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"Terrorism" Is a Wicked (not Tame) Problem

The Role of S/T in Future Intelligence Enterprise

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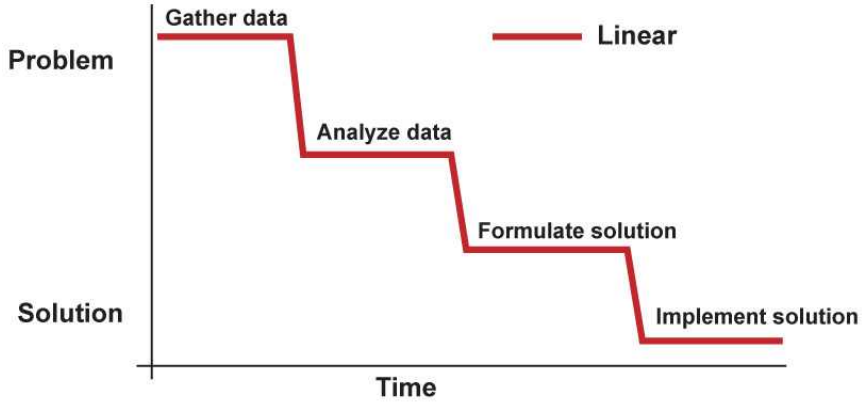
Tame problems have similar characteristics

1. Well-defined problem statement
2. Definite stopping point
3. Right or wrong solution
4. Similar to others of same class
5. Solutions easily tried and dropped
6. Few alternate solutions



Traditional wisdom for solving complex problems: the "waterfall"

Jeff Conklin, Wicked Problems and Social Complexity

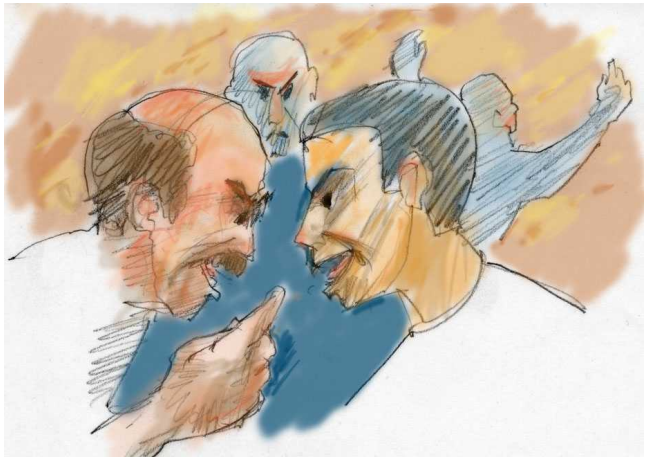
Linear solution approach to tame problems

1. Collect relevant information
2. Analyze
3. Formulate solution
4. Decide to implement solution
5. Implement solution

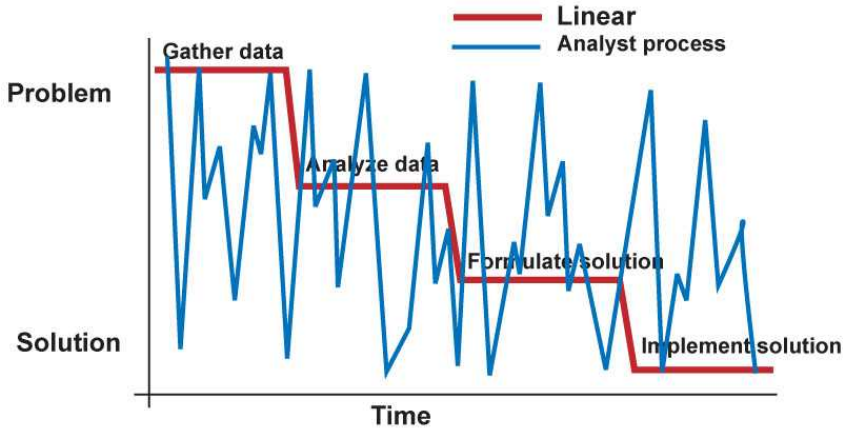
Data/Info Collection → Analysis → Decision

Trying to tame a wicked problem can lead to:

1. Freeze problem definition prematurely
2. Measure variables, drive toward targets
3. Ignore complicating factors
4. Select from a few over simplified solution options
5. Give up, do as you are told
6. Assert problem is solved



People taming wicked problems with different perspectives, backgrounds, organizations, and goals leads to escalating confusion, conflicts, and paralysis



Pattern of cognitive activity of one wicked engineer: the "jagged" line

Jeff Conklin, Wicked Problems and Social Complexity

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Symptoms that the Wicked Problem is disguised as a Tame Problem

1. People assume the problem is tame
2. Claim that the way out of the mess is better organization
3. Require defined clear roles and responsibilities
4. Get on with it

"if we could only get organized and put somebody in charge, we could solve this problem"

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Dealing with Wicked Problems

The approach:

1. "Formulate the mess"
2. Develop a spiral (not linear) process
3. Share awareness of changing context
4. Communicate often, with high fidelity, to all levels
5. Focus on system issues, not just pieces.
6. Remember: "success is the devil"
7. Trust each other as the game changes

Reference: System Thinking, Jamshid Gharagedaghi

The first step is to admit that the problem is not tame.

