

AV The Golden Age of Shale (Re)Discovery: The Art of Innovative Prospecting and Early Eagle Ford Musings*

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Abstract

Over the past decade “shales” have experienced a Golden Age of (Re)Discovery across North America. However, given the efficacy and velocity at which Industry operates, it is increasingly perceived that the major NAM opportunities have been captured. Yet, as we all know, these reservoirs are rarely shales but rather a complex mélange of lithologies that span the unconventional resource triangle. So, to continue successfully creating Tier One value in this vast resource space, learning to “see” differently, to “think” differently, combined with the Classical, empirically-based “ACB” discovery method, offers an alternate and compelling gateway to new world class discovery.

By 1978, it was common knowledge that the Eagle Ford, South Texas , was a major hydrocarbon resource; yet, ironically, it took some 30 years to be “discovered”. Fast forward to 2005 - shale exploration was booming yet disproportionately focused on THE Barnett shale model: siliceous, brittle, fractured, high Ro, 50+% adsorbed gas storage (NOT!), etc. But what about a deeper, hotter, softer, unfractured, 100% compression storage, liquids-rich, limy mudrock that had already been “tested” hundreds of times for over 40 years? An early Eagle Ford vignette illustrates how “seeing” differently and the “ACB” method resulted in BR/COP’s 2005-2008 early-mover characterization and capture of a material portion of the play’s sweet spot. Moving forward, it is suggested this toolbox will continue to be equally invaluable as we explore across the resource triangle.

Selected References

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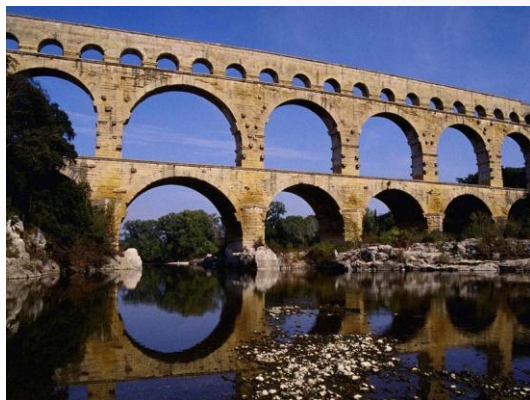
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Bordeaux Xploration, Inc.

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The Art of Innovative Prospecting &
Early Eagle Ford Musings**



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The Art of Innovation

- Colgate created an ingenious dental floss advertising campaign
- Please take a moment to appreciate it quietly



"Discovery consists of seeing what everybody has seen, & thinking what nobody has thought." Albert Szent-Gyorgyi

Learning to see what others fail to recognize is an essential 1st step toward Innovation



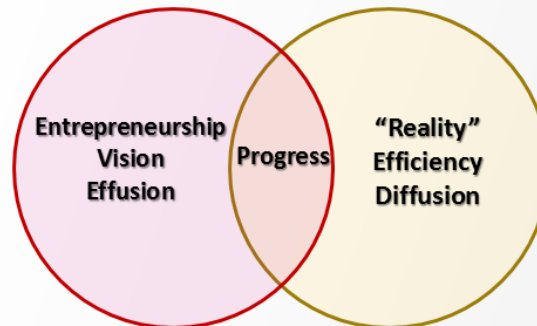
The Innovation-Scientific Method Continuum

	<u>Innovation Method</u>	<u>Scientific Method</u>
Method:	Non-linear (ACB)	Linear (ABC)
Defined by:	Result	Process
Requirement:	Expertise	Knowledge
Focus:	Generate more questions	Answer THE question
Execution:	Dynamic matrix (visualization)	Defined order (analog)
Risk:	Higher	Lower
Outcome:	Breakthrough	Improvement

Innovation



Innovative ↔ Scientific



Adapted from Innovation-Creativity.com, 2014

Scientific



**Innovation drives breakthroughs &
Scientific optimizes the result**



The **ACB**s of Innovative Prospecting

Discovery Processes:

Scientific (ABC) A:Question → B:How →

- Linear, process-driven, & analog-focused



Innovation (ACB) A:Questions

- Non-linear, **C:RESULT**, visualization
- Reiterate back on B:How w/ experts

B:How

3 Key questions

- Why?
- Why not?
- What if?

