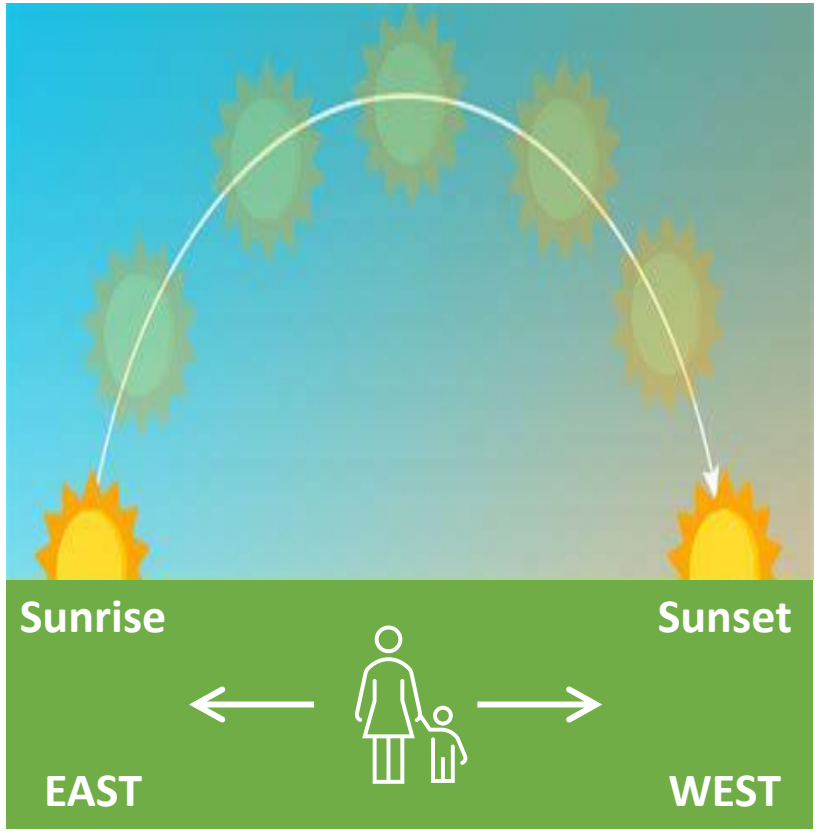
Why having a healthy mistrust of “Conventional Wisdom” is crucial for achieving breakthrough innovations

Texas A&M University
October 21, 2022
Greg Leveille

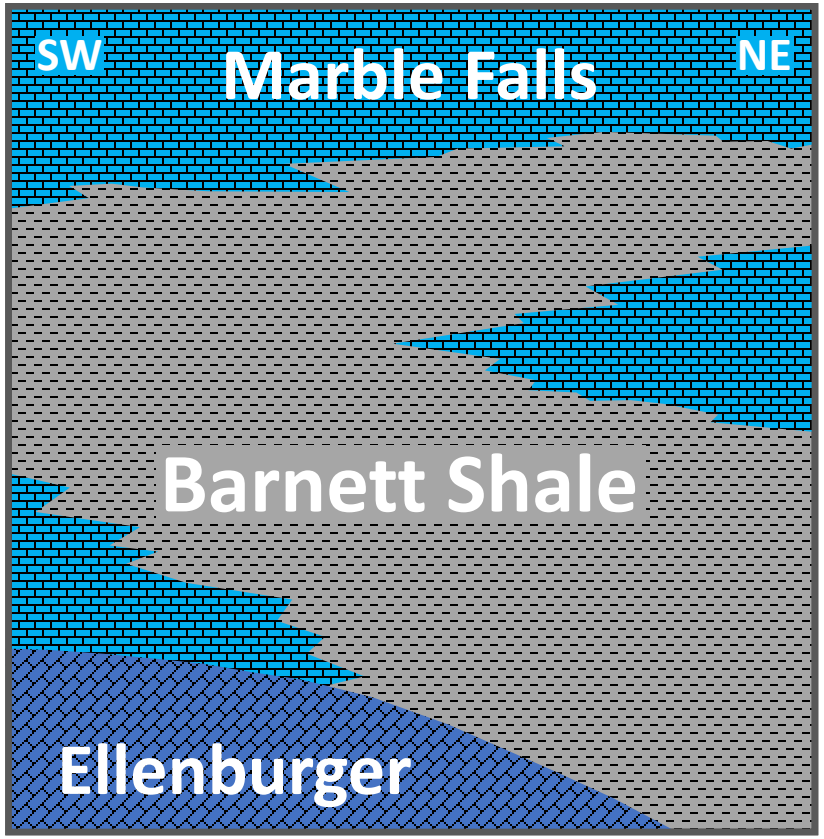
Why Might Conventional Wisdom be Wrong?

Misinformation

Simplifications



Ignorance



Schematic Cross Section

Examples of Inaccurate CW from My Geologic Youth

Plate Tectonics

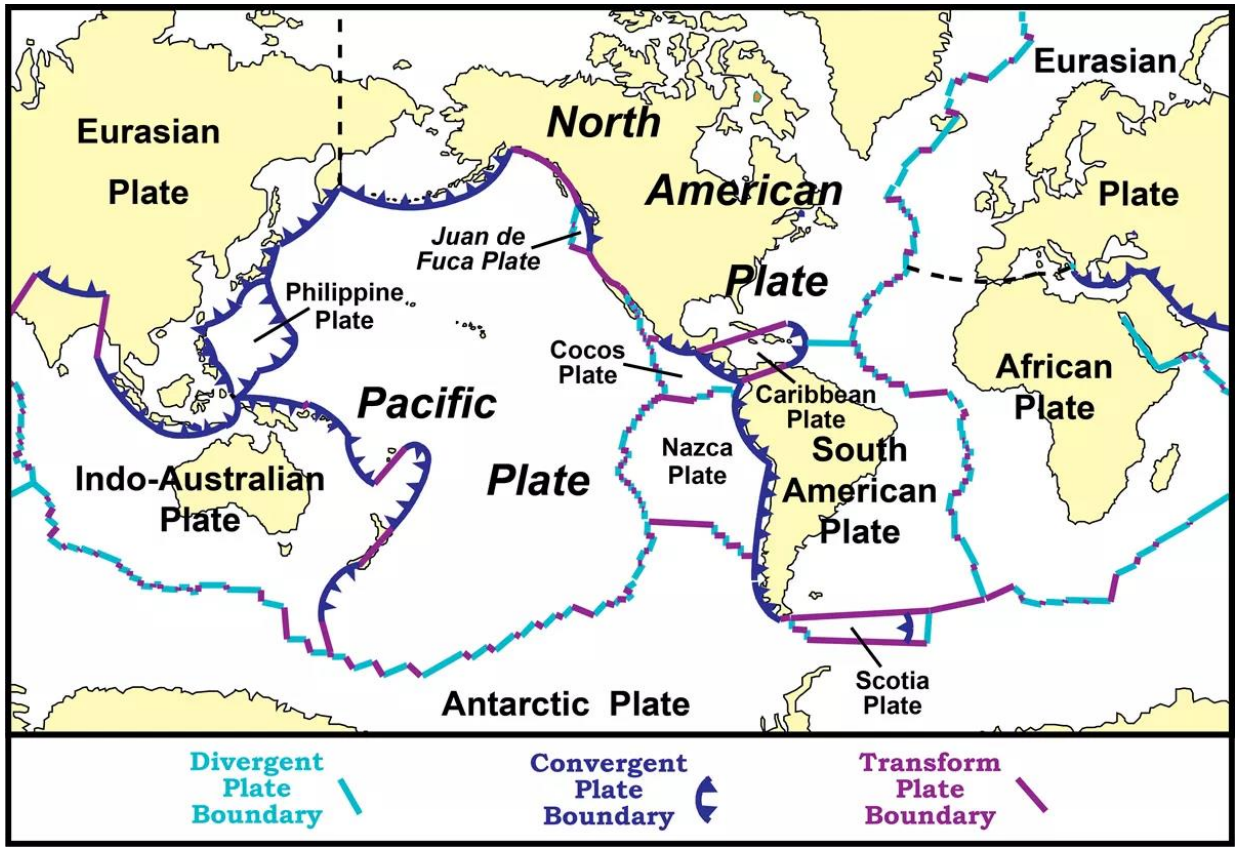
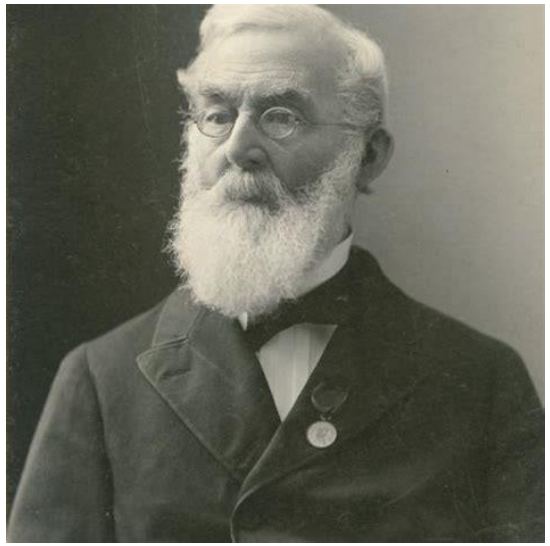


