

# **Not Your Father's Oilfield: How Technology is Changing Things\***

**Rod Nelson<sup>1</sup>**

Search and Discovery Article #120029 (2009)

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\*Adapted from presentation at Public Forum: America's Energy Heartland, America's Energy Future, at AAPG Mid-Continent Section Meeting, October 13, 2009

<sup>1</sup>Vice President of Communications, Schlumberger Limited, Houston, Texas ([rodnelson@slb.com](mailto:rodnelson@slb.com))

## **Key Concepts**

Technology development today is global and connected.

Four key drivers for technology needs

- Known reserves - Yet to be explored - Deep and harsh environments - Unconventional hydrocarbons

The value of technology integration

- Pre-drill – Prognosis - Data acquisition while drilling - Drilling operations support center - Integrated drilling - Update

Integration of resources and data (e.g., maximizing reservoir contact – multi-stage frac with microseismic monitoring)

- Major enabler for unconventional gas - Greater understanding of frac treatments - Fracture length - Fracture orientation - Zonal differences – Asymmetry - Real-time interpretation and control

Smart materials that respond to their environments

Nano-composites

Wireless power

Complex multiphase flows...at all scales

Biomimetics: Architectures from nature

- Conventional tool and sensor architectures face hard limits in size, cost
- Nature achieves sensing and response through very “simple” designs

