

Future Adversary Technologies

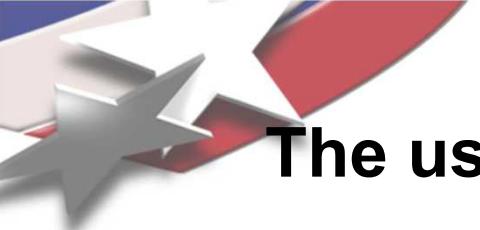
(Thinking about the future is “Wicked”)

Presented at

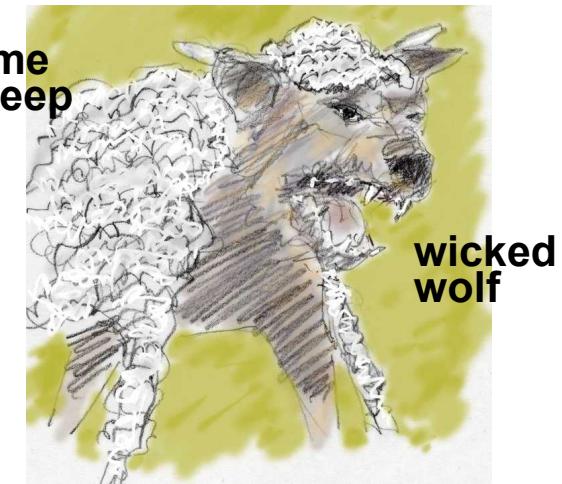
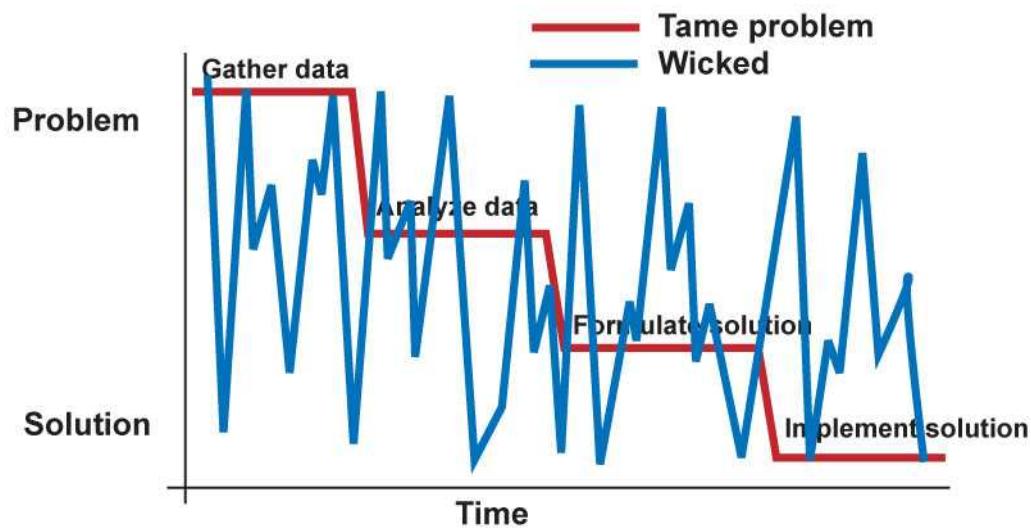
The Stanley Foundation/Potomac Institute
Future Weapons of Mass Destruction
Panel Discussion

December 11, 2006

Dr. Gerold Yonas, PhD
Vice President and Principal Scientist
Sandia National Laboratories



The usual approach to a “wicked” problem is to pretend it is tame



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

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



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

The wicked approach:

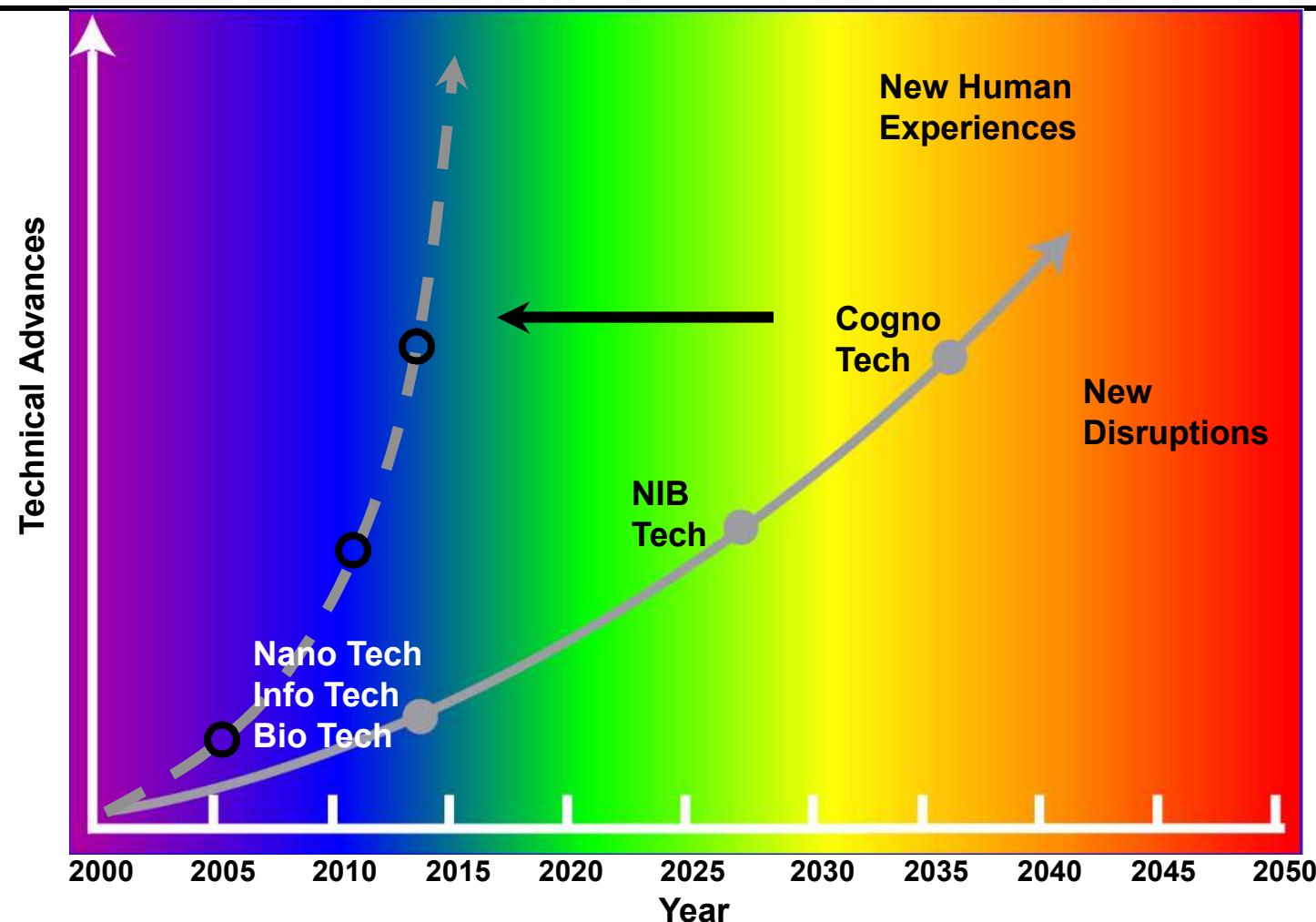
1. **“Formulate the mess”**
2. **Develop a spiral (not linear) process**
3. **Share awareness of changing context**
4. **Communicate often, with high fidelity, to all levels**
5. **Focus on system issues, not just pieces.**
6. **Remember: “success is the devil”**
7. **Trust each other as the game changes**



