Reliable vs. Unreliable Information in the Eagle Ford: Sources and Credibility Tests*

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Abstract

This presentation identifies the types and uses of information in fast-moving plays, such as the Eagle Ford, including quantitative, qualitative, and interpretive information which influences operations, decision-making, and perception-shaping. It discusses the role of data mining using Big Data / cloud computing, and the benefits and potential pitfalls. It then evaluates reports, studies, and public information and discusses how it can vary widely in reliability, depending on methods used, structure, purpose, and underlying assumptions and motivations.

Introduction

In a play, such as the Eagle Ford, what are the information sources? Which ones are reliable, current, and valid? Which ones can be reliably used, and which ones should never be used in quantitative surveys, but which might be used in terms of qualitative analysis, and in large-scale decision-making.

Data Mining and Analytics

Data mining and robust analytics are increasingly important in quickly-unfolding unconventional plays, including shales and carbonates, as massive amounts of data are collected and related to each other, and which blend upstream and downstream. Using analytics in predicting leasing and drilling activity, to work with logistics, to process acquired seismic data, and to monitor and predict production continues to be important. However, new capabilities encourage the manipulation of relational databases to see if meaningful (and predictive) patterns can be established. For example, seismic attributes can be potentially correlated with production data to determine how and where to drill to optimize the reservoir. In another example, data from microseismic surveys can be tied to sonic logs, which are then correlated with completion data to predict where and how the most productive fracture networks might occur. In short, relationships between various data sets can provide

valuable insights resulting in potential cost savings, enhanced production, improved site selection, efficient geosteering, and water sourcing / processing.

This presentation evaluates information and identifies some of the ways in which big data is used, and some of the ways it can be effective, with pitfalls. Data mining can provide important views. However, users must understand critical issues such as how to assure high quality compatible data and how to uncover and question assumptions used in the construction of algorithms, and in "cleaning" the data sets.

Published Studies, Reports, Qualitative Evaluations

Interpretative narratives help make sense of the proliferation of data. There are many sources of interpretative reports, ranging from government-funded studies designed to provide information for the public good, which can include policies and regulatory guidelines.

Reports can be scientific, with the goal of developing an understanding on large and small-scale phenomena. Alternatively, they can be business-related, with focus on applying knowledge to determine economic viability, including risk.

Evaluating technical, scientific, and business decision-focused reports benefits from the strategies used in deconstructive philosophy; tactics for addressing information and explanations with a view to interrogating the underlying epistemological structures, which often cause resistance to new ideas even as they wild social or popular influence over a supposedly inabrogatable knowledge system or scientific heuristic.

Cultural Zeitgeist, Social Media

Finally, the way in which the cultural milieu or zeitgeist affects scientific thinking must be addressed, along with the implications to oil and gas operations, policy decisions, legislation, and environmental activism. The influence of a deeply held belief system or religion can be profound, yet subtle to the point of being almost undetectable, except in retrospect (as in the case of Thomas Kuhn's analysis of the Copernican revolution in *The Structure of Scientific Revolutions* (1962)) or from the outside (as explored by Daniel Kahneman in his studies of cognitive bias and decision-making which are summarized in *Thinking Fast and Slow* (2011)).

Having an understanding of the conditions under which a belief system or set of assumptions (especially ones related to cause and effect, power / authority, and the nature of reality), can help one immensely when confronted by vast quantities of data, all of which self-purports to be valid, and much of which has been made unreliable by the conscious or unconscious mediating effects of underlying values, desires,

References Cited

Kuhn, Thomas S., 1962, *The Structure of Scientific Revolutions*: University of Chicago Press, 172p.
Kahneman, Daniel, 2011, *Thinking Fast and Slow*: Macmillan, 512p.

The quest for sweet spots is data driven.

