



# TEN STEPS TO SUCCESSFUL EXPLORATION AND DEVELOPMENT

**THE FUTURE OF ENERGY EXPLORATION:  
Essential Tools for the Next Generation**

**Jeffrey B. Aldrich**



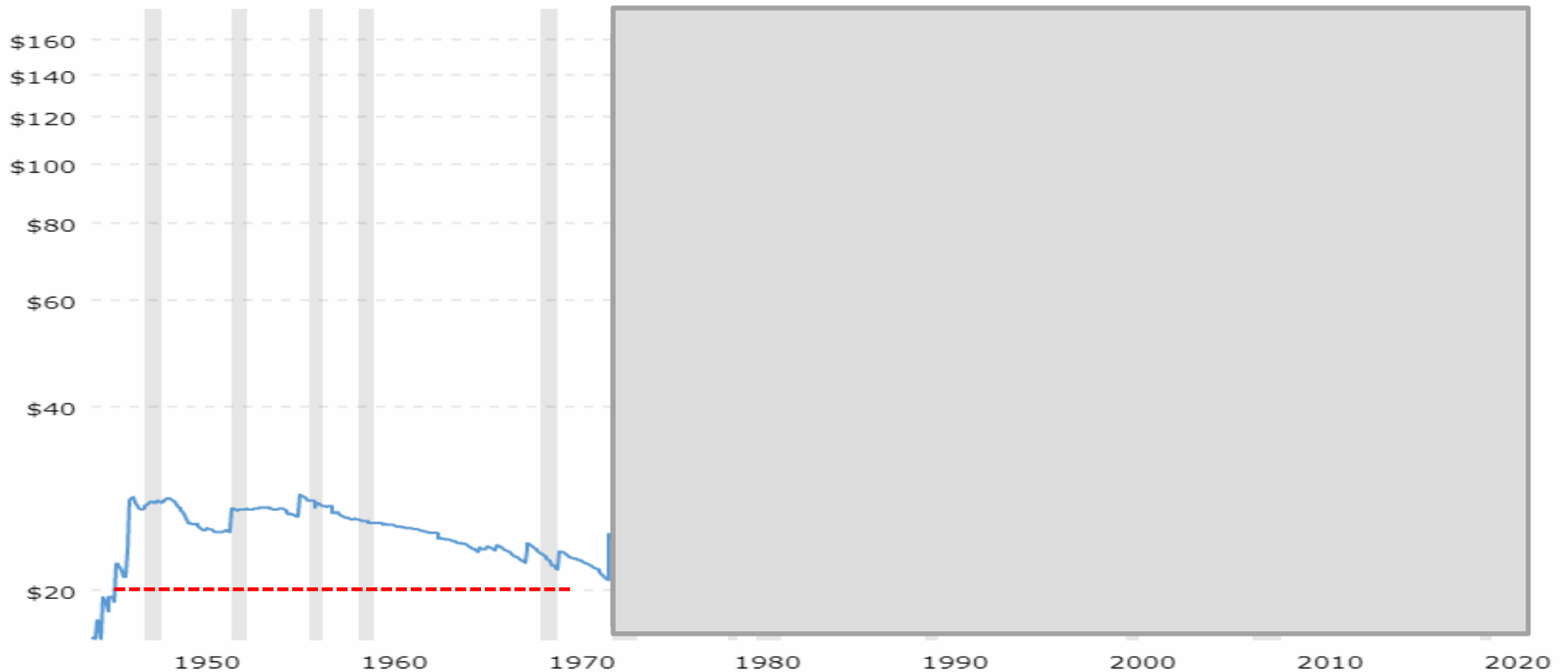
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# A STORY OF 3 GENERATIONS IN THE OIL PATCH

- \$/Bbl (2020 \$)



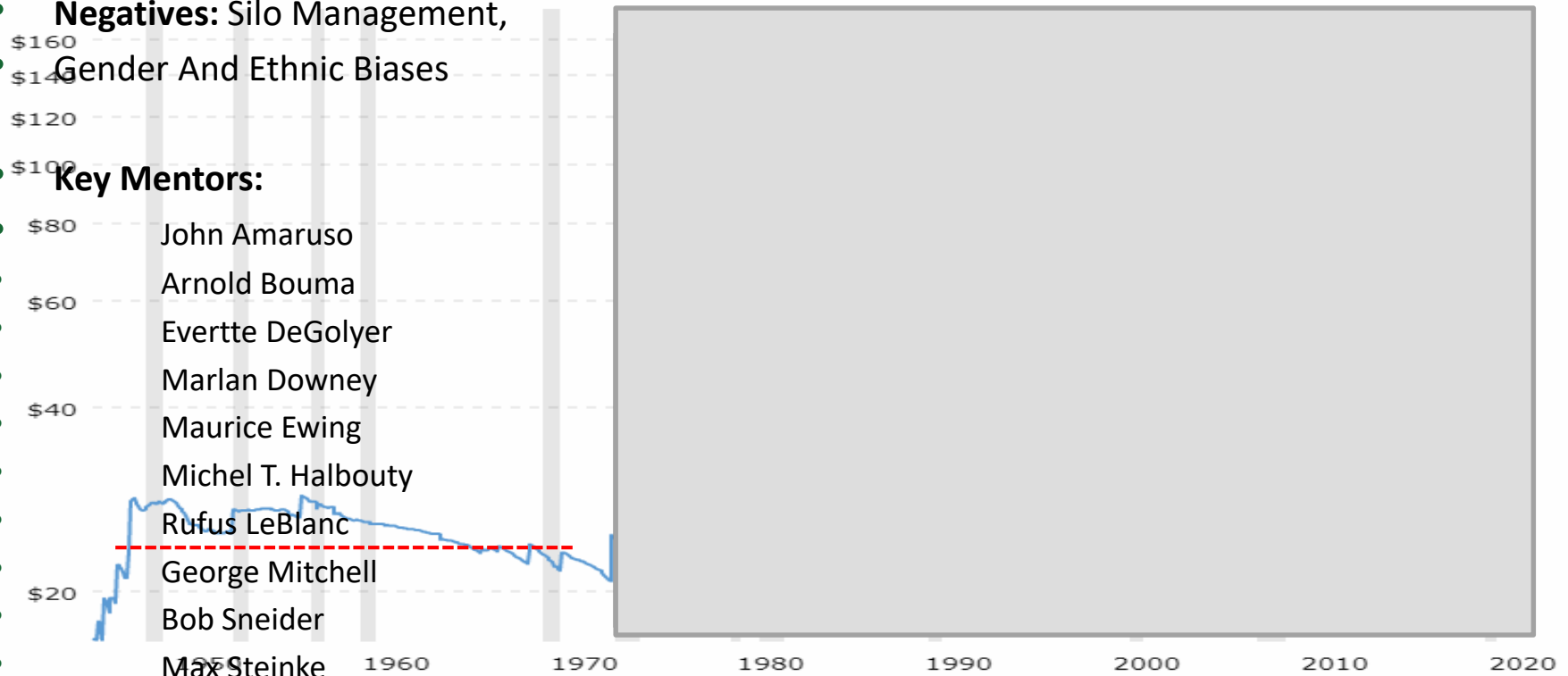
# A STORY OF 3 GENERATIONS IN THE OIL PATCH