Rapid advances in technology lead to wickedness



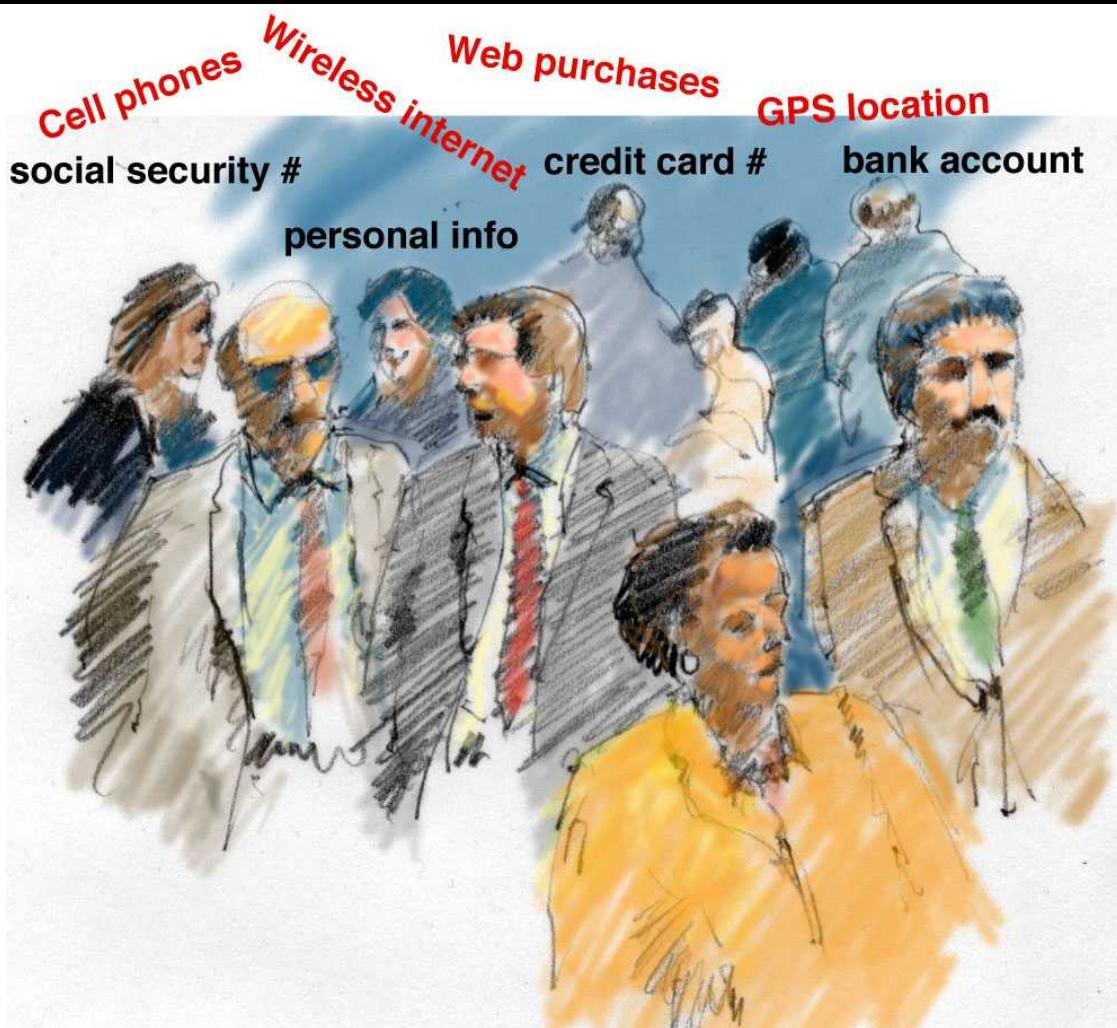
The advance of technology will be available to all sooner than we think...



