

Computer Ethics Helicopter View

Norberto Patrignani

*"Technology is the answer!
(But what was the question?)"*

Amory Lovins, Published as a guest essay, in G. Tyler Miller, "Environmental Science", 3rd ed. Belmont, CA, 1991

Values Embedded in Design





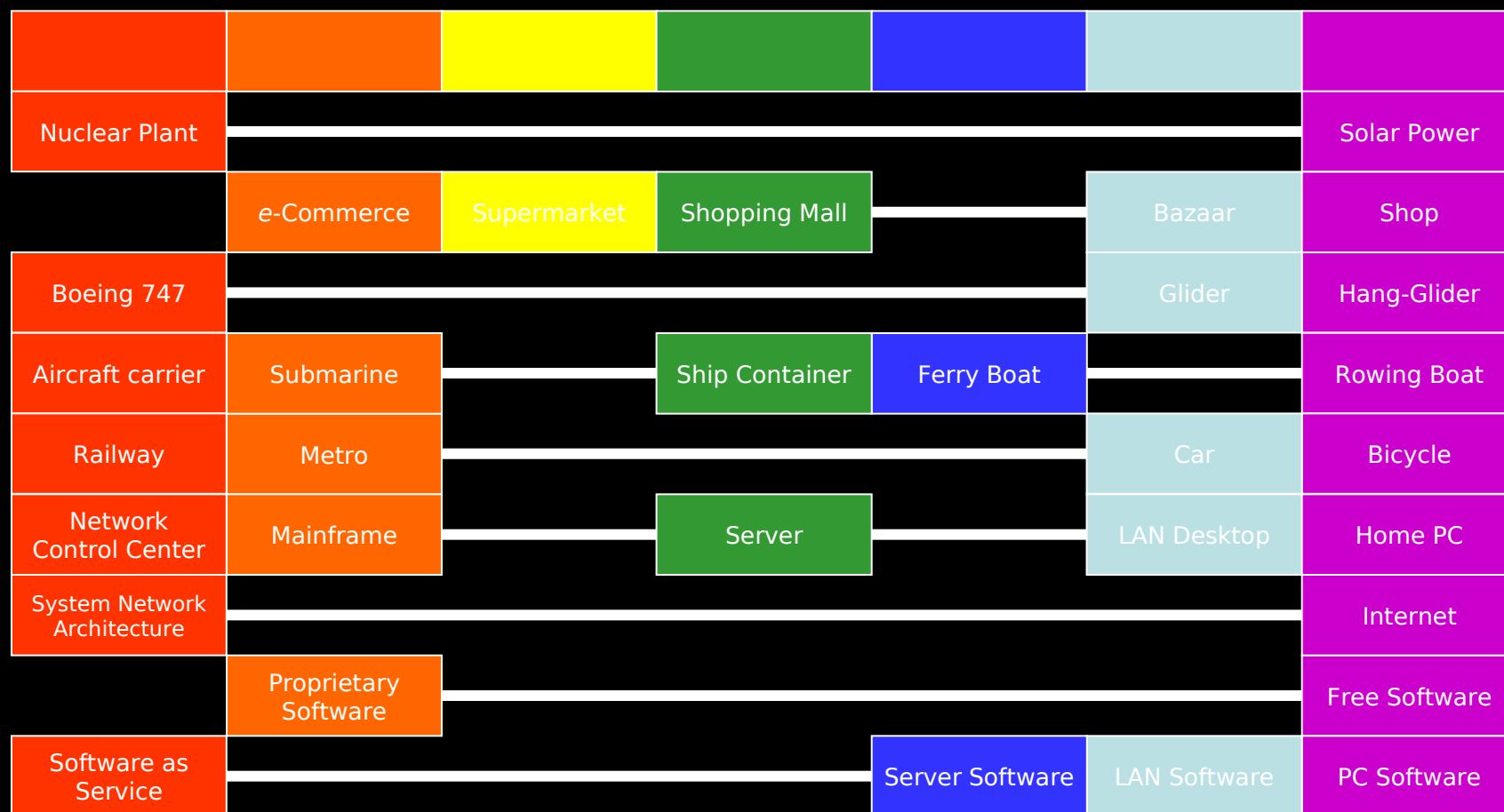
*Sailors must yield
to their captain's commands*
Plato, Republic

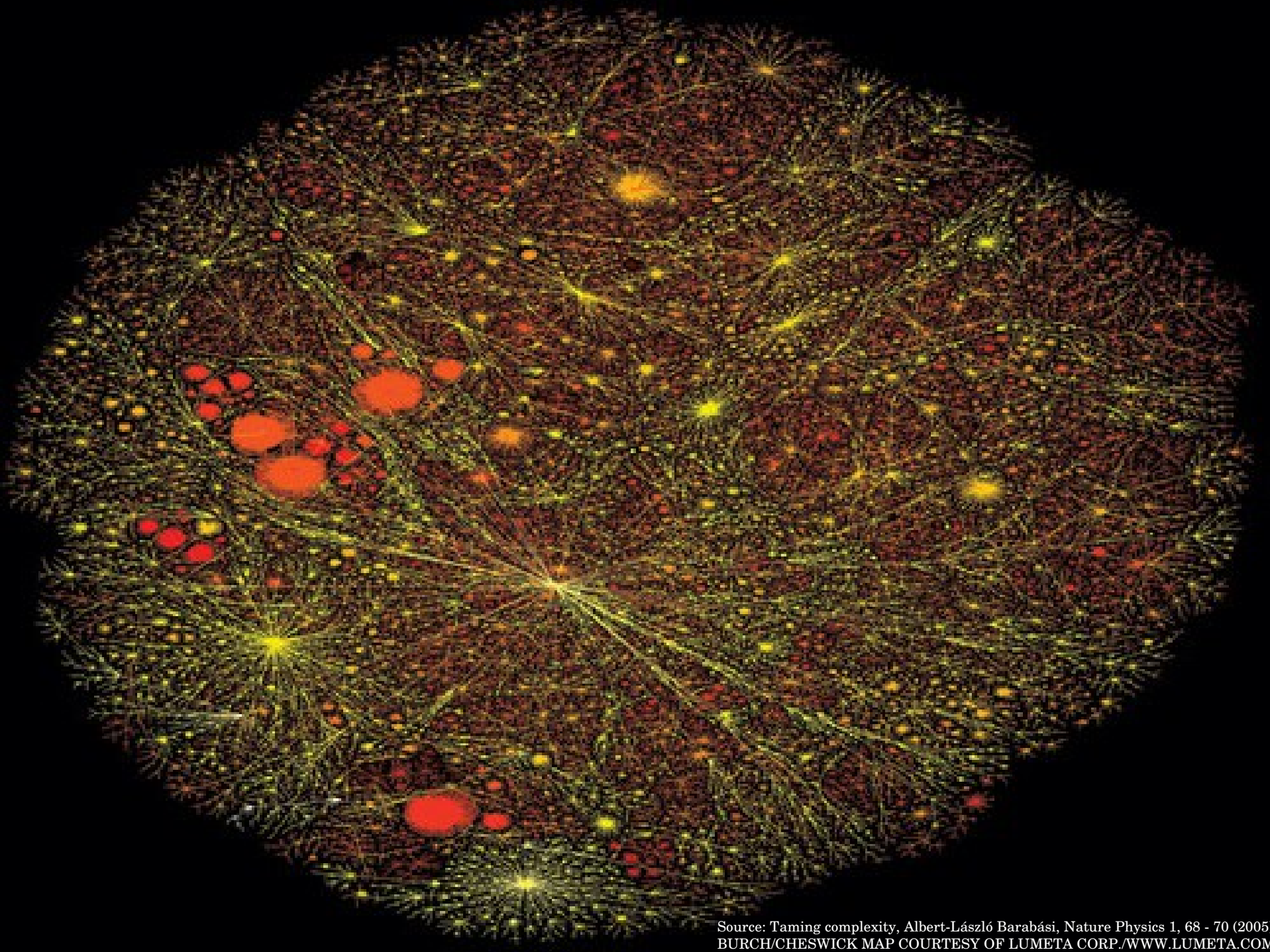
Do artifacts have politics?