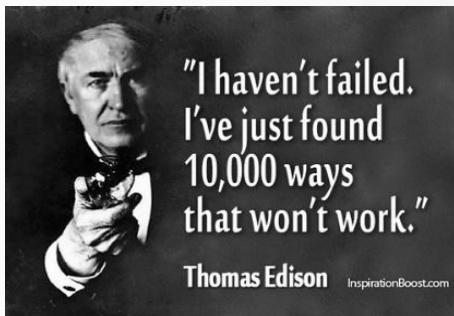


ACB Innovation space



The 3 Fs to success:

- Fail fast
- Fail frequently
- Fail smart



WARNING

(From Masters, J.A., 1996)

- ✓ **Innovation anathema to convention**
"Really new ideas are...usually met with derision & disbelief"
- ✓ **Maintain mental discipline**
"Is this still good?...It's hardest to say no to yourself"

Keys to Achieving Your **C:RESULT**

- Passion, collaborate, learn on the fly, persistence
- Embrace informed & rapid failure – then apply it



Beware “Secret Sauce” (ABC) Models



Coal Bed Methane: San Juan Basin 30-6 Unit

- ✓ Overpressure
- ✓ Thick seam
- ✓ Water, water, water

THE 1992 era CBM exploration model

Then came: Drunkards Wash, Powder River, Raton, Bowen-Surat, etc.

Shale: Barnett Shale Gas

- ✓ Silica (brittle)
- ✓ Open fractures
- ✓ Ro 1.4 – 1.6

THE 2005 era Shale exploration model

Then came: Haynesville, Marcellus, Muskwa, Montney, etc.

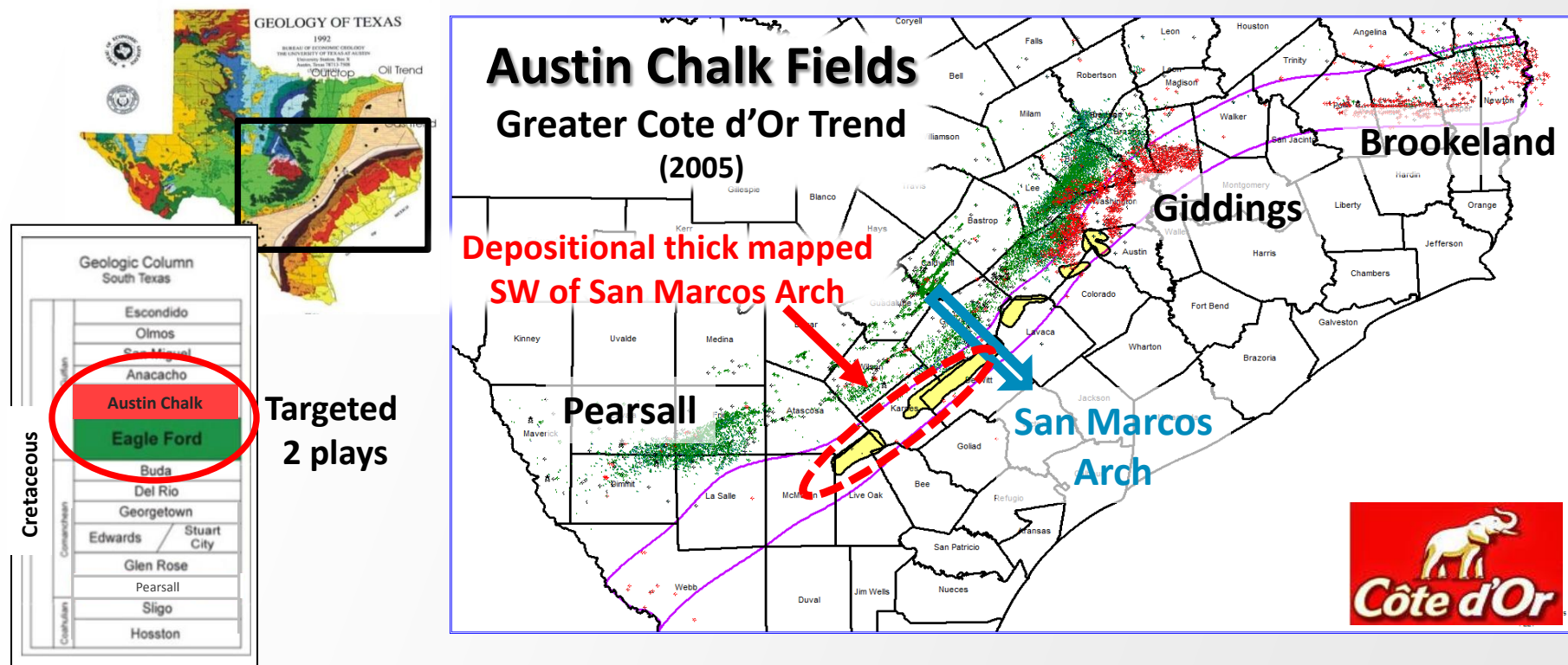


Sooo, why not... (C:RESULT)

An unfractured, carbonate- & liquids-rich play?