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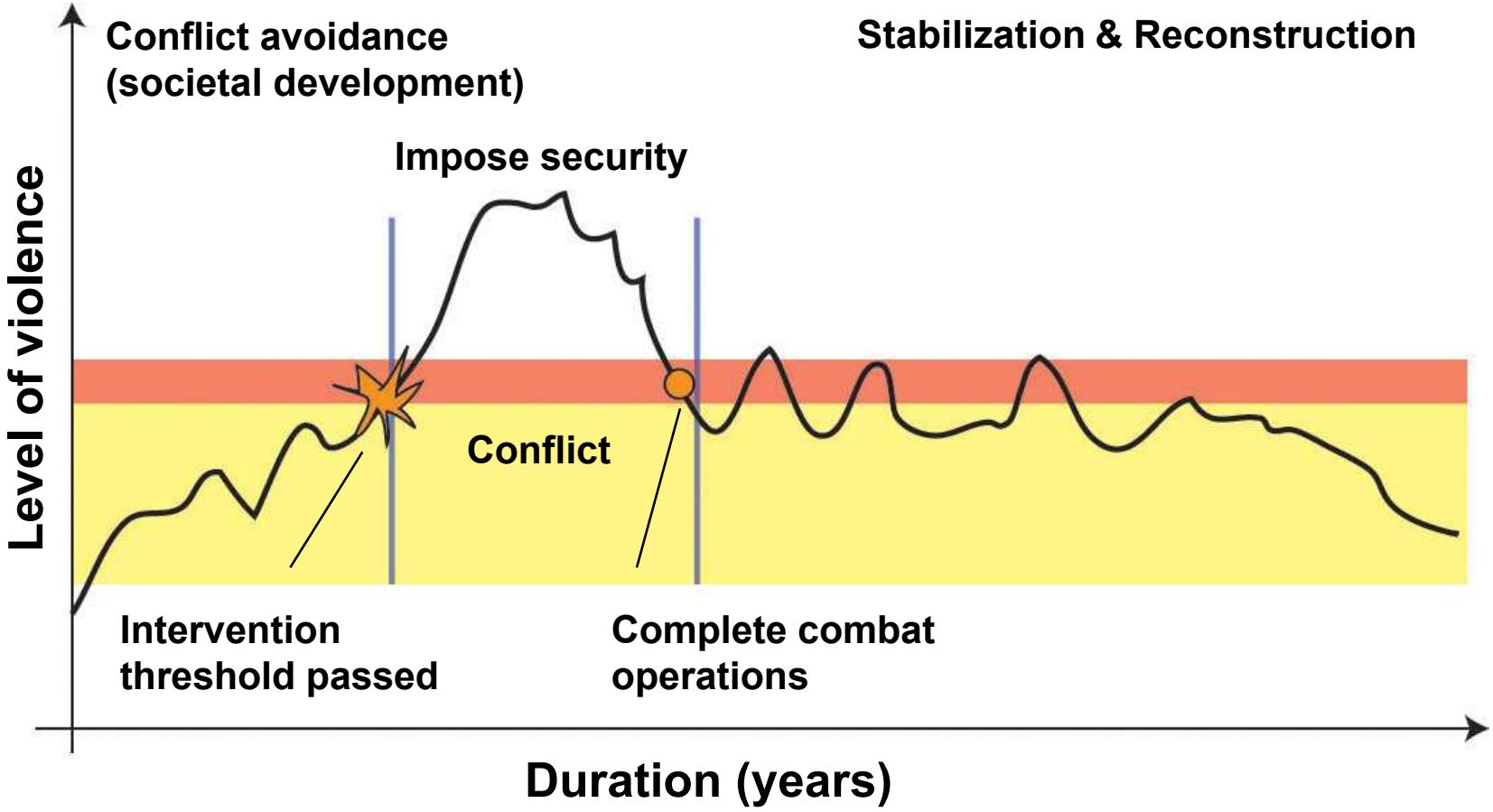
Military Perspective on Conflict—"The Long War"



Ref: Hans Benidike, NDU (getting from Liz)

