Beyond the Blue Horizon - A View from Two Perspectives: Technology and Thinking*

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Abstract

What does it take to be a successful exploration company, and carry the burden of being responsible for 'moving the chains of energy progress' forever forward? This article examines that challenge through two very different lenses of historic perspective of the sub-surface; firstly some psychological characteristics and perceptions applicable to successful oil and gas explorers, and secondly, through a more tangible review of physical game-changing technologies that affect breakthroughs. Stepping aside from our industry, three examples are provided from recent history where the prediction of the present day state (their future) can be shown to have been erroneous due to (i) the inability to think beyond the boundary conditions of the time, (ii) being unable to recognize the rate of progress and applicability of existing technologies, and (iii) stubbornness in assimilating the breakthroughs of others so that deployment value of the technology is minimalized in light of competition.

A review of familiar technologies available fifty years ago, in 1965, provides food for thought as to whether we would ever have predicted the nature of their 2015 counterparts. Moving to our industry and particularly Upstream Exploration related technologies, discussion focuses on those that are currently creating considerable change in both the accuracy of detection and observation of petroleum systems, and thus actually change the risk profile of plays and prospects before drilling. Gravity gradiometry and Unmanned Aerial Vehicles (UAVs or 'drones') are used as examples of deployable hardware technologies that are changing the game in multiple Upstream arenas. The other definition of technology, 'the application of scientific thinking to industrial objectives' (i.e. not the gadgetry and gizmos) is investigated through a few examples (not 'Unconventionals') where paradigm shifts in thinking and challenges to the conventional wisdom, have moved the discovery of hydrocarbons and our perception of what is possible, to new heights. On this basis of past and current experiences, the key to keeping 'the powerhouse' fueled well into the future, lies in achieving the best marriage of ideas and technology with the justification foresight to overwhelm the pessimists. If we can continue to deliver this potent combination of insightful perception and increased observational resolution in our data, we are indeed well placed to continue to move 'beyond the blue horizon' for many decades to come.

