

# Advanced Technology for Non-Traditional Security Analysis and Policy

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# The Security Community Faces New, Complex Challenges

- Well... not exactly...
- The Cold War and WWII were an aberrations
  - Simplified calculations of national power
  - Reduced the dimensionality of conflict
  - Justified the mobilization of national wealth for national security purposes
- A return to “normalcy”...
  - Calculations of power are complex and interdependent
  - Conflict is highly dimensional and contextual
  - The national security establishment does not have a monopolistic or primary claim over the nation’s resources
- What this means?
  - Much of what we know about world politics and how to analyze it is suspect
    - Bad models...
    - ... Or bad methods?



# Old Ideas Are Back

- The value of social or cultural knowledge has always been regarded as important by strategists
  - Sun Tzu – importance of knowing oneself, one’s enemy, and the terrain
  - Clausewitz – war as the continuation of politics...
    - ... It is a test of wills, not weapons
- Past efforts to capture this knowledge have been varied
  - Push to make social science “useful” has a long history
    - Similar to physical sciences, but project does not appear to be as successful
  - Efforts to incorporate social science into DoD fraught with political dangers
    - Project Camelot



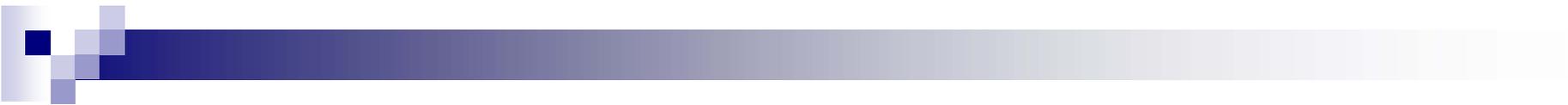
# What Is Going On Out There?

- Current security threats demand contextual understanding
  - Al Qaeda
    - What makes upper middle-class people with graduate degrees in technical fields, who are multi-lingual and live on multiple continents suicidal?
  - Iraqi WMD
    - How did we misinterpret denial and deception programs intended to convince domestic population of the existence of weapons and programs that had been dismantled/suspended?
  - Iran and North Korea
    - How are states linking WMD programs to dual-use, peaceful nuclear program and research, to take advantage of non-proliferation regimes?
- Increased data adds resolution...
  - ... But alternative contextual or interpretive frameworks provide more traction for decision-makers
- Is the problem “model population” or “model generation”?
  - Classical intelligence problem revisited:
    - More data for our models?
    - More theory to better explain our data?



# Social Science To The Rescue?

- The problems facing the security community are fundamentally social
  - Political rivalries and struggles
  - Effects of changing technological and economic systems on social patterns and relations
    - Sociology developed to examine, understand, and cope with the social strains of the industrial revolution and urbanization
  - Interplay between individual commitments to utopian ideologies and collective prosperity and security
    - Anthropology was developed to understand the behavior of “primitive” societies that were living under European colonial rule
  - Radical reinterpretation of current and past events that redefine individual and collective identities
    - Nothing is fixed, final, or unchanging
      - Did the Holocaust occur?
- But social science is not an animal well-bred to meet the demands of prediction and optimization
  - They are unruly, lawless disciples
    - Are the social sciences Dodge City, waiting for a strong sheriff to establish and enforce the law...
    - ... Or improvisational jazz, with no rules or scripts, just heuristics?



# The Social Sciences Have Laws

- Economics has the *Law of Diminishing Returns*...
  - ... Except when there are increasing returns...
- International Relations has the *Balance of Power*...
  - ... Except when states bandwagon...
- Rational actors maximize their self-interest...
  - ... Except when they are altruistic or pathological...
- Appeasement doesn't work...
  - ... Except when it does...
- Are these exceptions merely statistical outliers...
  - ... Or indicative of alternative behavioral logics?
    - Is it acceptable to simply treat them as error?



# A World Without Laws...

- Dominant use of analytic models and methods expect the model to be analogous to system
  - Implicitly assumes that “laws” exist
    - ... and can be captured in models...
    - ... and can be used to predict outcomes...
    - ... and can be exploited to achieve desired results...
- But... What is a “scientific law”?
  - Nothing more than statistical correlations that describe the mean behavior of very large samples over large numbers of cases...
  - Models or theories that have yet to broken through observation or experimentation
- Social science lacks controlled experimentation
- Social science lacks large samples
- Social science lacks homogeneous cases
- Social science lacks ground truth
  - Social reality is interpreted (and reinterpreted) by social actors



# What Does This Mean?

- Despite the demand for social and cultural knowledge, current practice ensures its exclusion from analysis
  - Cannot be measured in the same terms of the physical sciences
- Dominant use of analytic models and methods expect the model to be analogous to system
- Unless we change how we think about models and their use, social science will remain on the sidelines
  - Rethinking model use means rethinking practice of scientific inquiry

Now What?





