Protecting Security in an Unsecure World: New Threats, New Technologies and New Opportunities

Keynote Address

60th Anniversary of the Central Intelligence Agency

20 September

Dr. George Poste

Tel: 480-727-8662

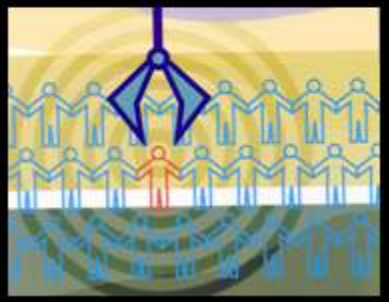
e.mail: george.poste@asu.edu

THE biodesign INSTITUTE
ARIZONA STATE UNIVERSITY

Navigating a World of Increasingly Complex and Diverse Threats: Challenges from All Directions

NEW THREATS

NEW CAPABILITIES



“Our nation is in a state of armed conflict with al Qaeda and its affiliates.”

“We who study and target this enemy see a danger more real than anything our citizens at home have confronted since our Civil War.”

General Michael V. Hayden
Director, CIA

Remarks at Council on Foreign Relations
7 September 2007

New Polarities and Asymmetries

- nation state adversaries → non-state actors
- geographically constrained adversaries → new group identities in virtualscapes
- dominant concepts of nationality → virtual Jihadist movement/nation
- formal, national governing structures for diplomacy → autonomous cells and global terror networks
- western social democratic ideologies and international legal codes of conduct → theocratic fundamentalism; ‘no limits’

Escalating Polarities and New Asymmetrics

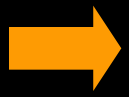
- IC/DOD capabilities vested in conventional warfare and ‘big bang: big metal’ weapons → lack of critical mass to address asymmetric and unconventional threats
- stringent oversight and international cooperation to limit WMD proliferation → proliferation, miniaturization and privatization of WMD production
- geographic concentration of technological/economic/ military power → rapid diffusion of critical technologies; rise of new economic centers

Transformational Technologies and the Relentless Destabilization of Societal and Institutional Relationships

- globalization and cultural homogenization
- new aspirants and future competitiveness
- the widening economic divide between the haves and have nots
- new political tensions, fundamentalism and anti-western ideologies

New Polarities and Asymmetries

- net-centric operations
  - pervasive dependency on electronic network connectivity
  - military and civilian sectors



- bringing down the network
- cyberwarfare and cybercrime
- militarization of space and new vulnerabilities
- maintaining USG capabilities in cyber-degraded environments

New Polarities and Asymmetries

Cold War

- easy to find
- very hard to kill

GWOT

- very hard to find
- easy to kill

New Polarities and Asymmetries

Cold War

- easy to find
- very hard to kill

GWOT

- very hard to find
- easy to kill

- quick to regenerate
- winning the “deep battle” for ideas

A Powerful Fifth Column

The Retreat from Complexity:
The Curse of Contemporary Governance

The Poverty of Imagination:
The Discomfort and Denial of Radical Change(s)

Hubris:
Divisiveness, Delusion and Dangers Ignored

Societal Retreat from Complexity: Unleashing a New Generation of Horsemen

- instant solutions
- insularity
- ignorance
- inertia

The Poverty of Imagination

The Retreat from Complexity: The Insularity and Risk-Aversion of USG Analytical and Decision Frameworks

- ‘too hard’ problems
- denial, avoidance, paralysis
- sustained focus/funding on ‘the familiar’ by ‘usual suspects’
- insufficient/inefficient use of unfettered red teaming

The Retreat from Complexity

BIG IDEAS
GO
UNEXPLORED
AND
UNFUNDED

MUST CATASTROPHE BE THE ONLY TRIGGER TO PROVOKE RADICAL REFORM?

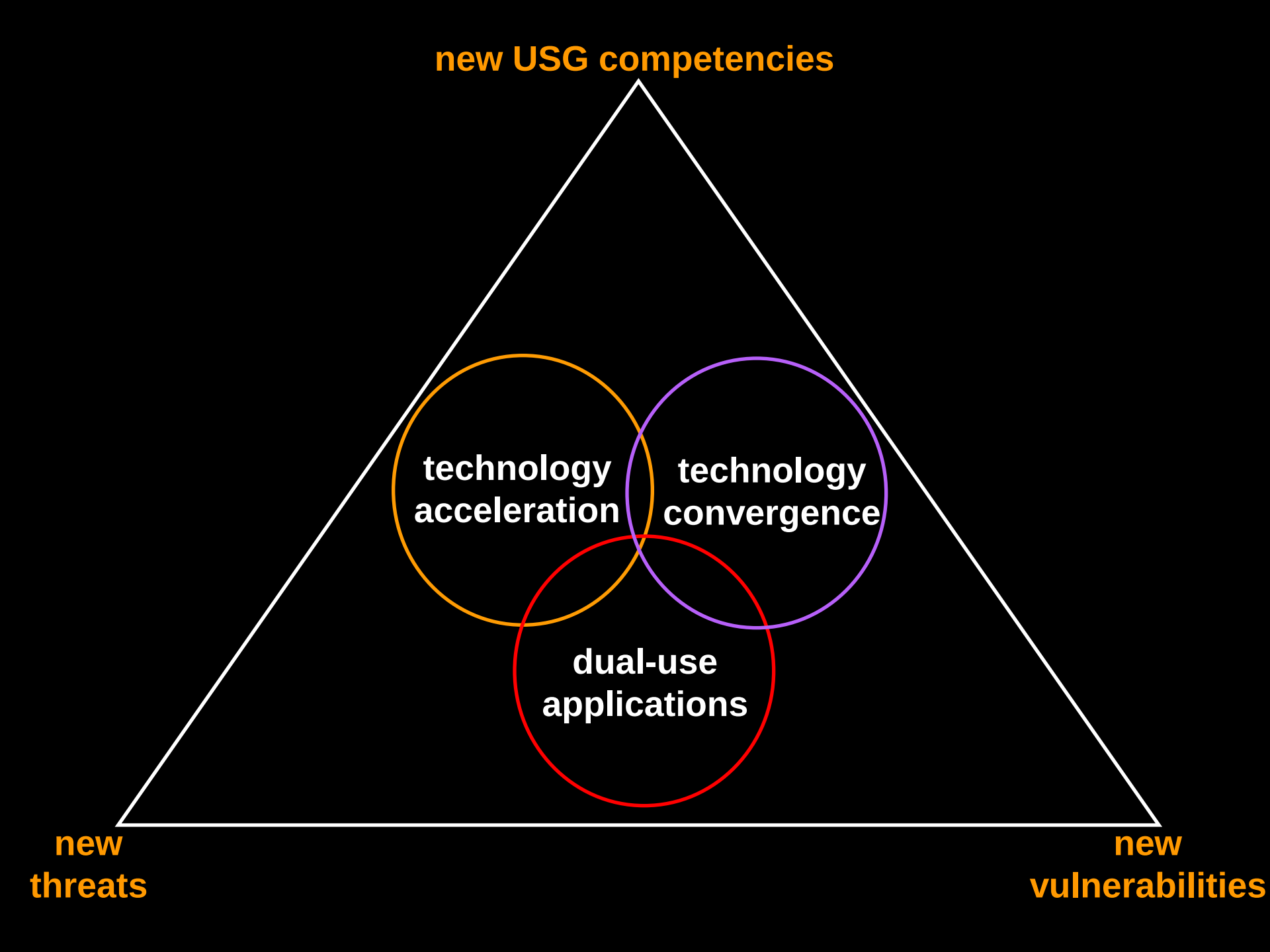
Meeting Previous Grand Challenges

CENTRAL INTELLIGENCE AGENCY

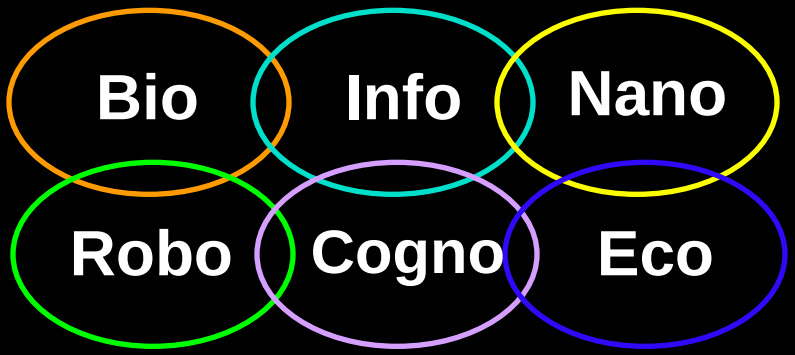
STRATEGIC INTENT
2007-2011

ONE AGENCY
ONE COMMUNITY

. . .