BEYOND THE BLUE HORIZON

A VIEW FROM TWO PERSPECTIVES: TECHNOLOGY AND THINKING

AAPG ICE

Melbourne, Australia

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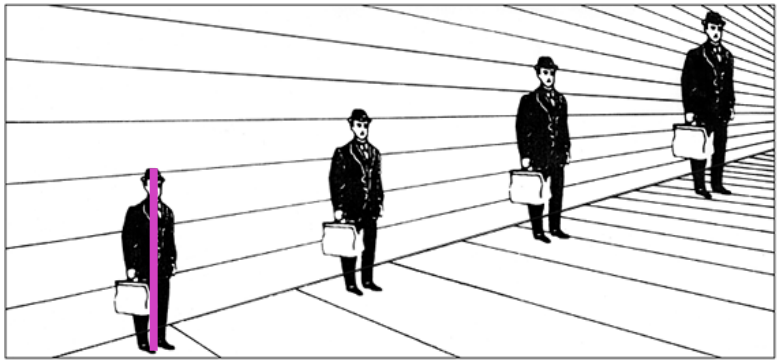
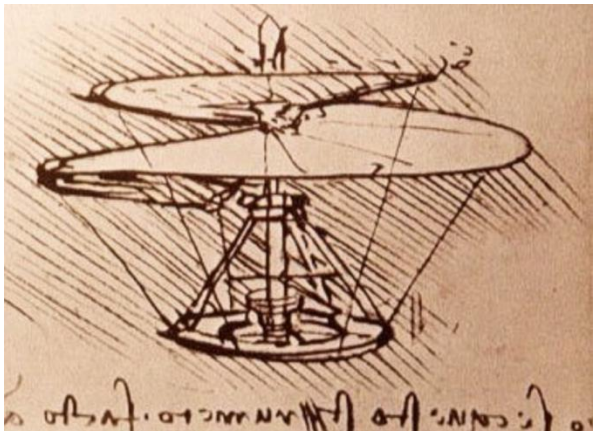
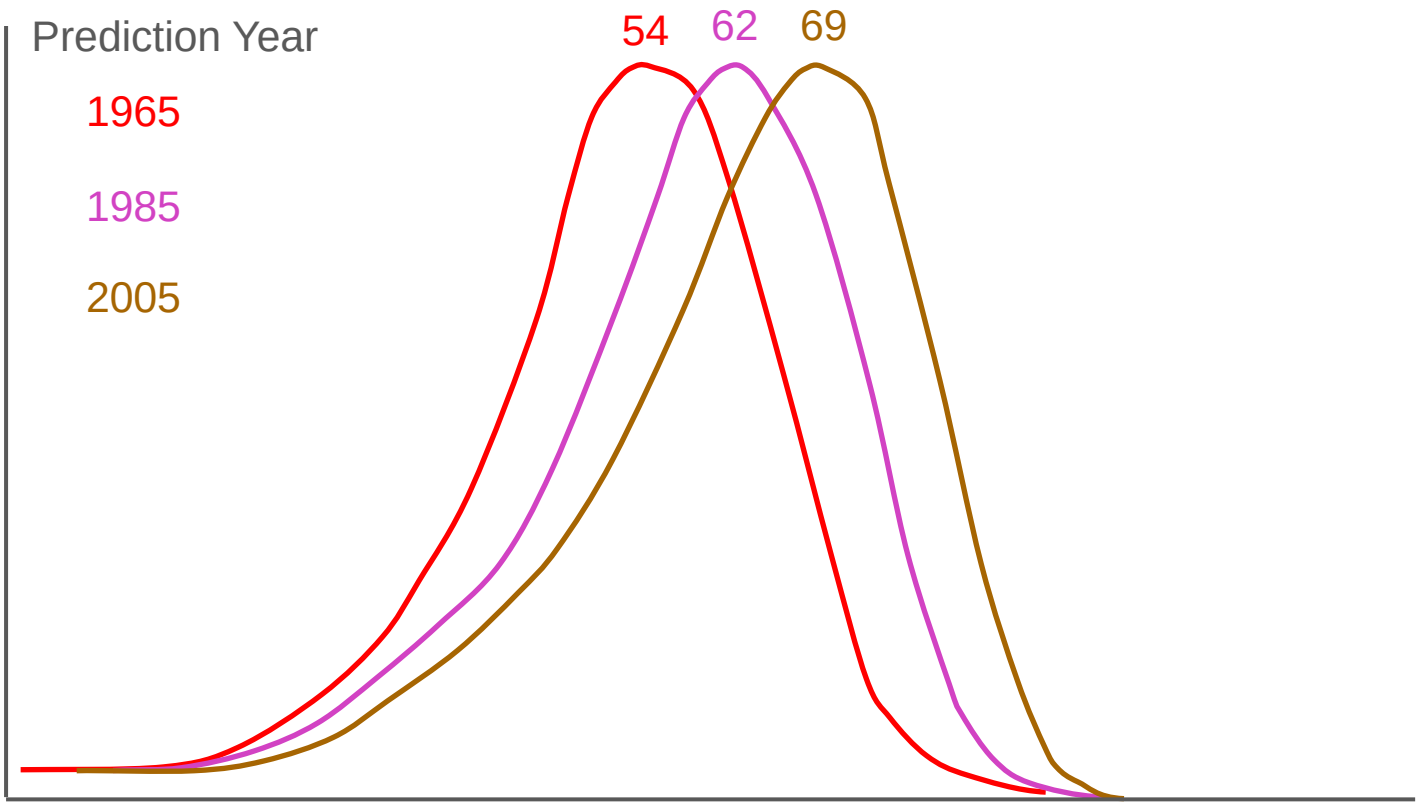
OUTLINE

- Psychological characteristics and perceptio constraints
  - Viewpoints and lenses
- Picking technology winners?
  - 1965 → 2015
- Two technology game-changers
  - Gravity Gradiometry
  - Drones
- The other definition of ‘technology’
  - Paradigm shifts in thinking, unexpected applications of science
- Conclusions