*Politeia vs Techne**

centralized

de-centralized





Source: Taming complexity, Albert-László Barabási, Nature Physics 1, 68 - 70 (2005)
BURCH/CHESWICK MAP COURTESY OF LUMETA CORP./WWW.LUMETA.COM

Co-Shaping





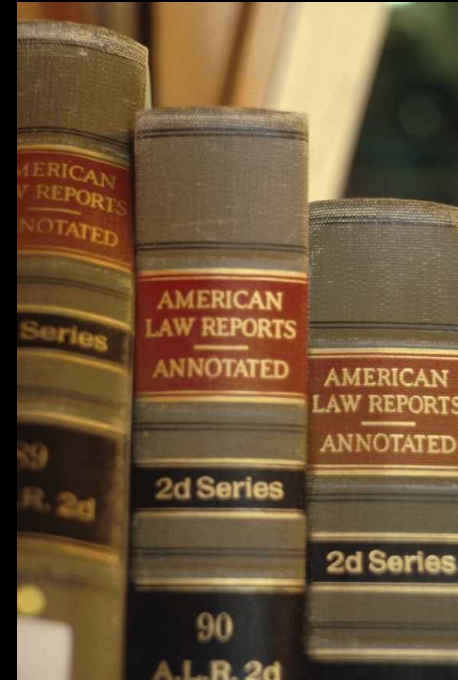
Value-Sensitive Design



Market



Architecture



Law



Education



Market



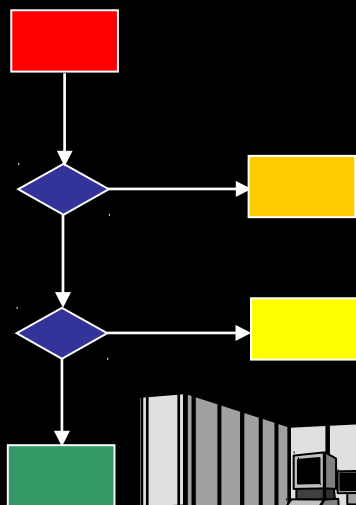
Architecture



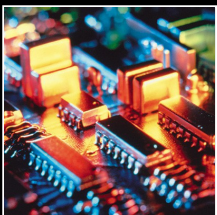
Law

Education





Architecture

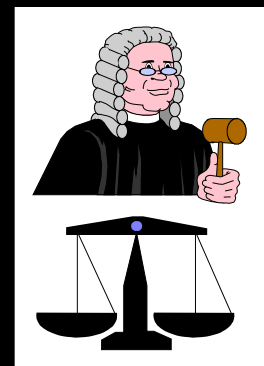


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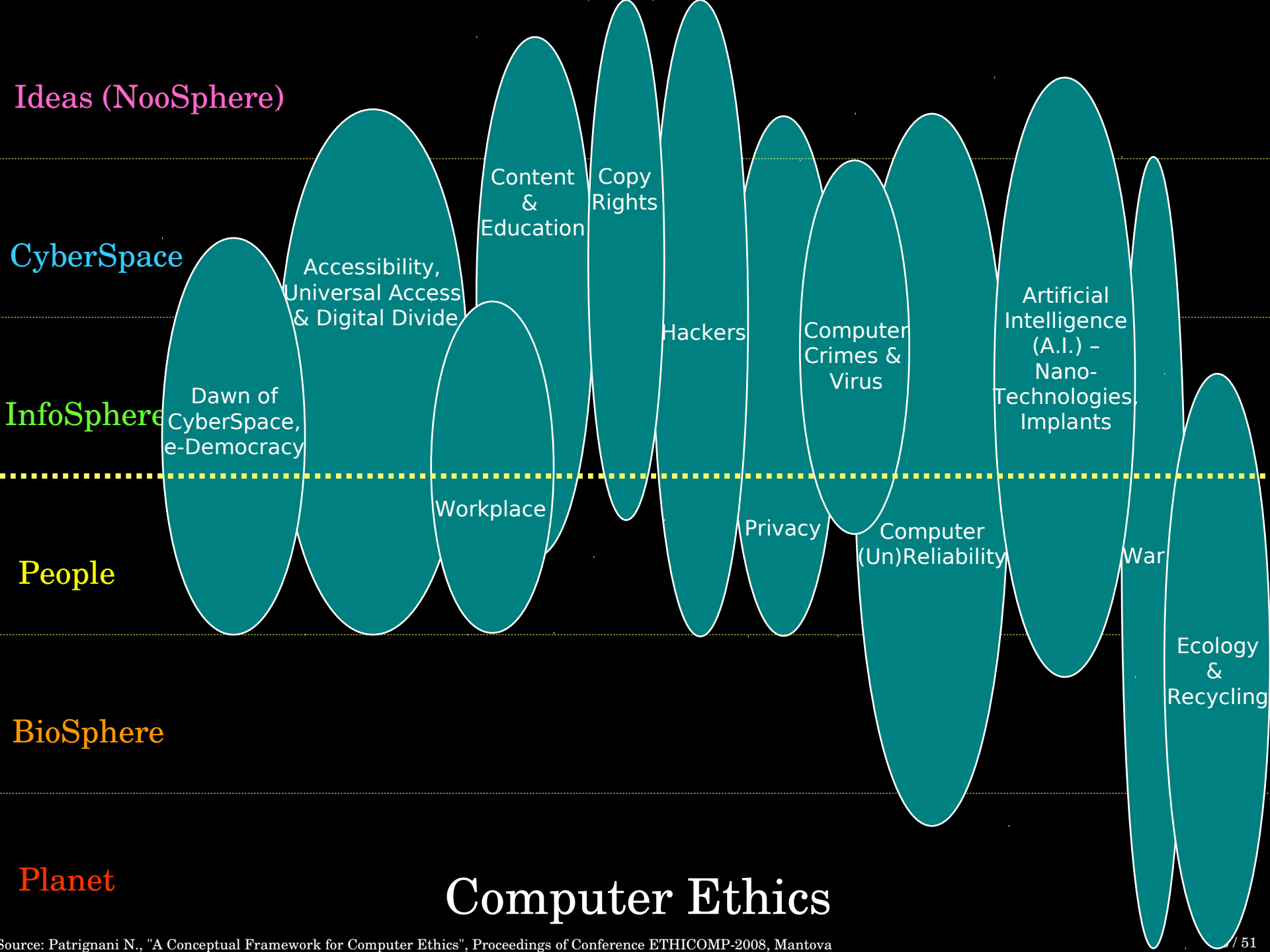
Education