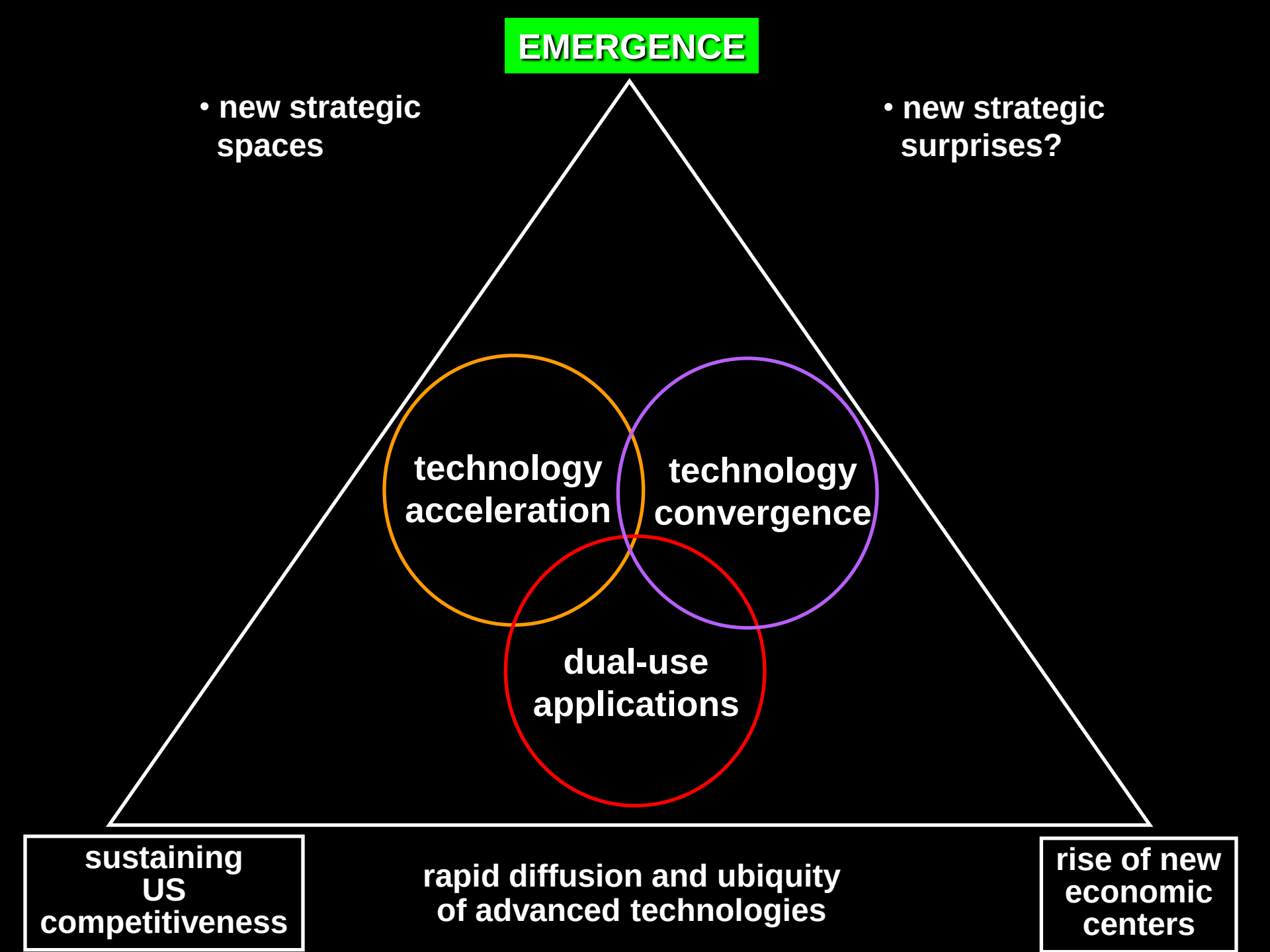

new USG competencies
technology acceleration
technology convergence
dual-use applications
new threats
new vulnerabilities

Combination, Convergence, Complexity and Emergence
Grand Challenges and Wicked Problems



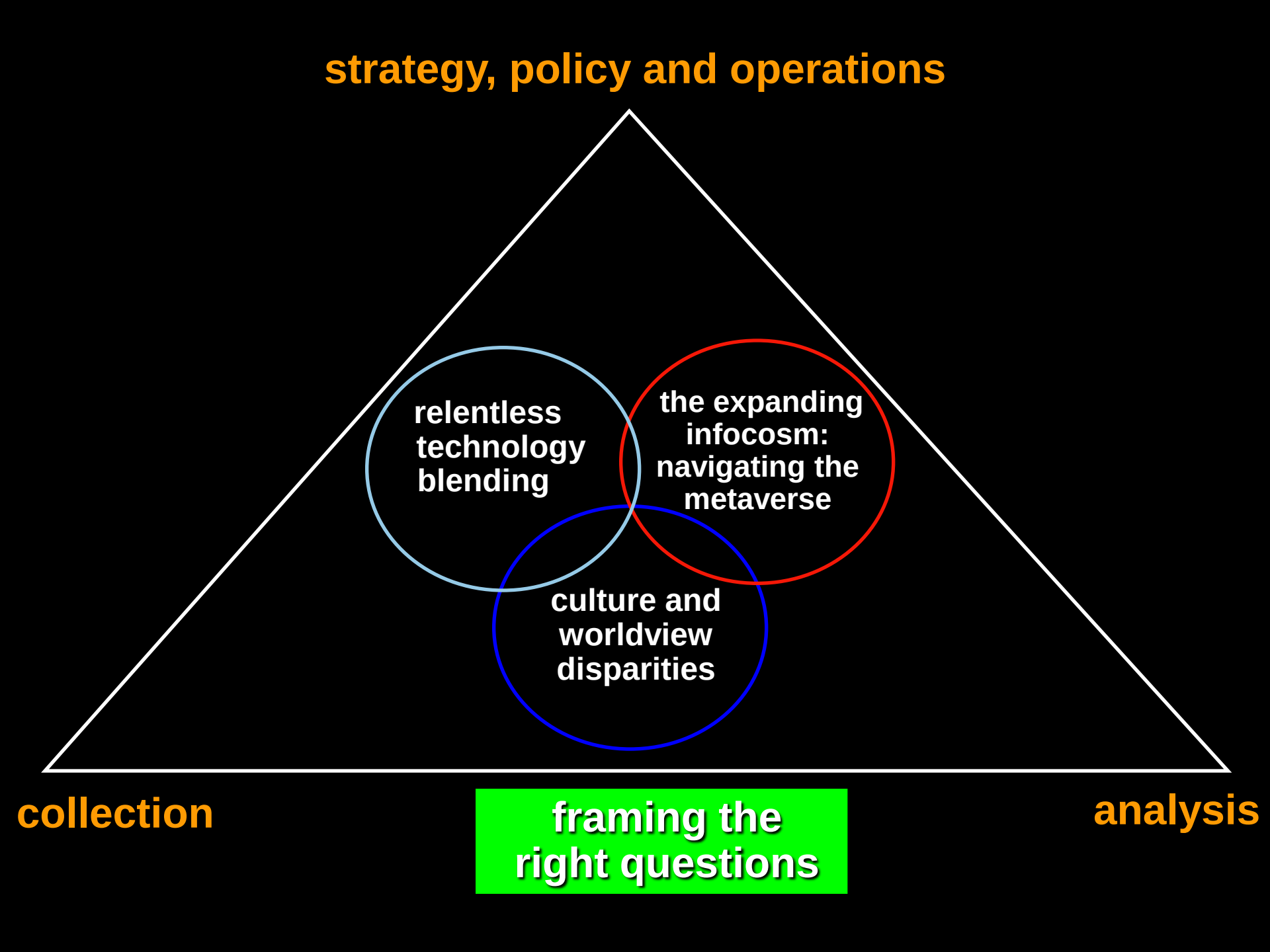
Convergent Technologies and Radical Shifts in Complex Adaptive Systems (Emergence)

- cardinal feature of complex adaptive systems
- macro-level effects from micro-level causes
- emergence of entirely new properties at each level of complexity
- convergence forges new patterns of complexity and increased probability of emergent phenomena


EMERGENCE
• new strategic spaces
• new strategic surprises?
technology acceleration
technology convergence
dual-use applications
sustaining US competitiveness
rapid diffusion and ubiquity of advanced technologies
rise of new economic centers