ACB @ Work: “Seeing” Differently to (Re)Discover

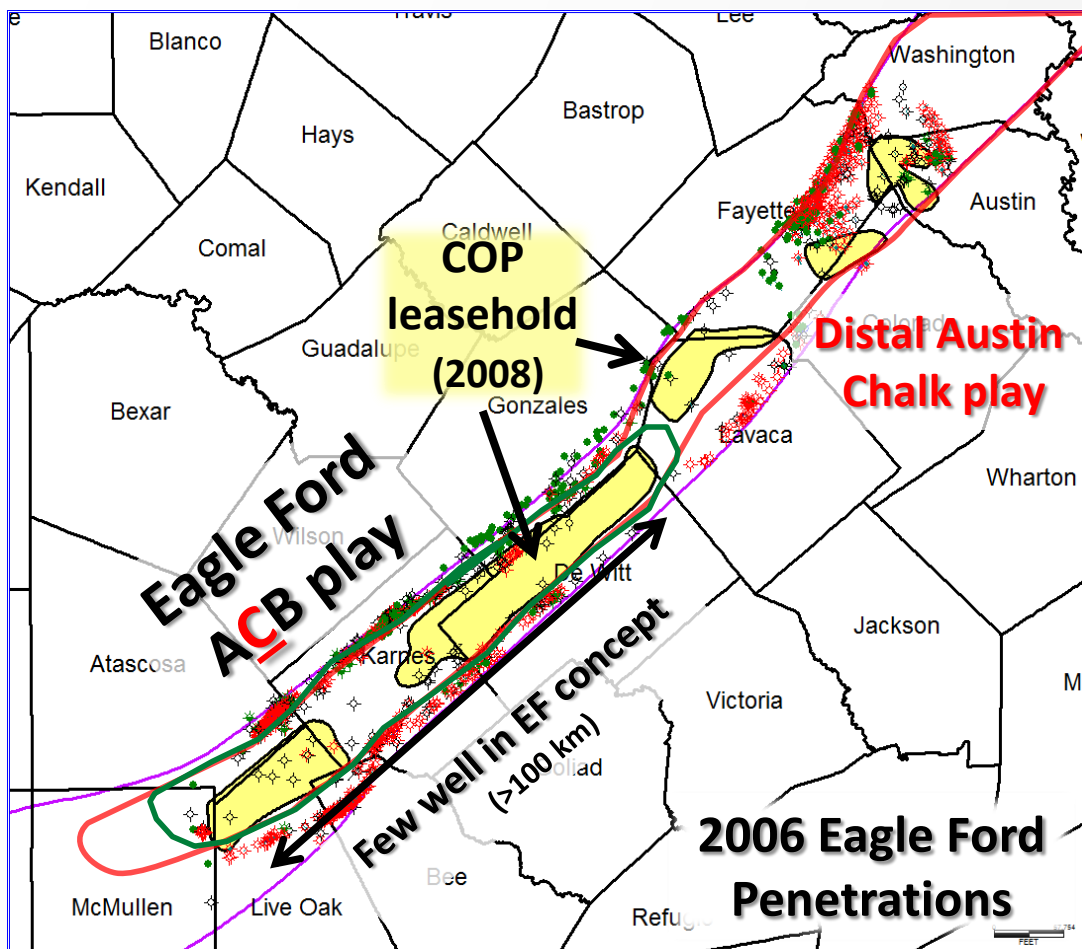


The Eagle Ford was common knowledge (From World Oil, 1Feb1978, P.58)

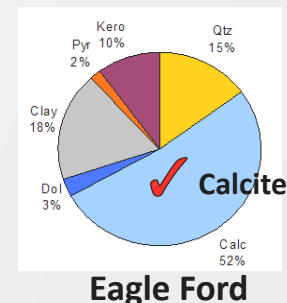
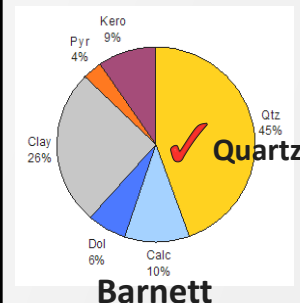
*“The Eagle Ford Shale is full of oil in most locations in the eastern...South Texas counties...it is brittle...black shale...there have been some recent completions...**although by itself, it could not be considered a target...**”*

The Eagle Ford had ALREADY been “discovered” by 1978!