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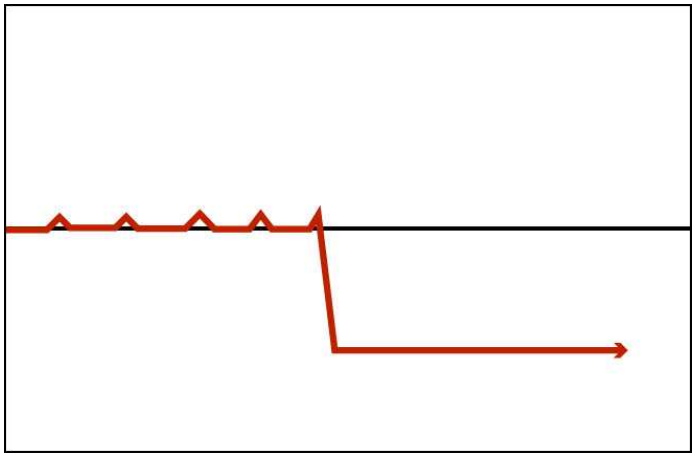
The Tools of Future Adversaries

Strategic	Conventional	Irregular	Social
• Nukes • Special nukes • Very special nukes	• ASATs • Cyber attack • Global strike • Fleet attack • Robot swarms • Nano attack	• IEDs • RDD • Bio/Ag attack • Hostage • Assassination • Infrastructure attack • Anti-material • Cyber	• Psyops • Induced chaos • Insider • Non-violent resistance • Exponential immigration • Financial attack • Military coup • Race war

A Goal of Adversaries is to Disrupt our Societal Stability

Collapse



Chaos

This slide needs to be changed

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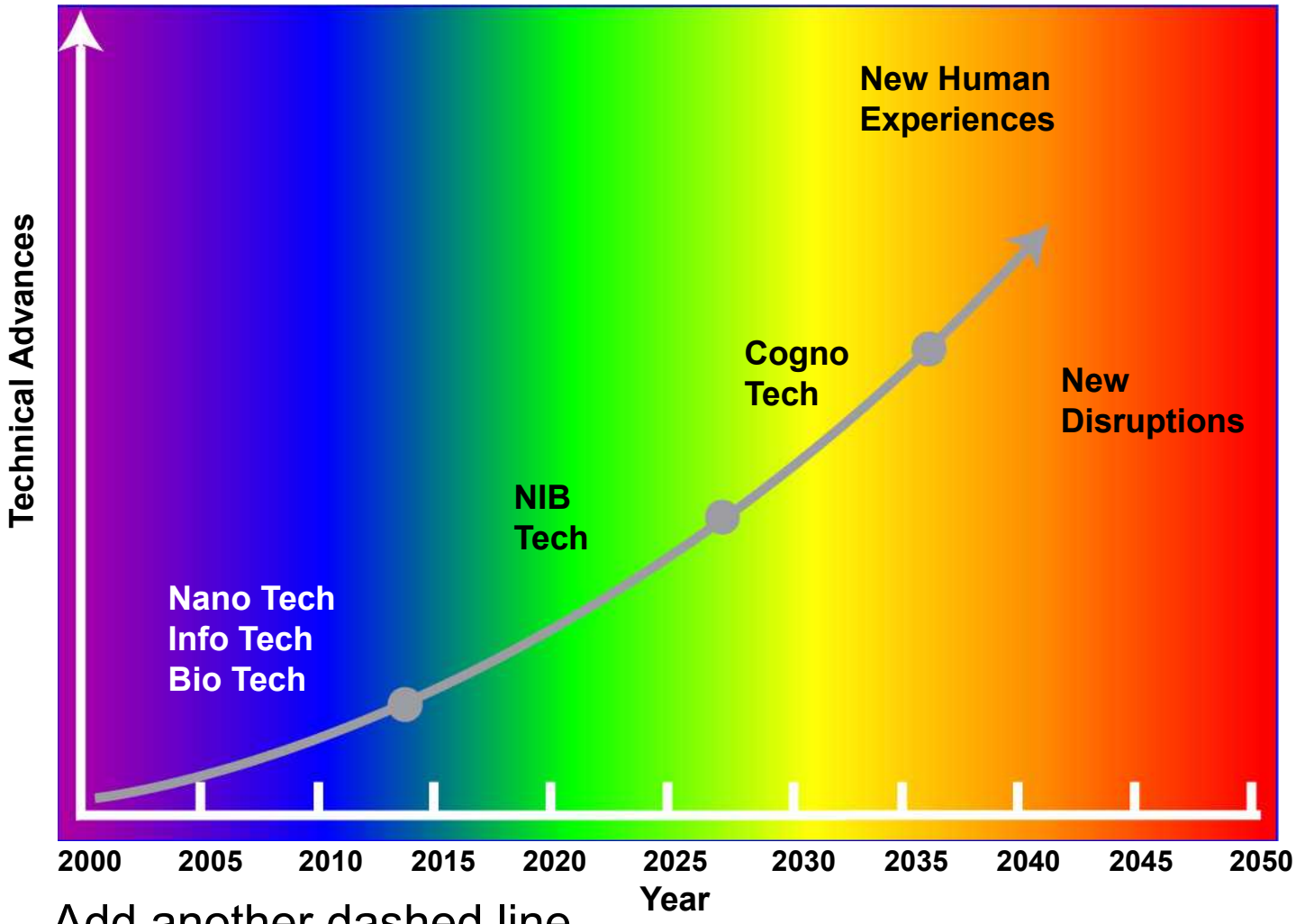
The Advance of Technology will be available to all sooner than we think