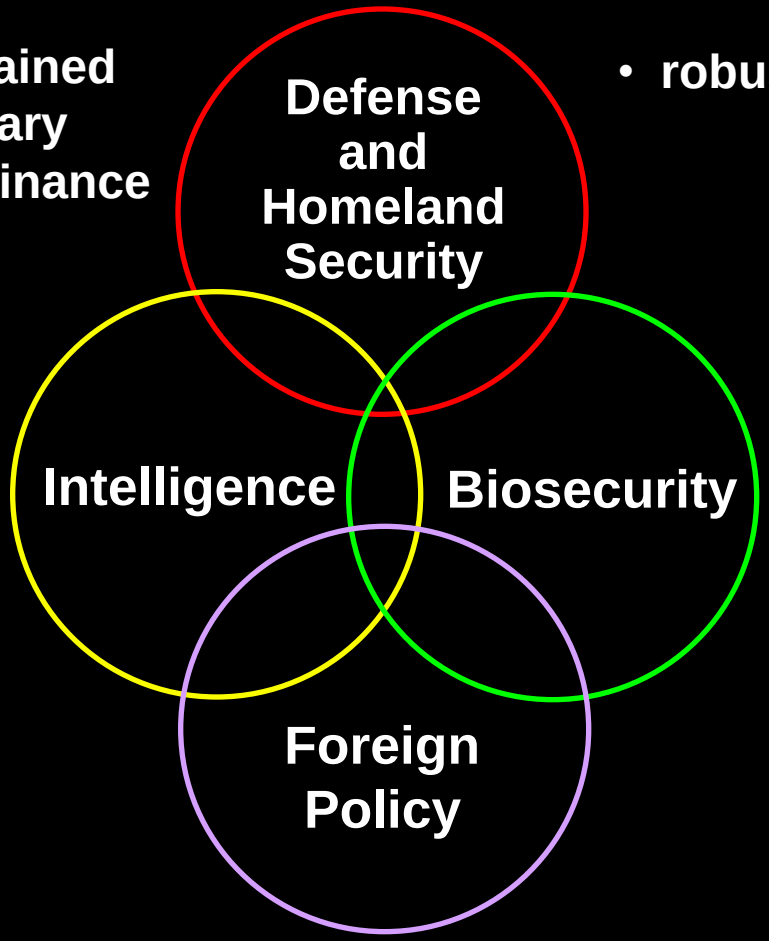
Trends in Threat Evolution

Threat Category	Impact			
	Technology Acceleration	Technology Convergence	Dual-Use Technology	Rapid Diffusion
• WMD proliferation	↑	↑	↑	↑
• miniaturized weapons	↑	↑	↑	↑
• new classes of unconventional weapons				
- bio beyond bugs	↑	↑	↑	↑
- cyber	↑	↑	↑	↑
• militarization of space	↑	↑		↑
• supply chain vulnerability and trojan horses	↑	↑	↑	↑
• terror networks (TTL)	↑	↑	↑	↑


strategy, policy and operations
relentless technology blending
the expanding infocosm: navigating the metaverse
culture and worldview disparities
collection
framing the right questions
analysis

The Multidimensional Roles of Science and Technology in National Security

- sustained military dominance
- robust homeland defense



- new capabilities for threat ID and pre-emption
- managing 'the global commons'
- science and technology as key (but neglected) elements of foreign affairs

“Biosecurity and The Global Commons”

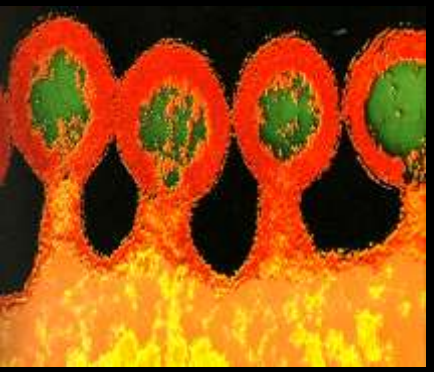
Assessing the Threat from Infectious Diseases