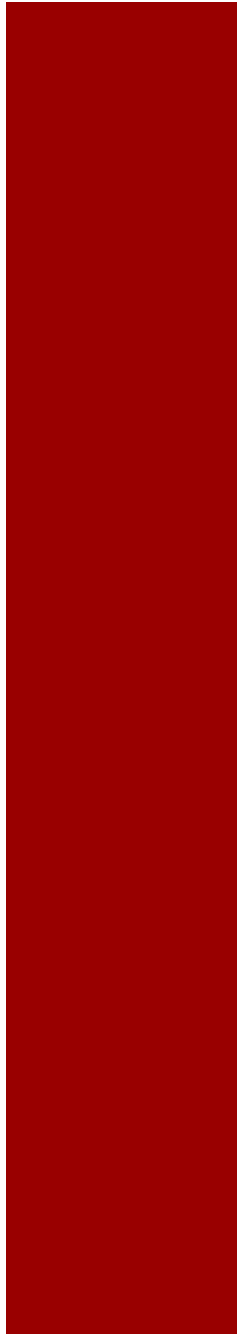# Reliable vs. Unreliable Information in the Eagle Ford: Sources and Credibility Tests

Susan Smith Nash, Ph.D.
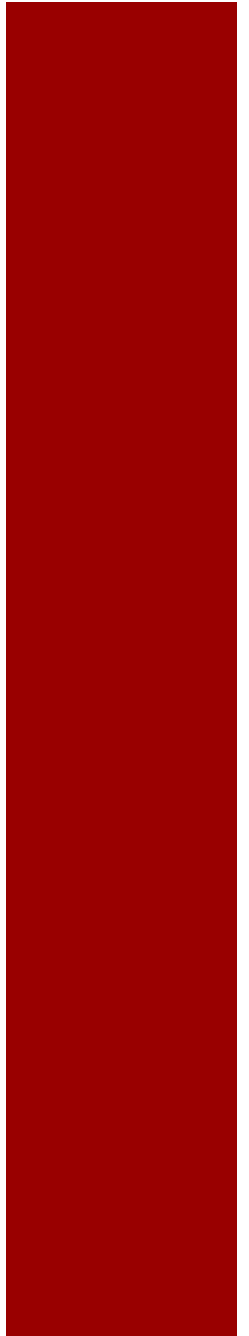**AAPG**

Information &
the Eagle Ford

The Necessity of New Approach:
Big Data & Cloud Computing

Science, Technology, and Decision-Making:
Sources

Re-Envisioning Information:
Credibility Tests

The Necessity of New Approach:
Big Data & Cloud Computing

Success in the Eagle Ford:
Big Data & Cloud Computing

Massive Data Sets: Real time acquisition, historical sets & distributed processing