- Post WWII Generation
- Flat Price: Big E: 2D
- **Pluses:** Found 80% of worlds oil
- Without any digital computers
- Foundational Science

- **Negatives:** Silo Management, Gender And Ethnic Biases

## Key Mentors:

- John Amaruso
- Arnold Bouma
- Evertte DeGolyer
- Marlan Downey
- Maurice Ewing
- Michel T. Halbouty
- Rufus LeBlanc
- George Mitchell
- Bob Sneider
- Max Steinke



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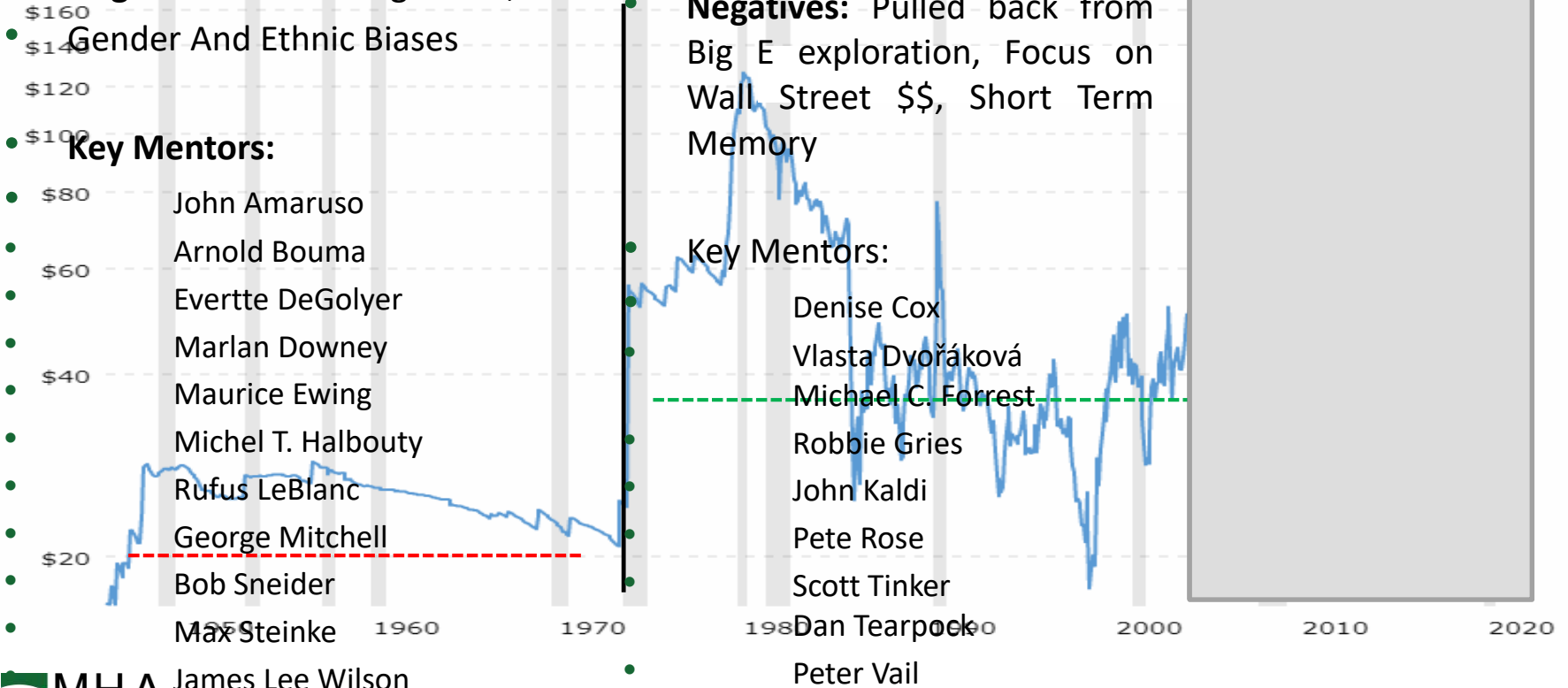
- **Post WWII Generation**
- **Flat Price: Big E: 2D**
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- **My Generation**
- **Uncertain Price: Little e: 3D**
- **Pluses:** Multidiscipline Teams, Digital Computing, 3D/4D Seismic, Deepwater Exploration, Unconventionals

- **Negatives:** Silo Management, Gender And Ethnic Biases

- **Negatives:** Pulled back from Big E exploration, Focus on Wall Street \$\$, Short Term Memory

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- **Pluses:** Multidiscipline Teams, Digital Computing, 3D/4D Seismic, Deepwater Exploration, Unconventionals
- **Your Generation**
- **Volatile Price: New E: Techno**
- **Pluses:** Virtual Teams, A.I., Big Data, DNA Reservoir Testing, ????