Law

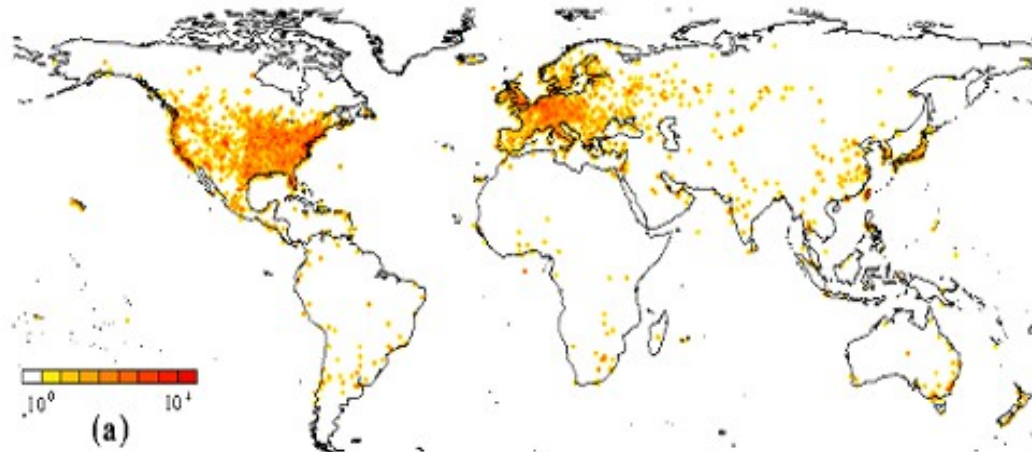


Computers' Social & Ethical Issues

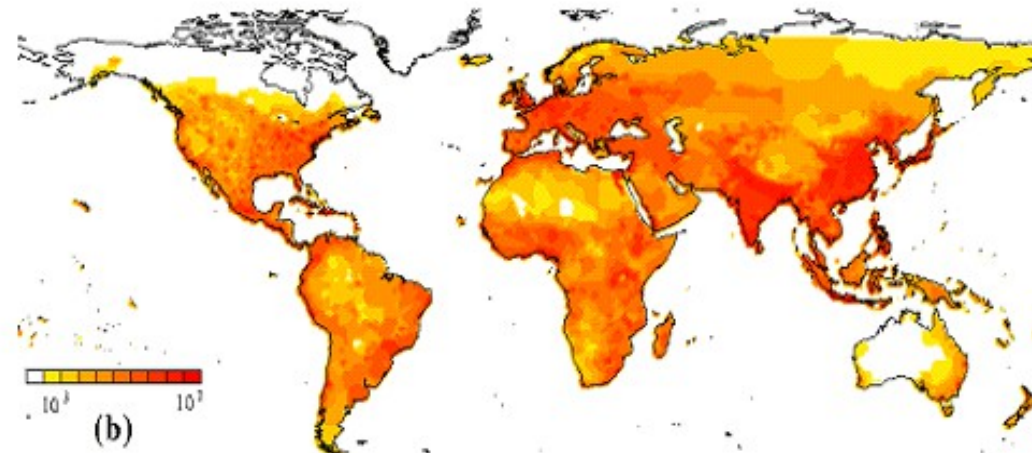


Accessibility, Universal Access & Digital Divide

Router
density



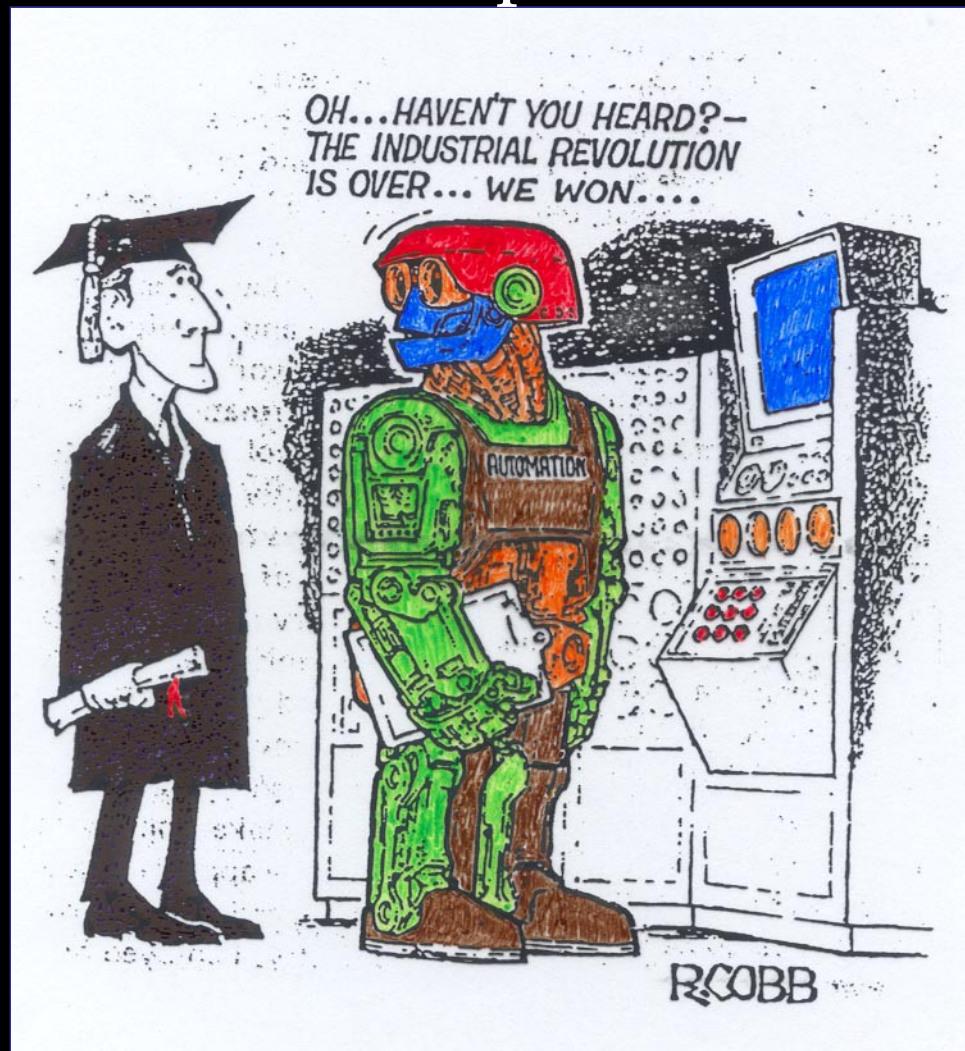
Population
density



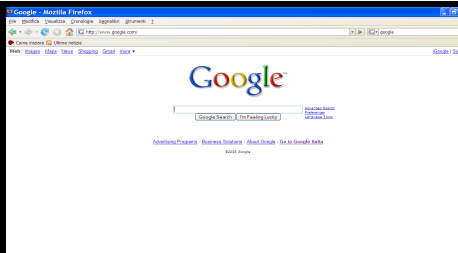
Accessibility, Universal Access & Digital Divide



Workplace



Content & Education



Copy Righth / Left



Knowledge multiplies when you give it away ...

Hackers' Ethic



Linus Torvald
Linux
1991



Robert Morris
Internet Worm
1988



Kevin Mitnick
Condor
1979



Vladimir Levin
10.7 M\$ Citibank hack
1994

Work Ethic

Money Ethic

Network Ethic

- Passion
- Freedom
- Social Values
- Openness
- Activity
- Responsibility
- Creativity

hacker

n [*hack* skillful repair of a computer program +*er*]
(1976): an expert at programming and
solving problems with a computer
(*Webster's Dictionary*)

Privacy



Source: "Barcelona clubbers get chipped", BBC News, September 2004

Big Brother isn't coming. He's already here.



And you better believe he's watching you.

Every citizen supports efforts to apprehend those responsible for past terrorist events and to prevent future attacks. But George Bush and Dick Cheney act as though their wholesale assault on our constitutional liberties will curb terrorism.

Question the need for suspension of citizens' rights and protections, and you are told that Big Brother knows what's best and he doesn't have to explain.

President Bush told the National Security Council:

"I do not need to explain why I say things. That's the interesting thing about being the President... [I] don't feel like I owe anybody an explanation."

Just follow orders? No public accountability? That's not the American way.

The New York Times finds the President on the wrong side of history in an editorial published on the eve of the first anniversary of the attacks on the twin towers:

"...to curtail individual rights, as the Bush Administration has done, is to draw exactly the wrong lessons from history. Every time the country has felt threatened and lightened the screws on civil liberties, it later wished it had not done so. In each case — whether the banning of government criticism under the Sedition Act of 1798 and the Espionage Act of 1916, the internment of Japanese-Americans in World War II or the McCarthyite witch hunts of the cold war — profound regrets set in later."

"...the American people need to make clear that they have learned from history and will not allow their rights to be rolled back. The world has changed since September 11, but the values this country was founded on have not."

New Power to Snoop

The misnamed Patriot Act, passed in the wake of panic after September 11, surrendered an unprecedented concentration of power to the Executive Branch. Repeatedly, the Bush Administration has demonstrated its contempt for open

- **Reading Your Medical Records**
- **Scrutinizing Your Credit Card Bills**
- **Searching Your Home or Business Without Telling You**
- **Patrolling Your Internet Use**
- **Wiretapping Your Phone**
- **Spying on You and Your House of Worship**
- **Examining Your Travel Records**
- **Inspecting Your Bookstore Purchases**
- **Snooping on Your Library Records**
- **Monitoring Your Political Activities**

courts and oversight of its performance by Congress. Now, the Bill of Rights is being shredded. Protections of free speech, privacy, assembly, and fair trial are being sacrificed — under the guise of national security.

Freefloating FBI Whirlpools

Under the Patriot Act, FBI agents searching primarily for evidence of crime can secretly conduct a physical search or wiretap without demonstrating probable cause of criminal activity in a court of law.

Chilling of Political Dissent

The Patriot Act defines a federal crime of "domestic terrorism" so broadly that it may be used by federal law enforcement agencies to chill political dissent and authorize the surveillance of activists and organizations opposed to government policies. Your freedom to challenge, to mobilize, and to monitor your government is being squeezed.

Withholding Government Secrecy

The Department of Homeland Security is given broad authority to withhold information now available to the press and public under the Freedom of Information Act (FOIA), further increasing government secrecy.

Ending Your Privacy

The Homeland Security Act gives the green light to Bush's Total Information Awareness Program, which could use computer networks to snoop up vast amounts of data on citizens.

Even more draconian schemes to enlist citizens to spy on their neighbors to "uncover suspicious activity" have been on the President's anti-terrorist drawing board.

The Bush Administration has shamelessly used the War on Terrorism as an excuse to squelch a secret government that restricts every American's civil liberties while deepening its costly entanglements with avoidable corporations, which are given expanding power, privileges, and immunities. History teaches us that such practices will lead to serious mistakes and becoming policies harmful to our country.