- **Acquisitions**

- **Processing**

- **Distribution (download)**

- **Storage**

- **Focus on what's going on**

  - **GOS**

  - **Filings**
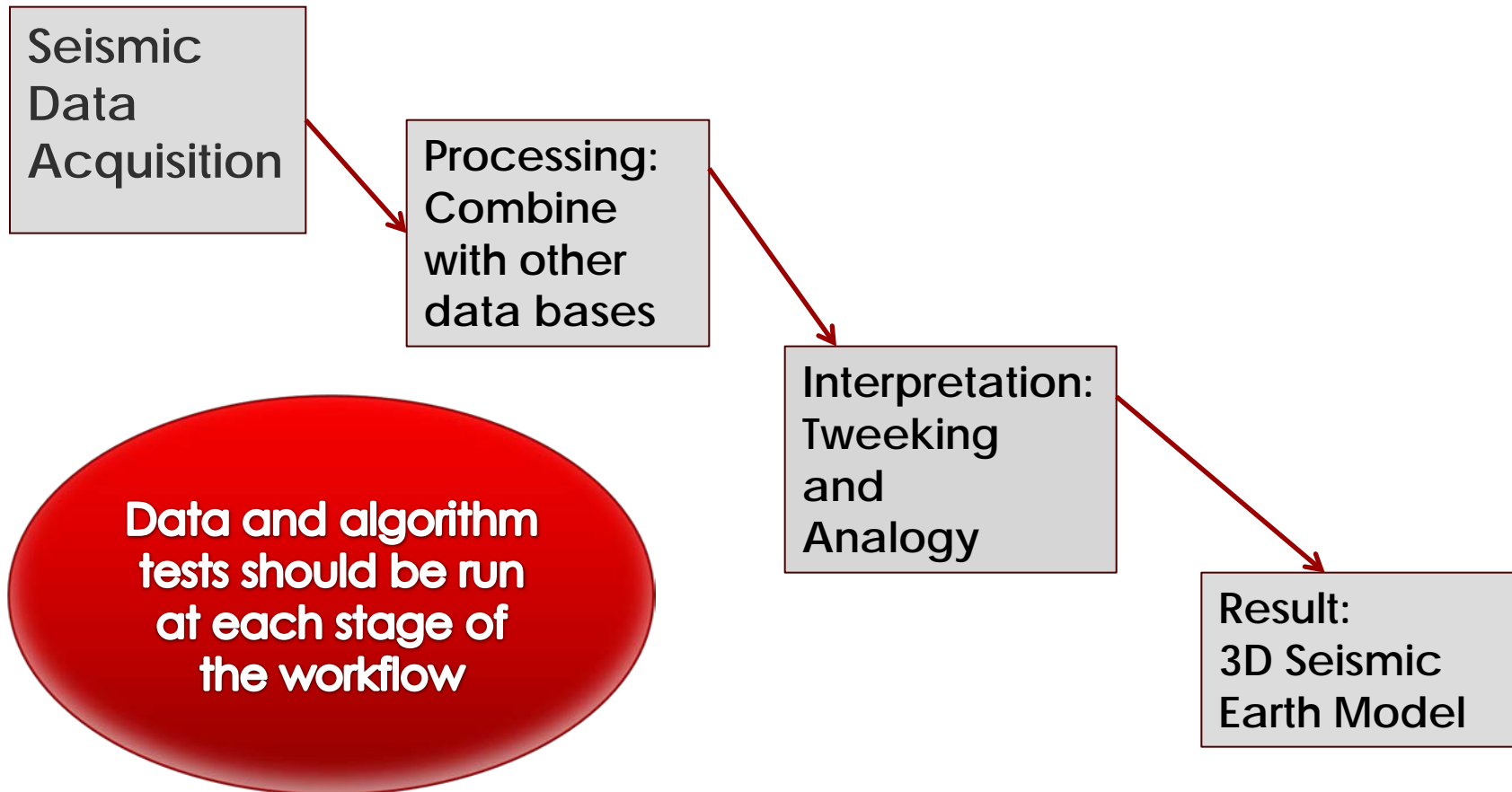
  - **Production**

  - **Behaviors / Attributes**
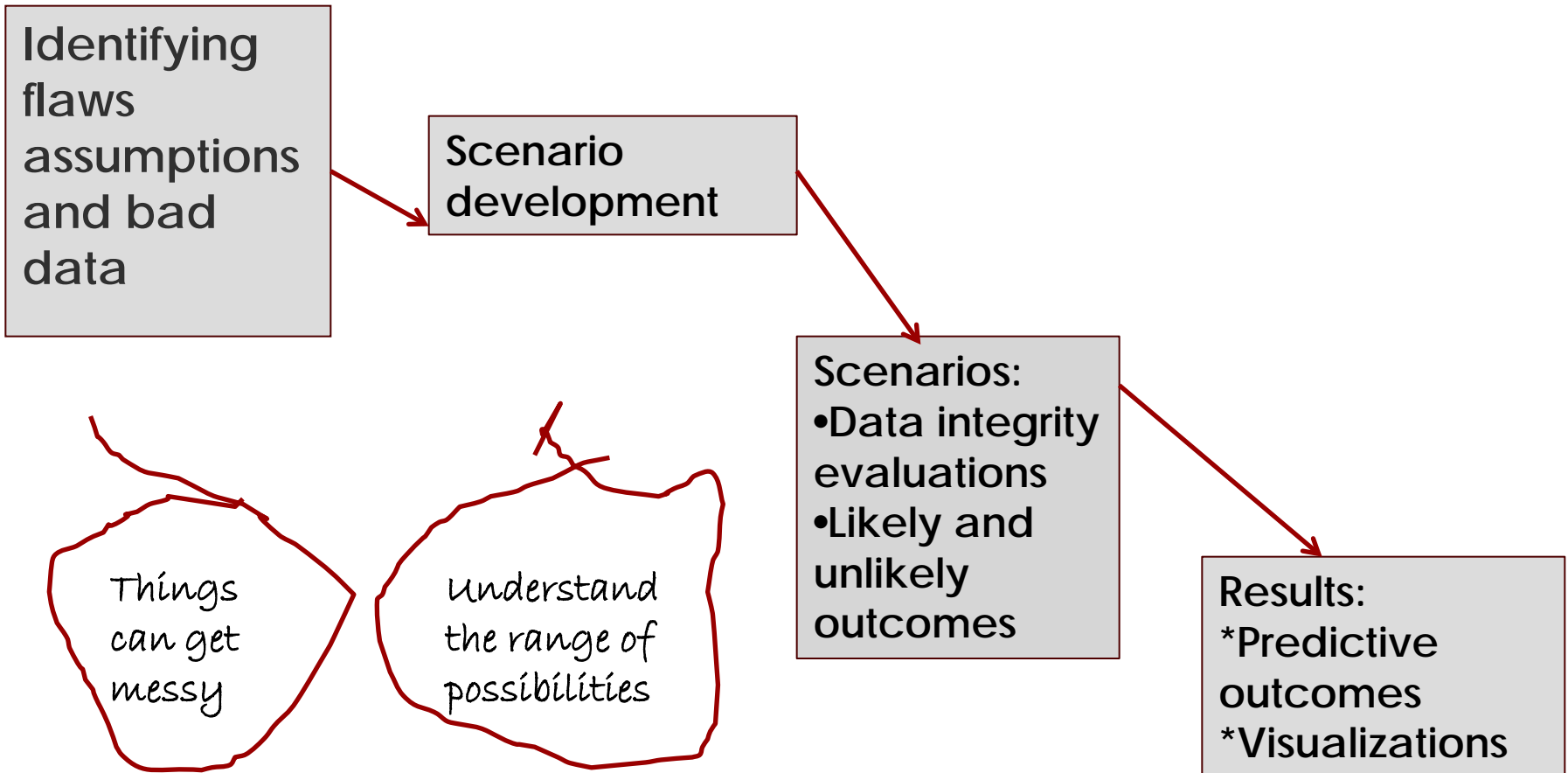
Advantages
- Massive
- Access
- Current