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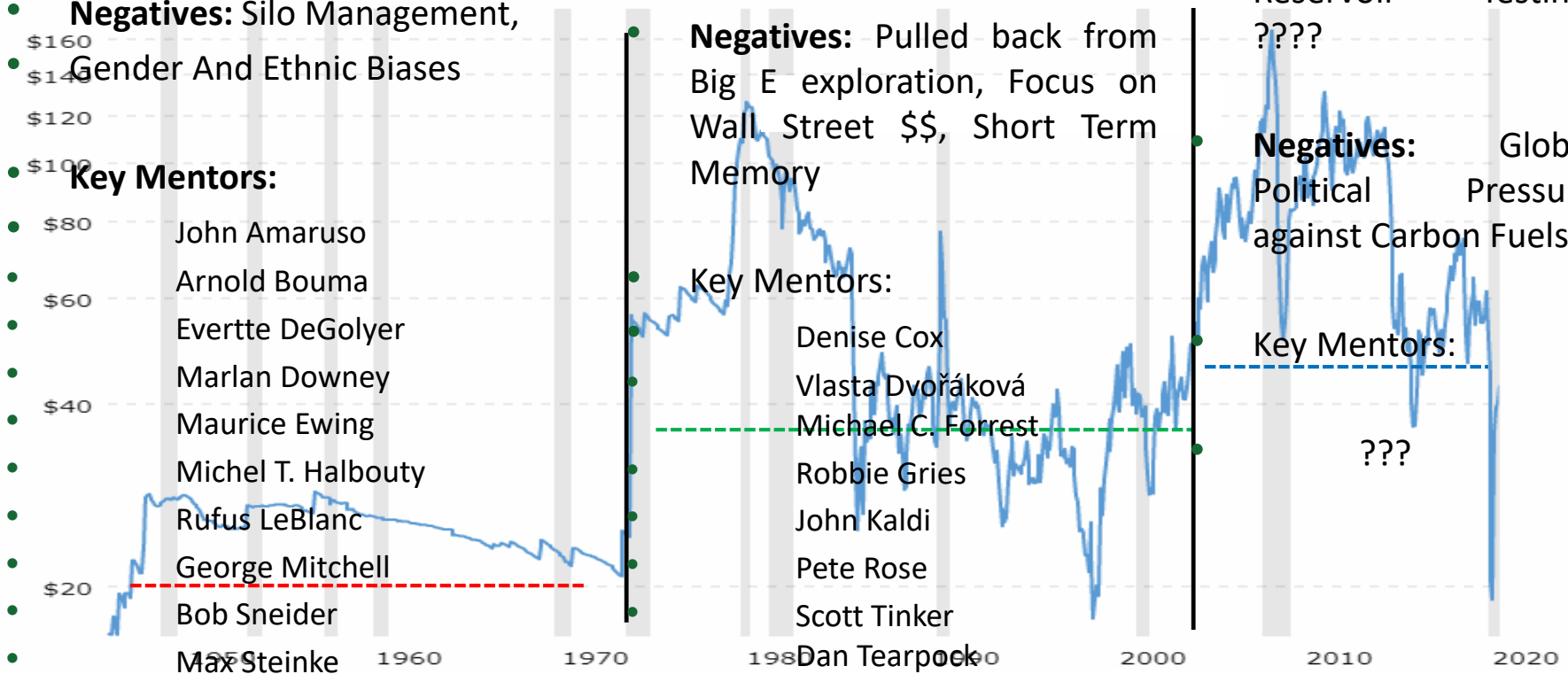
• **Key Mentors:**

- Denise Cox
- Vlasta Dvořáková
- Michael C. Forrest
- Robbie Gries
- John Kaldi
- Pete Rose
- Scott Tinker
- Dan Tearpock
- Peter Vail

• **Negatives:** Global Political Pressure against Carbon Fuels, ????

• **Key Mentors:**

• ???



# 10 RULES THAT ARE NEVER TAUGHT IN SCHOOL



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***Sometimes the Questions are Complicated and  
the Answers are Simple.***

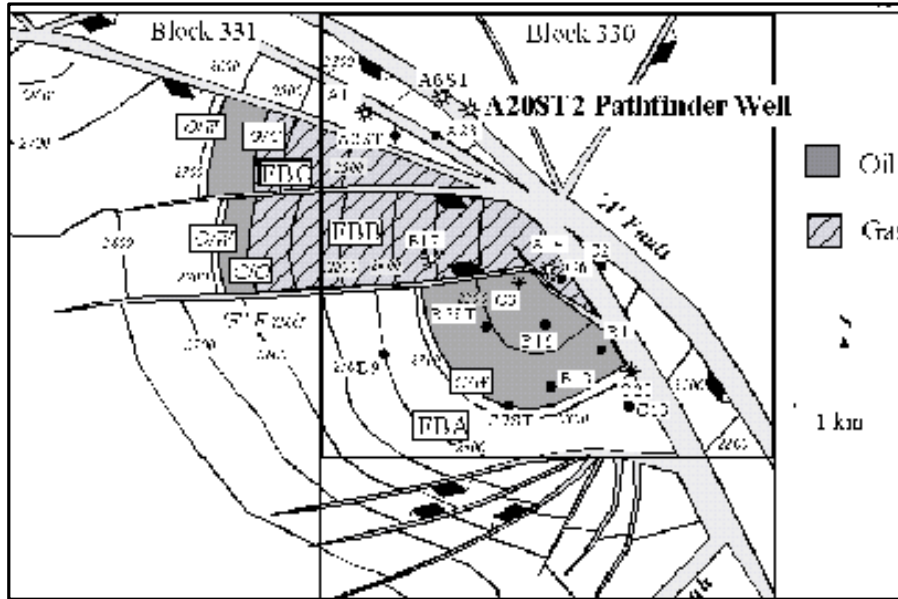
Dr. Seuss

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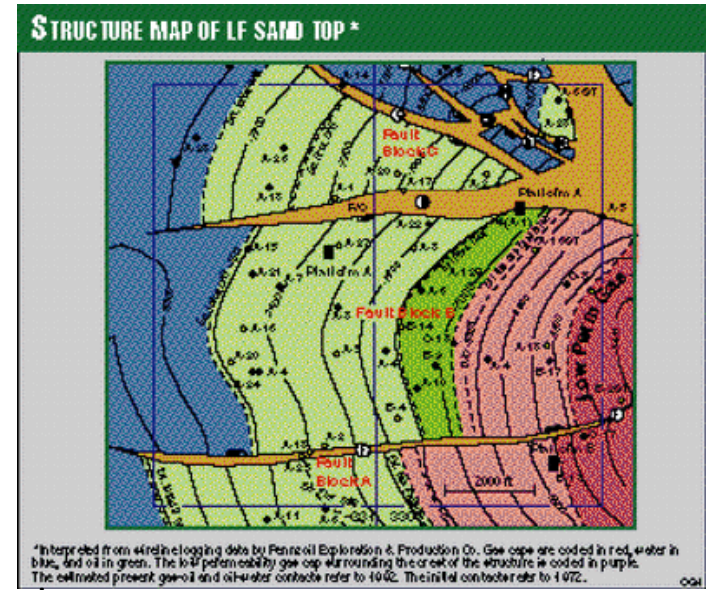
# 1: ALL MAPS ARE WRONG