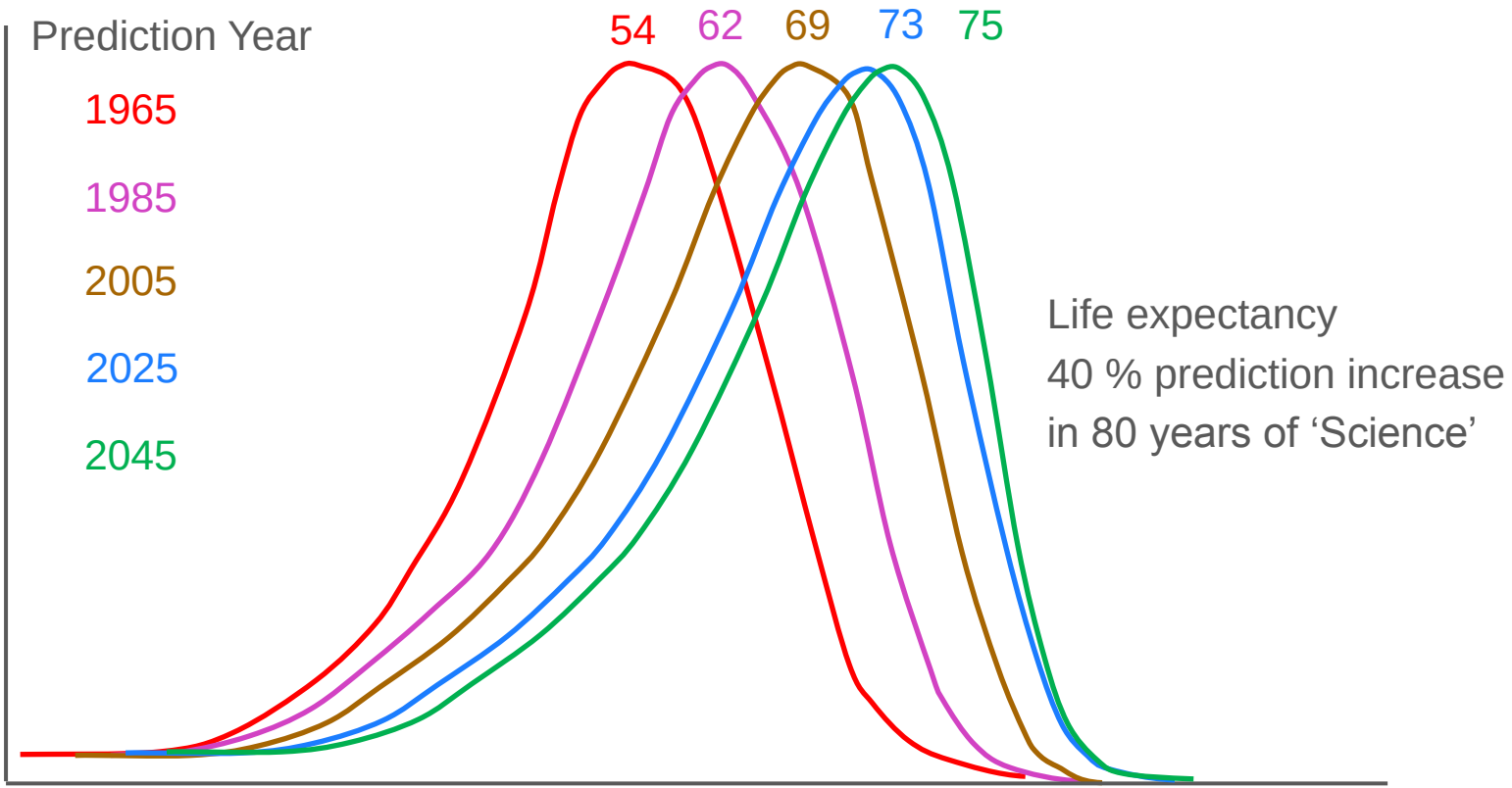


1. INABILITY TO THINK BEYOND THE CURRENT BOUNDARY CONDITIONS



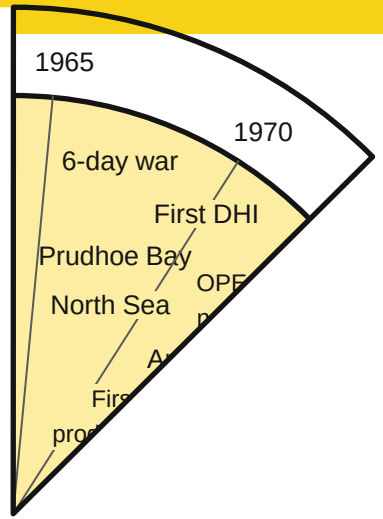
WHEN HAS HISTORY LET US DOWN ON FUTURE PREDICTION?

LIFE EXPECTANCY AT BIRTH – SE ASIA



Sources: UN World Population Prospects, 2008. US Social Security Actuarial Life Tables, 2010.