The **ACB** Visualization



In 2005, as Industry focused on the Barnett Shale Gas model,...



Data from NAM SH Consortium, Core Lab, 2012

Play Concept (**ACB**:RESULT)

- World class Turonian source
- Known source for Austin Chalk
- Ubiquitous mud gas shows
- Carbonates prolific reservoirs
- Unstructured homoclinal trend
- Compression vs adsorbed gas
- Focus on vapor phase window
- High resource concentration
- HZ drill & massive completions

Through 6/2008, 320K acres were leased for \$300/acre



Early & Essential Feedback

- ✓ Drilled for 50 years & EVERYBODY missed it?
- ✓ No fractures yet we avoid structures & faults???
- ✓ Can't frac limy mudrock - too soft
- ✓ Too young, tight, deep, hot, & EXPENSIVE
- ✓ Liquids from gas will kill production
- ✓ NO way it can be economic
- ✓ Impossible...where is the sales infrastructure?
- ✓ How can anything be THAT big?
- ✓ That rock can't produce – period ◦

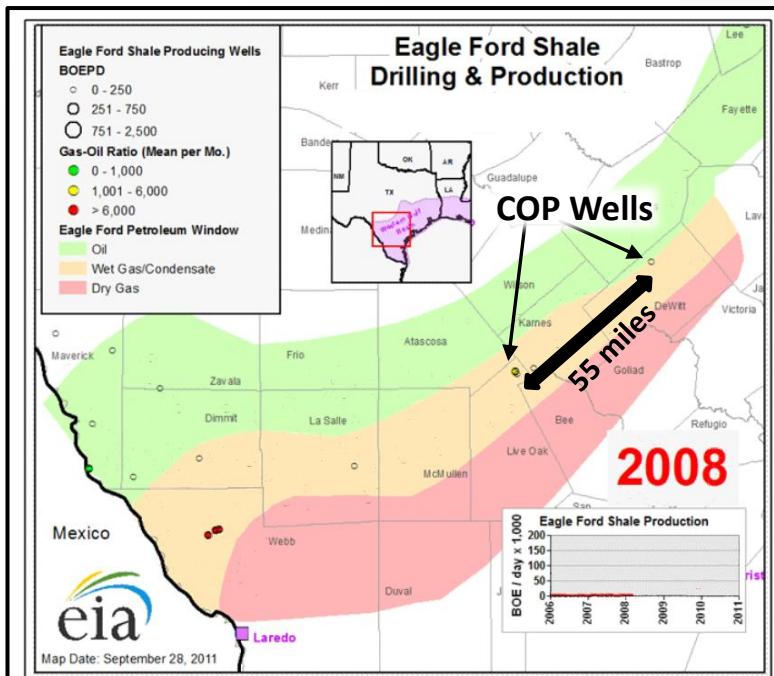


Invaluable, archetypal, & tough ABC feedback, given there was no analog, sharpened an “off-the-wall” idea after “Iterating Back on B:How”

C:RESULT: A dual-objective play with an ABC distal Austin Chalk facies field extension & the ACB Eagle Ford opportunity, both of which are “in the money” today