Infotech drives globalization and tech acceleration



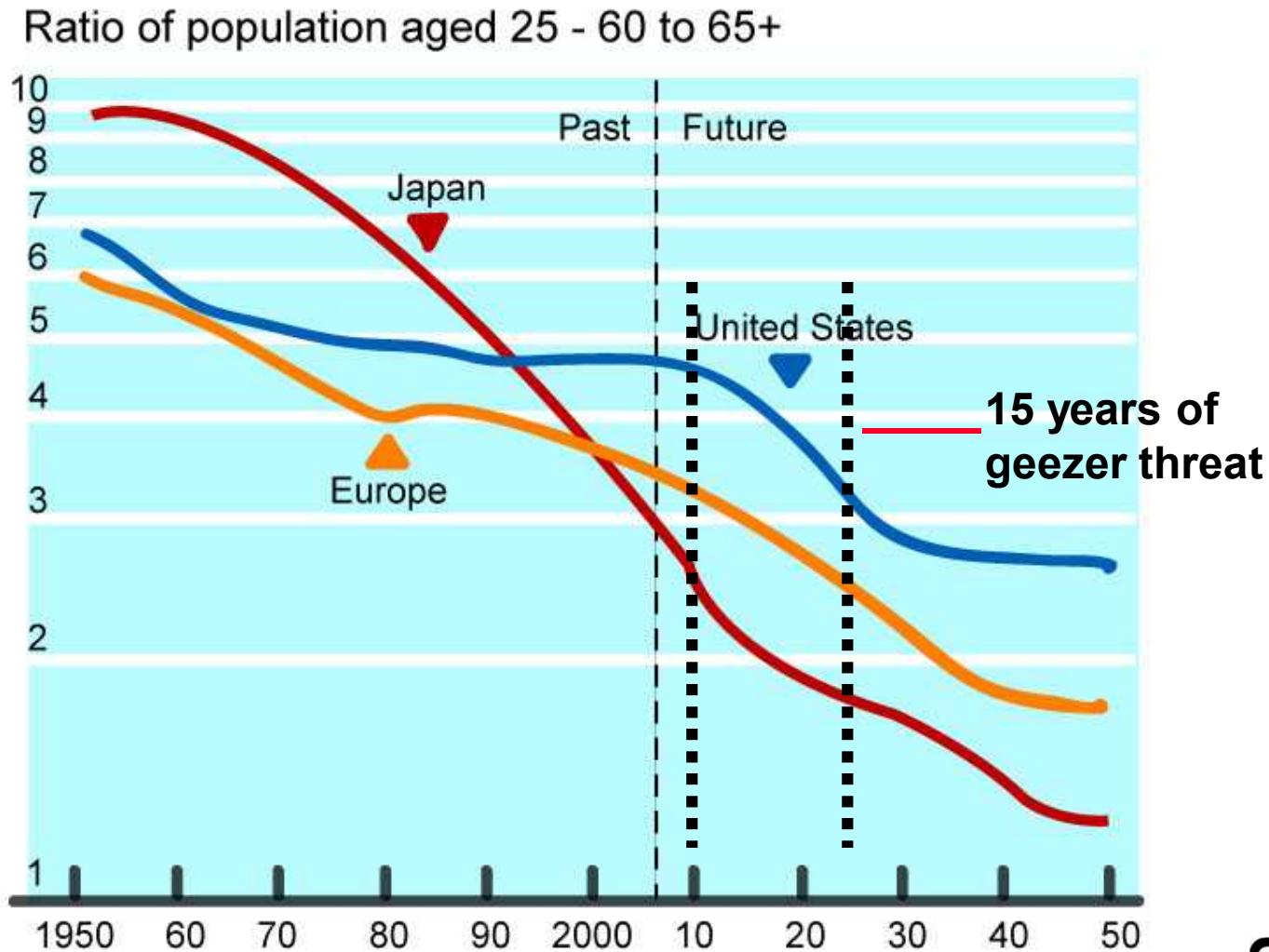
Ubiquitous Infotech is an enabler



**Adversary capabilities and societal vulnerability
can arise from complex interdependencies**



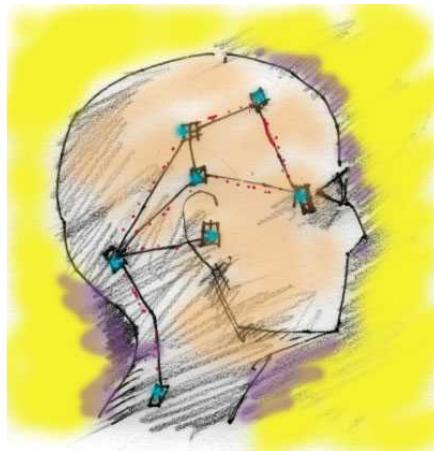
The Age Wave will drive tech advances and societal vulnerabilities





Aging population will demand technology

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

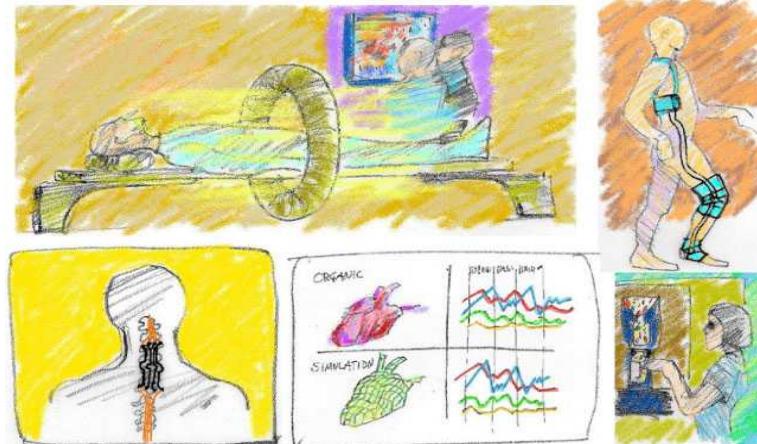


**Economic and social implications
will drive technology advances**



Everybody will demand applications of biotechnology