Figure taken from U.S. National Park Service website (LINK)

Geosynclinal **Theory**



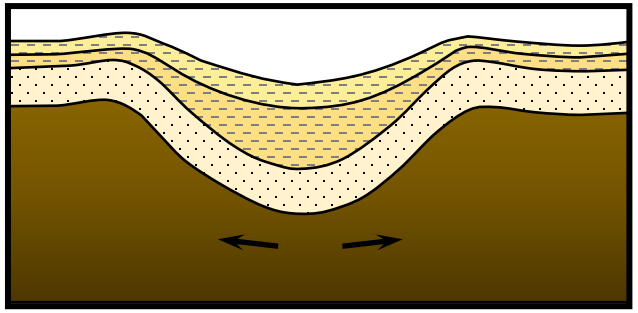
James Hall (1811-1898)

Proposed Geosynclinal Theory

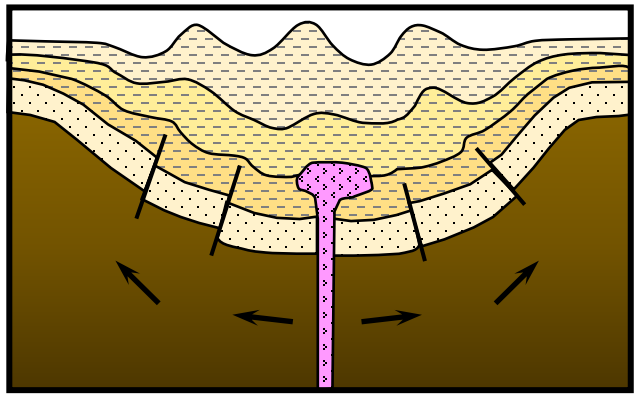
National Academy of Sciences

New York's State Geologist

Downwarping due to sedimentation



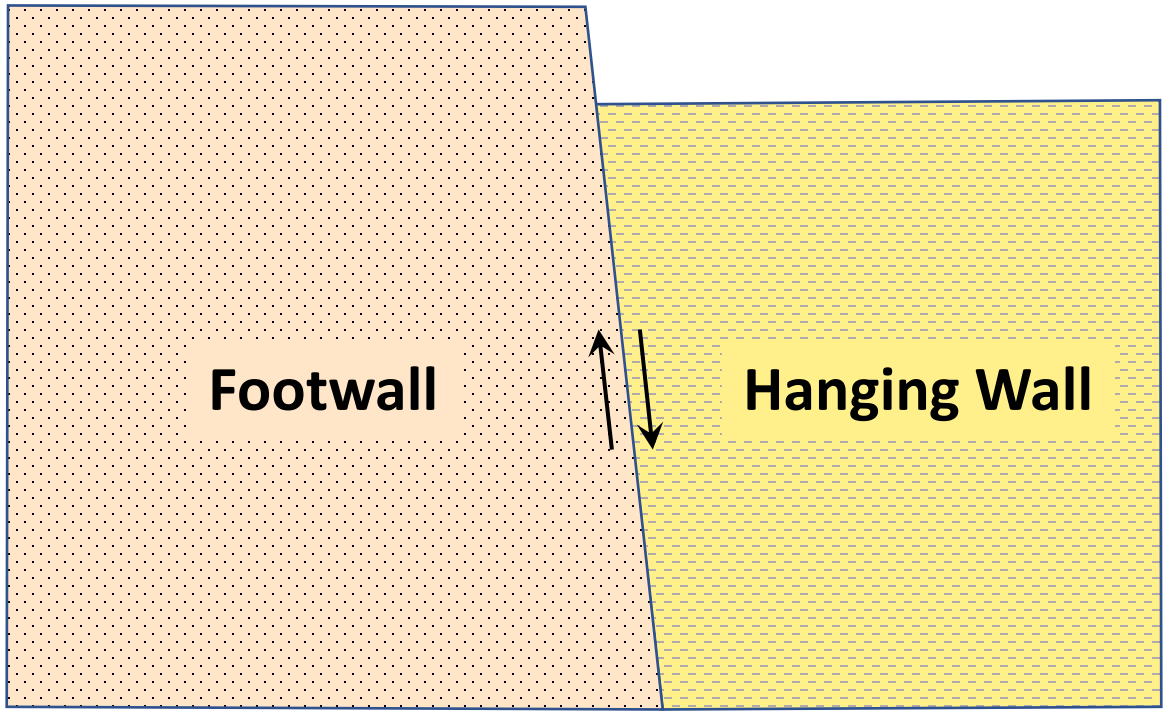
Crustal "crumpling" and intrusion



Schematic cross sections

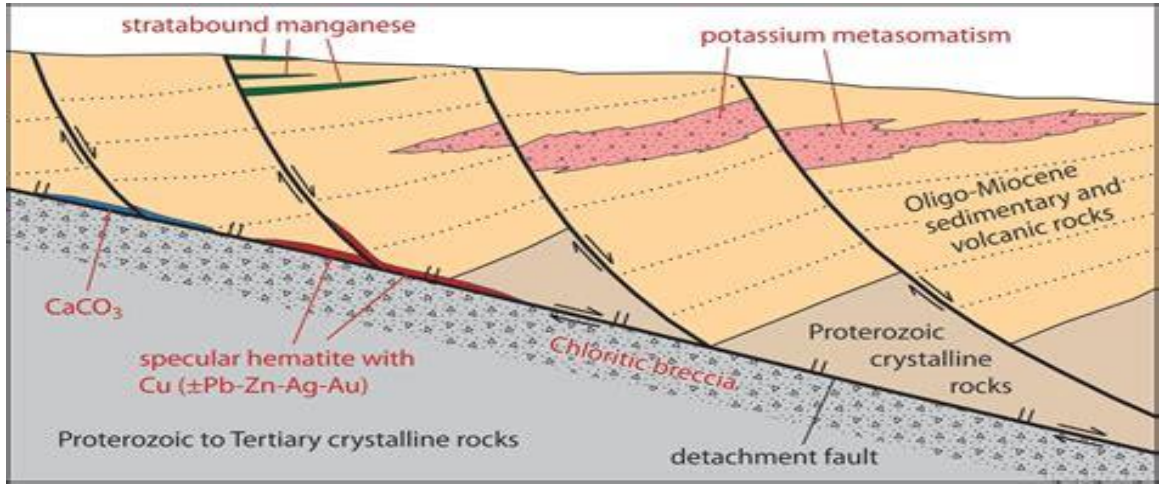
Examples of Inaccurate CW from My Geologic Youth