2. EARLIER THAN YOU THINK

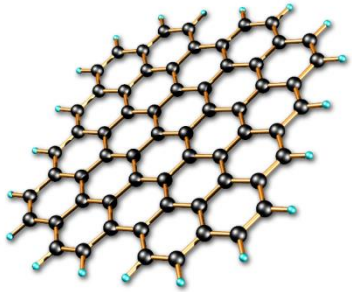


3. RATE OF PROGRESS AND RELEVANT APPLICATION

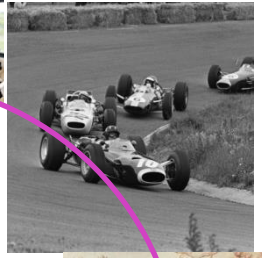
Some things are hard to improve upon

Some have been improved

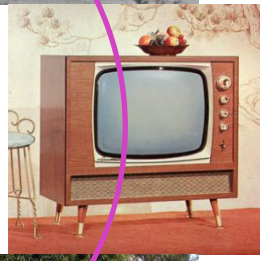
Some are just scientific revolution



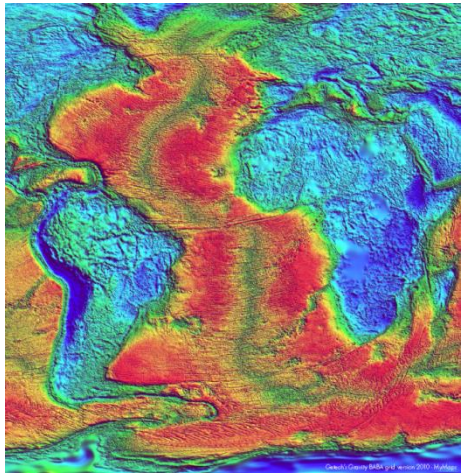
1965 TECHNOLOGY

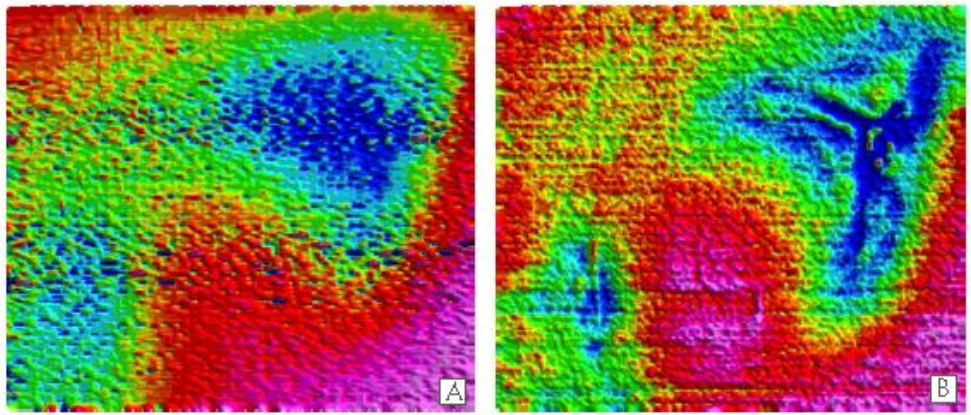


1965



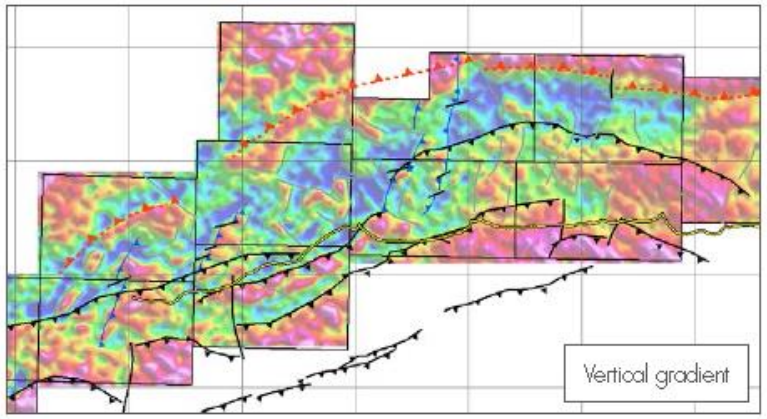
GRAVITY GRADIOMETRY: BASIN & PLAY DE-RISKING



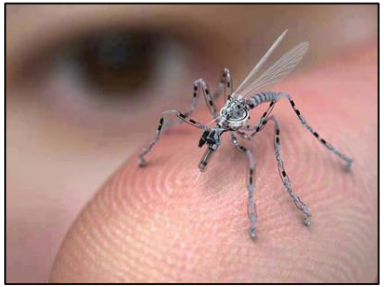


Comparison of spatial resolution (A) standard gravity and (B) gravity gradient

- Measures gradients
- Removes instrument motion errors/noise
- Improves accuracy and spatial resolution
- e.g. improved structural fidelity
- e.g. depth to basement granularity



DRONES



proven technology (already 10 years old)

scalable size … scalable payloads

multiple uses, multiple benefits (cost, human safety mitigation)