Bioterrorism

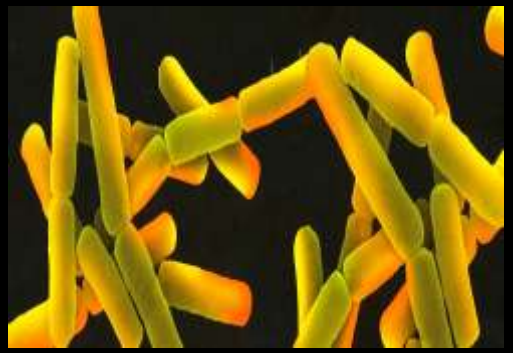
- low probability, high consequence

Natural Epidemics and Pandemics

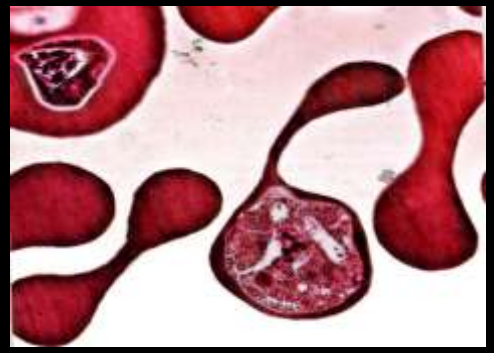
- high probability, high consequence



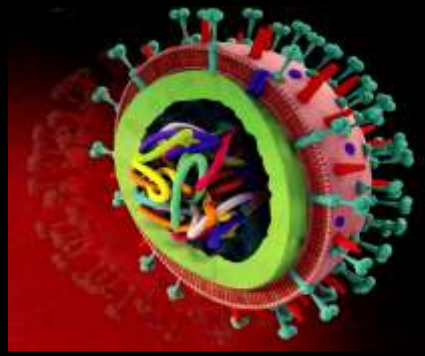
HIV



TB



Malaria



Influenza

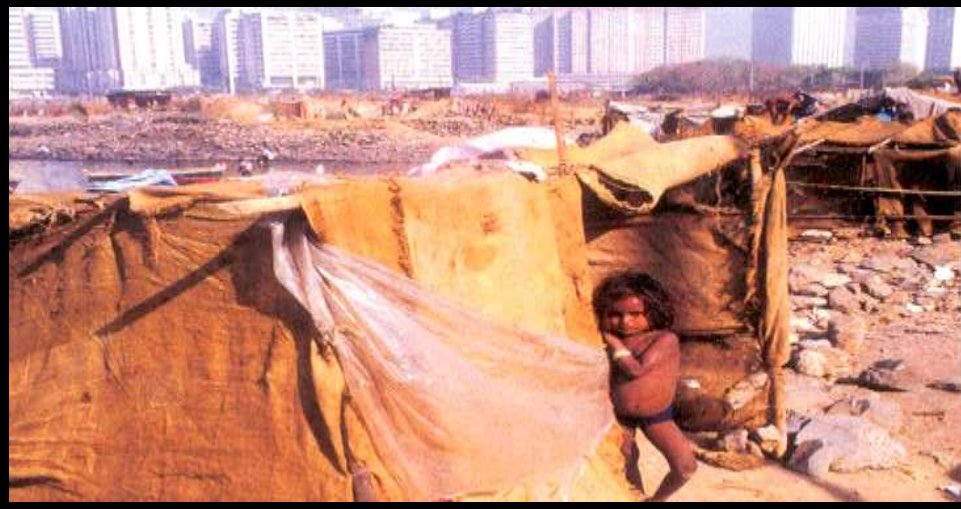
EIDs

Urbanization

Rx Resistance

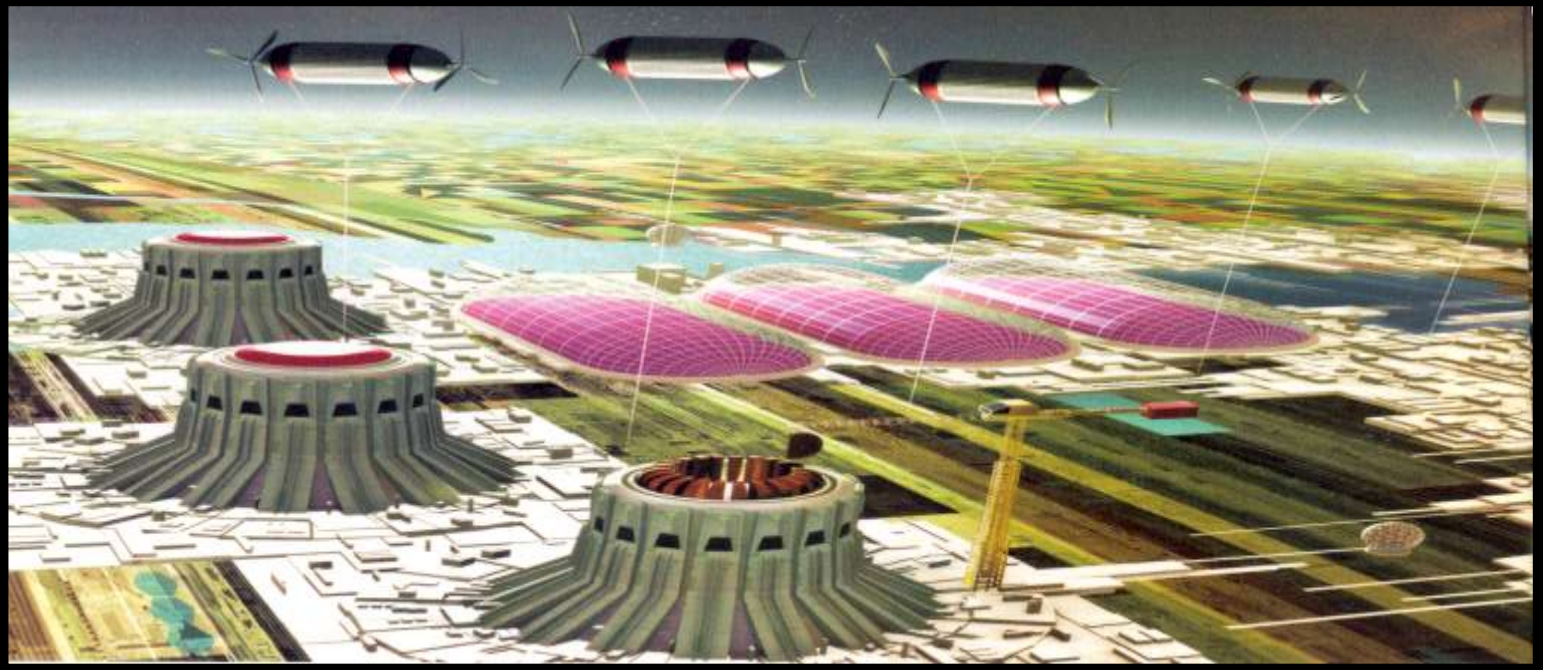
Incentives

The Lack of Public Health Infrastructure in Developing Countries: Urbanization and New Zoonoses



Water: Supply and Safety
A Source of Future Geopolitical and Economic Instabilities

Charting Sustainable Energy Sources



Defining Coherent and Holistic Strategies for Global Challenges:

Systems-Based Approaches

Macro-Systems	Micro-Systems	Nano-Systems

global, regional, local

individual impact

ubiquitous sensing

Digital Systems

networks
and
connectivity

knowledge,
education
training

brain: machine
co-evolution

The New "Strategic Spaces" in Military Affairs and National Security

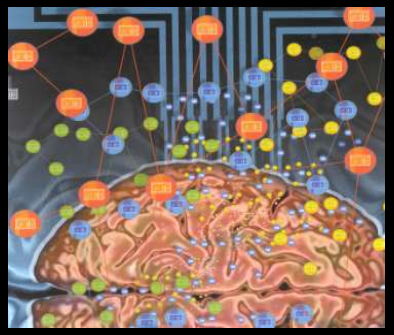
Ubiquitous Sensing

"Connected Space"

Synthetic Biology

"Biospace"

Cognitive Biology



"Smartspace"

Cyberwarfare Cybercrime

"Cyberspace"

Militarization of Space

"Outer Space"

Blending: Ever Shifting, Multi-Dimensional Matrices

THE biodesign INSTITUTE
ARIZONA STATE UNIVERSITY

The Infocosm: Emerging Networks of Global Connectivity

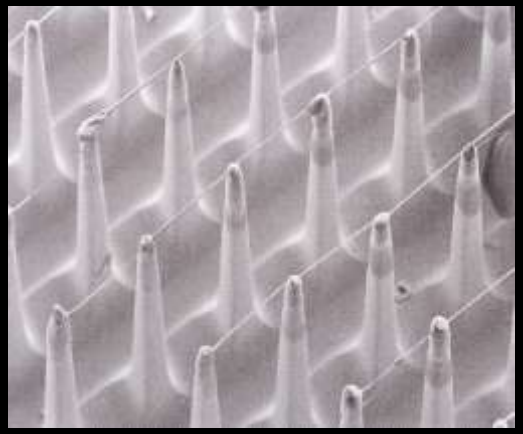
The Future Environment for Intelligence:
A Burgeoning Infocosm and An Expanding Metaverse

- everything is a reporter
- everything goes everywhere
- everybody sees everything
- everything moves fast

Ubiquitous Sensing and Ambient Intelligence: Instant Information: Anything, Anywhere, Anytime

- sensor networks/webs
- persistent surveillance
- net-centric warfare

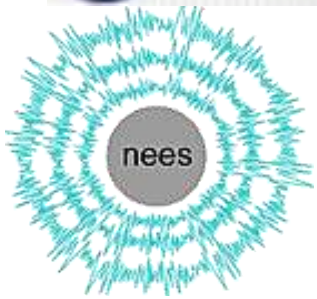
- new biology-based capabilities for ID of individuals

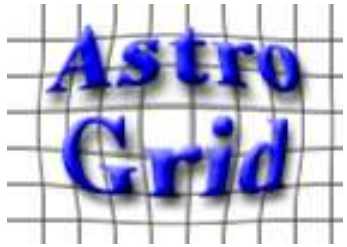


- miniaturization engineering

- linking the molecular world to the internet
- from deep blue to deep space to inner space
- complex legal, ethical and social implications

Grids of All Flavors





Everything of Value Will Be Tracked Everywhere: Challenges for a Trustworthy Information Society

- decentralized systems design and network topology
- heterogeneous data and semantic interoperability
- consequences of open systems
- emergence
- new computing paradigms

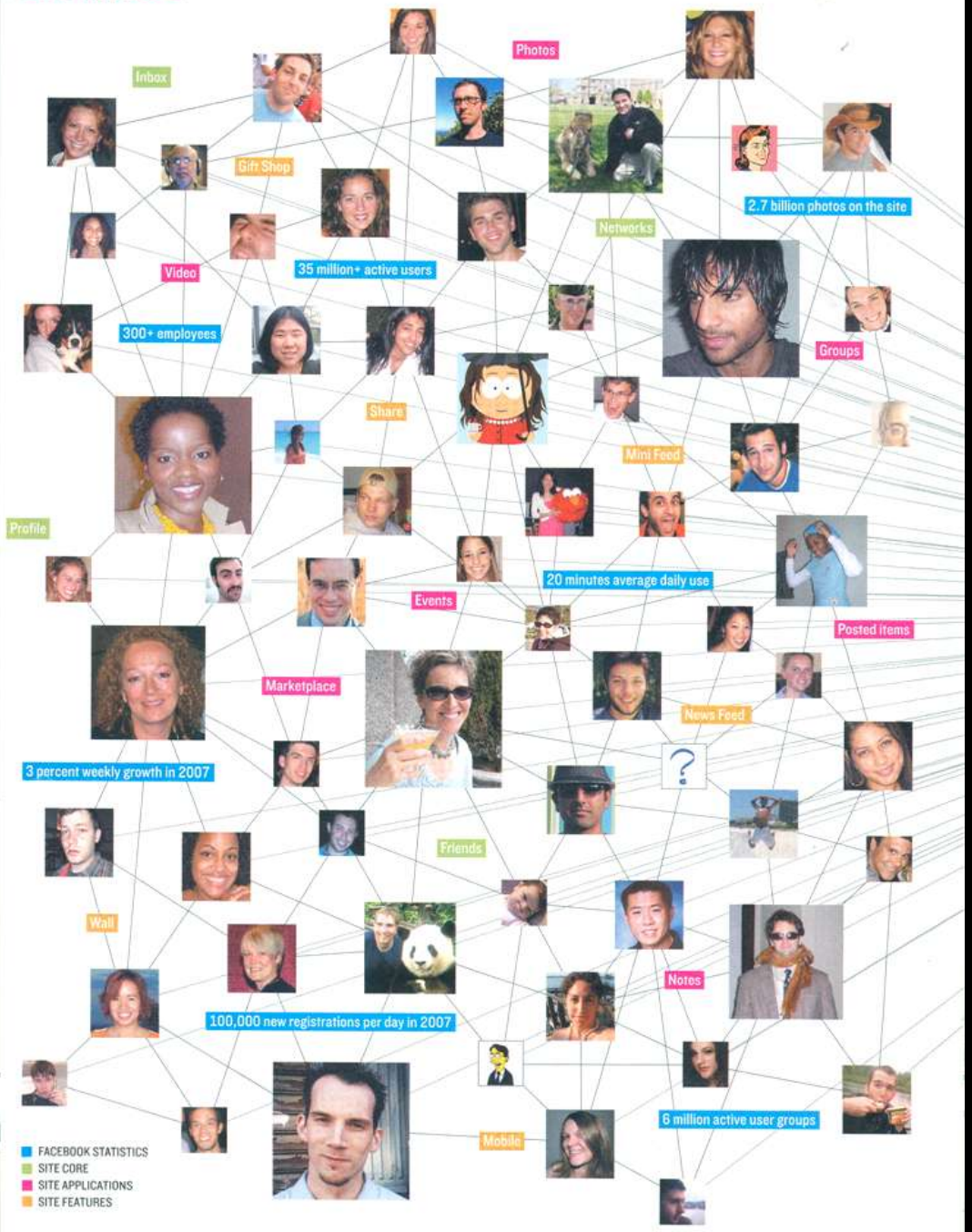
SECURITY, PRIVACY, LEGALITY

Herd Behavior: 1.3 Million Bathers, Coney Island 1951

The changing nature of social interaction

The new “virtual” community

Business


Photos
Inbox
Gift Shop
2.7 billion photos on the site
Networks
Video
35 million+ active users
300+ employees
Groups
Share
Mini Feed
Profile
20 minutes average daily use
Events
Posted items
Marketplace
News Feed
3 percent weekly growth in 2007
Friends
Wall
Notes
100,000 new registrations per day in 2007
6 million active user groups
Mobile
FACEBOOK STATISTICS
SITE CORE
SITE APPLICATIONS
SITE FEATURES