Add another dashed line

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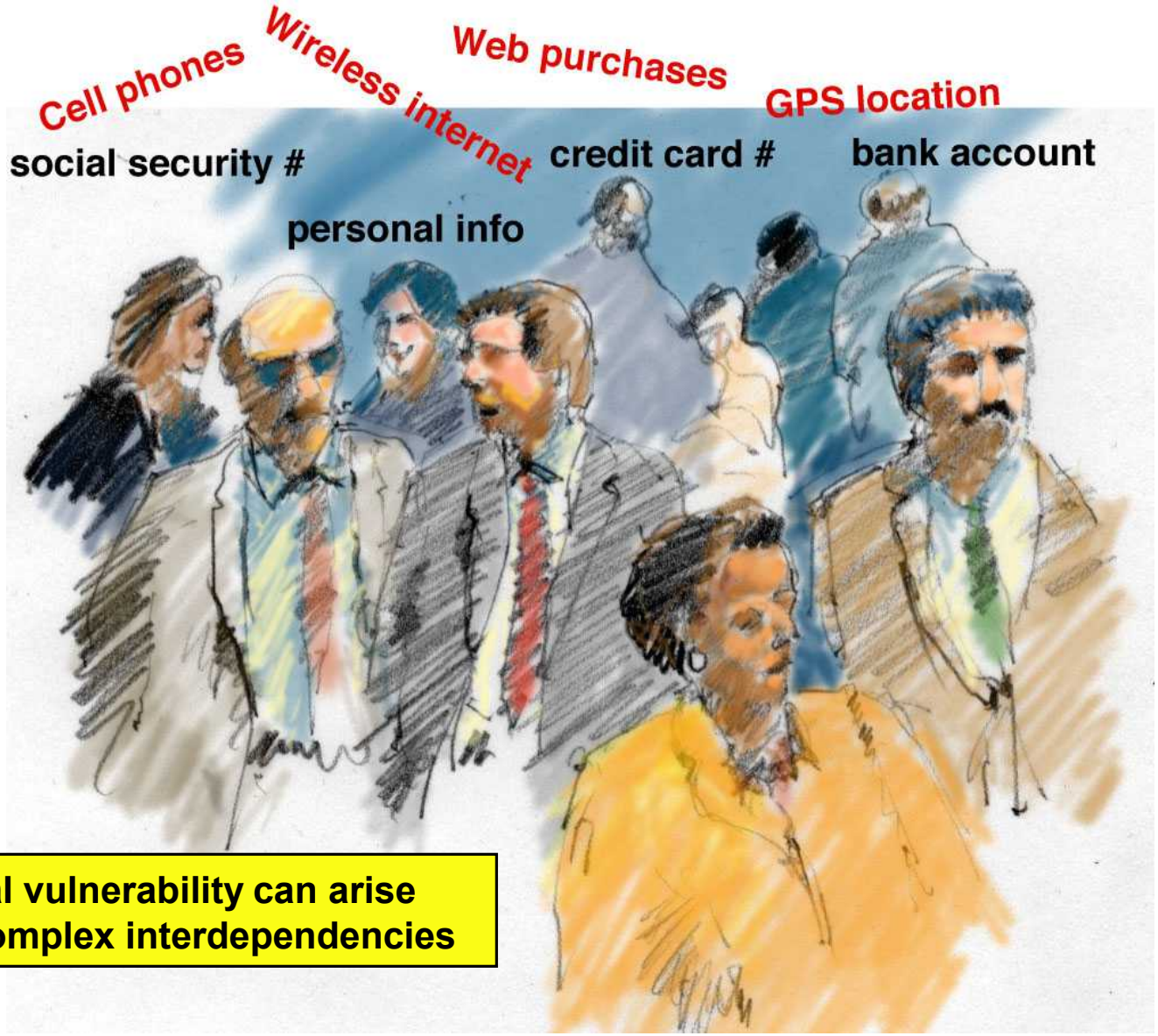
Ubiquitous Infotech