challenges include data chain of custody, regulations

QUICK QUIZ

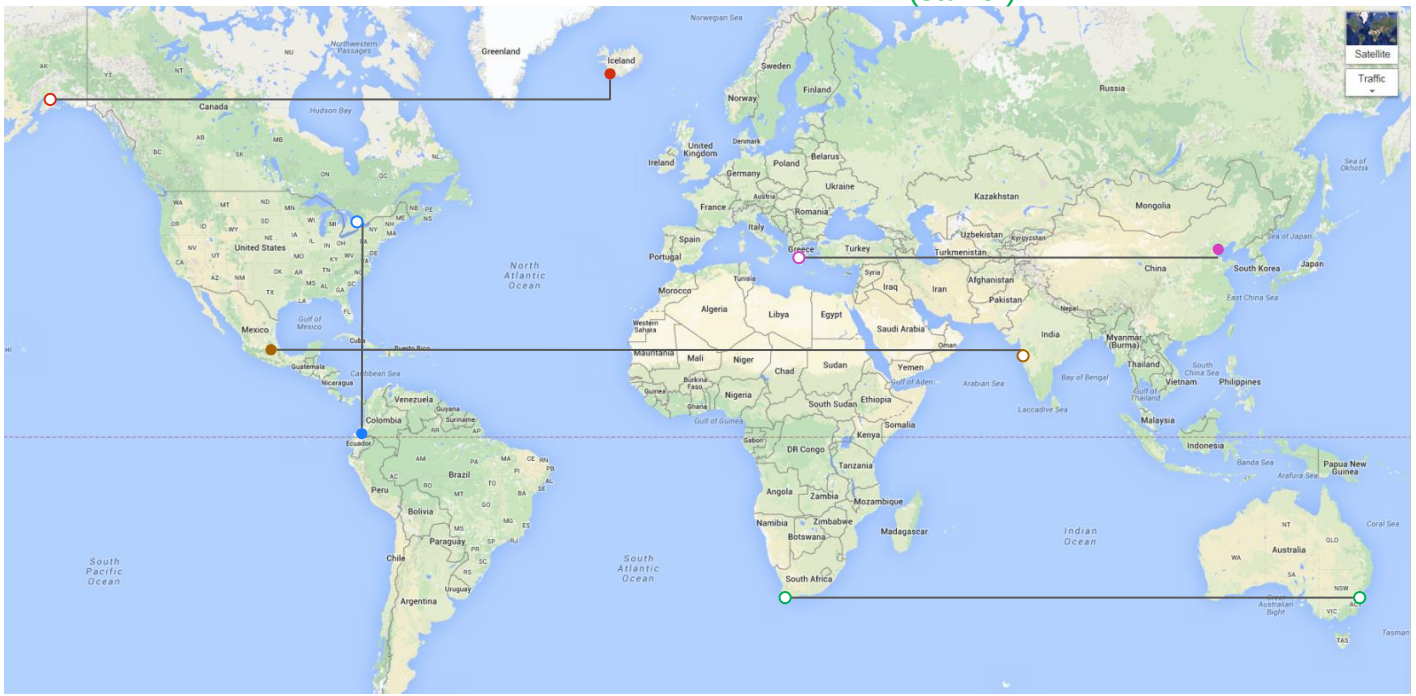
- Furthest North — Mexico City or Mumbai
- Athens or Beijing — Anchorage or Reykjavik

- Furthest East — Toronto or Quito
- Furthest South (same!) — Cape Town or Sydney

PARADIGM THINKING

- Furthest North — Mexico City or Mumbai
- Athens or Beijing — Anchorage or Reykjavik

- Furthest East — Toronto or Quito
- Furthest South — Cape Town or Sydney (same!)