Virtual Worlds: The Largest Design Space in Technology Today

- avatar-inhabited, multiuser on-line worlds
- immersive spaces in web-based ecosystems
- the emergent synthesis of the global collaboratory
- irreversible, symbiotic (?) interaction with the human nervous system

The Future Environment for Intelligence: A Burgeoning Infocosm and An Expanding Metaverse

- maintaining more than one viable identity in the infocosm will be virtually impossible
- being off-grid will be suspicious
- vital vehicle for winning the ‘deep battle’: the war of ideas for victory against jihadist ideology

The Future Environment for Intelligence: A Burgeoning Infocosm and An Expanding Metaverse

- boundaries between traditional domains (form, expertise) become increasingly blurred
- entirely new domains emerge, dissolve and re-emerge reconfigured at even faster rates
- escalating complexity of mapping fluid, multi-dimensional strategic spaces

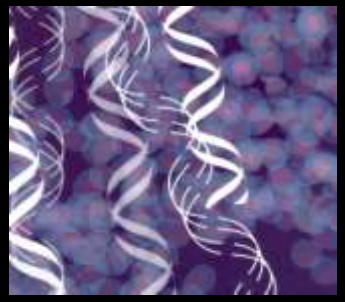
Transcending Boundaries

- systems biology
- synthetic biology
- replicating machines
- accelerated evolution
- biological form can be stored as digital information
- amplified humans
- human and machine intelligence

The Expanded Dimension of the ‘Bio’ Challenge

- thinking beyond ‘bio’ as just infectious agents (bugs)

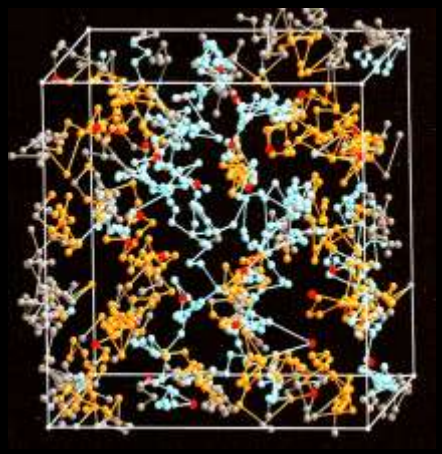
- systems biology
  - targeted disruption of ANY body function



- synthetic biology
  - exploring biospace: designing new life forms

- cognitive biology
  - charting a new course for human evolution

The Dual Use Dilemma in Life Sciences R&D



- future biothreats will not be limited to microorganisms
- mapping of genetic control circuits/networks for key homeostatic functions
  - major advances in medicine
  - simultaneous ID of “nodes” for malevolent perturbation
- creation of biological circuit disrupters (BCDs) will be easier than microbial modification

Synthetic Biology:
The Ultimate Dual-Use Technology

- genetic construction of new life forms and novel biological functions
- modified microorganisms as initial trajectory
- progressive expansion to more complex, high-order life forms

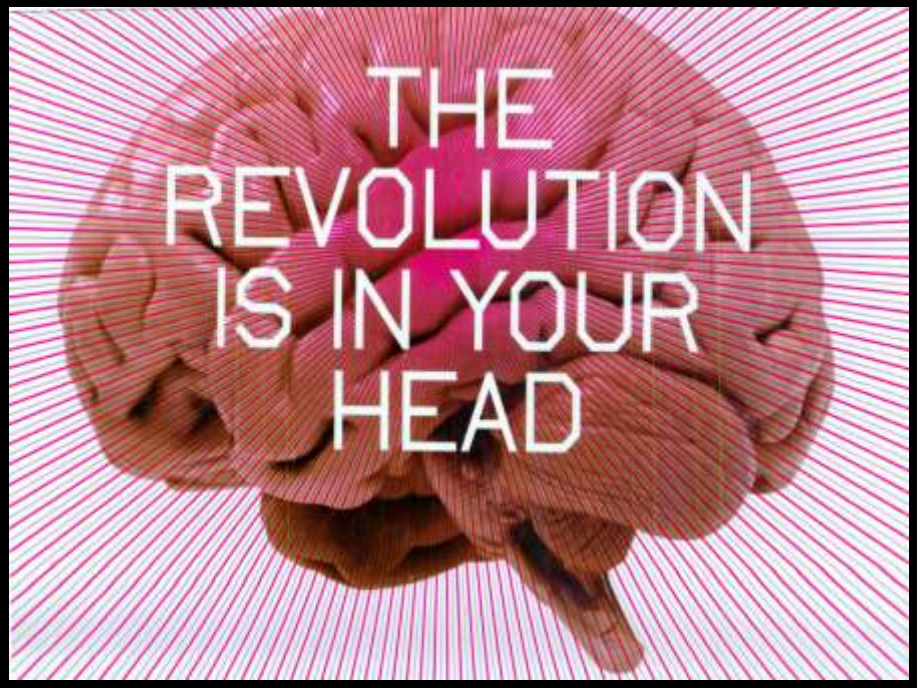
Synthetic Biology:
The Ultimate Dual-Use Technology

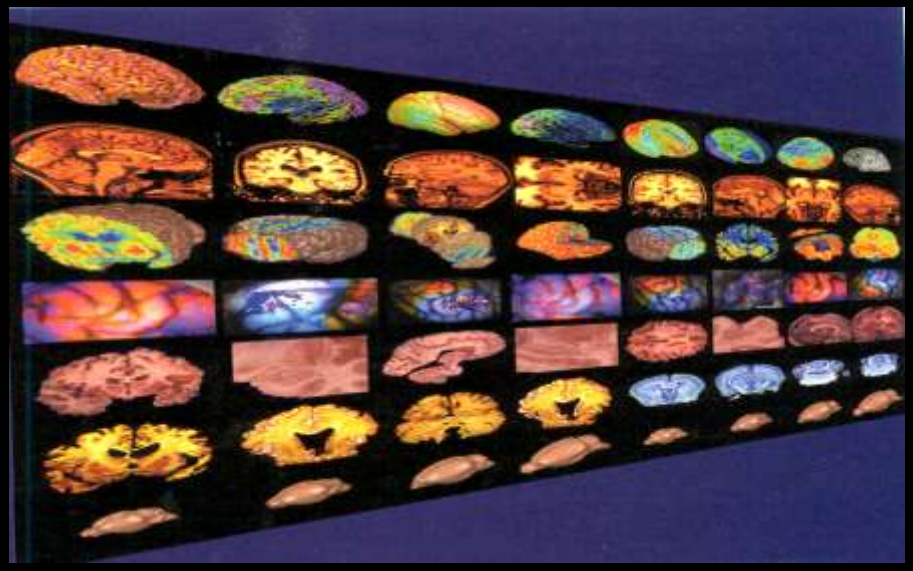
- expanding the theoretical ‘bio’-threat spectrum
  - organisms with altered virulence
  - targeted manipulation of limitless biological processes
- progressive adoption of modified organisms for novel bio-inspired manufacturing methods
  - ‘clean’-tech and reduced depletion of non-renewable resources
  - powerful vector for new industrial/national competitors