PAUL HARRIS, CHAIRMAN OF AMERICAN
NASS HARRISON, EXECUTIVE DIRECTOR
ANDREW COHEN, DIRECTOR OF
NATIONAL POLITICAL PIONEER
PETER, TERRY COHEN
NATIONAL, PIONEER
NATIONAL, PIONEER
JOHN COHEN, PIONEER
JERRY COHEN, PIONEER
LEE THE HARRISON PIONEER
NATIONAL
JANUARY, COHEN OF AMERICA
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NATIONAL

I want to help stop the war on our civil liberties.

Send your contributions to help protect our civil liberties and stop invasions into our privacy.

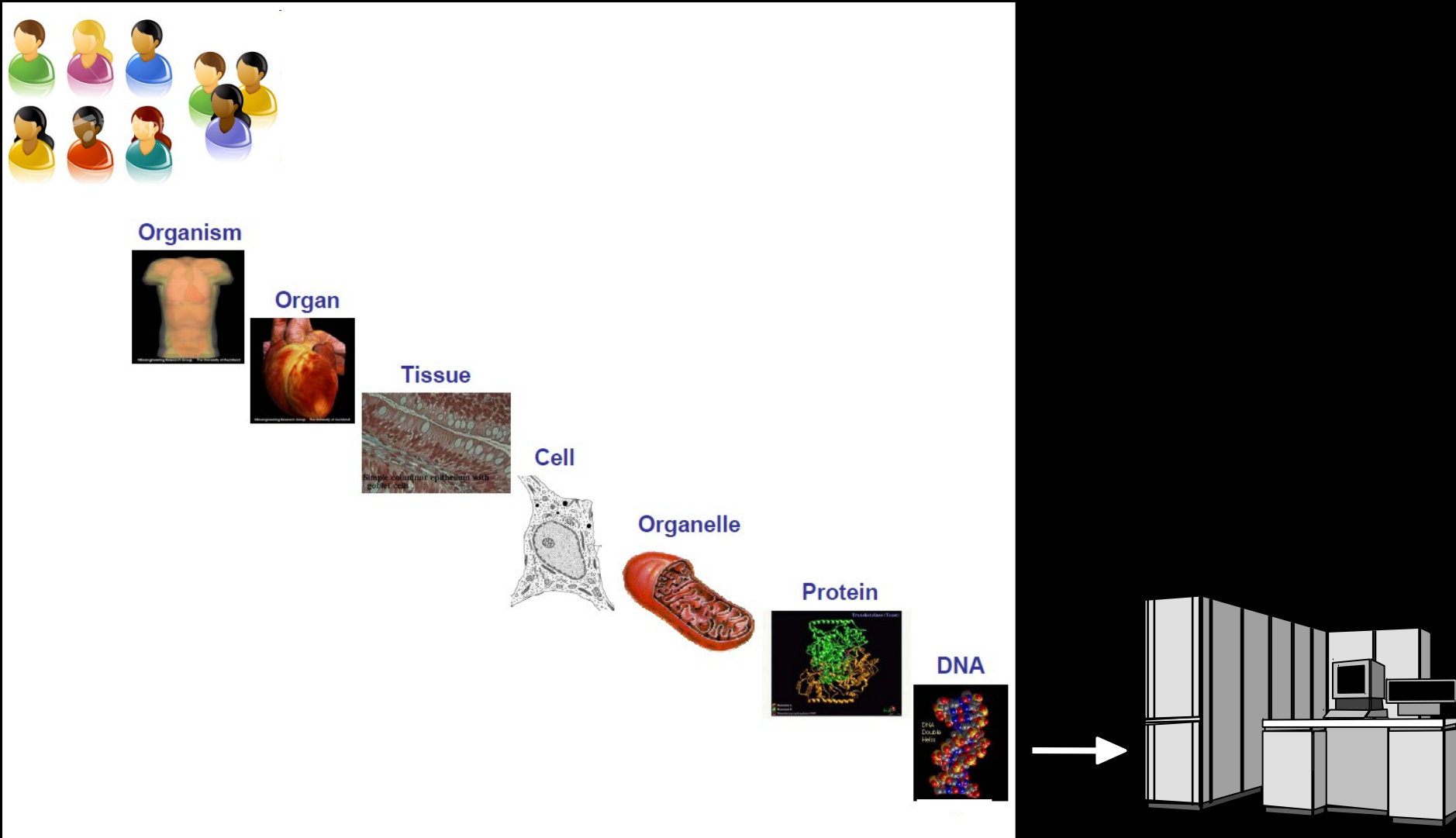
Send to: Stop the Snooping, P.O. Box 1000, Washington, DC 20006

☐ \$25 ☐ \$50 ☐ \$100 ☐ \$200 ☐ Other \$_____

Name _____
State _____
City _____ State _____ Zip _____
If you contribute \$100 or more we will send you *Stop the Snooping* Political
Strategy Book. Please include it and return the book to: Stop
the Snooping, P.O. Box 1000, Washington, DC 20006.
For more info visit us at www.StopTheSnooping.org

DNA DataBases

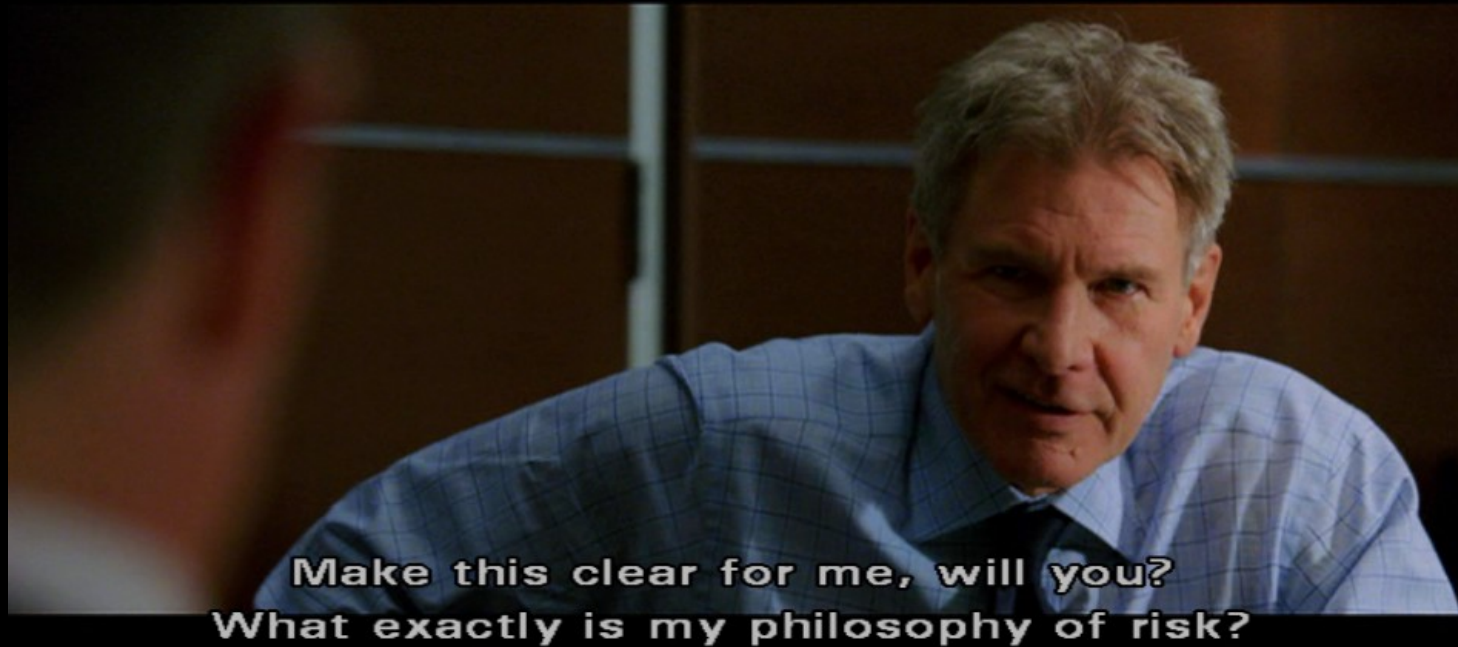
The Next Frontier of Crime "Prevention"



Ambient Intelligence



Computer Crimes



Computer Virus



Computers' (Un)Reliability

THE TITANIC EFFECT

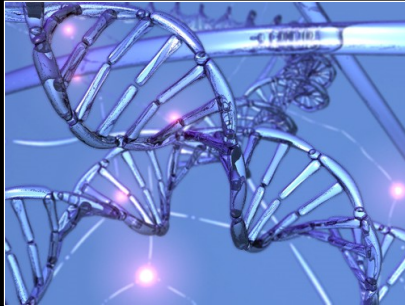
The severity with which a system fails
is directly proportional
to the intensity of the designer's belief
that it cannot.