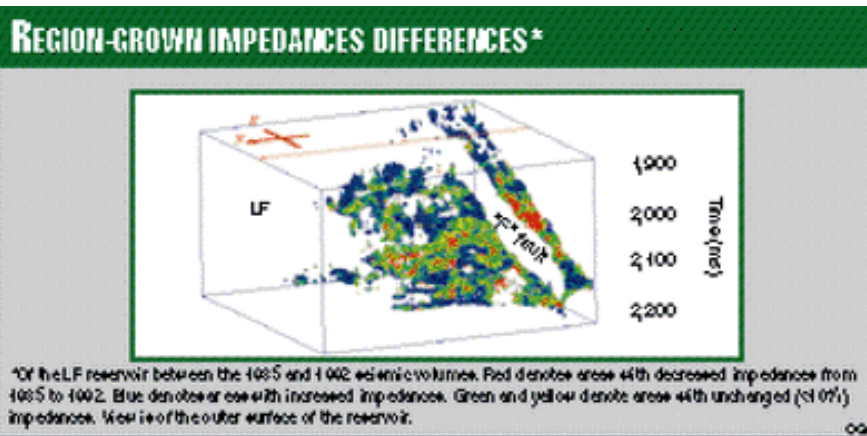
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a. Original limited 2D



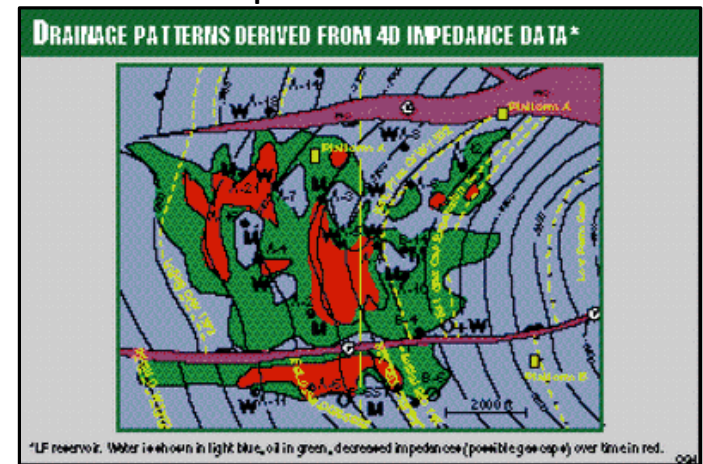
b.. Development 2D



c. 3D Seismic



EI 330 in Gulf of Mexico



d. 4D Seismic

# 1: ALL MAPS ARE WRONG

- **“All Models are Wrong – some are Useful” – George Box 1976**
- **Drill On The Least Incorrect Map**
- **Don’t Fall in Love With Your Own Map**

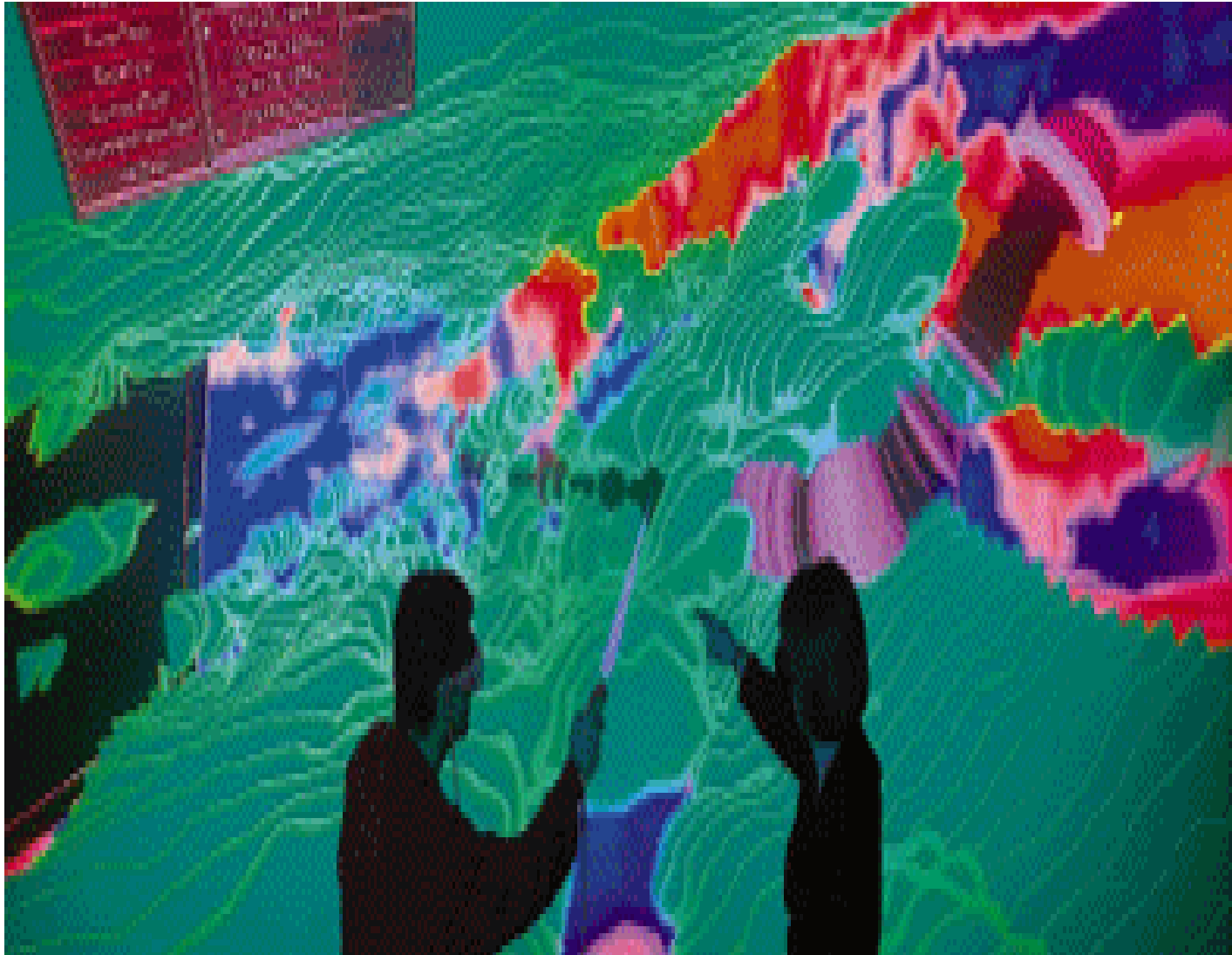
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## 2: DRILL TO MAKE MONEY – LET OTHERS DRILL FOR SCIENCE