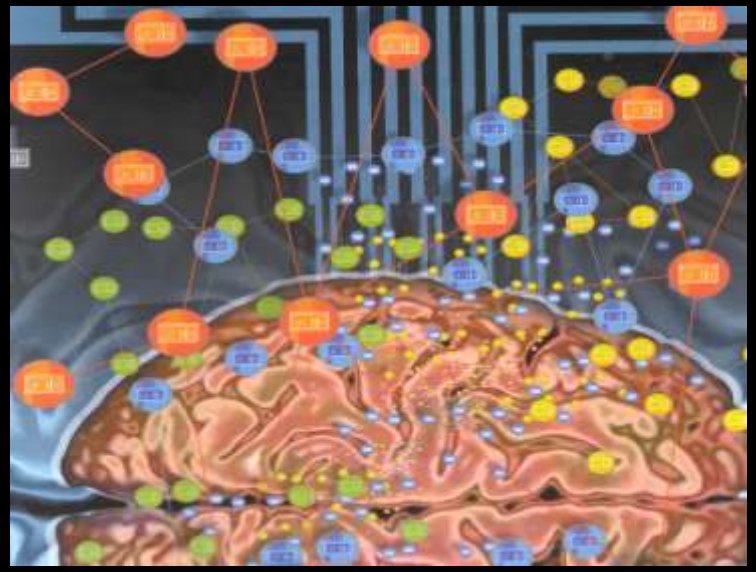
Synthetic Biology: A Powerful Component in Future Military Superiority and National Security

- modified organisms as ubiquitous sensors
- novel biomass for energy independence
- portable, highly distributed manufacturing capabilities for superior civilian and military supply chain logistics
- designer organisms for degradation of critical infrastructure/materiel
- eco-warfare

New Vistas in Cognitive Biology





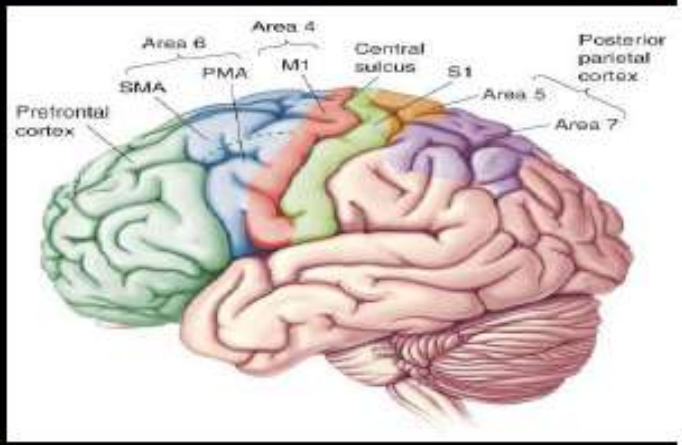


New Vistas in Cognitive Biology

- mapping the biological processes underlying brain functions
- “kinds of minds”: what are the constraints of “hard wiring”?
- optimizing information formatting for enhanced cognition and superior analysis
- brain:machine interface technologies

Blue Brain

The first objective of the **Blue Brain** is to create a cellular level, software replica of the Neocortical Column for real-time simulations.



Blue Brain will search for:

- New insights into how human beings think and remember.
- How specific defects in our circuitry may contribute to autism, schizophrenia and Parkinson's.

With Blue Brain, research that used to require several years of lab work can be done in a matter of days or minutes – using **Blue Gene**.

A project of Ecole Polytechnique Fédérale de Lausanne.

© 2006 IBM Corporation

Q (Bus. Week):

"Is Google really creating a true artificial intelligence or thinking machine, as Goggle's founders have set up as a goal?"

A (Eric E. Schmidt, CEO, Google)

"In the next few years, cognition, or real understanding, remains a research goal"

Bus. Week 9 April 2007

Neuroenhancement

"Mental health is the ultimate competitive weapon.
Even if just a few people choose to use neuro-enhancements, their choice will change the basis of business competition for the rest of us"

Zack Lynch
Managing Director, NeuroInsights
AAS Symposium on Impact of Human Enhancement
www.aas.org/news/releases/2006/0609enhancement.shtml

ASU Proprietary

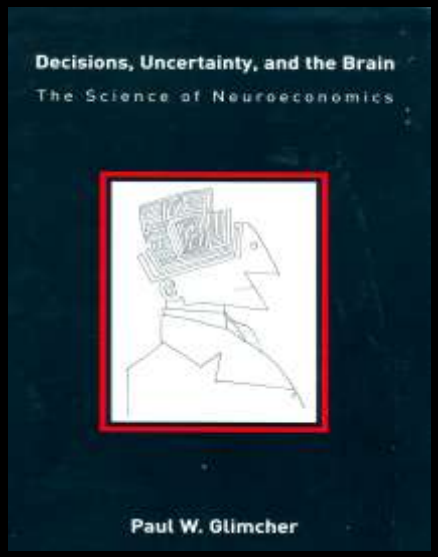
Neuroenhancement

"Mental health is the ultimate competitive weapon.
Even if just a few people choose to use neuro-enhancements, their choice will change the basis of business competition for the rest of us"

(and nations too . . . . . .?)

Zack Lynch
Managing Director, NeuroInsights
AAS Symposium on Impact of Human Enhancement
www.aas.org/news/releases/2006/0609enhancement.shtml

“COGINT”



choice

risk reward

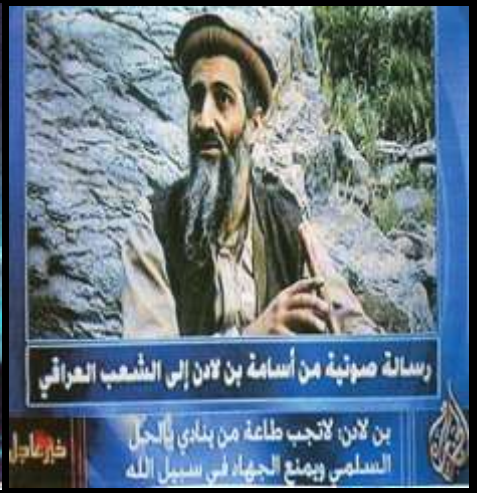
rational (?) economics

religion

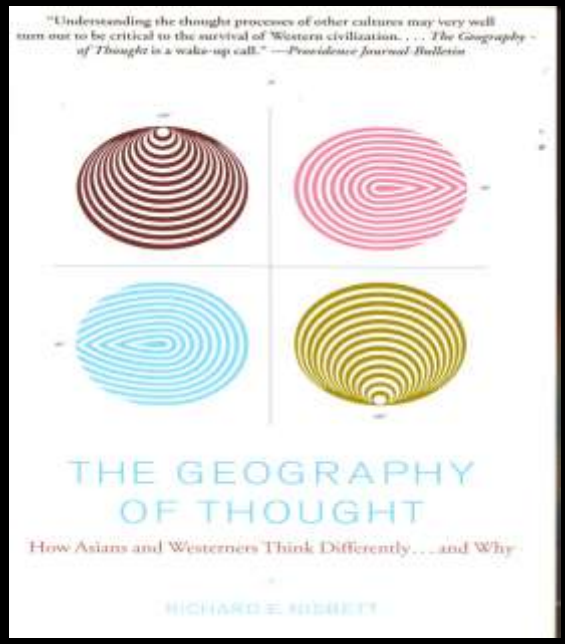
fear, deception and violence

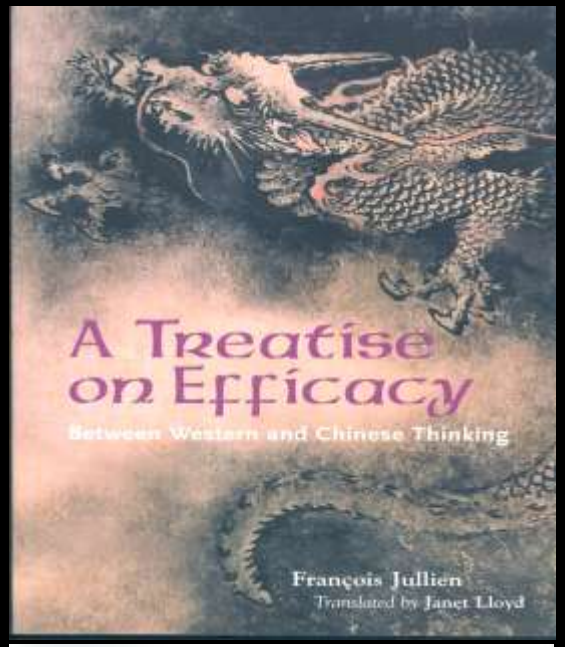
Behavioral Genetics: A Non-PC But Unavoidable Domain of Cognitive Neurosciences

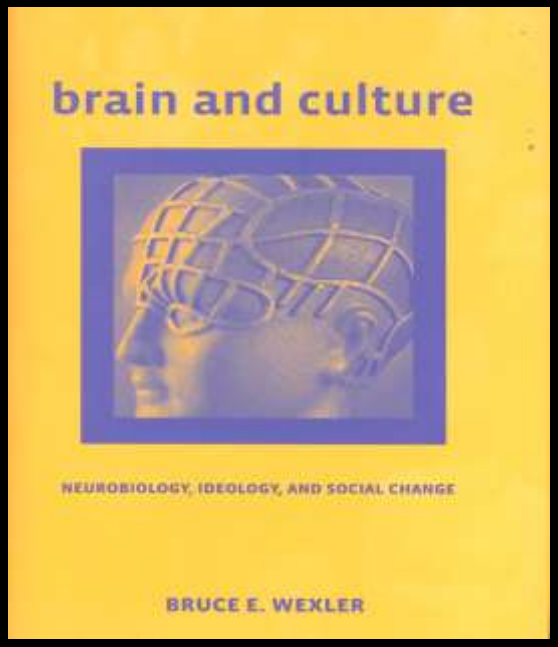
Is the human species inherently violent and are ethnic and theological differences the inevitable drivers of violent confrontation?