COROLLARY

The quantity and quality of built-in redundancy
is directly proportional to the degree of concern
about failure.

Converging Technologies

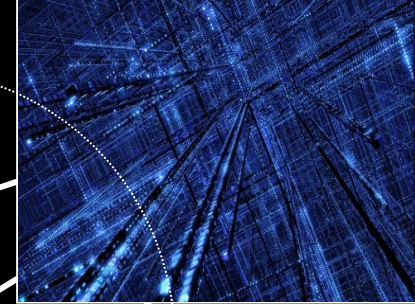
Bio



source: sr.burnham.org

"Golem" Effect
SynBio = Life?

Info

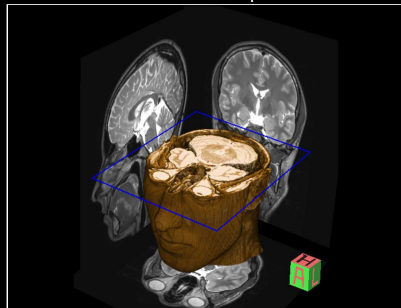


source: biogrid.computing

ICT main actor in BINN:
the "structure that connects",
collect INPUTS
PROCESS and DECIDE
then drive OUTPUTS

"Titanic" Effect
Models = Reality?

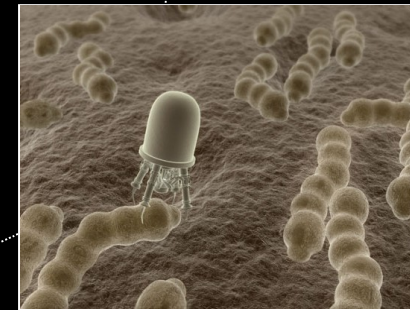
Neuro



source: mri.radiology.uiowa.edu

"Blade Runner" Effect
Brain = Mind?

Nano



source: techwall.org

"Pandora Box" Effect
Nano-Systems = Complex Systems?

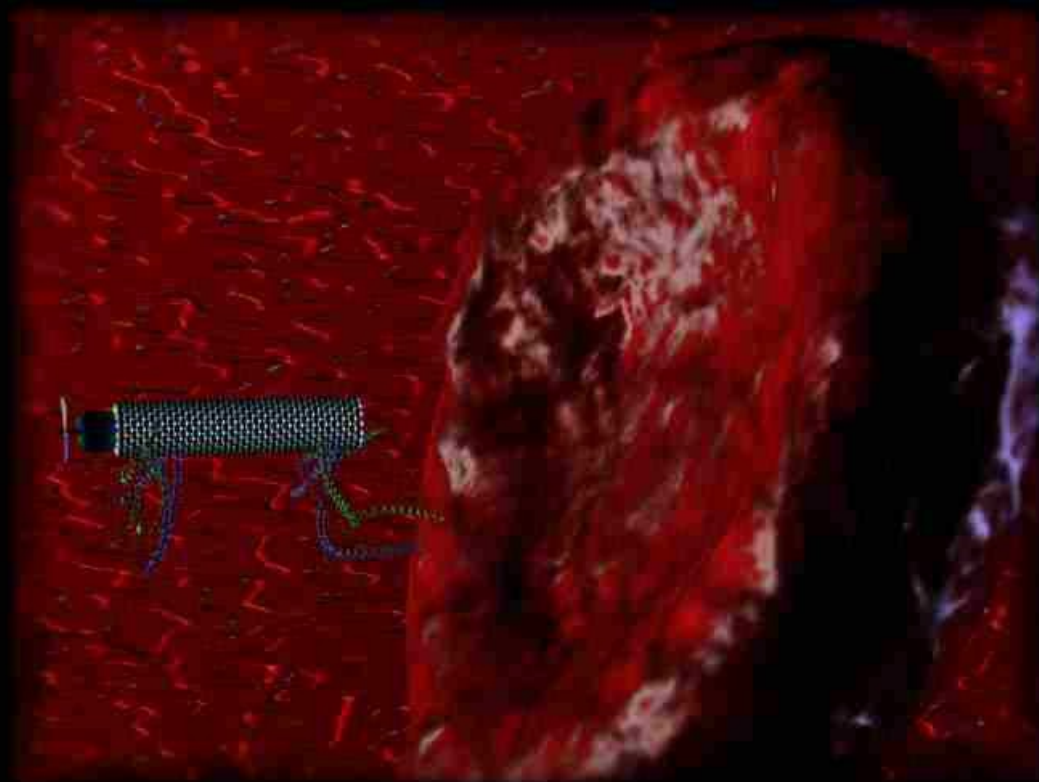
BODY

BRAIN

PLANET

Bio-NanoBots

The *Next Frontier* of "Medicine"



Source: Mavroidis, C., and Dubey, A., 2003, "From Pulses to Motors", *Nature Materials*, September 2(9):573-574.

Unmanned Aerial Vehicles (UAV)

Drones

Environmental Monitoring / Surveillance / Attack ?



Unmanned Ground Vehicles (UGV)

Autonomous Weapons with Sensors



The Precautionary Principle

The Precautionary Principle

"When an activity raises threats of harm to human health or the environment, precautionary measures should be taken even if some cause and effect relationships are not fully established scientifically.

In this context the proponent of an activity, rather than the public, should bear the burden of proof.

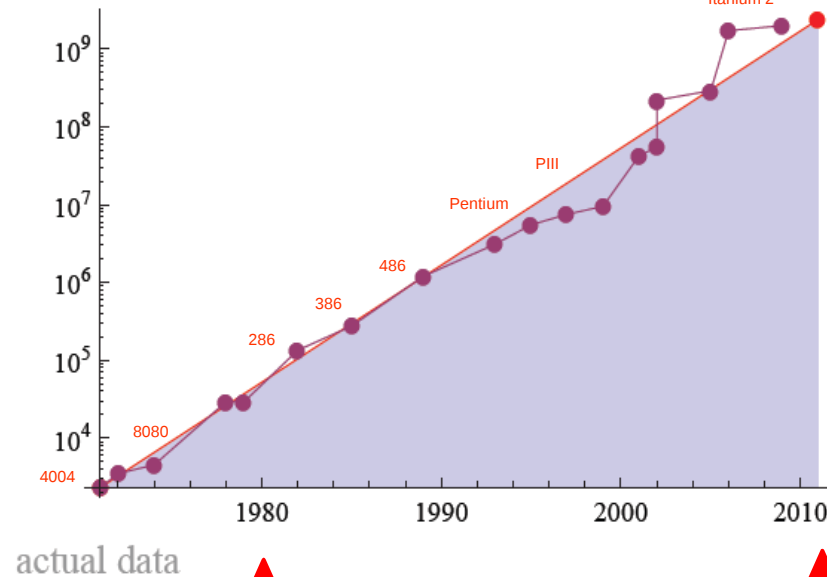
The process of applying the Precautionary Principle must be open, informed and democratic and must include potentially affected parties. It must also involve an examination of the full range of alternatives, including no action."