Disadvantages
- Data integrity
- Relative importance of the data
- Need multiple scenarios
- Processing time
- Ranking / prioritizing

Big Data: Seismic Example

Seismic Data Acquisition

Processing: Combine with other data bases

Interpretation: Tweeking and Analogy

Result: 3D Seismic Earth Model

Data and algorithm tests should be run at each stage of the workflow

Risky Data + Risky Analytics

Identifying flaws assumptions and bad data

Scenario development

Scenarios:
•Data integrity evaluations
•Likely and unlikely outcomes

Results:
*Predictive outcomes
*Visualizations

Things can get messy

Understand the range of possibilities

The "Smart" Oilfield: Getting Smarter

Upstream: Seismic Acquisition, Processing, Interpretation

Forecasting - Sweet Spot Identification: Data Integration

Programs / Services
- PointCross "Smart Oilfield"
- IBM Smart Analytics
- Oseberg Energy
- Intel
- SAS
- Cloudera
- (Apache Hadoop distributed processing)

Operations Optimization Location Planning & Geosteering:
*Real time
*Historical
*GIS

Completions & Stimulation:
- Microseismic
- Geomechanical Models
- Real-time data
- Historical data

Data Mining

- Software packages are off-the-shelf and customized / customizable:

- IBM / Pentaho / Oracle / Apache Hadoop / Spotfire GIS / SAS

  - Collected information from data acquisition modules

  - Behavioral data

  - Filing information

 - Seismic / production / logistics / lab

Advantages
- Can accommodate a great variety of data
- Integrative

Disadvantages
- Expensive
- Requires professional staff versed in Big Data strategies

Critical Issues with Data

- Quality of gathered data – must be sure to clean it up

- Units of measure within your databases

- Compatibility of data

- Comparability of data in different databases

- Assumptions used in developing algorithms

- Cluster analysis – assumptions used in weighting
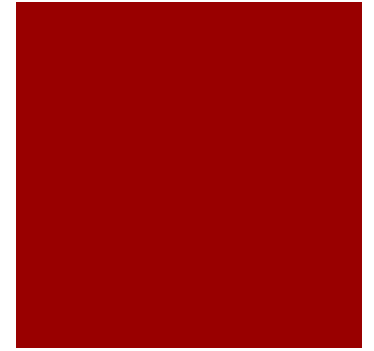
Commercial Sources

- I.H.S.

- DrillingInfo

- Databases (seismic, etc.)