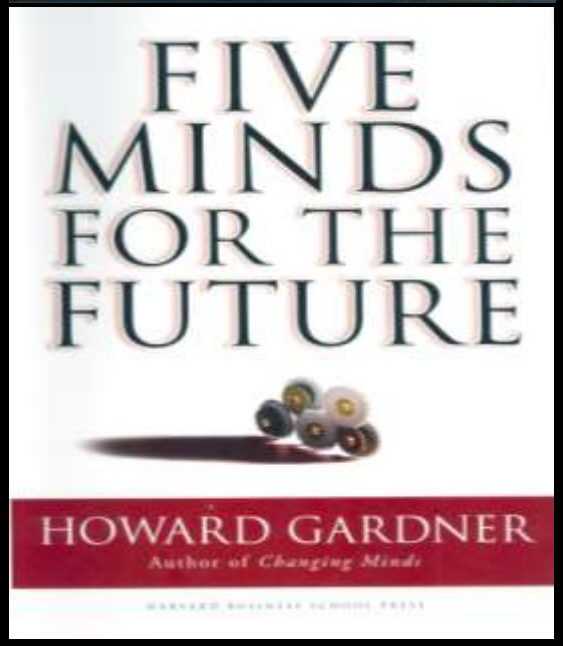


Kinds of Minds?







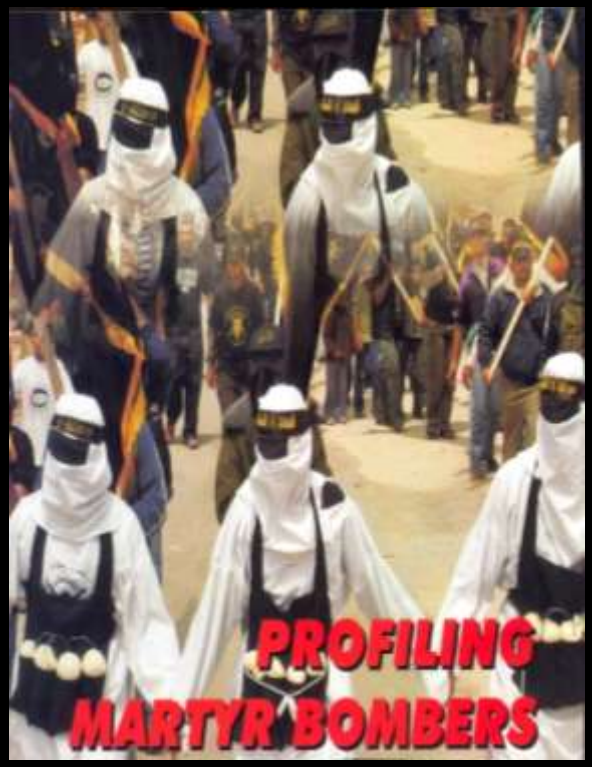


Managing Perceptions

“The Americans have the watches
We have the time”

Tribal Chieftan,
Afghan-Pakistan Border 2007

Getting Inside the Mind of Terrorists



Managing Perceptions

- a core element of strategy and operations
- creating and manipulating symbols that forge the dominant reality
- shaping mental representations of the reality we see (or don’t see)

“Two Battles”

The Close Battle

- killing people who want to kill us

The Deep Battle

- defeating the vehicles that propagate the bankrupt jihadist ideology of violence, extremism, intolerance and grotesque distortion of religious faith
- winning the war of ideas defines victory

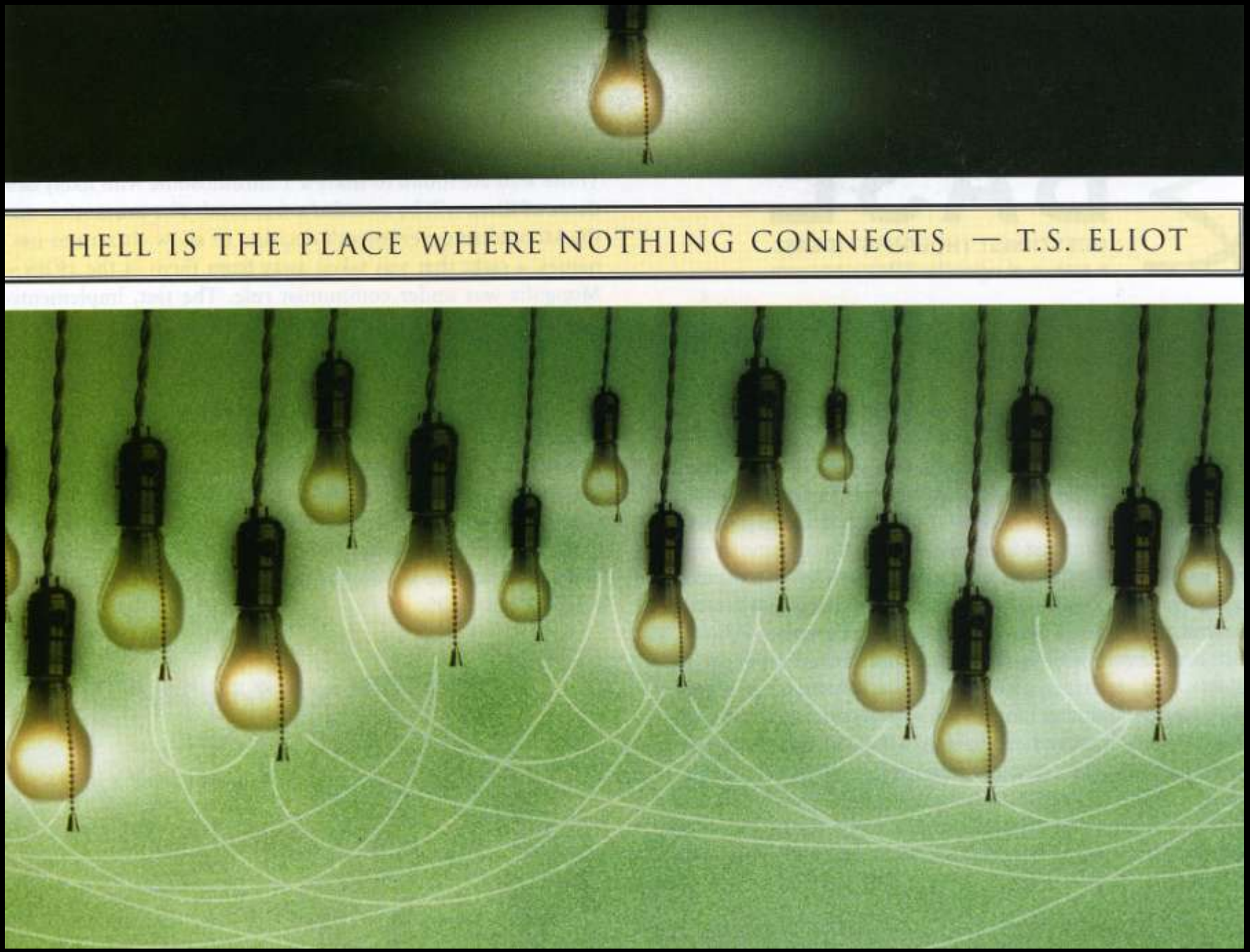
Changing Perceptions

- de-legitimize our adversaries themes and claims
- “all politics is local” : “all communications are global”
- uproot the root-cause
- rebalance strategic investments in non-military instruments of national power and values
  - health, environment, education
  - trade, law, alliances, treaties
- sustained not episodic
- leverage national multi-media talents

Children and Intelligence Collection

- are children new intelligence targets?
- new patterns of electronic connectivity at progressively younger ages
- ‘poly-Ender’ talents increasingly in number, friend and foe
  - uninhibited are already leveraging them!
- can/should children be targeted for actions in support of US intelligence?
- complex ELSI questions