The "Wingspread Statement on the Precautionary Principle", Wingspread Center, Racine, Wisconsin, USA, January, 1998

Challenging Moore's Law

Moore's law plot:

transistor count



Group #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Period	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1	1 H																	2 He
2	3 Li	4 Be											5 B	6 C	7 N	8 O	9 F	10 Ne
3	11 Na	12 Mg											13 Al	14 Si	15 P	16 S	17 Cl	18 Ar
4	19 K	20 Ca	21 Sc	22 Ti	23 V	24 Cr	25 Mn	26 Fe	27 Co	28 Ni	29 Cu	30 Zn	31 Ga	32 Ge	33 As	34 Se	35 Br	36 Kr
5	37 Rb	38 Sr	39 Y	40 Zr	41 Nb	42 Mo	43 Tc	44 Ru	45 Rh	46 Pd	47 Ag	48 Cd	49 In	50 Sn	51 Sb	52 Te	53 I	54 Xe
6	55 Cs	56 Ba		57 La	58 Ce	59 Pr	60 Nd	61 Pm	62 Sm	63 Eu	64 Gd	65 Tb	66 Dy	67 Ho	68 Er	69 Tm	70 Yb	71 Lu
7	87 Fr	88 Ra		89 Ac	90 Th	91 Pa	92 U	93 Np	94 Pu	95 Am	96 Cm	97 Bk	98 Cf	99 Es	100 Fm	101 Md	102 No	103 Lr

Group #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	
Period	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	
1	1 H																	2 He	
2	3 Li	4 Be												5 B	6 C	7 N	8 O	9 F	10 Ne
3	11 Na	12 Mg												13 Al	14 Si	15 P	16 S	17 Cl	18 Ar
4	19 K	20 Ca	21 Sc	22 Ti	23 V	24 Cr	25 Mn	26 Fe	27 Co	28 Ni	29 Cu	30 Zn	31 Ga	32 Ge	33 As	34 Se	35 Br	36 Kr	
5	37 Rb	38 Sr	39 Y	40 Zr	41 Nb	42 Mo	43 Tc	44 Ru	45 Rh	46 Pd	47 Ag	48 Cd	49 In	50 Sn	51 Sb	52 Te	53 I	54 Xe	
6	55 Cs	56 Ba		57 La	58 Ce	59 Pr	60 Nd	61 Pm	62 Sm	63 Eu	64 Gd	65 Tb	66 Dy	67 Ho	68 Er	69 Tm	70 Yb	71 Lu	
7	87 Fr	88 Ra		89 Ac	90 Th	91 Pa	92 U	93 Np	94 Pu	95 Am	96 Cm	97 Bk	98 Cf	99 Es	100 Fm	101 Md	102 No	103 Lr	
* Lanthanoids				57 La	58 Ce	59 Pr	60 Nd	61 Pm	62 Sm	63 Eu	64 Gd	65 Tb	66 Dy	67 Ho	68 Er	69 Tm	70 Yb	71 Lu	
** Actinoids				89 Ac	90 Th	91 Pa	92 U	93 Np	94 Pu	95 Am	96 Cm	97 Bk	98 Cf	99 Es	100 Fm	101 Md	102 No	103 Lr	

Computer chips made use of 11 major elements in the 1980s but now use about 60 (two-thirds of the Periodic Table)

41
Nb
73
Ta

Niobium (Columbium)

→ COLumbite

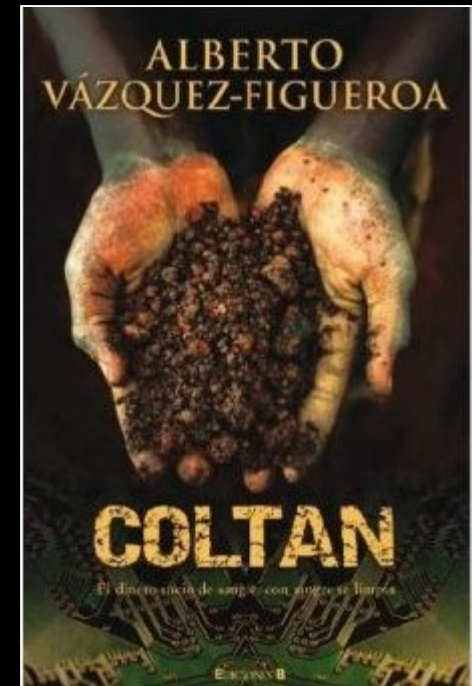
Tantalum

→ TANtalite

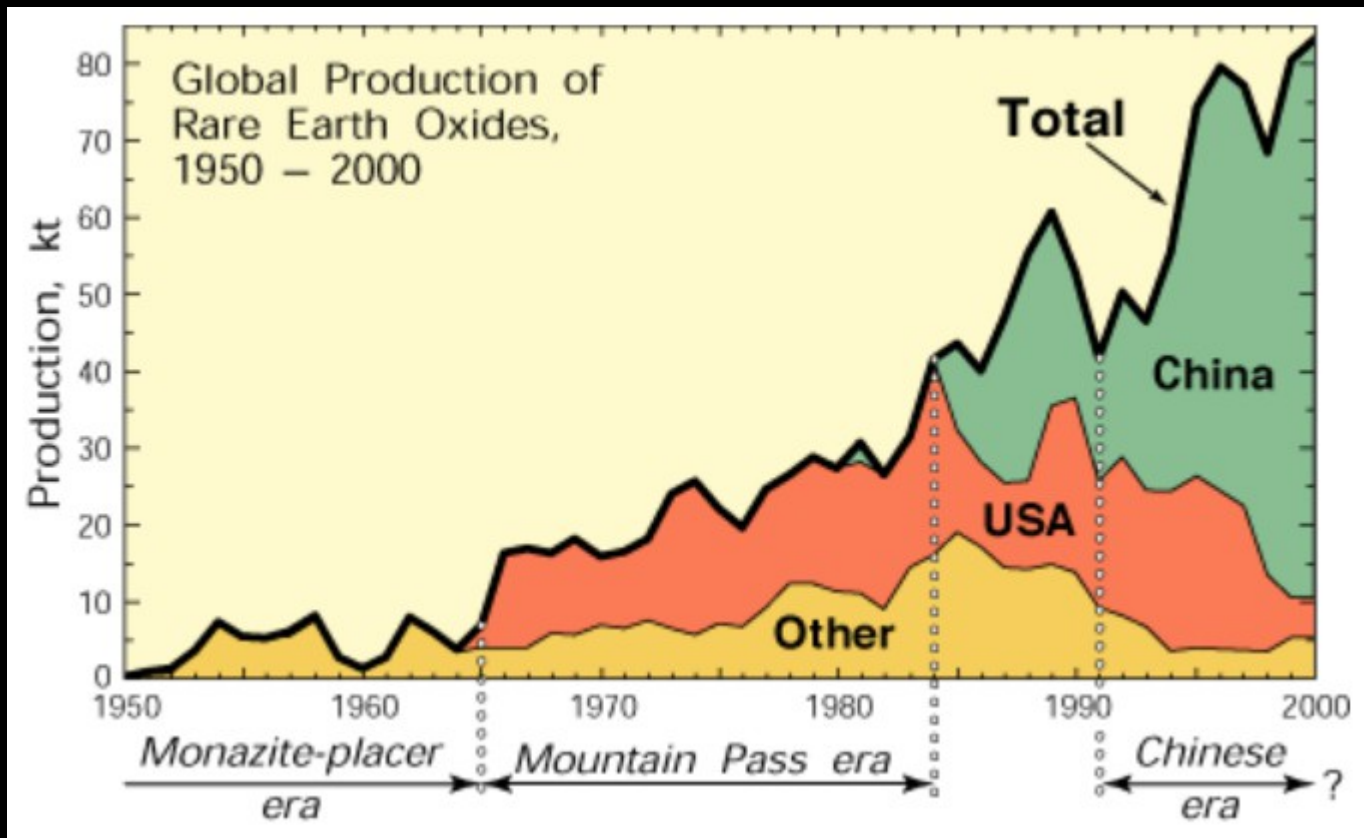
COLTAN



Group #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
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4	19 K	20 Ca	21 Sc	22 Ti	23 V	24 Cr	25 Mn	26 Fe	27 Co	28 Ni	29 Cu	30 Zn	31 Ga	32 Ge	33 As	34 Se	35 Br	36 Kr
5	37 Rb	38 Sr	39 Y	40 Zr	41 Nb	42 Mo	43 Tc	44 Ru	45 Rh	46 Pd	47 Ag	48 Cd	49 In	50 Sn	51 Sb	52 Te	53 I	54 Xe
6	55 Cs	56 Ba		72 Hf	73 Ta	74 W	75 Re	76 Os	77 Ir	78 Pt	79 Au	80 Hg	81 Tl	82 Pb	83 Bi	84 Po	85 At	86 Rn
7	87 Fr	88 Ra		104 Rf	105 Db	106 Sg	107 Bh	108 Hs	109 Mt	110 Ds	111 Rg	112 Ch	113 Uut	114 Uuq	115 Uup	116 Uuh	117 Uus	118 Uuo
* Lanthanoids																		
** Actinoids																		
	57 La	58 Ce	59 Pr	60 Nd	61 Pm	62 Sm	63 Eu	64 Gd	65 Tb	66 Dy	67 Ho	68 Er	69 Tm	70 Yb	71 Lu			
	89 Ac	90 Th	91 Pa	92 U	93 Np	94 Pu	95 Am	96 Cm	97 Bk	98 Cf	99 Es	100 Fm	101 Md	102 No	103 Lr			