Societal vulnerability can arise from complex interdependencies

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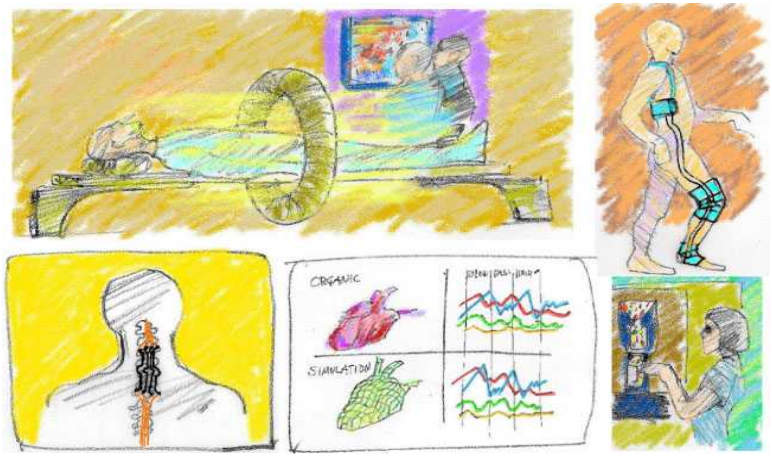
Everybody will demand applications of biotechnology

- Disease detection/prevention
- Injury healing
- Disability reduction
- Affordable health care



Bioweapons?

Tracking advances in biotech will be very challenging

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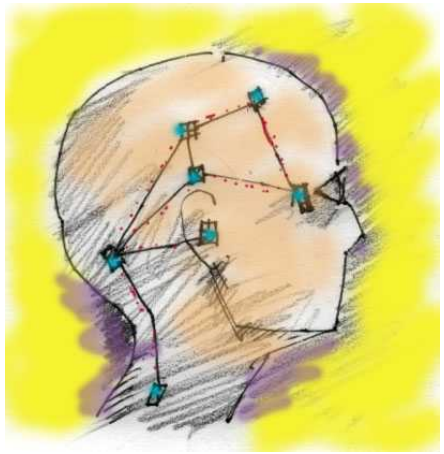
Cogno Tech Is Accelerating

- Wearable monitors
- Sensory and neural prosthetics
- Behavior & cognitive enhancement



Economic and social implications will drive technology advances very rapidly

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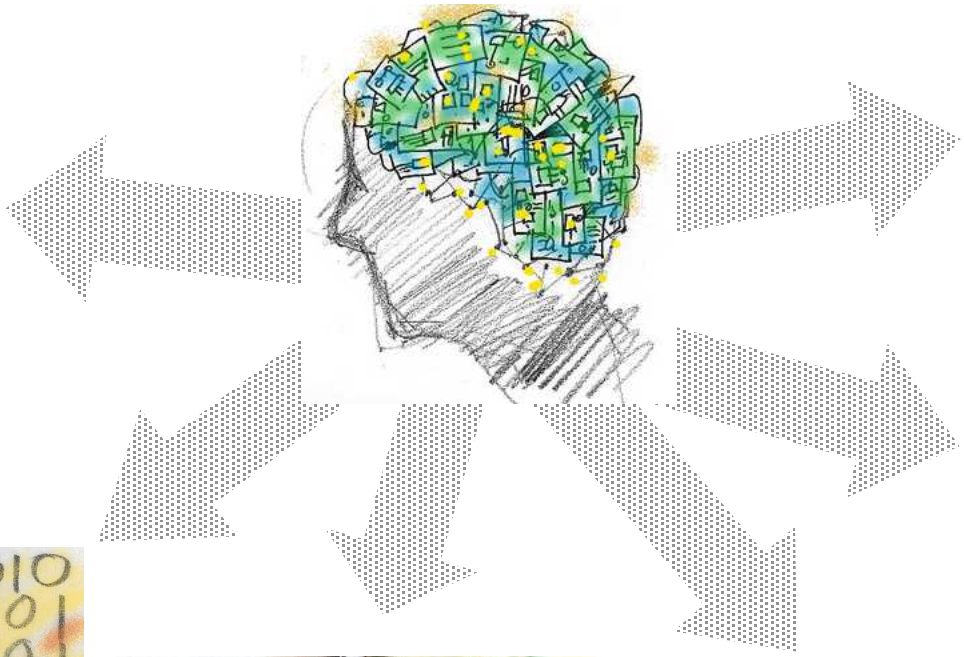
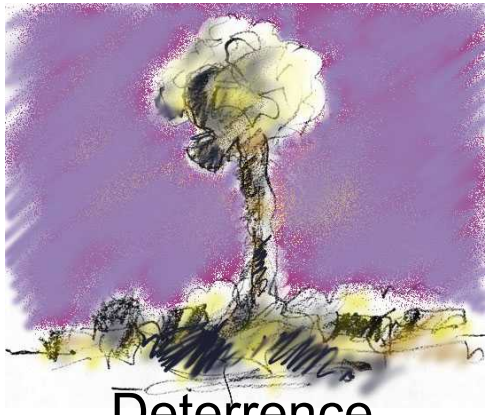
Advances in neuroscience will have many National Security impacts

Traumatic brain injury





Deterrence & dissuasion

Understanding the adversary

Enhanced analyst

Enhanced soldier

Deception

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The Neuro Spectrum

Understand

- brain trauma
- attention
- sleep
- stress
- peer pressure
- decisionmaking
- learning
- trust
- religious feelings

Restore

- treat injury
- manage fatigue
- treat disease
- stress mitigation
- pain management
- addiction correction
- manage depression

Enhance

- trauma “armor”
- custom attention
- improve decisions
- pain tolerance
- drug tolerance
- instant learning
- improved cognition
- improved memory

Degrade

- reversible trauma
- artificial fatigue
- artificial narcolepsy
- unreasoning fear
- false pain
- substance sensitivity
- memory loss

Acceptable — Controversial — Questionable

Social, moral, ethical

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Enhanced cognition can have positive and negative implications

- Judgment and decision support

- Enhanced learning & cognition

- Negative societal control?

