claude Shannon, Donald MacKay, Alan Turing, and John Von Neumann the course will explore how computers have opened up new ways of thinking about a variety of cultural practices and how these transformed practices feed back into the production of new tools. Artificial Life, Cellular Automata, Complexity Theory, Cyberspace, Robotics, Nanotechnology and the Post Human body will serve as the underlying framework for a discussion of the morphological and technical future of architecture in a post critical context. Beginning with a series of lectures, programming exercises, readings and guest speaker's students will be asked to explore a chosen area of research and to present their findings with a spoken presentation and a final paper.

The first four-week sessions will include a 20-30 minute talk by Mike Silver followed by a discussion of readings led by a student. During selected weeks, there will be an additional student presentation on a prescribed topic. A final project/paper, (abstract due at the end of the semester) completes the requirements of the seminar.

771b-Architecture, Informatics and Cyberpunk:

Schedule

Week 1- (January 17th) Introduction

Week 2 – (January 24th) Talk: “Evolution of the Universal Machine”

Martin Davis, “Leibniz’s Dream”, from *Engines of Logic*, W.W. Norton & Co., New York, 2000, Pp. 3-20.

Jon Agar, “The Blue Pig” from *Turning and the Universal Machine*, MIT Press, Cambridge, Massachusetts, 1998. Pp. 1-30.

Week 3 – (January 31st) Talk: “Information Theory: Messages, Signal Processing and Noise” (Archives Project)

Warren Weaver and Claude Shannon, “The Mathematical Theory of Communication”, Urbana: University of Illinois Press, 1949.

Mark C. Taylor, “Noise in Formation” from *The Moment of Complexity*, University of Chicago Press, Chicago, 2001.

Donald M. MacKay, “Meaning and Mechanism” from *Information, Mechanism and Meaning*, MIT Press, Cambridge, Massachusetts, 1969, Pp. 19-30.

Week 4 – (February 7th) Talk: Guest Speaker: Brendan Hookway: “Pandemonium”

Branden Hookway, "Pandemonium: The Rise of Predatory Locales in the Postwar World", Princeton Architectural Press, New York, 1999. Student Presentations

Week 5 – (February 14th) Talk: “Bottoms Up: Cellular Automata, Autopoiesis and Complexity” (SJ Museum and the LCG House)

William Aspray, "A theory of Information Processing" from *John Von Neumann and the Origins of Modern Computing*, MIT Press, Cambridge, Massachusetts, 1998, Pp.173-234.

Stephan Wolfram, "The Crucial Experiment" & "Starting from Randomness" from *A New Kind of Science*, Wolfram Media, Inc., Champaign, Illinois, 2002.

John Frazer, "A Natural Model for Architecture", from *An Evolutionary Architecture*, London: Architectural Association Publications, 1981.

Week 6 – (February 21st) Pin-up/ Programming Workshop

Student Presentations: Cellular Automaton Exercises Due. "Cellabration" Mac or PC Program Download at <http://classes.yale.edu/fractals/index.html>

3D CA Applet: <http://rfhs8012.fh-regensburg.de/~saj39122/doefe/>

Week 7 – (February 28th) Talk: “From Memex to Google: Hypertext and the Internet”

Vannevar Bush, "As We May Think", *The Atlantic Monthly*, July 1945.

George p. Landow, "Hypertext and Critical Theory", Johns Hopkins University Press, Baltimore and London, 1992, Pp. 2-34.

Student Presentation

(Midterm week - March 3rd –7th) No Class

Spring Break – (March 10th-21st) No Class

Week 8 – (March 28th) - “Self-(dis)organization: Fractures, Catastrophes, and the Continuity of Discontinuous Wholes” (Chapel Project)

Philip Ball, "Breakdowns" from *The Self-made Tapestry: Pattern Formation in Nature*, Oxford University Press, United Kingdom, 1999, Pp.140-164.

Diffusion Limited Aggregation Simulator: <http://ory.ph.biu.ac.il/2000/english/demos/dla/>

Student Presentations

Week 9 – (March 28th) – “Matter, Data, Networks: Envisioning the Contemporary Metropolis”

William Mitchell, "Soft Cities", from *City of Bits: Space, Place and the Infobahn*, MIT Press, Cambridge, Massachusetts, 1995. Pp. 106-132.

Sanford Kwinter, "Architectures of Time: The Complex and the Singular", MIT Press, Cambridge, Massachusetts, 2001.

Student Presentations

Week 10 – (April 4th) Talk: Evan Douglas, “ Auto/Braids-Auto/Breeding: Recent Work”

Week 11 – (April 11th) Talk: “Bodies, Subjects and Identities: The Metaphysics of Digital Technology”

N. Katharine Hales, “How We Became Post Human: Virtual Bodies in Cybernetics, Literature and Informatics”, University of Chicago Press, Chicago, 1999.