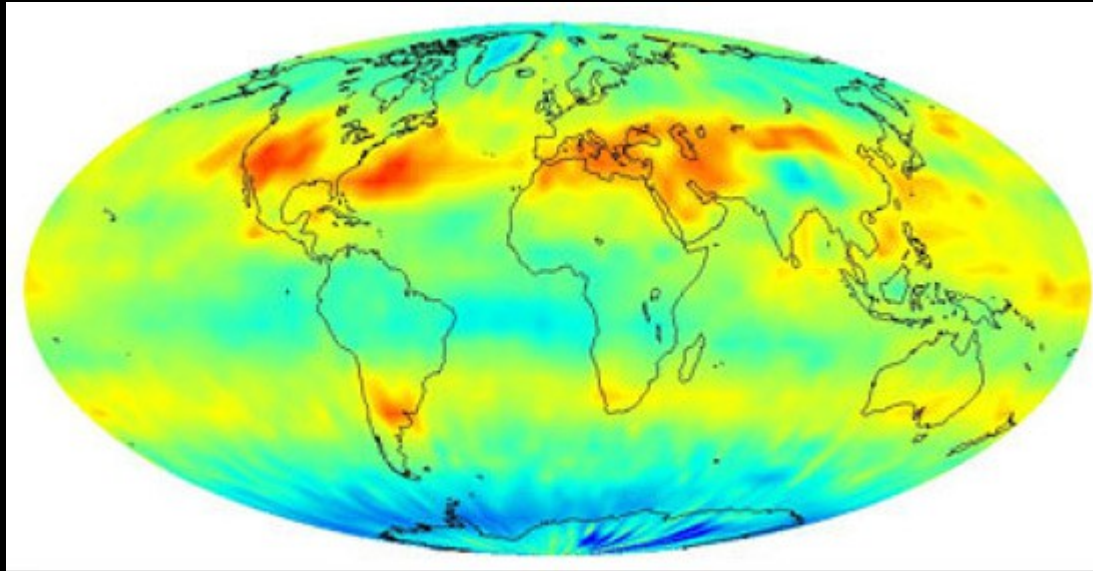


Rare Earth Elements Critical Resources for ICT



Source: "Rare Earth Elements - Critical Resources for High Technology", U.S. Geological Survey Fact Sheet 087-02

$$\text{ICT} = 3\% \text{ CO}_2$$



Source: NASA, 2008



EU Commission - Information Society
Energy efficient ICT: Toward Zero-Power Devices for a Greener Planet

e-Waste: where do they go?

Known and Suspected Routes of e-waste Dumping

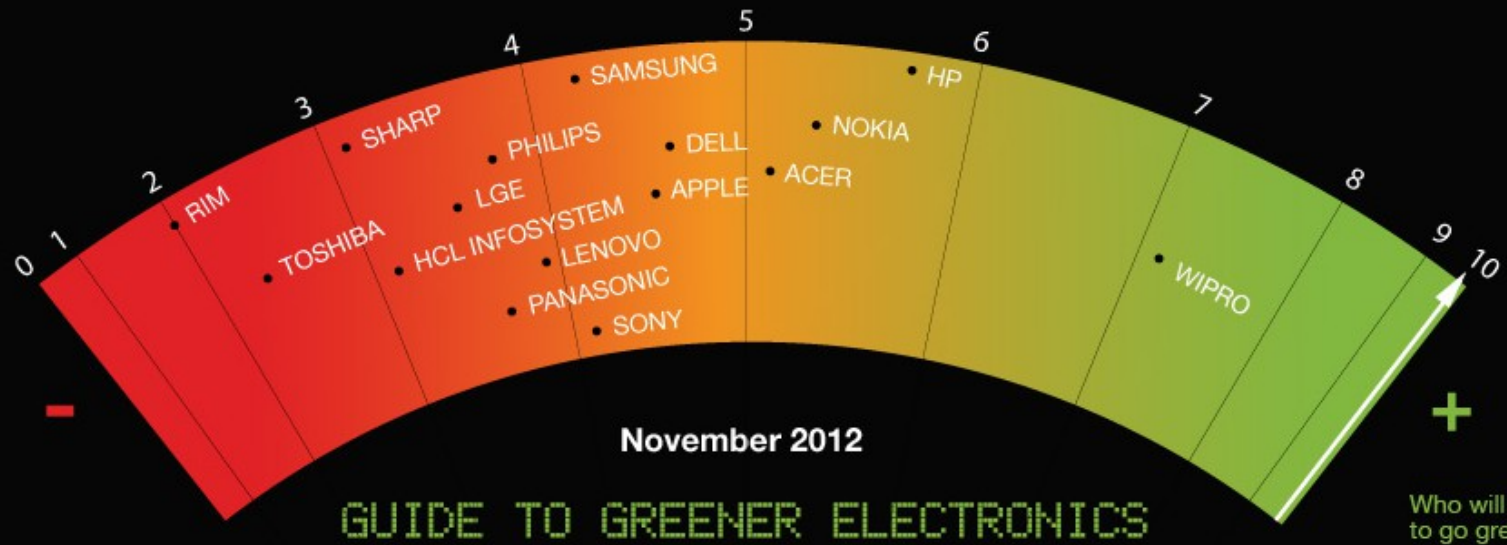
- US consumers replace roughly 133,000 PC/day !
- Only 20% recycled
- Wall Street Journal: "the world's fastest growing and potentially most dangerous waste problem": plastic, lead, cadmium, chromium, mercury



There is currently no system for tracking legal or illegal (under international law) shipments of electronic waste, and therefore, there is no quantitative data on volumes or even all of the true destinations. Some electronic waste is shipped as "working equipment" only to end-up as waste upon arrival. This map indicates information collected through investigations by organizations such as the Basel Action Network, Silicon Valley Toxics Coalition, Toxics Link India, SCOPE (in Pakistan), Greenpeace and others.

The health burden of e-waste falls on the world's poorest workers, who labor long hours without basic protections from toxic exposure

GREENPEACE



A Methodology for Introducing Computer Ethics

(Scuola di Dottorato, Politecnico di Torino, 2008)

Case Study

Group exercise and feedback

- Is there something that could be right / wrong with ICT?
- Organize the group in several teams for "role playing":
 - Developers (the techies)
 - Users
 - Policy Makers
- Discuss a simple real case
 - 3 main levels of discussion
 - Brainstorming
 - Code of Ethics ("soft" laws)
 - Laws ("hard" laws)
 - 4 main drivers
 - Architecture
 - Education
 - Market
 - Law