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- All data acquired for a dry hole is infinitely expensive.
- Any data acquired and not used to lower the risk of the next well is dereliction.
- Don't lose sight of the financial goal by being blinded by scientific objectives

### 3: IF YOU CAN'T VISUALIZE IT, DON'T RECOMMEND IT UNTIL YOU CAN.



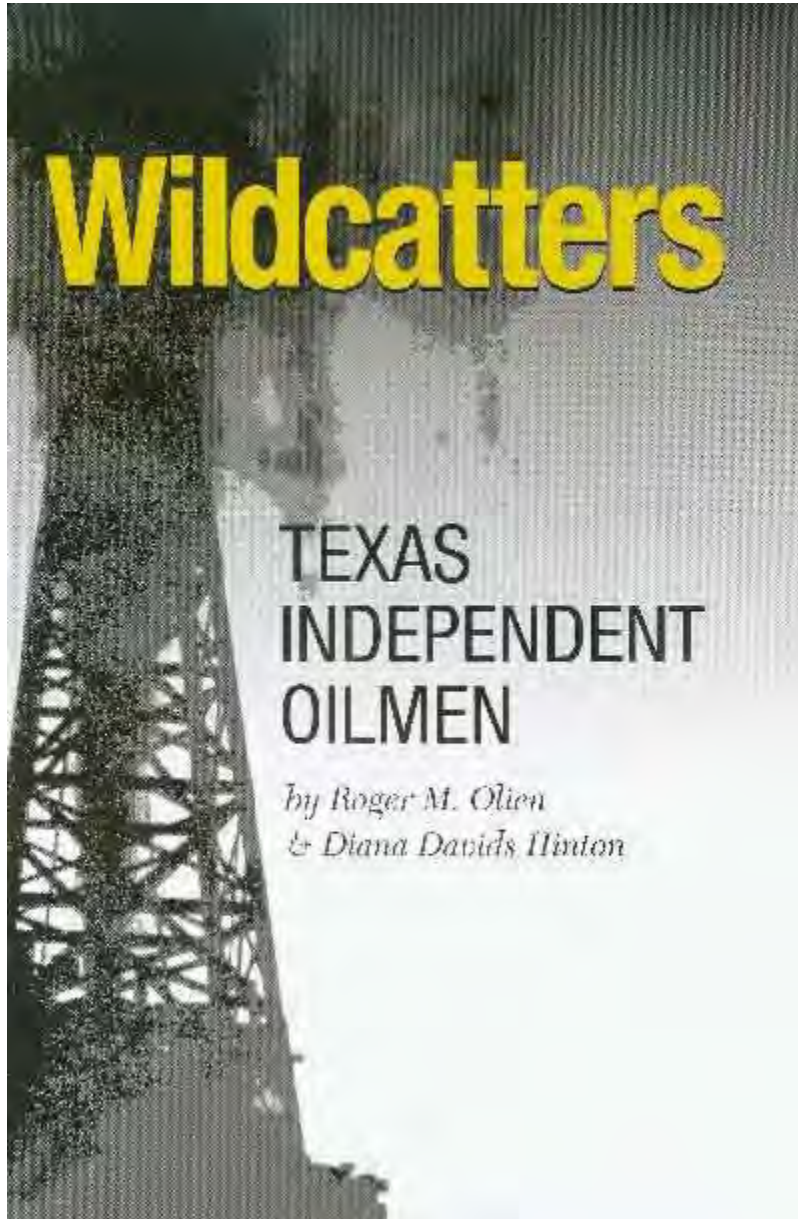
### **3: IF YOU CAN'T VISUALIZE IT, DON'T RECOMMEND IT UNTIL YOU CAN.**

**There are tools to use (Seismic, Wells, Cross-Sections, Maps, Grav/Mag, Models etc.) but these are not substitutes for understanding but methods to use to come to an understanding.**

**A 3D model is no better than both the data and the CONCEPT that created it.**

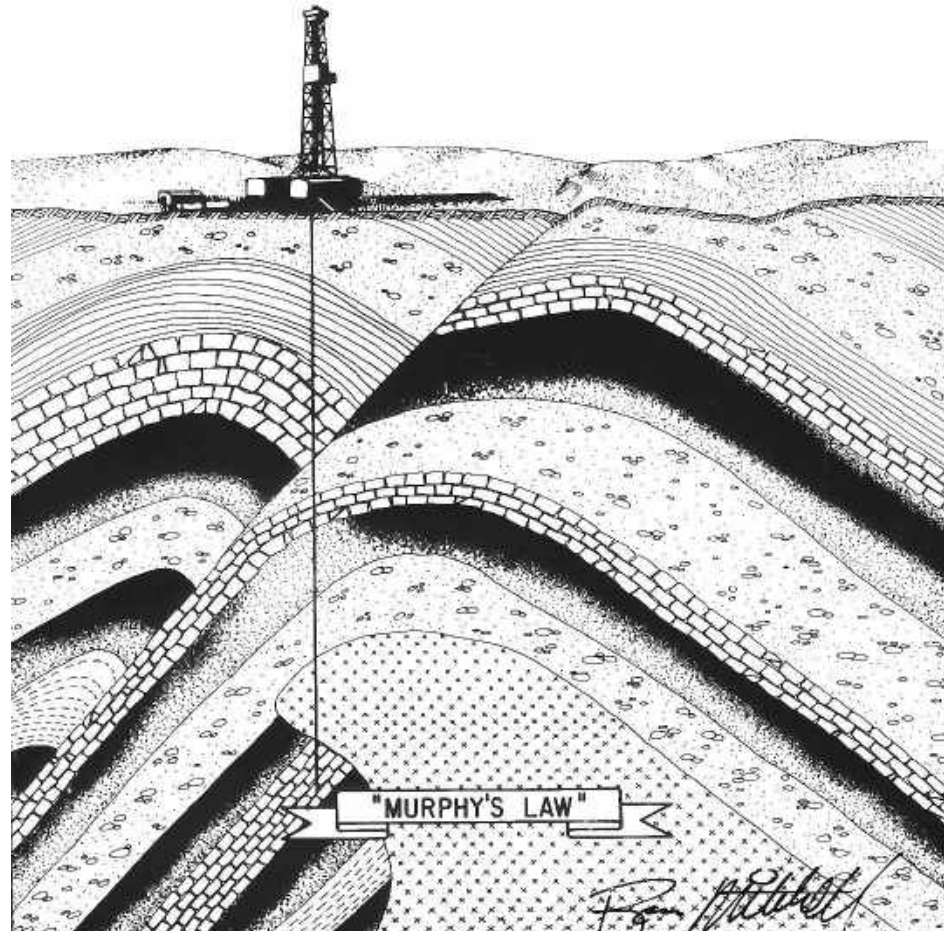
**The 2 Things that most assist accurate visualizations are**