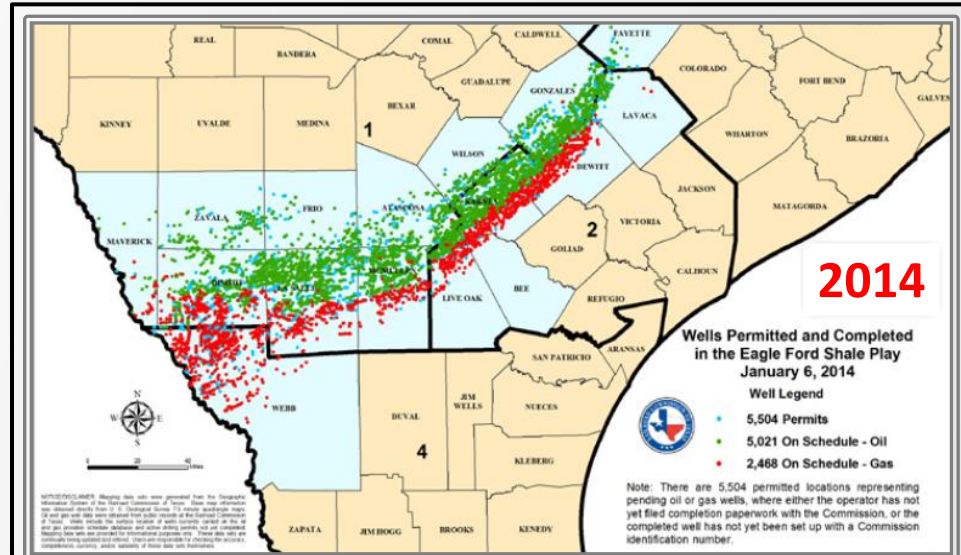


The Eagle Ford ACB Discovery



In 2005, COP/BR began the COP/BR Eagle Ford exploration program. It was the 1st Company to test the play & finished leasing before most companies had entered.

In less than 6 years, the Eagle Ford went from a crazy ACB idea to a world-class discovery



Today over 7500 wells have been drilled, COP is in the best part of the play, & COP acreage transacts @ \$45,000 per acre.

"Nothing in this world can take the place of persistence. Talent will not; nothing is more common than unsuccessful people with talent. Genius will not; unrewarded genius is almost a proverb. Education will not; the world is full of educated derelicts. Persistence and determination alone are omnipotent." Calvin Coolidge

ACB @ Work: Tactics

- ✓ Team of passionate & persistent “heretics”
- ✓ Empowering, long-term Corporate support
- ✓ Fit-for-purpose collaborative Teams
- ✓ Project kept “top secret” for years (unleased for 250 km)
- ✓ Pilot program focused on critical path data
- ✓ Leasing program aligned with pilot results
- ✓ Making & learning from mistakes
- ✓ Creating a unique culture & having fun!



***“Logic will get you from A to B.
Imagination will take you everywhere”***

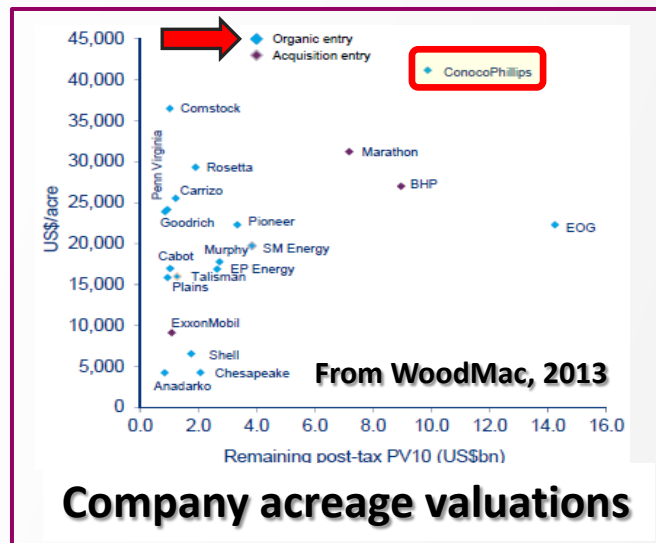
Albert Einstein



The Eagle Ford in 2013

“Eagle Ford - The Best Position in The Best Play”

- Netted 1.8 BBOe - largest organic discovery in COP history
50%+ return; leads industry performance (From COP, 2012)
- \$61B 2012 economic impact & 116,000 jobs
- Play is *“largest single O&G development in the world”* (From UTSA, 2013)



“The Eagle Ford Shale is quite possibly the largest single economic development in the history of the State of Texas”



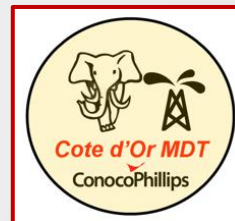
Heartfelt thanks to COP/BR & the “Crack Team” of heretics that never lost the faith & passionately invested years to “pull this off”!



And BRAVO! to: M.Carlisle, A.Celli, M.Commisso, C.Crabtree, A.Cyrus, S.Goehring, T.Hawkins, J.Knaebel, B.Landwer, S.Larkin, G.Leveille, C.Montgomery, D.O'Brien, K.Mouton, P.Schmitz, T.Thornburgh, B.Tillotson, A.Wilkie....(they stayed @ the office & kept working!)



Thank You & Think Unconventional!



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