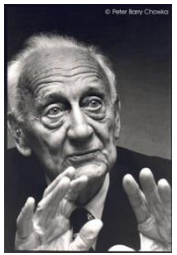


A ‘WRONG’ PREDICTION

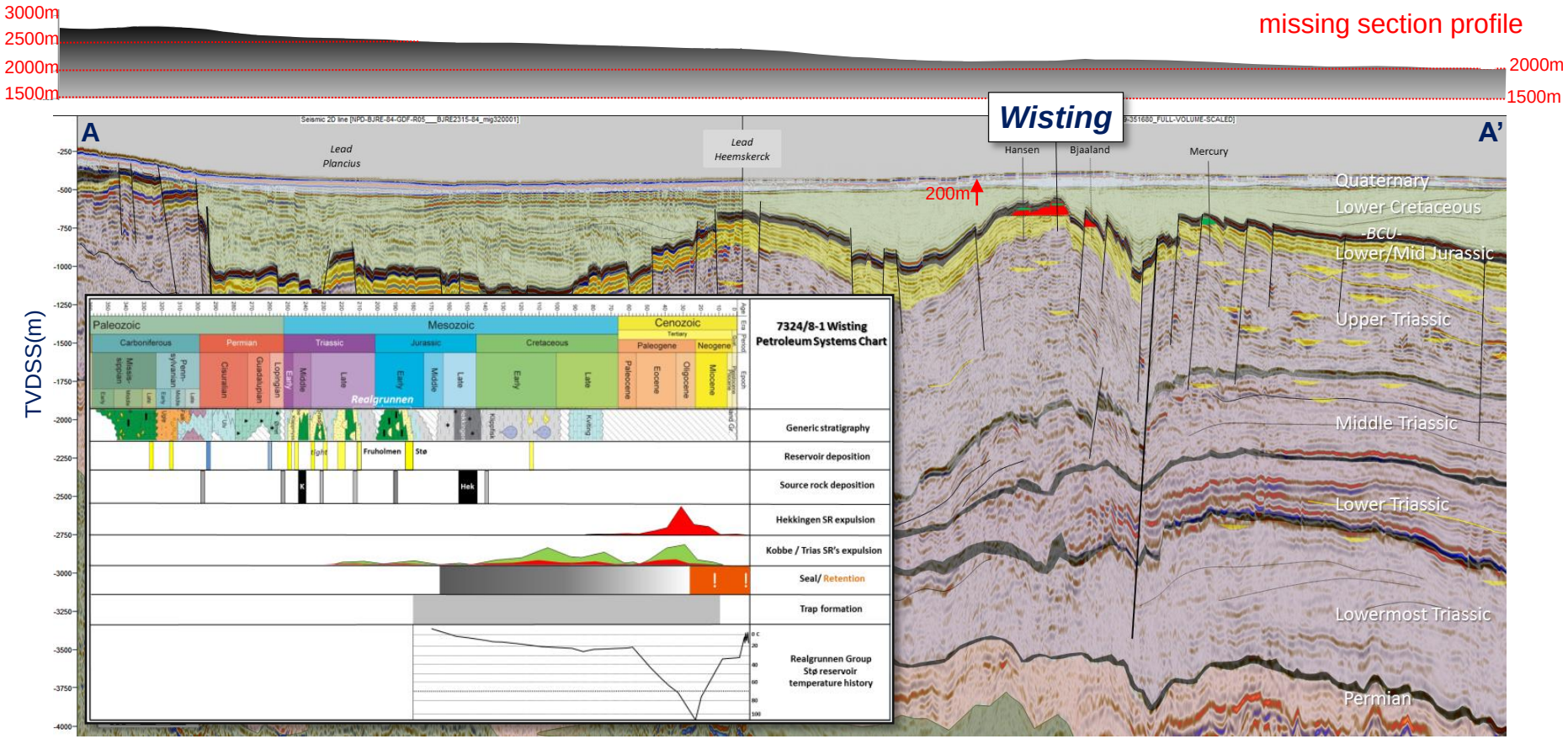
Ingenuity
Nanotechnology
Robotics
Chemistry
Extra-terrestrial resources

Climate change
Domestic water
Carbon management
Land use
Commodity economics

“***Discovery consists in seeing what everyone else has seen and thinking what no one else has thought***”, so said Albert Szent-Gyorgyi (1894 -1986), 1937 Nobel Prize winner in Physiology and Medicine for his definitive work on understanding Vitamin C