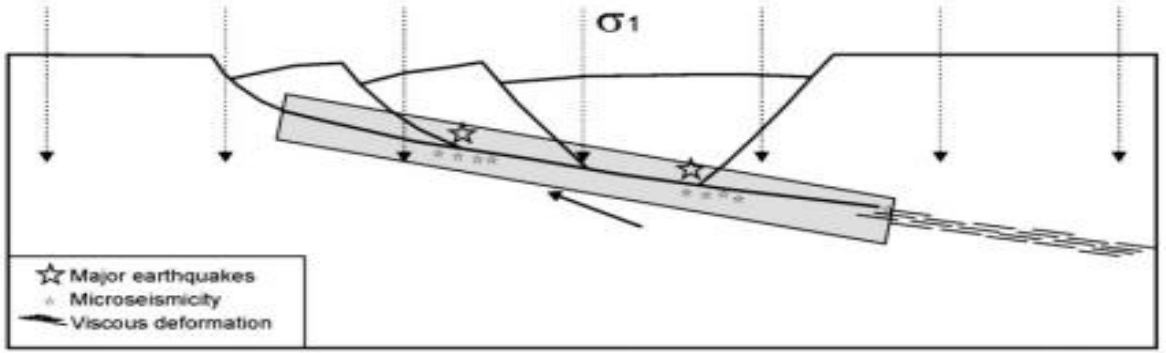
Normal Fault **Definition**



*A type of fault in which the hanging wall moves down relative to the footwall, and **the fault surface dips steeply**, commonly > 60 degrees*

Low-Angle Normal Faults





Diagrams on this slide are cross section views; not to scale

Examples of Inaccurate Petroleum Related CW

Porosity Preservation

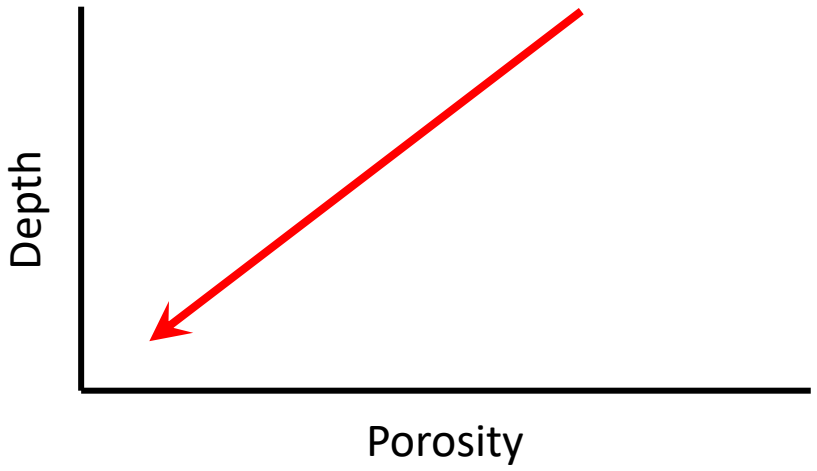


Photo from ConocoPhillips' website (circa 2018)

Deepwater Reservoirs

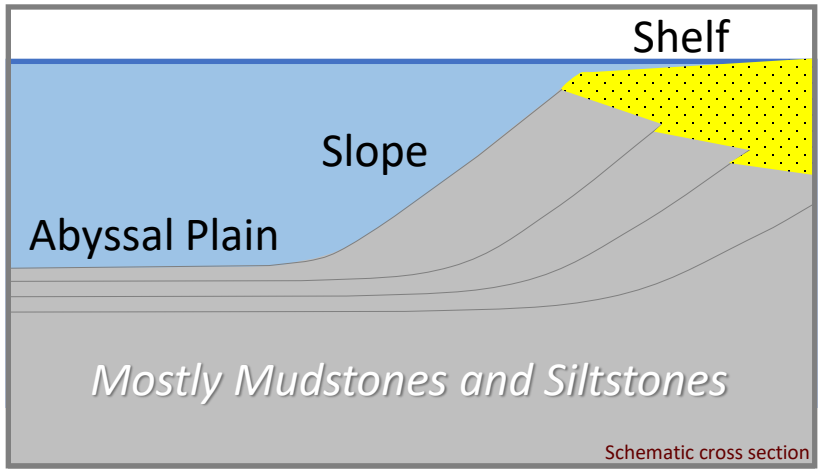
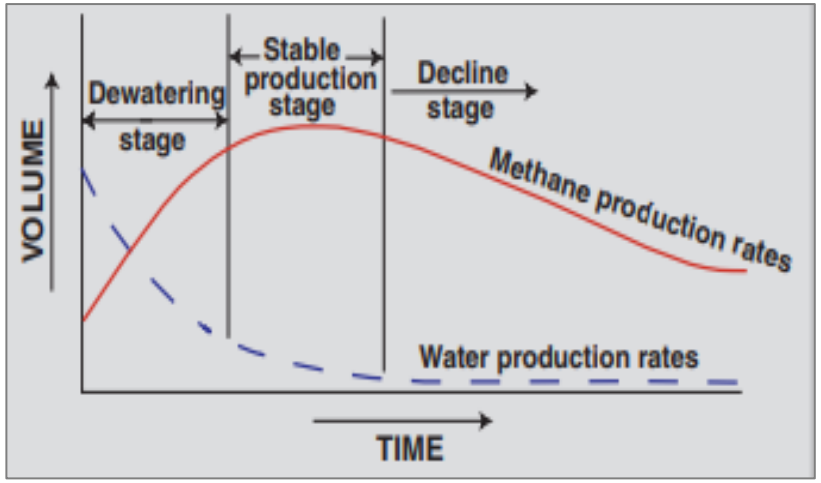


Photo from Forbes article (LINK)