Hans Moravec, “The Senses Have No Future” from *Mind Children: The Future of Robot and Human Intelligence*, Cambridge MA, Harvard University Press, 1988. (Not in the Reader)

Week 12 – (April 18th) Guest Speakers: Chris Perry and Alicia Androsek: “Emergence”

Week 13 – (April 25th) - “Super Computers and the New Abstraction”
(Baptistry Project)

John Rajchman, “Abstraction”, from *Constructions: Writing Architecture Series*, MIT Press, Cambridge, Massachusetts, 1998, Pp. 55-76.

John Casti, “Would-be Worlds: How Simulation is Changing the Frontiers of Science”, John Wiley and Sons, Inc. New York 1997.

Week 14 – (May 9th) – Future Forms: Nanotechnology and Programmable Matter

K. Eric Drexler, “Engines of Creation”, from, *Cyber_Reader*, Neil Spiller (ed.) Phaidon Press LTD, London, 2002 Pp. 116-125.

Wil McCarthy, “Programmable Matter: A Retrospective” from *Hacking Matter*, Perseus Books, New York, 2003. Pp. xi-xiii.

Final Paper’s Due

Additional Readings

1. Hardware and Software

Charles Babbage, “The Difference Engine” from *Passages from the Life of a Philosopher*, London: Pickering & Chatto, 1994.

Paul E. Ceruzzi, “A History of Modern Computing”, MIT Press, Cambridge, Massachusetts, 1998.

Alan Turing, “On Computable Numbers with an Application to the Entscheidungs Problem”, Proceedings London Mathematical Society, July 1937.

2. Simulations

Andrew Darley, “Realism, Simulation, Interaction”, from *Visual Digital Culture*, Routledge, London 2000.

Stephan Wolfram, "The World of Simple Programs" from *A New Kind of Science*, Wolfram Media, Inc., Champaign, Illinois, 2002.

Stephan Wolfram, "The Thermodynamics and Hydrodynamics of Cellular Automata", from *Cellular Automata and Complexity: Collected Papers*, Westview Press, Champaign, Illinois, 1994.

Martin Gardner, Mathematical Games: The Fantastic Combinations of John Conway's New Solitaire Game "Life" (The Game of Life), *Scientific American* 233 (October 1970) Pp. 120-123.

M. Mitchell Waldrop, "Life at the Edge of Chaos" from *Complexity*, Touchstone Books, New York, 1992.

Gilles Deleuze, "Mediators" from *Incorporations*, Zone Books, New York, 1992, Pp. 280-294.

3. Morphologies

Manuel De Landa, "Nonorganic Life" from *Incorporations*, Urzone Books, New York, 1992.

Cedric Price, "The Generator Project", from *Cedric Price Works II*, London: Architectural Association Publications, 1981.

John Frazer, "A Natural Model for Architecture", from *An Evolutionary Architecture*, London: Architectural Association Publications, 1981.

4. Bodies, Subjects and Identities

Norbert Weiner, "Organization as the Message" from *The Human Use of Human Beings*, New York: Doubleday Anchor books, 1954/London: Sphere Books, 1968.

Hans Moravec, "The Senses Have No Future" from *Mind Children: The Future of Robot and Human Intelligence*, Cambridge MA, Harvard University Press, 1988.

Mark C. Taylor, "Screening Information", from *The Moment of Complexity*, University of Chicago Press, Chicago, 2001.

Eric Davis, "Technosis: Magic Memory and the Angels of Information" *South Atlantic Quarterly* 92:4 (Fall 1993) Durham, NC: Duke University Press, 1993.

Daniel Dennet, "An Empirical Theory of the Mind" from *Consciousness Explained*, Penguin Books, London, 1993.

Sir John Woodroffe, "The Science of Death" from "The Tibetan Book of the Dead", edited by W.Y. Evans-Wentz, Oxford University Press, 1959.

Donna Haraway, "A Cyborg Manifesto: Science Technology, and Socialist Feminism in the 1980's", *Socialist Review* 80 (March-April) 1985.

Katie Hafner & John Markoff, "Cyberpunk", Touchstone Books, New York, 2000.

5. Fictions

William Gibson, "Neuromancer" New York, Ace Books 1984/London: Gafton, 1986.

Jeff Noon, "Stash Riders", from *Vurt*, Manchester: Ringpull Press, Ltd., 1993.

William Gibson and Neal Stephenson, "The Difference Engine", VGSE, Victor Gollancz, Ltd., 1991.

William S. Burroughs, "The Ticket that Exploded" Grove Press, New York, 1997.

Scott Bukatman, "Terminal Resistance/ Cyborg Acceptance", from *Terminal Identity*, Duke University Press, North Carolina, 1993.

Suggested Research Topics

1. Simulation and Meteorology
2. Cinematic Special Effects
3. Supercomputation
4. Video Games
5. Robotics and Architectural Fabrication
6. Digital Cartography
7. Nanotechnology
8. Consumer Electronics and New Hardware
9. Military Technology
10. Digital Practices (Architecture and Design)
11. Fuzzy Logic
12. Game Theory