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



Bioweapons?

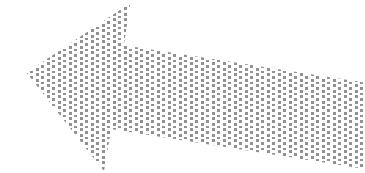


Tracking advances in biotech will be very challenging

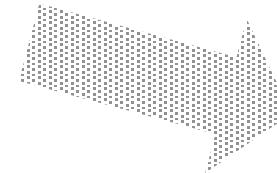


Advances in neuroscience will have wide impacts

Health care



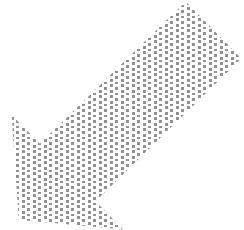
Health Maintenance



- Adaptive brain/computer systems
- Wearable sensors/computers/actuators
- Cognitive enhancement
- Management and decision support

Education

Social interactions



Entertainment

Transportation



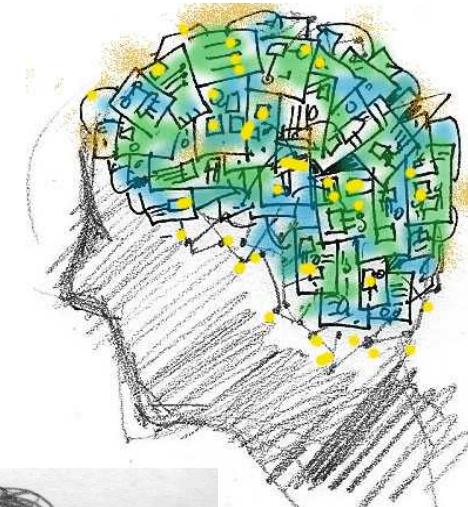
Commerce



Military technology will be driven by “Non-Kinetics”