Adversaries won't have the same limitations

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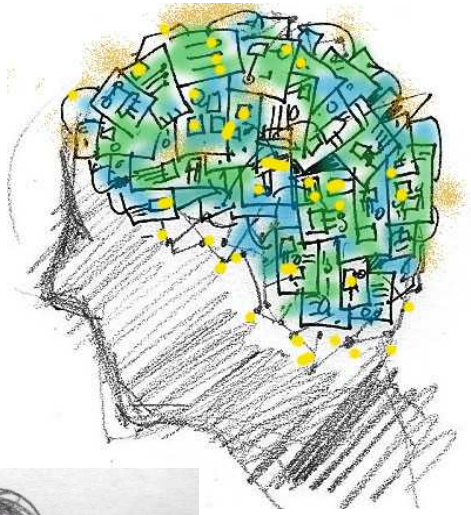
Military intelligence will be impacted by advanced is brains, biotech, biomed

- Adaptive brain/computer systems
- Wearable sensors/computers/actuators
- Performance enhancing drugs/EM field



Information Systems will be vulnerable to hacking/ jamming/damage

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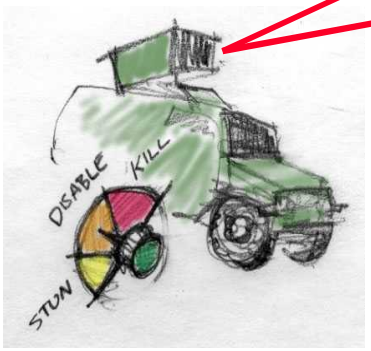
Beams as weapons for defense & offense

Lasers, HPM,
& particle beams

Non lethal weapons
tunable to

- stun
- permanently disable
- kill



Doctrinal / legal / ethical issues will limit our use

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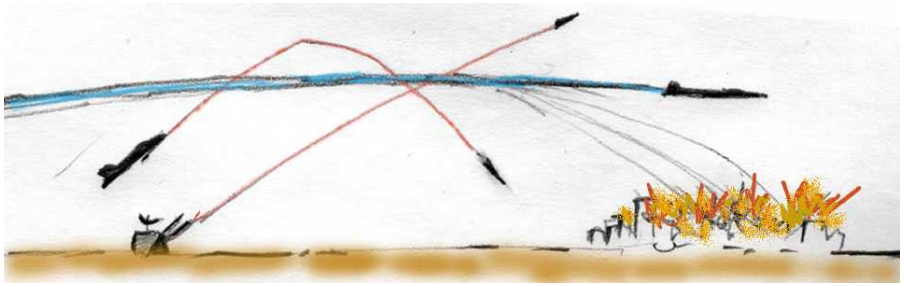
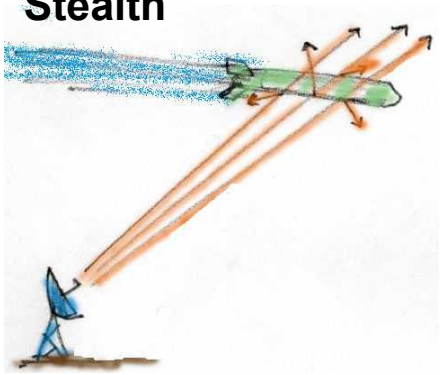
Hypersonics and Stealth