- USGS / State Survey production and drilling information
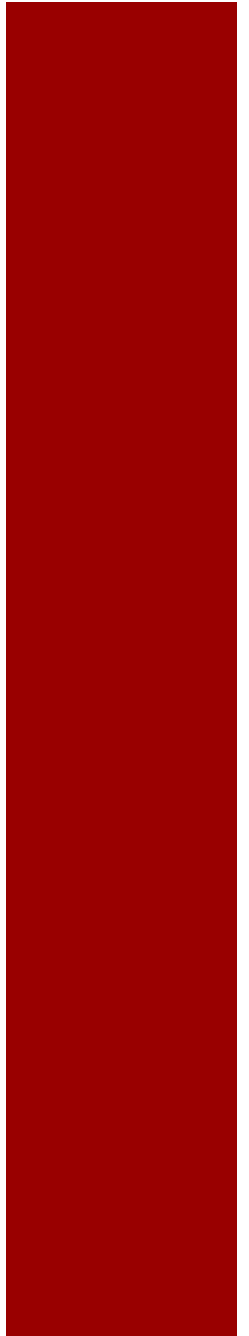
- PetroView

Advantages
- Can use with commercial software
- Integrative

Disadvantages
- May be incomplete
- Expensive at times
- May not be compatible with all software

Science, Technology, and Decision-Making: Sources

Types of Information (Public)

- Peer-reviewed journals

- Government-supported research projects

- Non-refereed journals

- Press releases

- SEC filings

- Regulatory filings

- White Papers

- Consortium studies

- Blogs, social media
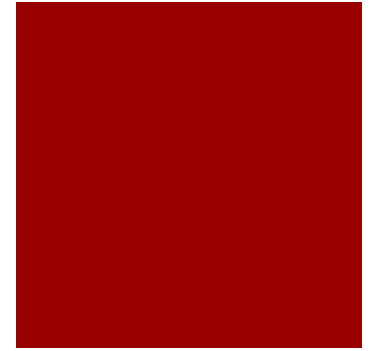
Peer-Reviewed Journals

Professions

- **Professional Organizations**
  - **AAPG *Bulletin*, memoirs, special publications (Datapages)**
  - **SPE *JPT* (OnePetro)**
  - **SEG *Leading Edge* (GeoScienceWorld)**
- **Universities / Organizations (EBSCO, Gale, WileyInterscience)**
- **Open Source (search engines)**
  - **DOAJ**
  - **Search & Discovery**

Advantages
- Reviewed by peers
- Relatively inexpensive

Disadvantages
- Peers not necessarily knowledgeable
- Agendas
- Perpetuation of old views (inherently conservative)

Government-supported research projects

Energy Projects

- **DOE funding**
  - **REPSEA and other consortium groups**
  - **Conferences / grants**
- **USGS**
  - **U.S. and Global estimates**
- **University Grants / funding**
  - **Focus on technology and science (as relates to security, etc.)**
- **NSF**

Advantages
- Openly available
- Inexpensive
- Leverage university resources

Disadvantages
- Missing critical info
- Limited data sets, limited expert base
- Budget cuts
- Lag times
- Political agendas
- Too influential? (USGS estimates, for example)

Consortia and Multi-Client Studies

Corporate Groups and Universities

- **Expert Consulting Groups**
  - **Reports**
  - **Maps / Recommendations**
  - **Software / analytical imaging, etc.**

- **University Consortia**
  - **Reports**
  - **Maps**
  - **Software**

Advantages
- Collaborative
- More information and data sets than in a single company
- Highly technical and specialized

Disadvantages
- Created for a single purpose; hence, myopic or tunnel-vision
- Slow development; can be less than timely
- Biased or controlled by old paradigm (potentially)

Regulatory Filings

Governmental (State and Federal)

- SEC
  - Disclosures
  - Financial Reporting
- Permitting
  - Leases
  - Wells / pipelines / gathering systems
- Environmental
- Water Quality

Advantages
- Accurate
- Must disclose risk
- Includes overviews

Disadvantages
- May be overly cautious
- Show a limited view
- Avoid forward-looking statements
- Only available for public companies (in the case of the SEC)
- Each state has different regulations (environment, permitting, etc.)

Non-refereed journals and publications

Generally Free or Low-Cost Publications

- **E-Journals / Blogs**
  - **Multimedia: PDFs, graphics, audio, video**
  - **Webinars**
- **Corporate White Papers**
  - **PDFs**
  - **Diagrams**
  - **Analytical software**

Advantages
- Openly available
- Inexpensive
- Written by experts
- Encourages dialogue / discussion

Disadvantages
- May be highly opinionated
- Data may not be accurate
- "Learnings" may be premature
- Vested interests (commercial, etc.)