Brains – biotech – biomed

Sensors – systems - signals





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

Degradate

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

Acceptable

Controversial

Questionable

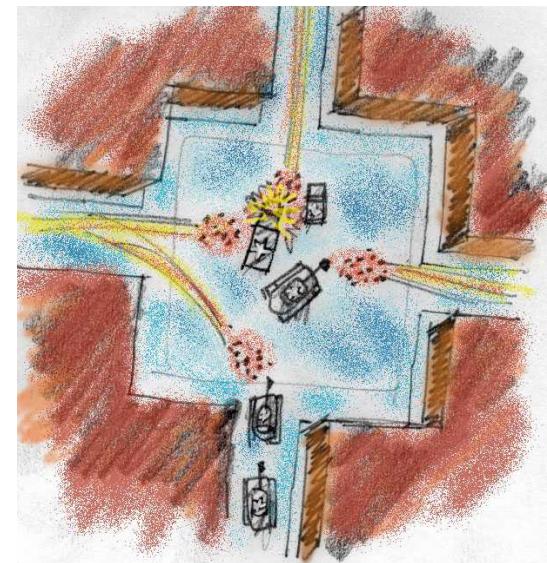
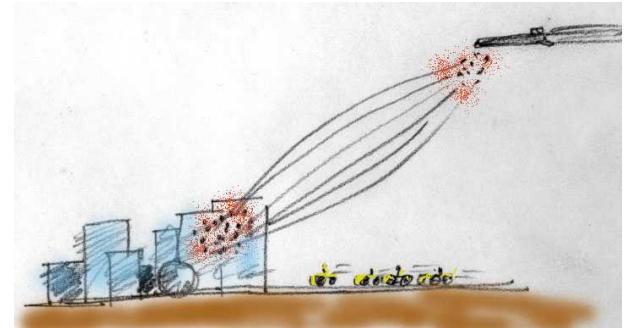
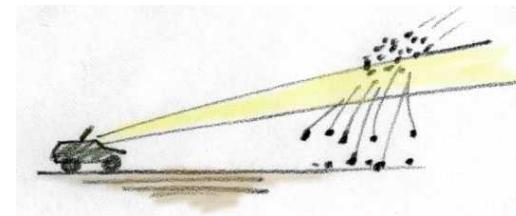
Social, moral, ethical