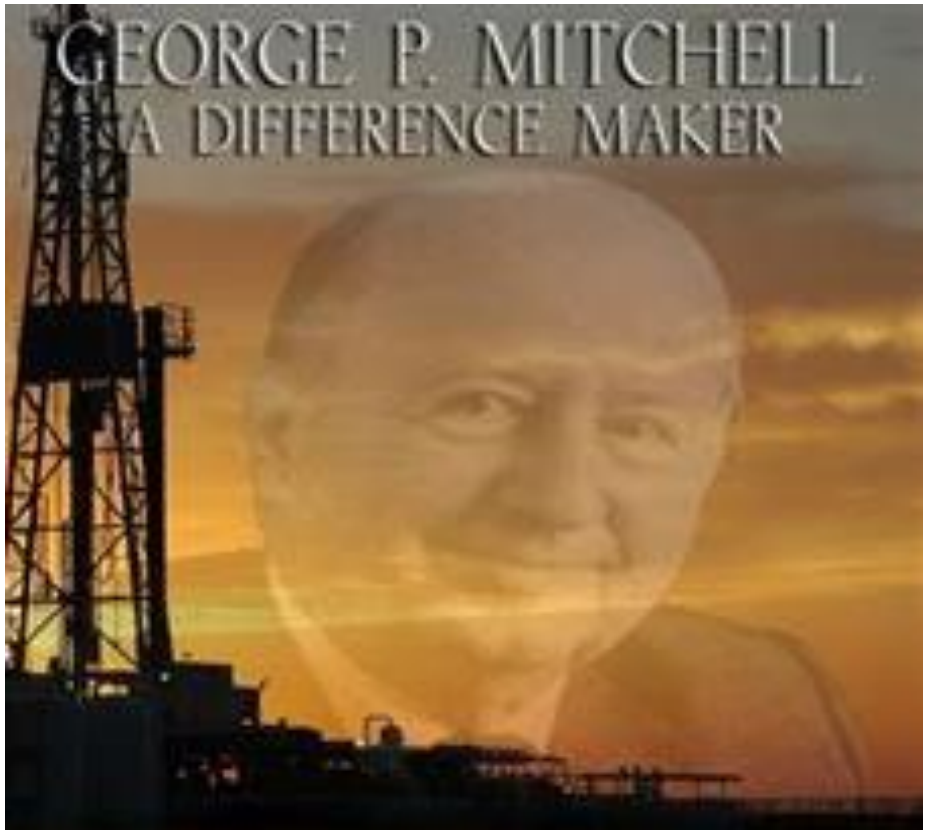
Coalbed Methane



Graph from USGS article "Coal-Bed Methane: Potential and Concerns" (LINK)

Examples of Inaccurate Petroleum Related CW

Unconventional Reservoirs – A Texas A&M Success Story

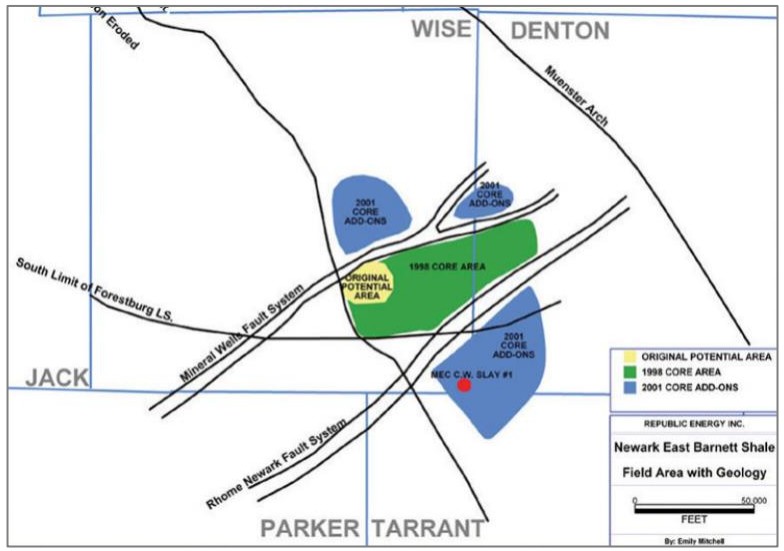


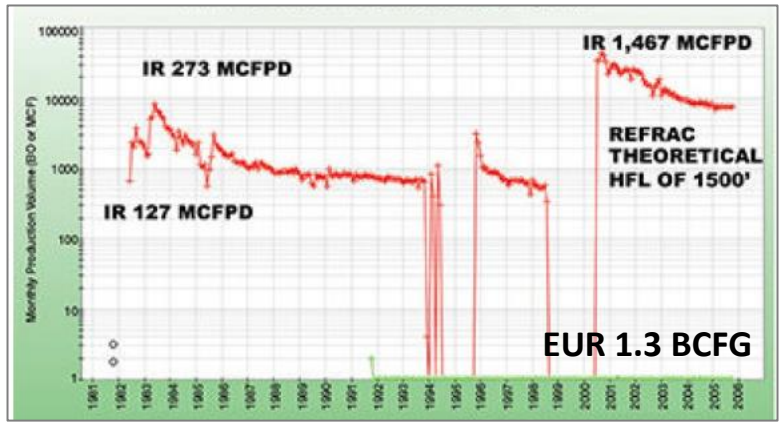
- 1940 Texas A&M Graduate
- Petroleum Engineering Degree with an emphasis in Geology

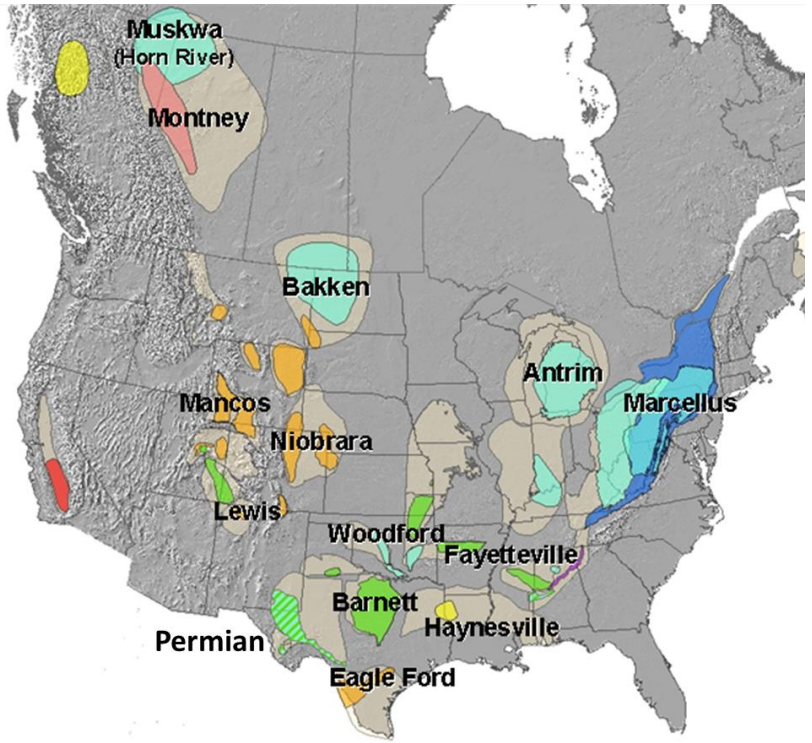
"As early as 1986, Mitchell had established, in the case of the Barnett, natural fractures were not a contributor to production… ***(which was a) conclusion in direct conflict with the prevailing models at the time".***[1]

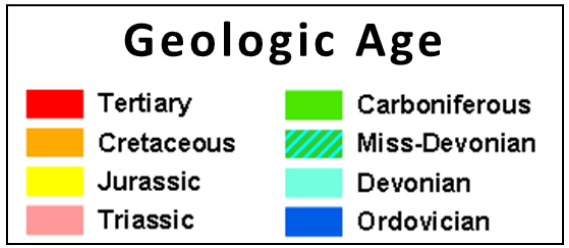
[1] from JPT Article "George P. Mitchell and the Barnett Shale" October 31, 2013 (LINK)