News, Blogs, Social Media

Traditional and Non-Traditional News

- **News Agencies, Traditional News**
  - Websites / television / print
  - Index: Lexis-Nexis
- **Blogs**
  - Associated with companies, news, etc.
  - Independent opinion
  - Hype or advertising platforms
  - Scams and disinformation
- **Twitter, FaceBook, Linkedin, etc.**

Advantages
- Timely
- Relevant
- Connects to social context
- Free

Disadvantages
- Meme-sensitive
- Highly biased
- May be completely incorrect; incorrect information propagates

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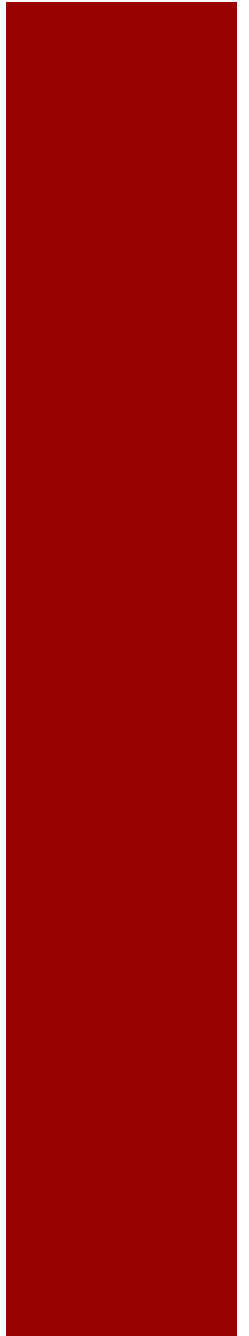   - Production
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# Re-Envisioning Information: Credibility Tests

Enter the World: Public & Corporate Data: Deconstructing Intent

Ask Questions about Authors, Supporters
(employ Nietzsche, Foucault, Derrida, Kristeva)

- Who benefits from a certain viewpoint
- Who loses?
- What are the conditions that allow a certain idea to prevail?
- *When are the assumptions in flux and why?*
- *How does a cultural or political context encourage a new worldview that destabilizes old assumptions?*
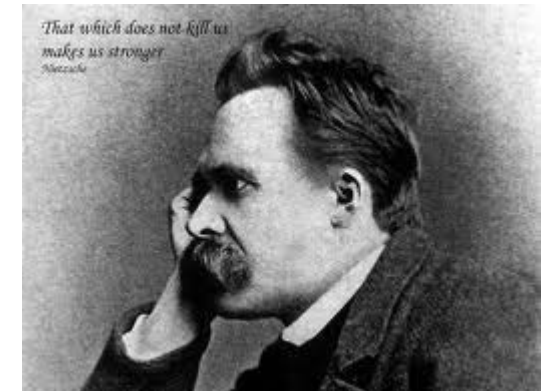
Memes and their Discontents:
Is it ever possible to fight the prevailing paradigm? Are you always swept away?

What is a "meme"?

- Richard Dawkins, *The Selfish Gene*

- Definition: an idea, behavior or style that spreads from person to person within a culture

- Can seem instantaneous

- "Synchronicity" – believes and unswervable convictions seem to occur at the same time throughout seemingly unrelated sets of people

Communicate!

Example: Meme In Action
"Fracking Is Evil"

Memes Explain Recurring Ethical Themes in Technology

- Neutrality vs. Moral Agency
  - Hydraulic fracturing is a neutral process; the people who apply it can behave in an evil way

  - Hydraulic Fracturing Is Evil

- Responsibility, Design, Risk Assessment

- *For best result, use "neutrality" argument and emphasize responsibility (for the implementers of technology as well as the beneficiaries / stakeholders)*

"It Is Better to be Feared than Loved"

Niccolo Machiavelli, *The Prince*

Does fear and intimidation work? Consider…

ACTIVIST GROUPS:
- PETA
- Sierra Club
- Greenpeace, etc.

"SHAREHOLDER ADVOCATES":
- Carl Icahn, etc.
- Manipulating issues to affect investor behaviors

COMMUNITY DEVELOPERS:
- Want to block oil and gas operations because they resent water usage
- Decorative water
- Design "value-adds"

Niccolo Machiavelli

Conclusions

The Necessity of New Approach:
Big Data & Cloud Computing
Implement and test models and data

Science, Technology, and Decision-Making:
Sources
Read critically & understand assumptions

Re-Envisioning Information:
Credibility Tests
Run multiple scenarios / assumptions