- 1) Field Analogues**
- 2) Hand Contouring**



**4: IT IS BETTER TO BE  
100% LUCKY IN AN  
OVERLOOKED ZONE  
THAN 50% RIGHT IN  
THE TARGET ZONE.**

# 5) YOU DON'T KNOW A LOT MORE THAN YOU THINK YOU DON'T KNOW.

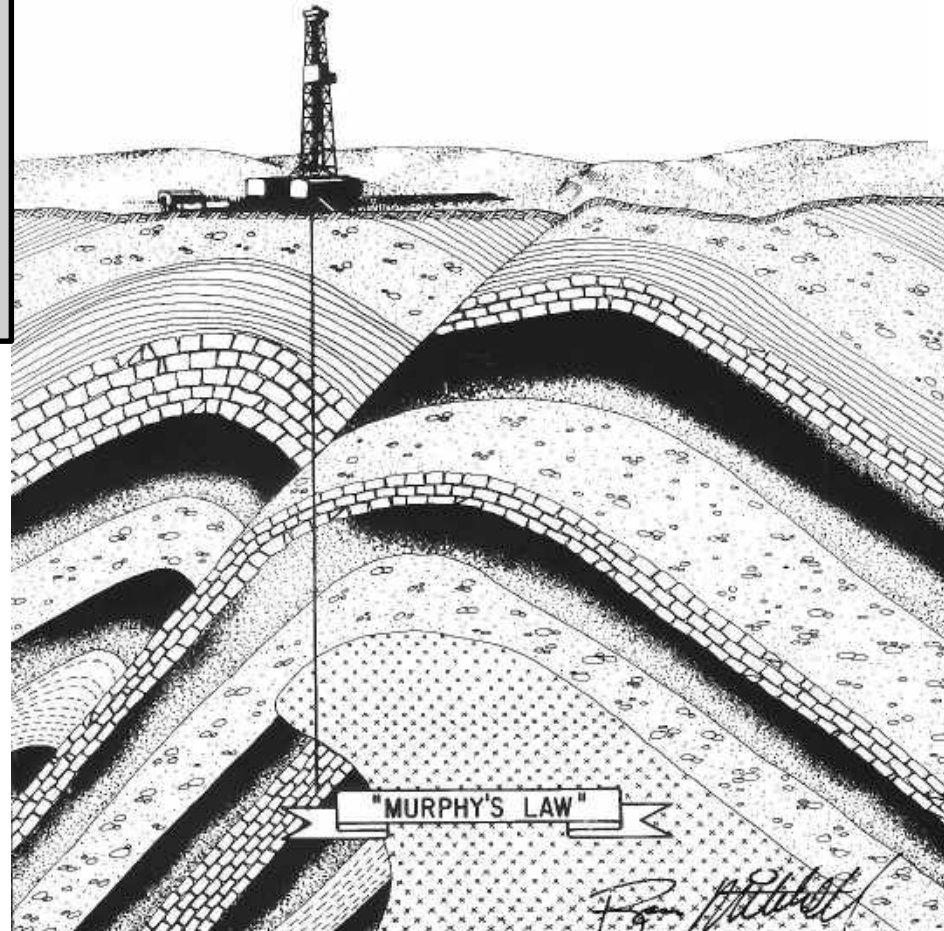




# 5) YOU DON'T KNOW A LOT MORE THAN YOU THINK YOU DON'T KNOW.

**CERTAINTY DOES  
NOT EXIST IN THE  
FUTURE, ONLY IN  
THE PAST!**

JEAN LAHERRERE 2007



# AUDIENCE PARTICIPATION!

- Choose the correct definition for the three terms
  - A) Uncertainty \_\_\_\_
  - B) Probability \_\_\_\_
  - C) Risk \_\_\_\_
1. **1-Chance of Success (1-COS)**
  2. **The Chance of Success**
  3. **Variations in Individual Values**
  4. **The range of possible outcomes**
  5. **The deviation from the median**
  6. **The Most Likely outcome**

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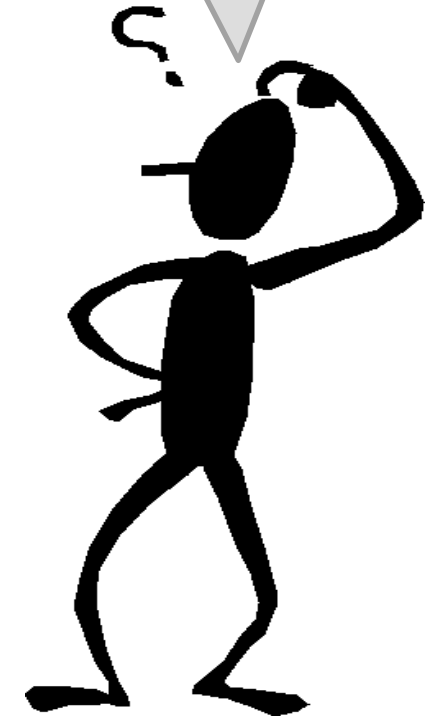
# RESULTS

## 6) CALCULATE PROBABILITIES, DEFINE UNCERTAINTIES IN ORDER TO REDUCE RISK.

Based on our integrated team analysis, the full stochastic evaluation of the property has a range of resources between 300 and 850 MMBls with the current price strip



Can't you do better than that? Just give me a number!