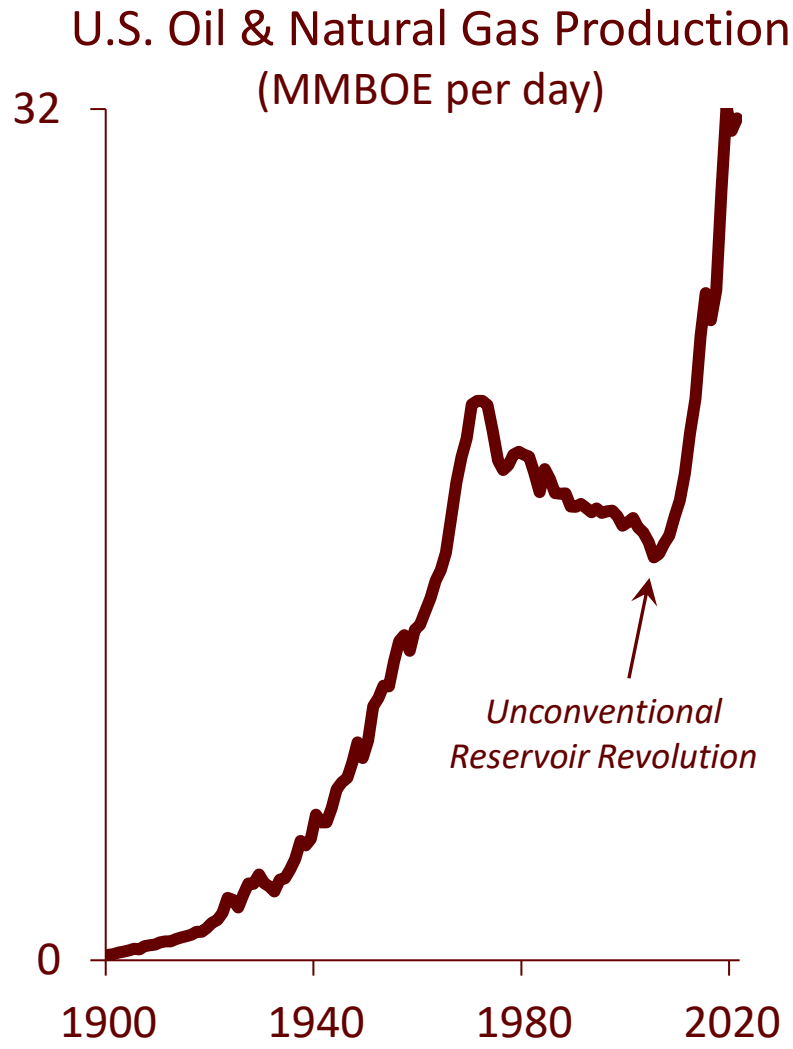
Unconventional Reservoirs – A Texas A&M Success Story











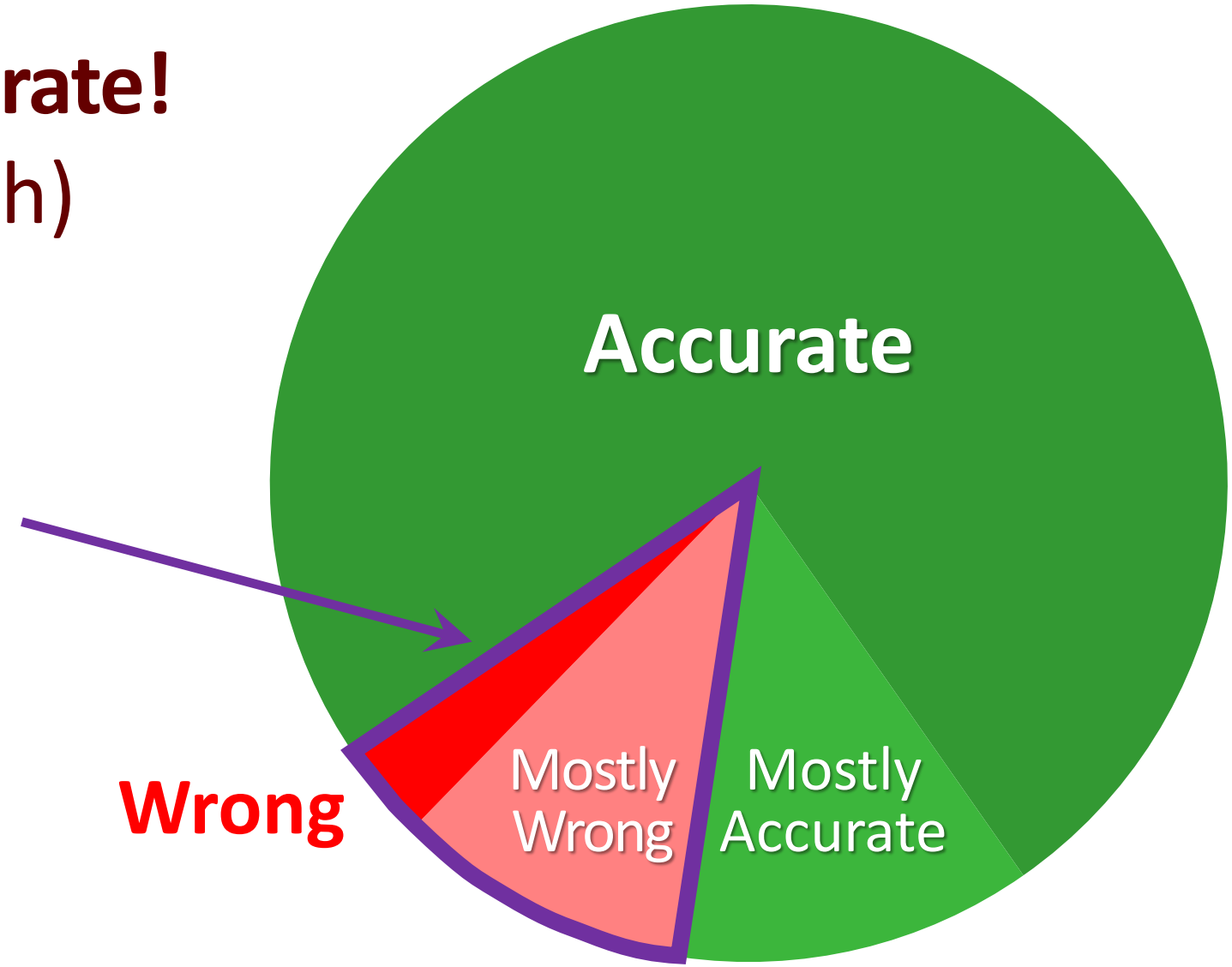
From JPT Article "George P. Mitchell and the Barnett Shale" October 31, 2013 (LINK)

Data sources: 1965 to 2021 data taken from 2022 BP Statistical Review of World Energy report; Pre-1965 oil production data from U.S. EIA website; Pre-1965 gas volumes estimated from multiple sources.

Why is it Hard to Spot Inaccurate Conventional Wisdom?