Steps for Case Analysis

1. SCENARIO

Describe and Analyze a Real Case

2. STAKEHOLDERS' NETWORK

Identify Stakeholders and their Relationships

3. ETHICAL ISSUES

Identify Social and Ethical Issues

4. ALTERNATIVE SCENARIO(s)

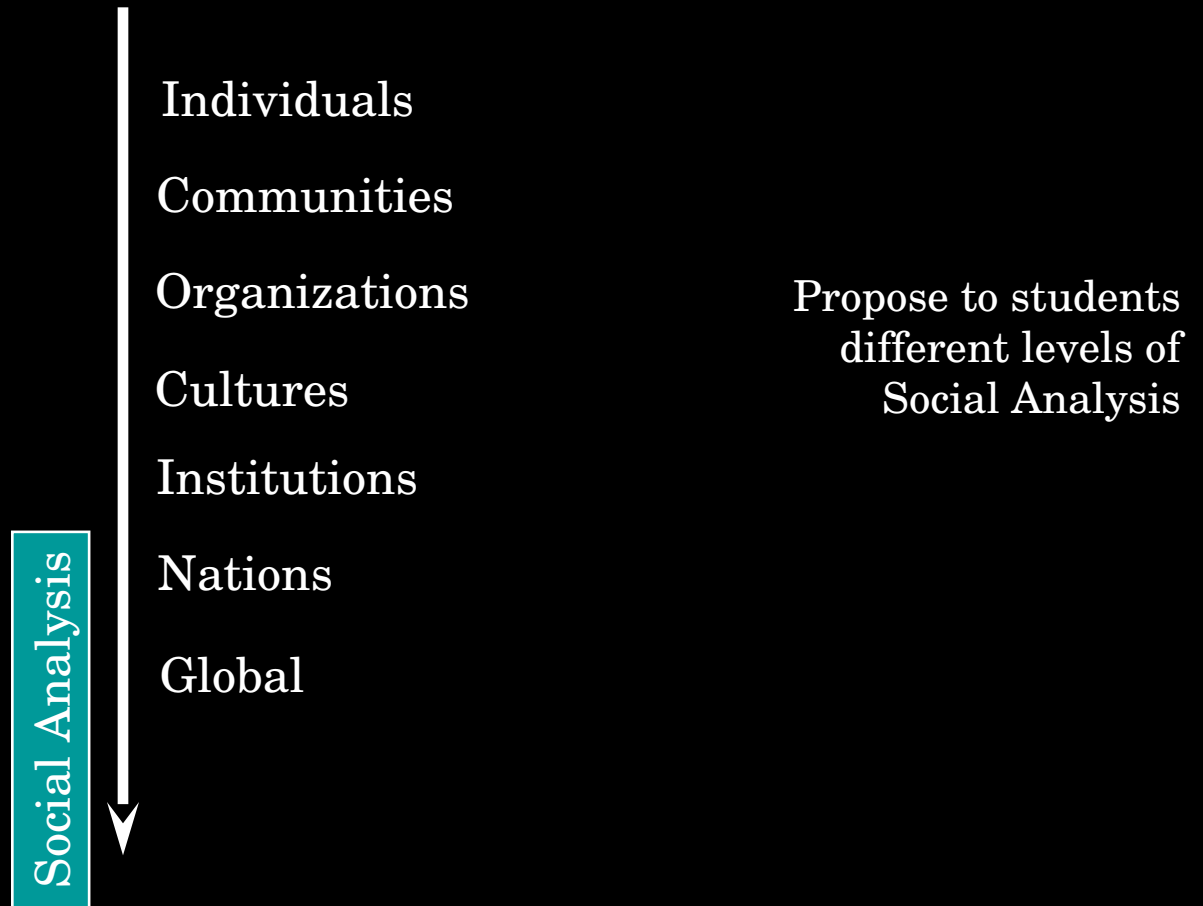
Envisage and Evaluate Alternative Courses of Action

1. SCENARIO

Describe and Analyze a Real Case

(From the many areas of concern related to Computing)

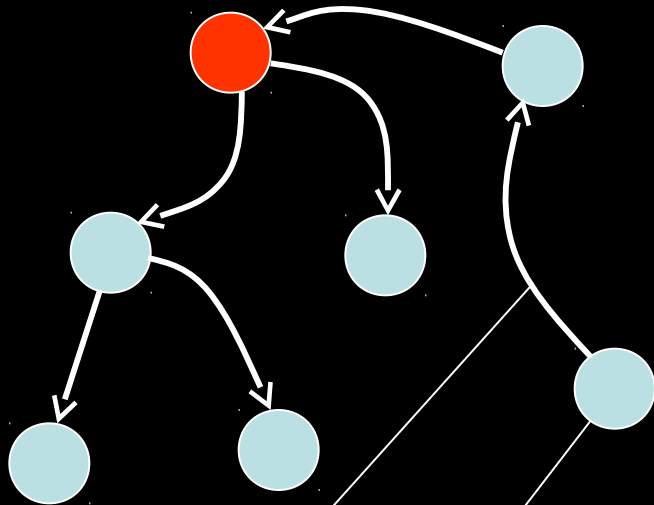
Levels of Social Analysis



2. STAKEHOLDERS' NETWORK

Identify Stakeholders and their Relationships
(Development of Social & Ethical Skills)

2. STAKEHOLDERS' NETWORK



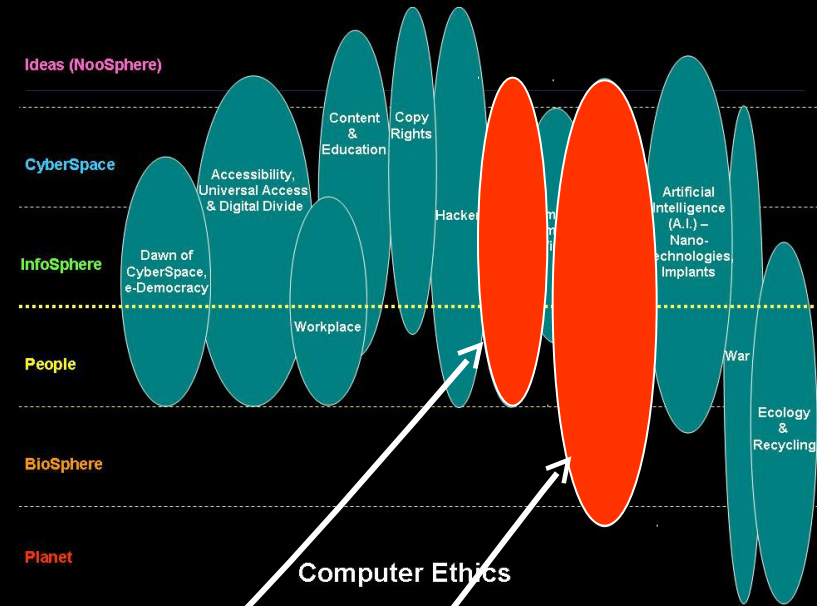
Relationships

Stakeholders

Identify Social and Ethical Issues (Development of Social & Ethical Skills)

A directed graph with 7 nodes. One node is red, and the others are light blue. The graph shows a complex set of directed edges, including a cycle involving the red node and two light blue nodes.

Stakeholders



Computer Ethics

4. ALTERNATIVE SCENARIO(s)

Envisage and Evaluate Alternative Courses of Action

The most challenging step

- What is right? What is wrong?
- Can we propose something different?
- What is the role of Computer Professionals involved into the case?
- Moratorium?
- Precautionary Principle
- Ethical Reviews (FP7)

- Recommendations for
 - Project Teams (Writing a proposal)
 - Universities (Next Generations of Engineers, Computer Professionals, Designers,...)
 - Organizations ("soft-laws", Guidelines, Code of Ethics, etc.)
 - Public Authorities ("hard-laws", Requirements, Policy Makers, etc.)

"Technology is driving the future,
the steering is up to us"

Computer Professionals for Social Responsibility
www.cpsr.org

CPSR's Mission:
the Public Interest
in Information Technology

Why Computer Ethics ?

Levels of justification for the study of Computer Ethics

Level 1: "... will make us behave like responsible professionals"

Level 2: "... will teach us how to avoid computer abuse and catastrophes"

Level 3: "... the advance of computing technology will continue to create temporary policy vacuums"

Level 4: "... the use of computing permanently transforms certain ethical issues to the degree that their alterations require independent study"

Level 5: "... the use of computing technology creates, and will continue to create, novel ethical issues that require special study"

Level 6: "We should study computer ethics because the set of novel and transformed issues is large enough and coherent enough to define a new field"

Why Computer Ethics ? (why not typewriter ethics?)

Level 5: Issues and problems unique to Information Technology (Would NOT have arisen WITHOUT computers; no-satisfactory non-computer analog)

- **Uniquely STORED**

20 Nov 1985, BoNY -32B\$ due to an overflow ($65535+1=65536$ 1 0000 0000 0000 0000 = 0!), 21 Nov BoNY -23.4B\$ x 1 day. Total interest = 5M\$. Y2K!

- **Uniquely MALLEABLE**

General Purpose Machine, Universally adaptable, Universal Access is a Must. Computers can do anything we can describe in terms of Input, Process, Output.

- **Uniquely COMPLEX**

Programming = creation of discrete functions of arbitrary (super-human) complexity. Total behavior cannot be described in any compact function. Testing is a nightmare.

- **Uniquely FAST**

Buy / Sell commands by the same algorithms at the same time: destabilized market of futures (contract to buy a stock at a set time and price)

- **Uniquely CHEAP**

Crazy scheme of "salami": 0,001€, 10^{-3} € x 10^5 accounts (cheap!)= 100€/day x 200days = 20.000€/year. Spamming: $1p/10^6 \times 10Mp = 10p/day \times 10^6 = 100€/day$.

- **Uniquely CLONED**

•1st time in history: exact copy. No transfer of possession. (copy + remix!)

- **Uniquely DISCRETE**

Continuous systems = tolerance (small changes, small effects); Discrete systems = no tolerance. Continuity does NOT hold for computers. 1 bit changes ...

- **Uniquely CODED**

Degradable nature of media. Obsolescence of I/O devices. Evolution of media formats (& encryption?!). No documentation: computers accelerate the tx of information BUT also reverse effect: computers will impede the generational flow of information: will any stored records be readable in the future? Data archeologists?

- **Uniquely INTERNETWORKED**

Dawn of cyberspace!