Hypersonics



Stealth



Surprise attack / instability / psychology of precision strike

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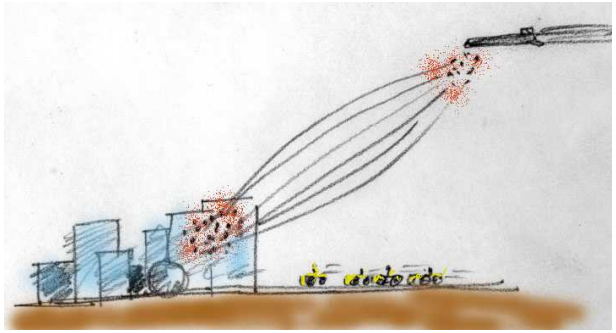
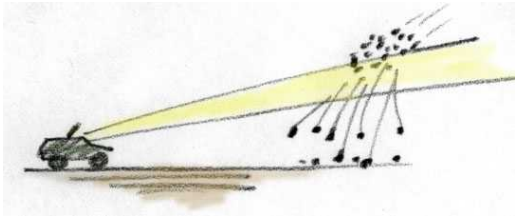
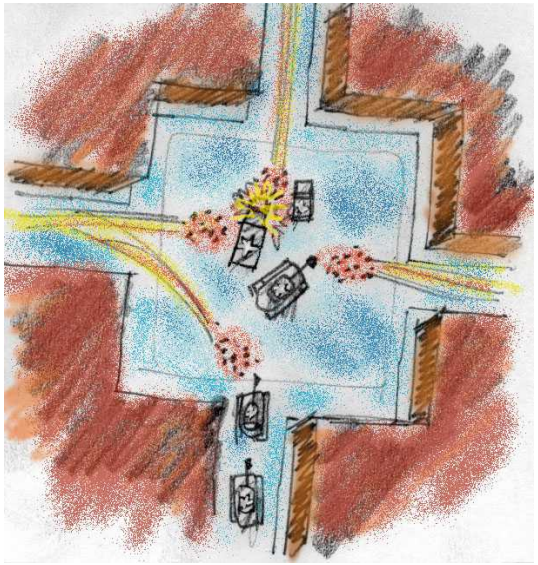
The battlefield will be dominated by swarms of robots



Small, cheap, mobile robots

- Swarm behavior
- RSTA & attack ops
- Sensors & weapons





Perch, search and lurch will replace lurch, lurch, lurch

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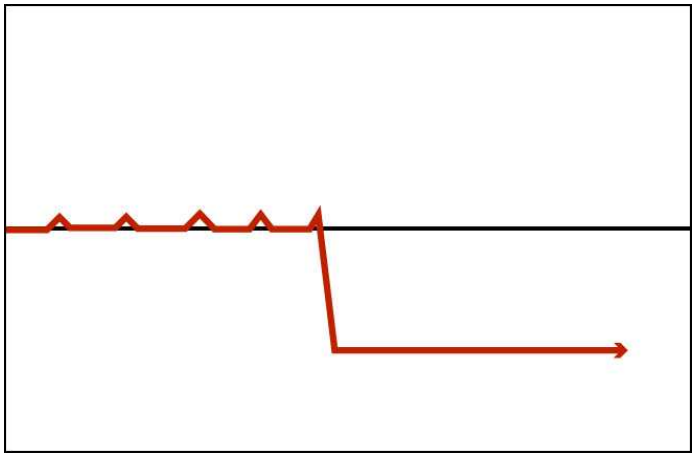
Protect/attack: Societal stability

Collapse of Brittle Society

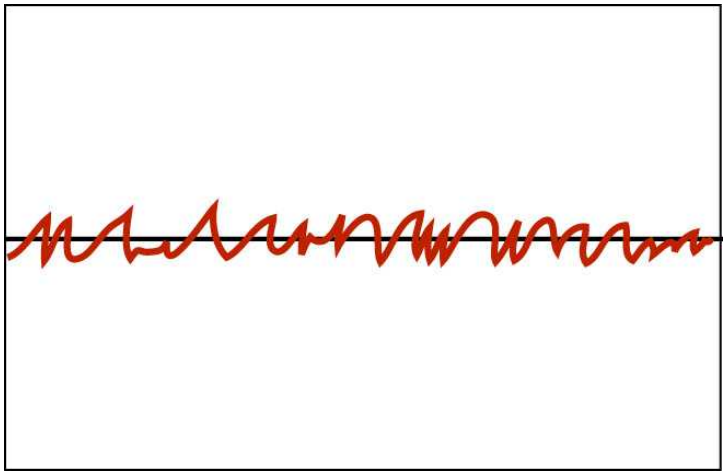


or

Transition to Chaos

or

Sustainable Dynamic stability



Change chaos box!