Majority of CW is accurate!
(or accurate enough)

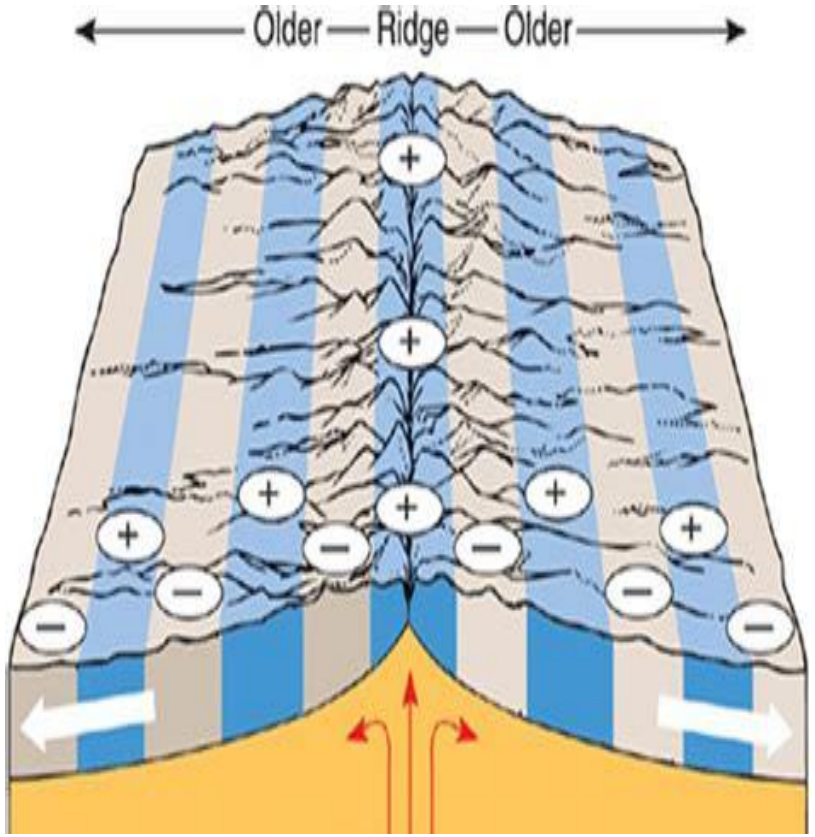
Fertile Ground for Innovation



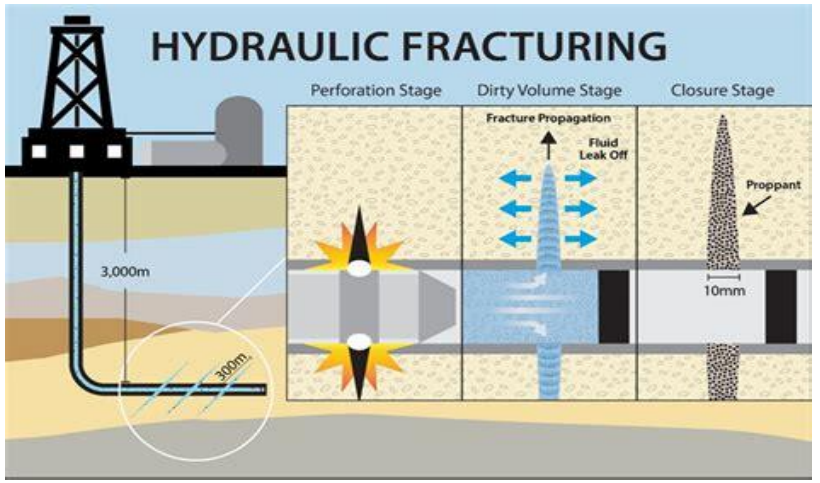
The pie chart shown on this slide is a hypothetical example; percentages vary by topic and sources of conventional wisdom

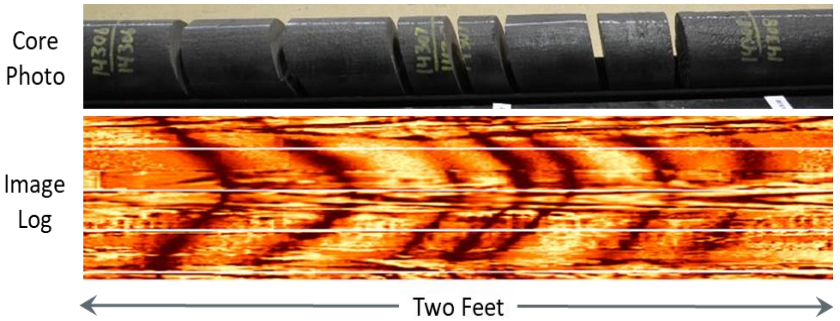
Ways to Identify Inaccurate Conventional Wisdom[1]