Charting New Vistas in USG Capabilities to Sustain Strategic Dominance

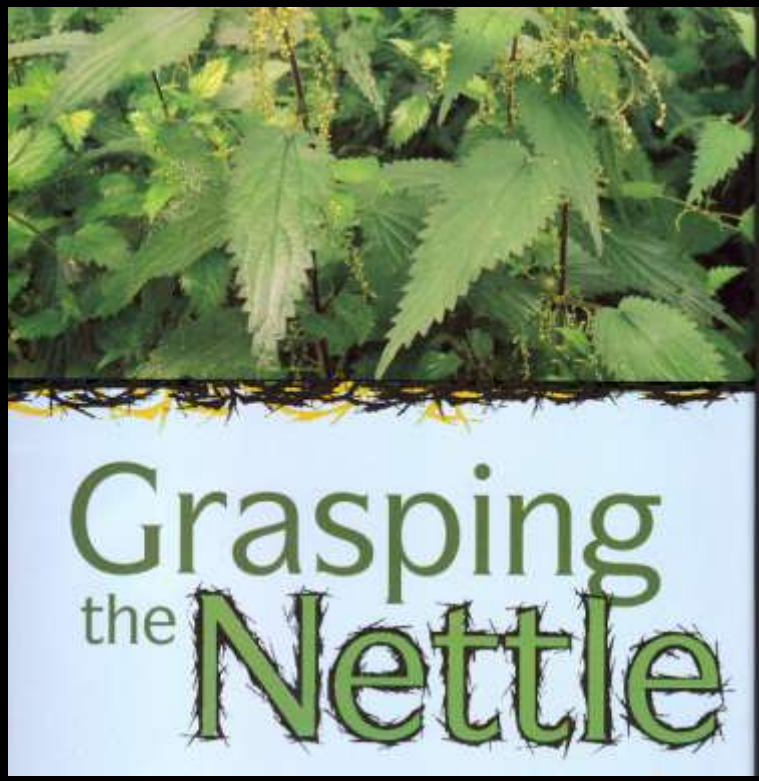

HELL IS THE PLACE WHERE NOTHING CONNECTS — T.S. ELIOT

New Polarities and Asymmetries

- IC doctrines/operations based on trade craft and need-to-know → open-source analysis
- compartmentalized expertise/knowledge/ communication → coherent intra-and inter-agency integration
  - international alliances
- minimum role of private sector beyond traditional defense contractors → rapid expansion of dual-use industrial R&D created by technology convergence/new industries
- technology advances enhance our capabilities → rapid diffusion of technology benefits adversaries

Great Expectations and Great Demands

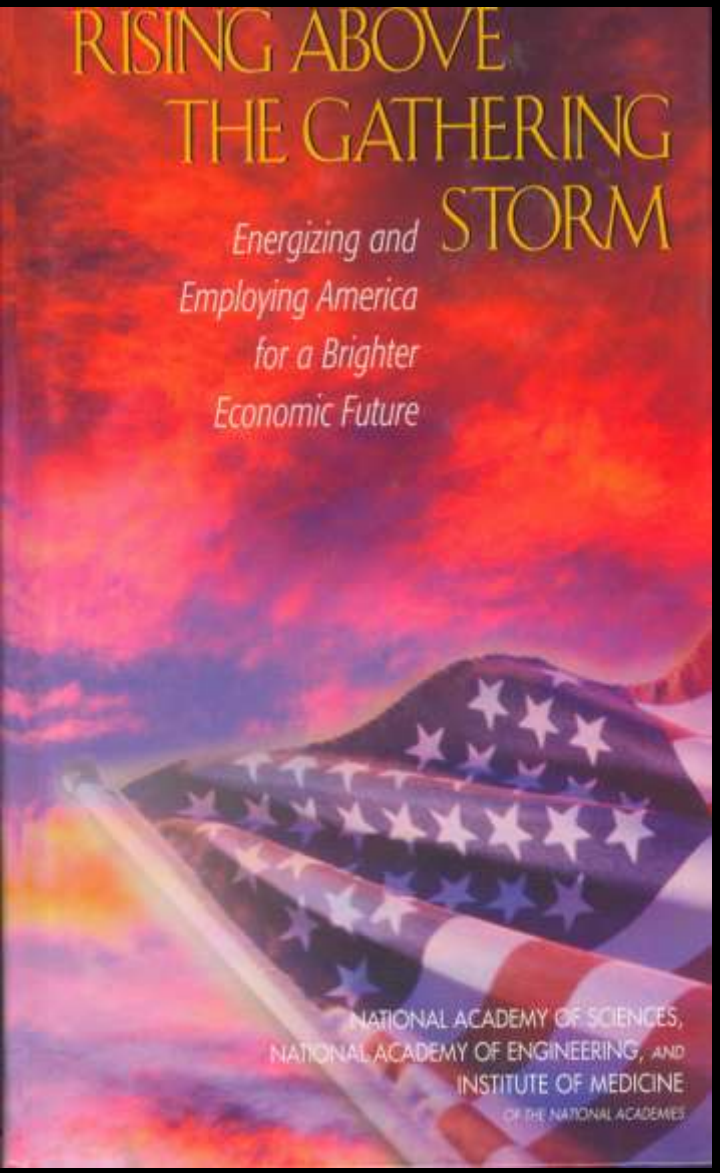
- expectations for both tactical and strategic intelligence
- new tradecraft
- new open sources
- new ways to validate sources
- new technical competencies
- new knowledge integration tools
- intensified red teaming
- new behaviors
  - systems versus stovepipes
  - open source knowledge
  - new relationships



American Progress: John Gast 1872

National Competitiveness in Transforming and Disruptive Technologies

The Crucial Importance of Incentives to Build New Private Public Partnerships



One Hundred Thirty-Three Thousand H-1B Visa Applications Submitted In Two Days

- elevate the role of S&T advice in all branches of government
- resuscitate (but with radical debridement) the national laboratory system
- promulgate a national security S&T education act
- incentivize recruitment and retention of foreign-born S&T graduates/professionals
- restore the concept of a global commons
- establish US leadership in international civic nationalism

Managing Complex Adaptive Systems

- realign expectations about certainty
- recognize loose-and tight coupling between key variables
- define and monitor critical indicators of emergent behavior
- dangerous snapshots versus systems engineering
- the long term is long!

ASU Proprietary

No Ambiguity, No Error (No Problem)

Mr. Spock: "Insufficient data, Captain"

Captain Kirk: "Insufficient data is not sufficient, Mr. Spock.
You're the Science Officer.
You're supposed to have sufficient data
all the time"

Star Trek
The Immunity Syndrome

ASU Proprietary

The Most Important "Space"

- the boundaries of the operational space given by the American people

- pivotal role of foreign partners

The Most Important “Space”

- the boundaries of the operational space given by the American people
- sustaining the legal and ethical foundations of US society and commitment to individual freedoms and civil liberties
- role of certain elite media and political cultures in squeezing operational space

Trends

- technology acceleration and convergence, combined with global economic and macro-political trends, requires a **BROADER CONCEPTUALIZATION OF NATIONAL SECURITY** that transcends traditional military, intelligence and foreign policy approaches

Trends

- **USG has not mobilized with sufficient speed or sophistication to create robust analysis and decision frameworks to address EMERGENT GRAND CHALLENGES**

Trends

- the slow mobilization to address emergent grand challenges mirrors:
  - lack of political/public consensus on scale of the threat(s)
  - societal retreat from confronting complexity
  - a poverty of imagination about next-generation technological surprise(s)
  - the triumph of timidity and incrementalism over the bold pursuit of **RADICAL AND TRANSFORMATIVE OPTIONS**

Trends

- engagement with grand challenges is an urgent imperative to redress the current vacuum in which **BIG IDEAS GO UNEXPLORED AND UNFUNDED**

Trends

- **LEADERSHIP IN DISRUPTIVE TECHNOLOGIES** will confer increasing strategic advantage to us (or our adversaries)
- **The SOCIETAL COST** for failure to recognize/adapt/capture disruptive technologies will intensify

Trends

- new processes to ACCELERATE TRANSLATION OF DISCOVERIES TO FULL COMMERCIAL/MILITARY DEPLOYMENT will have enormous disruptive potential

Trends

- **FUTURE DOMINATION OF NEW STRATEGIC SPACES will be influenced profoundly by disruptive, dual-use technologies for:**
  - **ubiquitous sensing (connected space)**
  - **systems and synthetic biology (biospace)**
  - **cognitive biology (smart space)**
  - **advanced computing (cyberspace)**
  - **security of assets for net-centric warfare (outer space)**

Trends

- building **NEW IC STRATEGIC AND OPERATIONAL CAPABILITIES WILL DEMAND RADICAL SHIFTS** in:
  - spectrum of analytical skills
  - reliance on open-source collection
  - engagement with new private sector expertise
  - cross-agency systems for data acquisition and analysis
  - new international alliances

“We can forgive a child who is afraid of the dark;
the real tragedy of life
is when men are afraid of the light”.

Plato

60th Anniversary

One Agency : One Community
Service : Integrity : Excellence