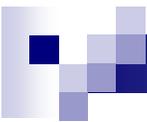
# We're A Little Different...

- We don't provide prediction
- We don't provide validated models
- The model is not a standalone product
  - It cannot speak for the analyst
  - It cannot make value judgments
- We believe that analysis is about the credible use of models in order to provide meaningful information to decision-makers
  - This is about helping people make choices
    - We're the clergy with different tools
- We believe that it is a false assertion that:
  - Facts and values can be separated creating a purely objective social science...
  - ... Even if they could, they can't be rejoined later in the analytic process



# What We Mean By Model...

- A model is a simplified representation of a system
  - Mathematical – Deductively generated equations
  - Statistical – Inductively generated equations
  - Physical – Physical representations of systems
  - Computational – Algorithmic representations of behaviors
  - Conceptual – Mental models that reside in the mind
- The model is the theory
- Internal consistency is more important than external validity
- Useful models capture and represent social theory
  - Tools that reveal the logical conclusions of our assumptions
- New tools allow for the instantiation of new theory
  - Old theory is now testable
  - New theory will develop because of new experimental opportunities



# The Black Hole of Validation and Quantification

- A valid model should faithfully capture the dynamics of the system
  - But all we really know is what happened...
  - ... Why things happened is open to debate, interpretation, and reinterpretation
- Many models can “fit” the data with some degree of precision, which is the “right” one?
  - During the Enlightenment Europe collapsed from 250+ kingdoms to approximately 50 states... why?
- Quantification is useful if we have an objective unit of measurement...
  - ... But nothing is more unnatural reducing highly complex, qualitatively different phenomenon to a numeric value...
- Qualitative measurements are best arrived at through comparison, not quantification
  - I can't quantify the difference between an apple and an orange, but I can compare them in meaningful ways
  - How to generate cases from which we can compare features of interest?



# How We Use Models

- We place a greater emphasis on theoretical representation
  - Deemphasize historical replication and predictive accuracy
- We don't believe in a single, truthful model
  - Reason from large ensembles of models and computational experiments
  - Ensembles create a body of structured cases from which comparisons can be made
- Theory-base is more powerful than a data-base
  - Greater returns from matching of beliefs to expectations than from greater detail about specific model parameters
- We provide systems within which decision-makers can engage in a dialog with models
  - Develop an understanding of their own hidden beliefs
  - Instantiation of their implicitly held mental models
  - Highlight areas of cognitive dissonance
  - Establishment of sign posts that suggest when existing paradigms are no longer valid
  - Development of strategies and policies that satisfice across multiple, plausible futures, each one theoretically or empirically consistent



# Additional Thoughts...

- Science vs. policy analysis
  - Views on uncertainty
  - Over-determination of outcomes
- Current practice is inverted from the perspective of the social sciences
  - Satisfice on the search for the model and then optimize within the model's outcome space
- Invert the practice
  - Don't pick a single model that is "good enough" – use many at the same time...
    - ... Then satisfice across the outcome space of the ensemble
  - Computational "competitive analysis"
- Integration of complexity-sciences into strategy is problematic
  - Sound strategy is fundamentally about anticipating the consequences of your (or your adversary's) actions
    - Predict-then-act paradigm
  - Complexity is fundamentally about explaining the pathology of a system
    - Explains its evolution and why early decisions cast their shadow into the future
    - Understanding is developed by acting-then-observing
      - We learn about CAS by perturbing them and seeing what happens
- Can strategic and complexity sciences be reconciled?



# Wrap-Up

- The current disciplinary tendencies militate against the inclusion of social science in analytic community
  - Social science models do not conform to standards of physical science or engineering models
- The ability to capitalize on Computational Social Science will be contingent on rethinking the current state-of-the-art
  - Return to first-principles of inquiry is necessary
- Alternative methodologies under-development and are being operationalized
  - Progress is real but slow
  - Technical barriers
  - Theoretical barriers
  - Cultural barriers
  - Data remains problematic, but far less important