Acquire Additional (Types of) Data

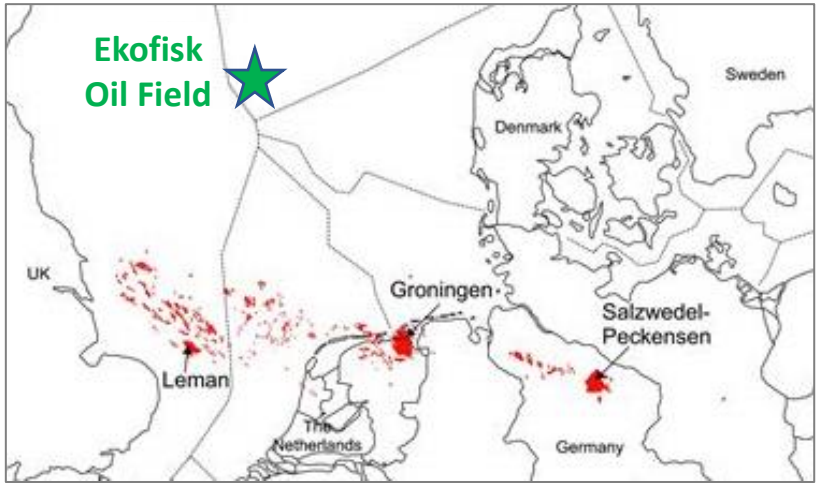


Question 'Model-Based' Wisdom





Ask 'What If', 'Why' & 'Why Not' Questions

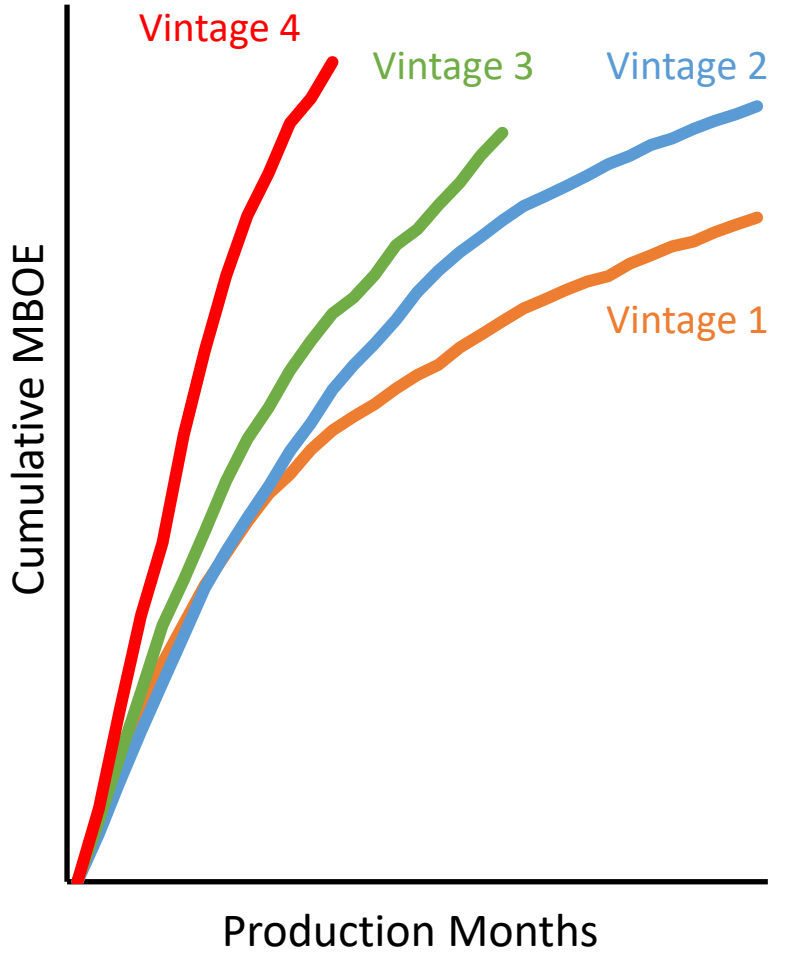


[1] *Slide does not show an exhaustive list of ways to identify inaccurate CW*

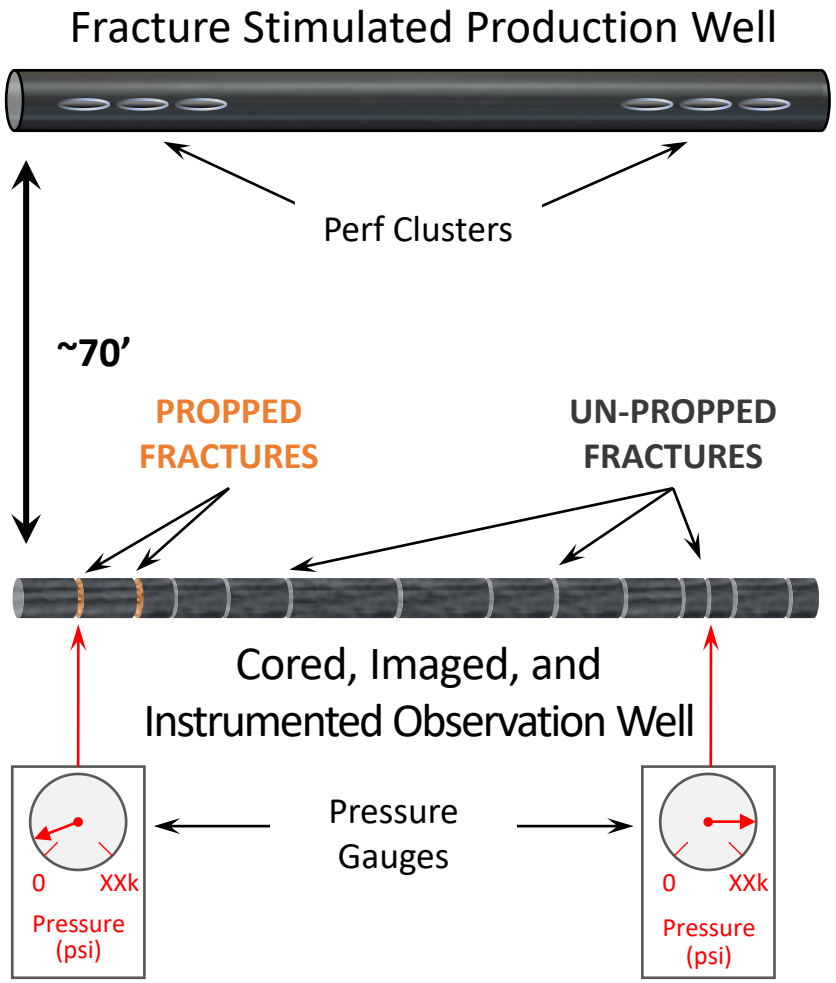
Top diagram from Kwon Research Group website (LINK); bottom image from COP Barclay's Shale Teach-In slide deck

Opportunity: Increase Recovery from Unconventionals

Production Rate & EUR Increases from Improved Completion Designs

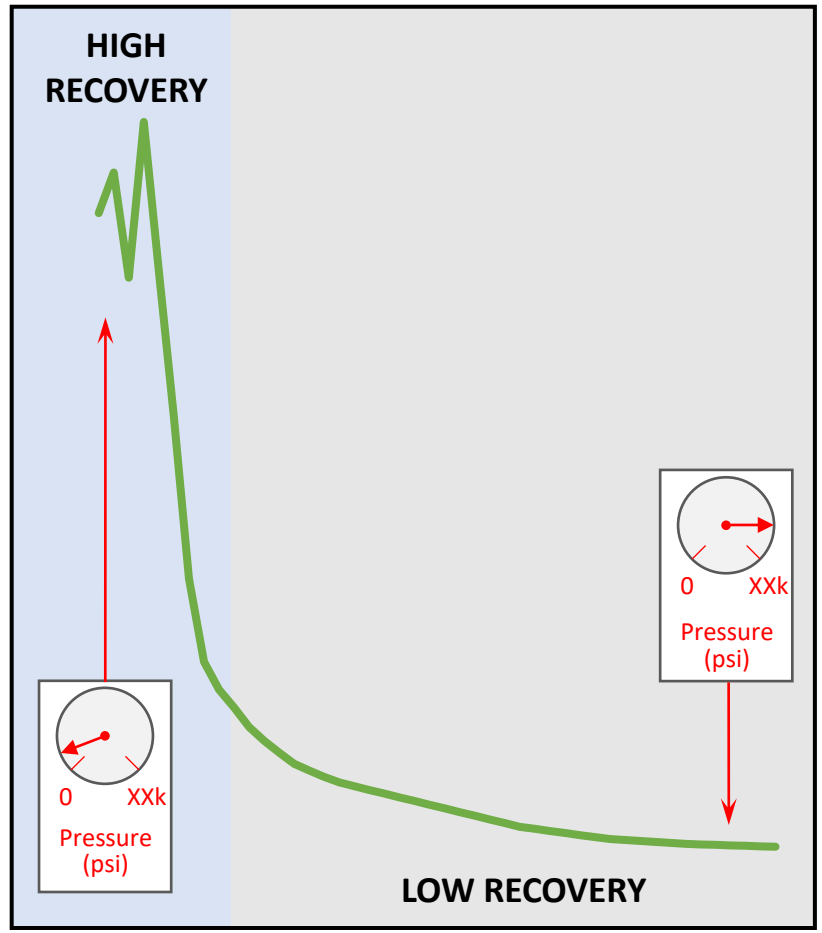


Critical Dynamic & Static Data Gathered from Observation Wells



Map View; not to scale

Modeled Recovery Indicates Large Amounts of Oil & Gas Left Behind



Recovery Factor at Observation Well Location

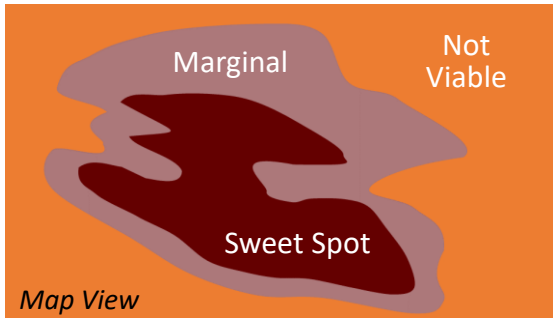
Material taken from ConocoPhillips Scotiabank Shale Oil Technical Teach-In, Feb. 2020

Opportunity: Geothermal Energy Development

Location Selection

…geothermal energy available **anywhere and everywhere**[1]

vs.



As is: ≈ Location Agnostic[2]

Could be: Sweet Spot Focus[3]

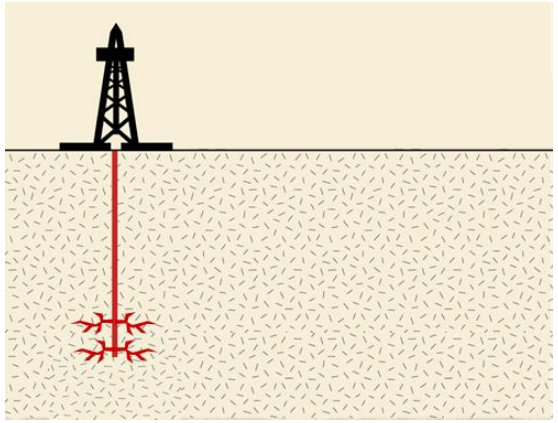
Drilling

vs.