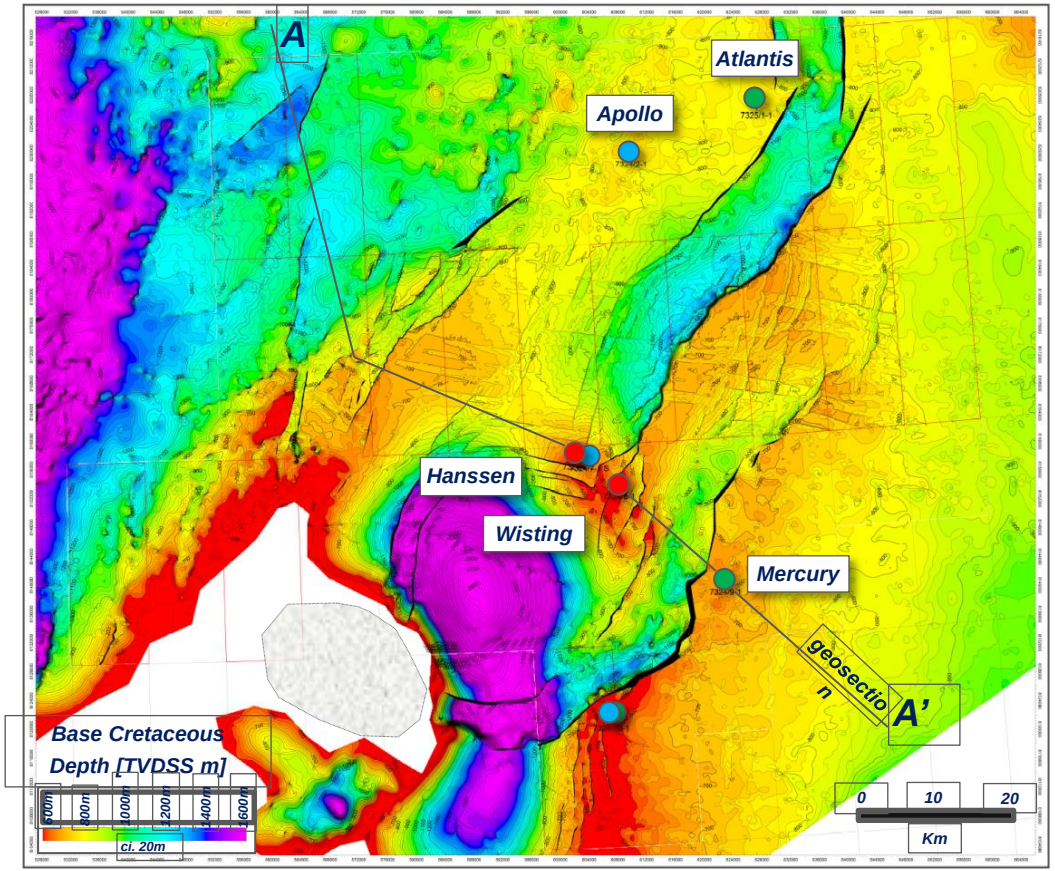


MOST PEOPLE DIDN'T THINK THIS WOULD WORK



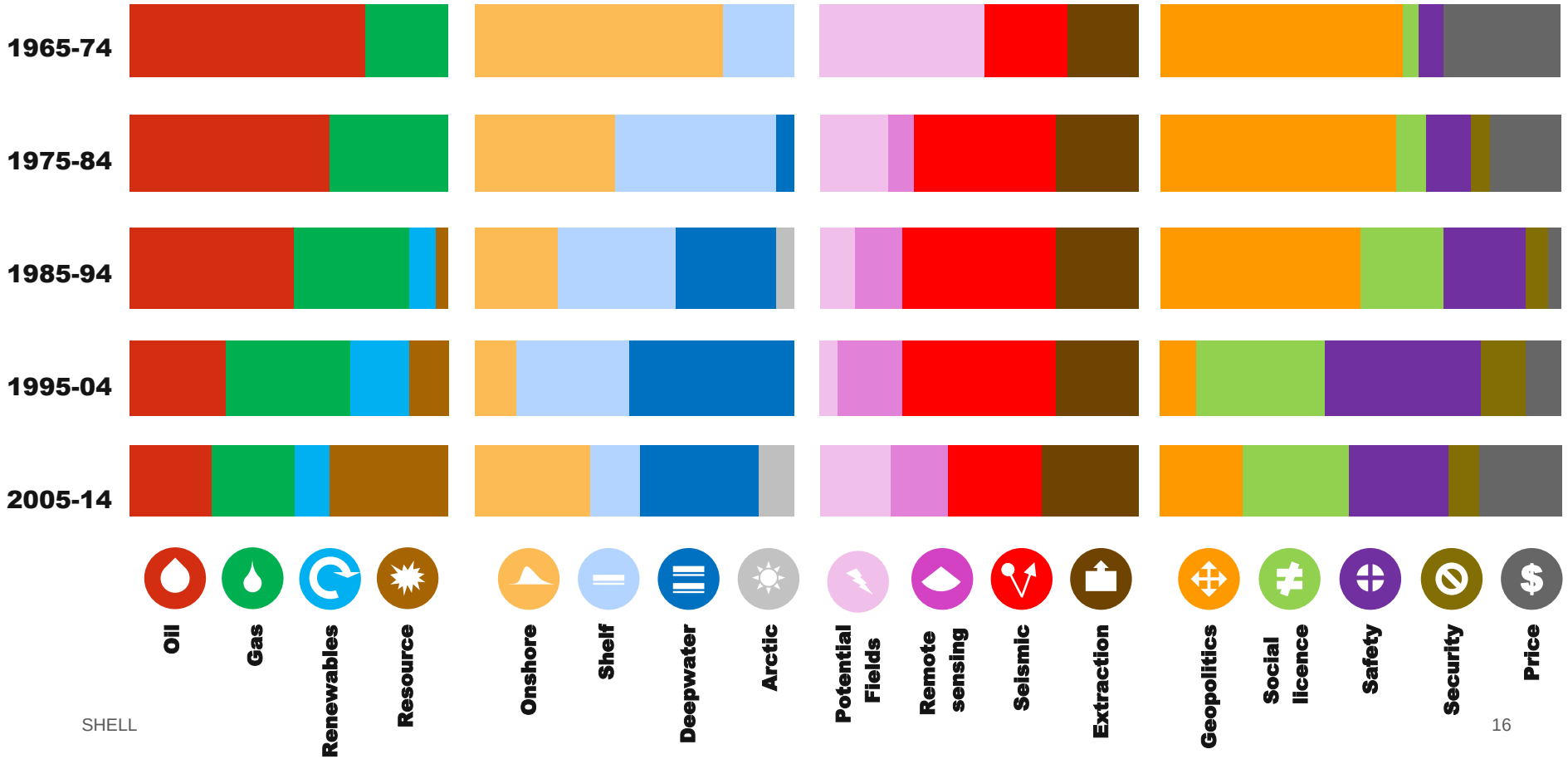
The *Wisting* discovery of Hoop area, Barents Sea, Norway

“ DIDN’T EXPECT THAT! ”