Robot battlefield swarms

Small, cheap, mobile robots

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

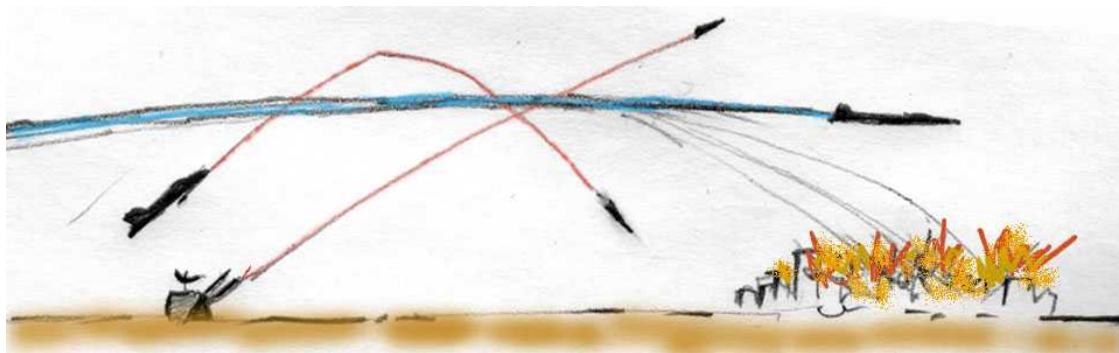


Our swarms vs. their swarms

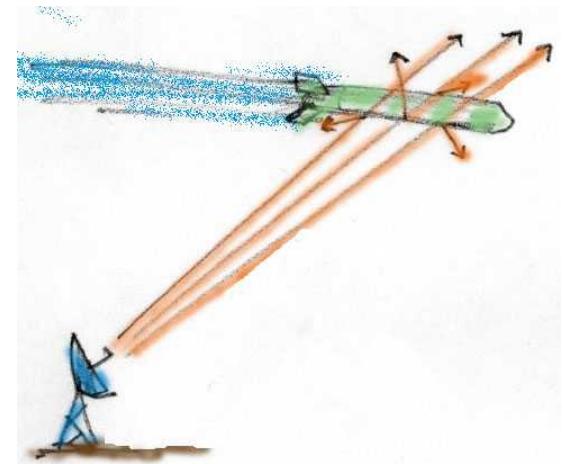


Hypersonics and Stealth

Hypersonics



Stealth



Surprise attack / instability / psychology



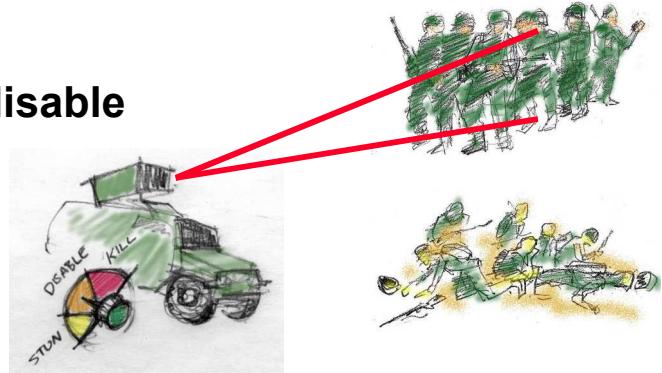
Beams as weapons for defense & offense

Lasers, HPM,
& particle beams



Non lethal weapons
tunable to

- stun
- permanently disable
- kill

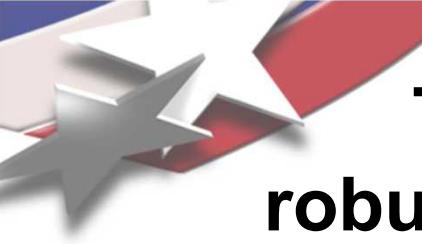


Doctrinal / legal / ethical issues / limits our use



The Tools of Future Adversaries

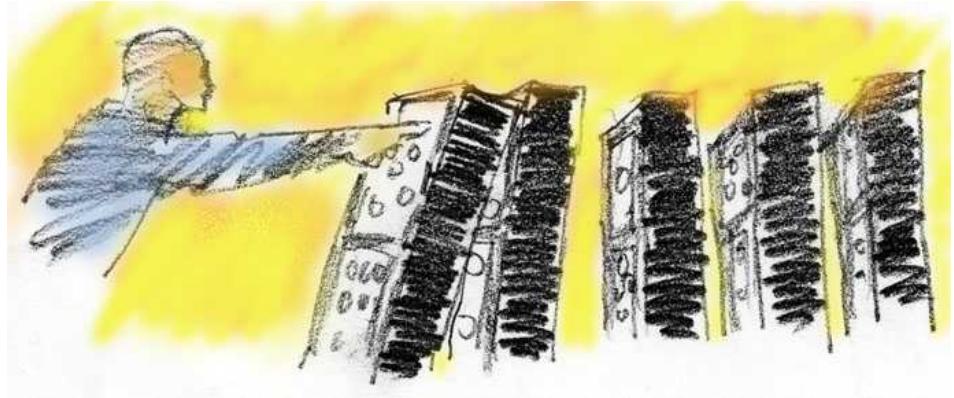
Strategic	Conventional	Irregular	Social
<ul style="list-style-type: none">• Nukes• Special nukes• Very special nukes	<ul style="list-style-type: none">• ASATs• Cyber attack• Global strike• Fleet attack• Robot swarms• Nano attack	<ul style="list-style-type: none">• IEDs• RDD• Bio/Ag attack• Hostage• Assassination• Infrastructure attack• Anti-material• Cyber	<ul style="list-style-type: none">• Psyops• Induced chaos• Insider• Non-violent resistance• Exponential immigration• Financial attack• Military coup• Race war