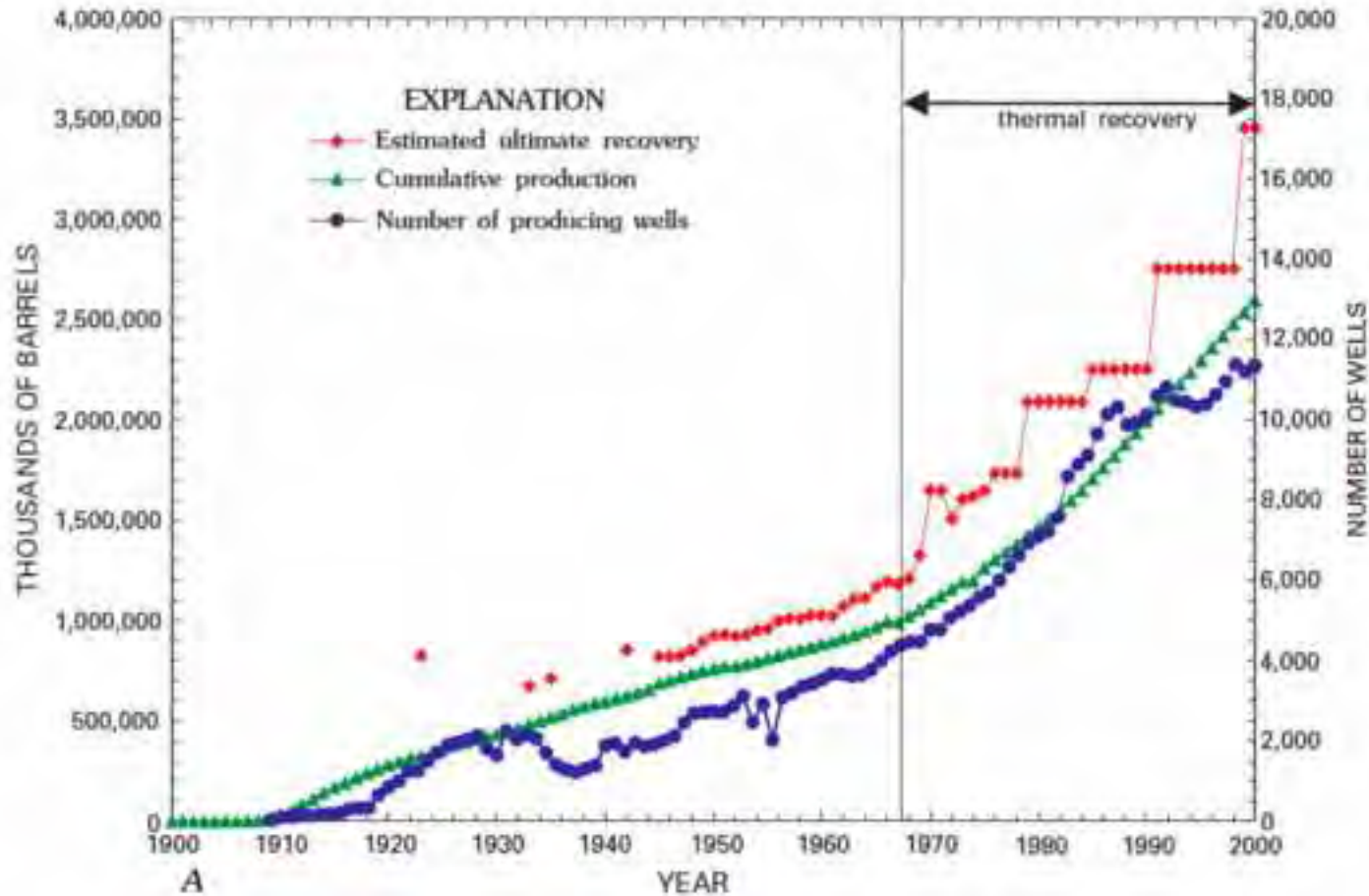


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## 6) CALCULATE PROBABILITIES, DEFINE UNCERTAINTIES IN ORDER TO REDUCE RISK.

- Do not confuse
  - Range of Possible Outcomes
  - Variations of Individual Values
  - Chance of Failure