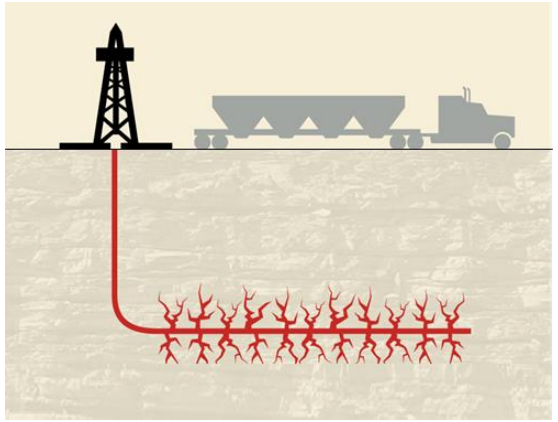
As is: Rock Bits

Could be: PDC Bits

Completions



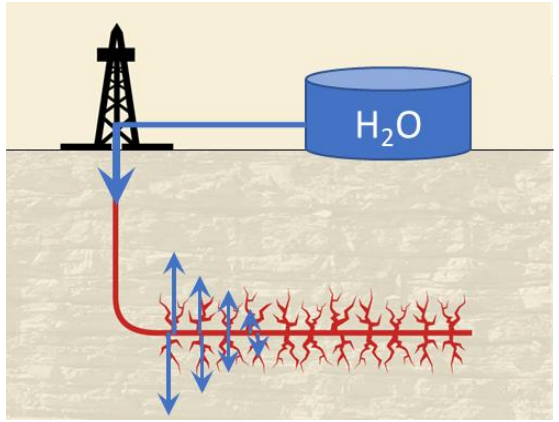
vs.



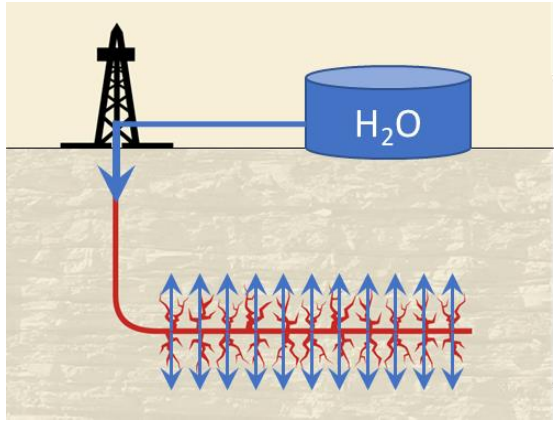
As is: Near Vertical Wells

Could be: Horizontal Wells

Injection Water Placement



vs.



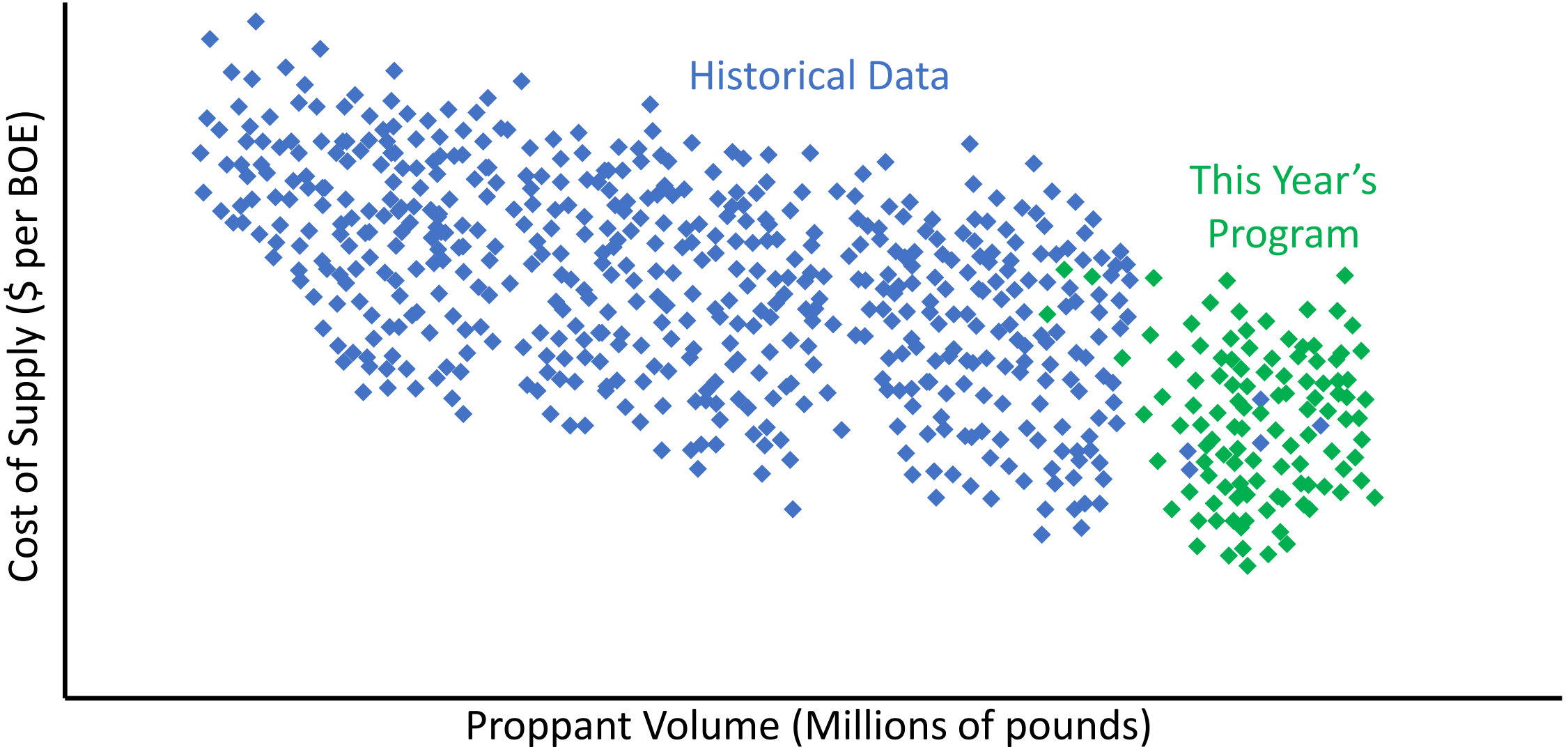
As is: Pump & Pray

Could be: Placement Control

[1] from AltaRock Energy's website, October 10, 2022 (LINK); [2] with regards to factors other than heat content of the "reservoir"; [3] sweet spot controls in addition to heat content will likely include rock type & fabric, structural geometry, stress field, etc.

Opportunity: Exploring Beyond the Limits of “Big Data”

Question CW derived solely from empirical data



Key Take-Away Messages

- Some portion of conventional wisdom is inaccurate
- Identifying inaccurate conventional wisdom is often the first step in achieving breakthrough innovations
- While humankind has made great progress towards understanding the physical world, there are still many subjects and technologies ripe for future breakthroughs

Why having a healthy mistrust of “Conventional Wisdom” is crucial for achieving breakthrough innovations

Texas A&M University
October 21, 2022
Greg Leveille