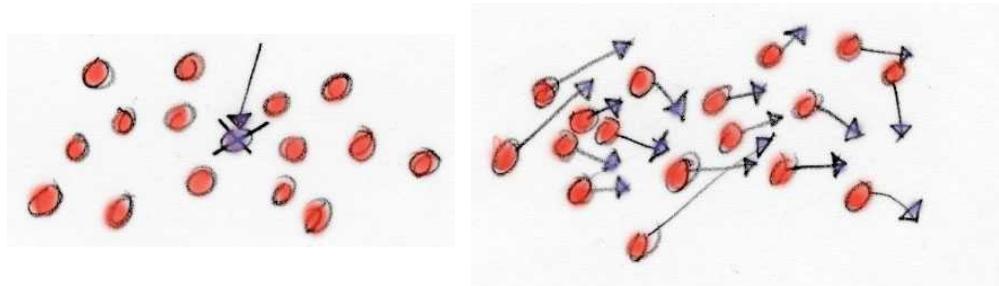
The societal manipulator vs. the robust, distributed, semi-chaotic society



The brittle society single point failure



Robust, distributed, semichaotic



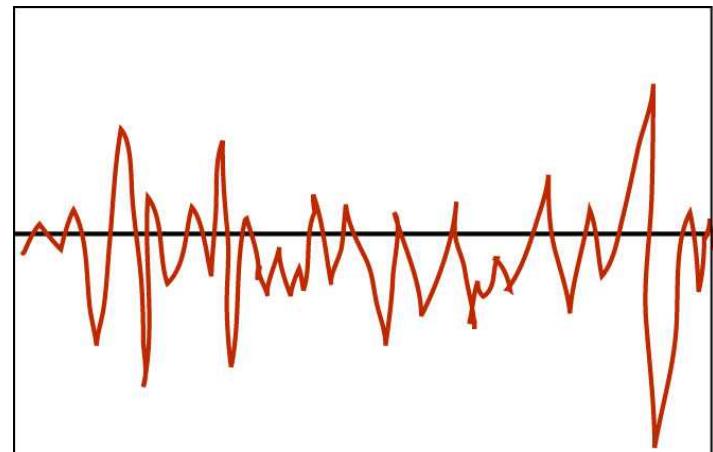


Societal stability

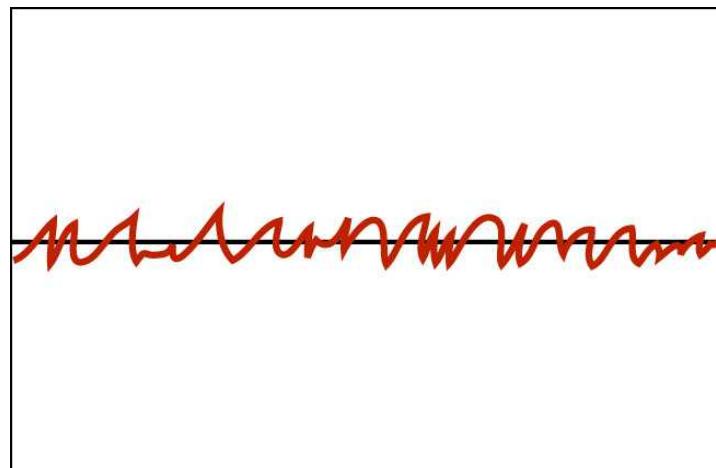
Fragile

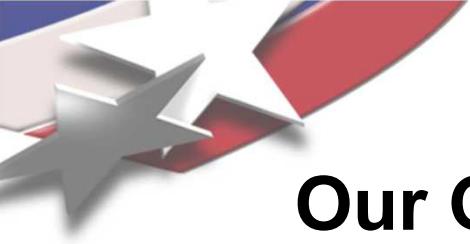


Chaotic



Dynamic stability





Our Goal Should Be Dynamic Stability