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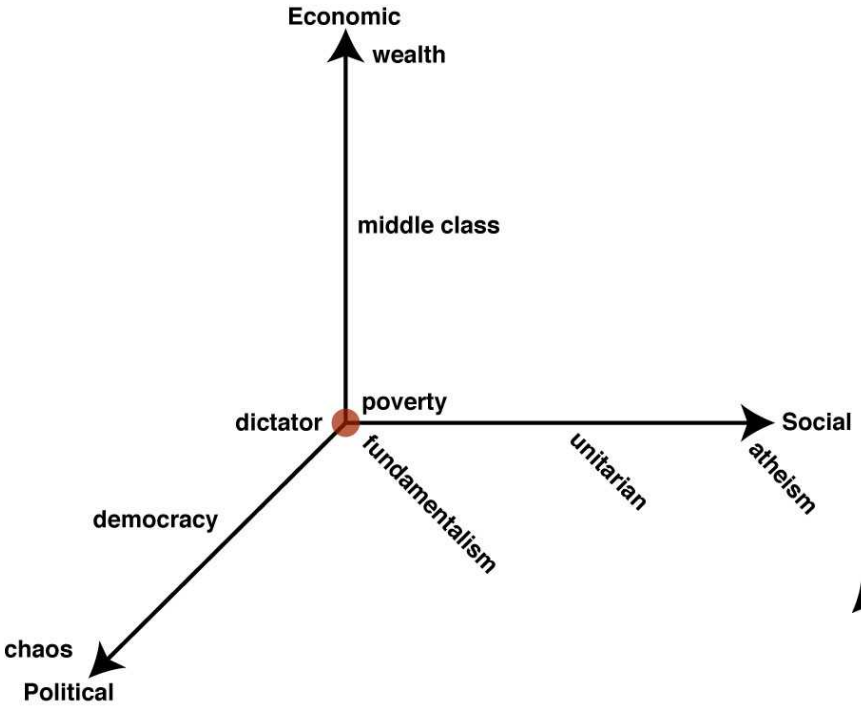
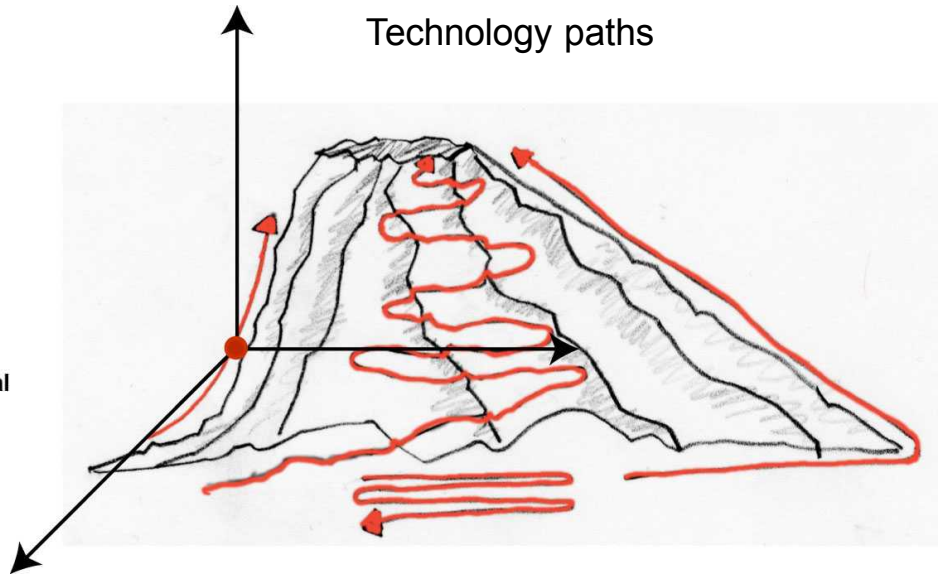
Analysts must follow the technology trails in a social, political, economic context





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Our Goal Should Be Dynamic stability

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Don’t use the following

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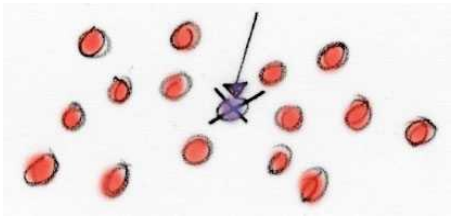
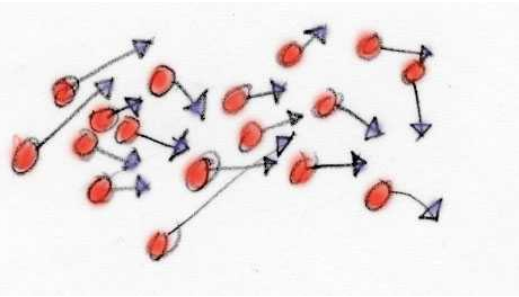
The societal manipulator vs the robust, distributed, semichaotic society

The brittle society single point failure

Robust, distributed, semichaotic





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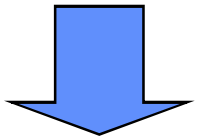
Wicked engineering programs will attract a different kind of student with real advantages

- More diverse – civil/environmental ahead?
- More systems-oriented
- More political/economical/societal



- Better positioned to take leadership roles in industry, government
- Better career/job security (wicked work is harder to export)
- More flexible/adaptable backgrounds, perspectives and skills

Wicked engineers need a different kind of education

- Embedded complex systems thinking, not added-on electives
- Interdisciplinary as well as multidisciplinary
- Problem-based learning, experiential learning, gaming/simulation
- Neuroscience-based pedagogy?

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To make a difference in the future, your graduates will need to be more "wicked"

- Homeland Security
- Infrastructures resilience
- Climate Change
- "Peaking" Oil
- Genetics/Health Maintenance
- Modeling/Computing/Predictive Engineering
- Neuroscience/Psychology/Enhanced Cognition
- Quality of Life/Economic Well Being
- The "Long War"

and

Rapidly Advancing Technology

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