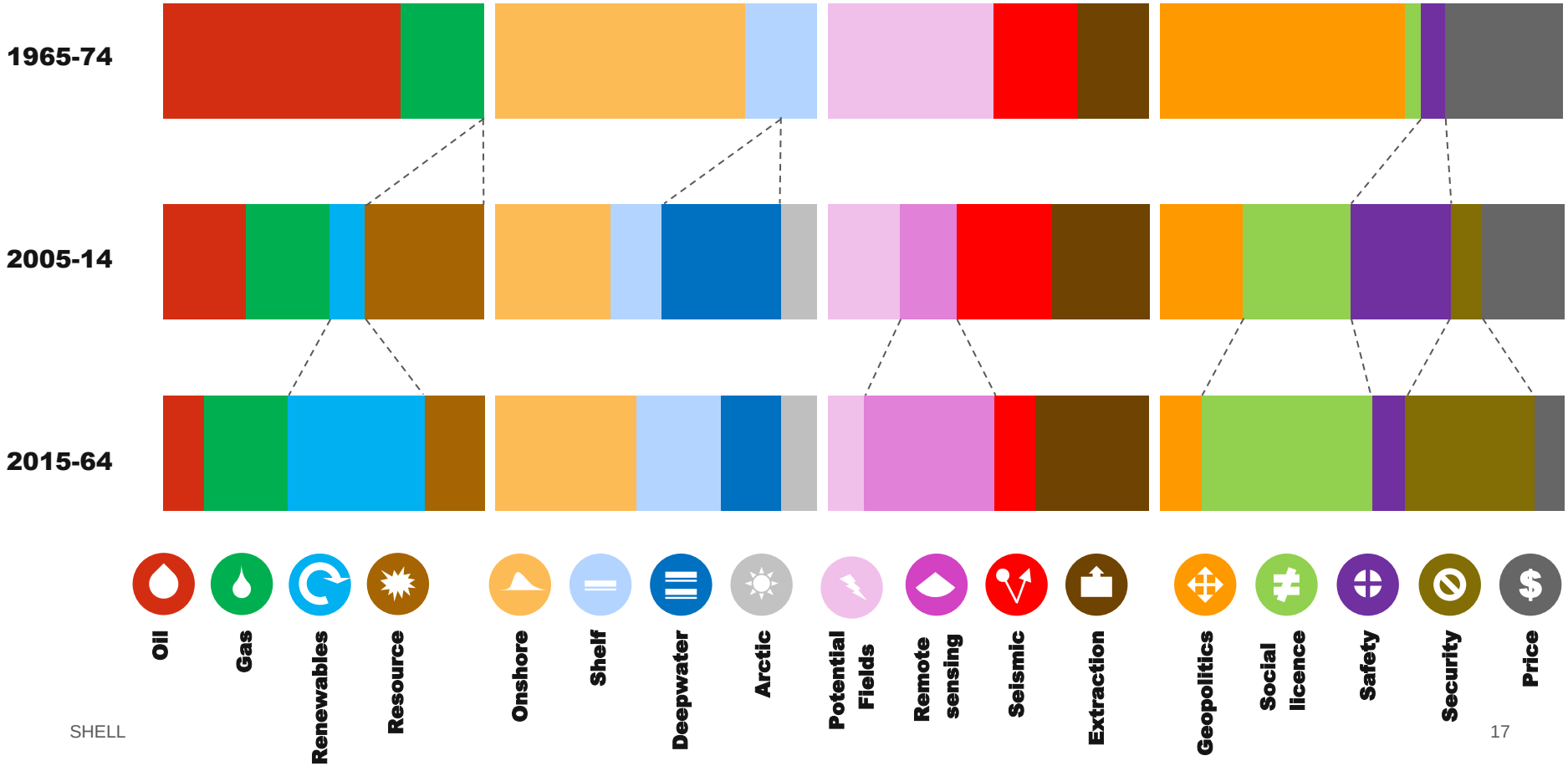


- Wisting and Hanssen shallow oil discoveries
  - *just 200m below mudline*
  - *18m gas, 78m oil column*
  - *STOIIP/UR: 670/270 mmbbls*
  - *Excellent reservoir, 25% por, Darcy sands*
  - *39 API oil, 1-2cp, no biodegradation, successful test*

5 DECADES OF UPSTREAM FOCUS



ANOTHER ‘WRONG’ PREDICTION



SUMMARY

- If the last 50 years of history teaches us anything… it's that only some of the issues to face the oil and gas industry will actually be predictable with lead time… the rest will just happen
- … but geoscientist/engineer ingenuity will prevail
- Invest early in technology to polarize risk and reduce uncertainty
- … technology comes in many flavours and ISN'T just new gadgets, often old gadgets re-applied
- Un-learn your paradigms

Moses viewing the Promised Land – Frederic Edwin Church