# 7) MOST FIELDS RESERVES GROW THROUGH TIME – DON'T SELL YOURSELF SHORT IN THE POST MORTEM.

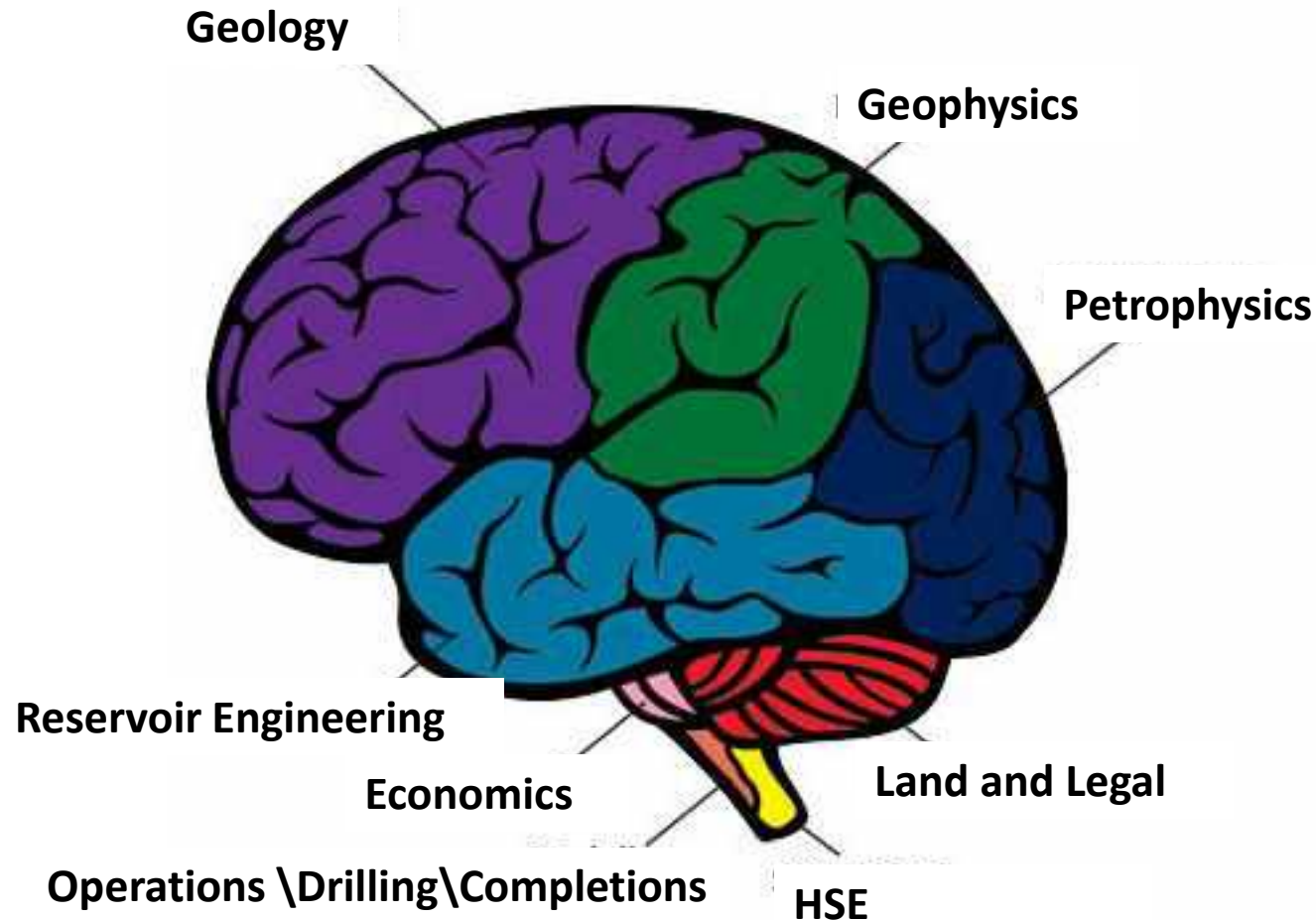


Midway-Sunset Field, Estimated Ultimate Reserves through Time

## **7) MOST FIELDS RESERVES GROW THROUGH TIME – DON'T SELL YOURSELF SHORT IN THE POST MORTEM.**

- **This is why the PRMS was created**
  - **Value not just the PROVED RESERVES**
  - **Value the CONTINGENT RESOURCES**
  - **Value the PROSPECTIVE RESOURCES**
- **Use the PRMS to plan the Work Program to advance volumes up the ladder as fast as possible**

## 8) MULTIDISCIPLINE TEAMWORK IS THE BEST SOLUTION.



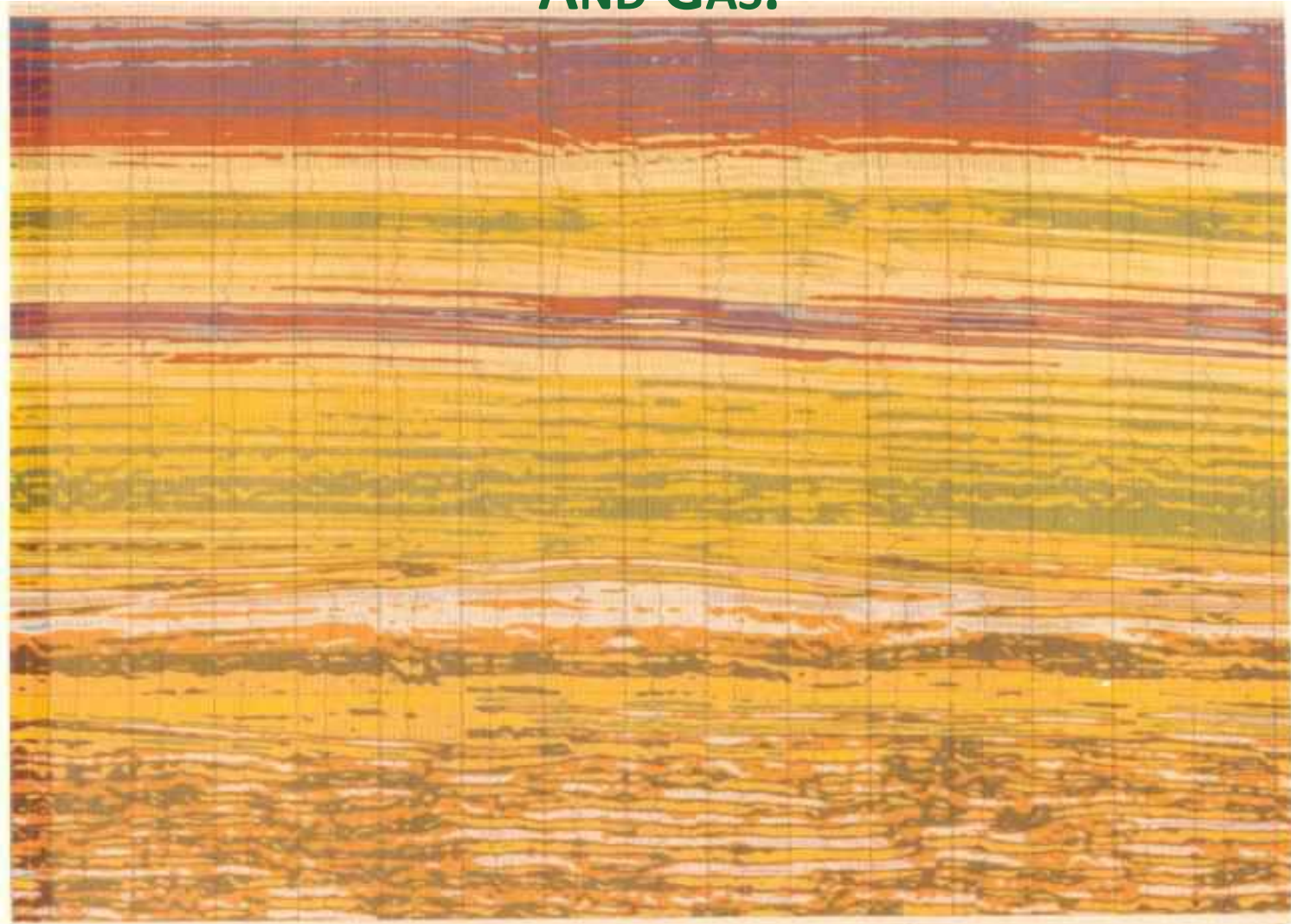
*Adapted from  
John A. Masters*



## 8) MULTIDISCIPLINE TEAMWORK IS THE BEST SOLUTION.

- **To Determine What Questions Need to be Asked**
- **To Look at the Problem with Fresh Perspectives**
- **The Solution is Not Complete Until All Agree**

## 9) IF IT IS COMMON KNOWLEDGE IT WON'T FIND NEW OIL AND GAS.



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- A) “Everyone already knows it”
- B) “Everyone knows it won’t work”
- C) “It has already been looked at”
  
- All things told to John Masters about the Falther Formation that became the Elmsworth Field– the largest gas field in North America – after it had been penetrated by over 200 wells without being recognized as being productive.
  
- “Business as Usual” attitude and processes are not creative – question everything!

# 10) HYDROCARBONS ARE FIRST FOUND IN THE MINDS OF EXPLORATIONISTS (MODIFIED FROM W. PRATT)



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# ACKNOWLEDGEMENTS

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However – the contents, opinions and thoughts of this presentation are the authors alone and may not reflect the opinions of Sproule Consultants.

The “10 Rules of Successful Exploration and Development” are available by contacting the author through Sproule Consultants.