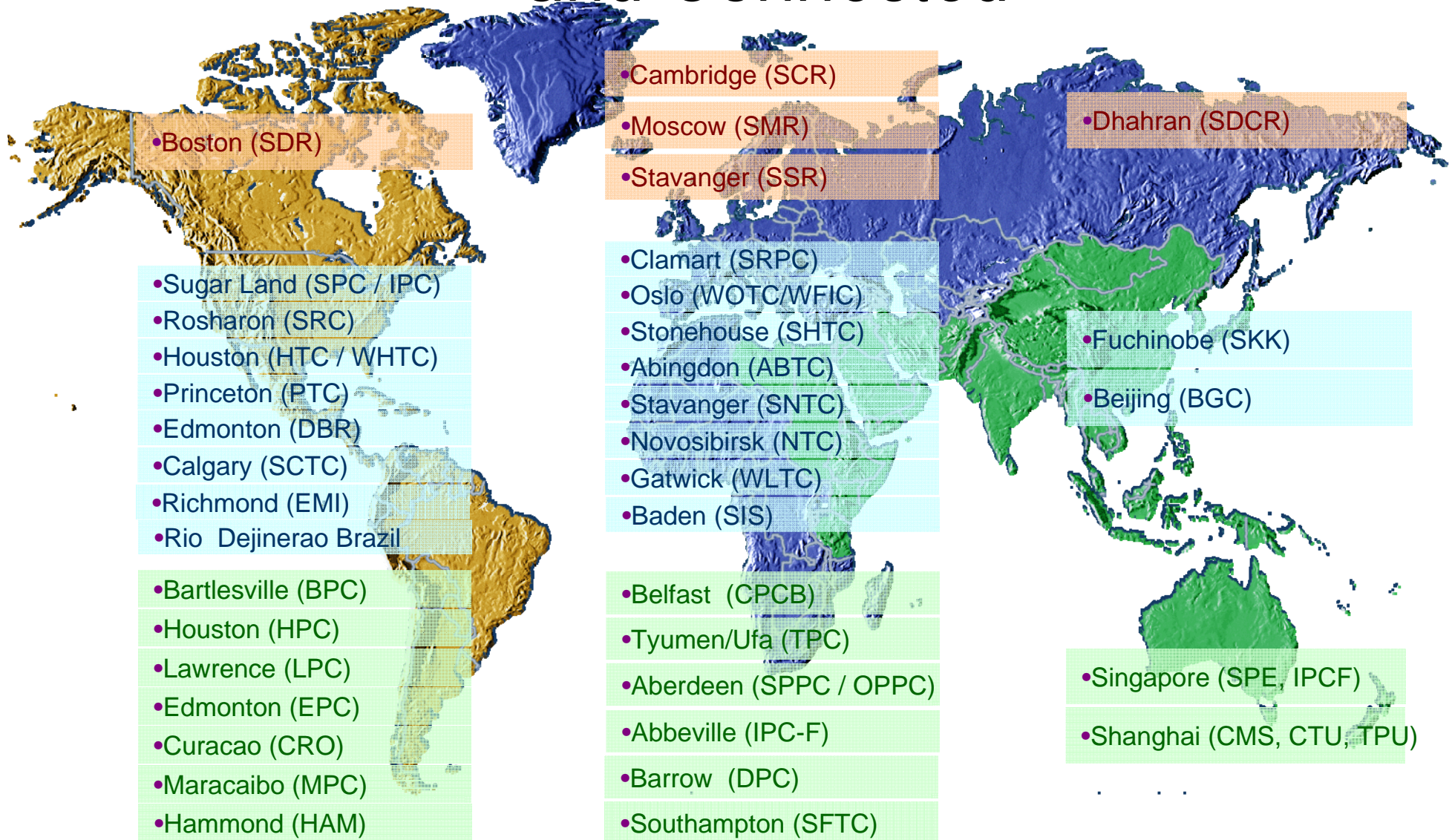


# Not Your Father's Oilfield

## How Technology is Changing Things

Rod Nelson, Schlumberger  
AAPG Mid-Continent Section Meeting  
October 13, 2009

# Technology Development Today is Global and Connected

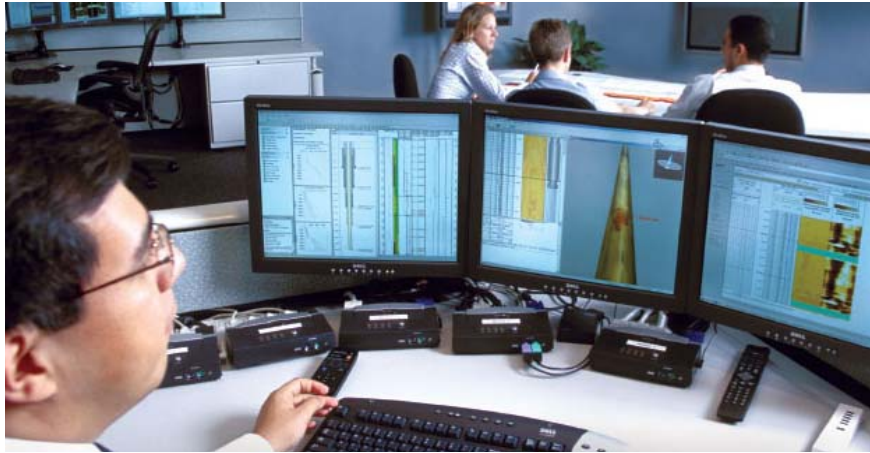


## Schlumberger's R&D Organization

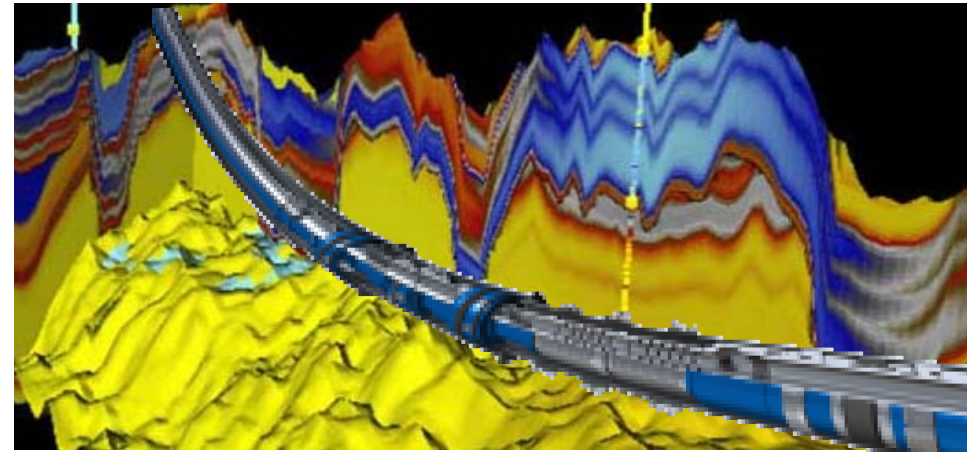


# Four Key Drivers for Technology Needs

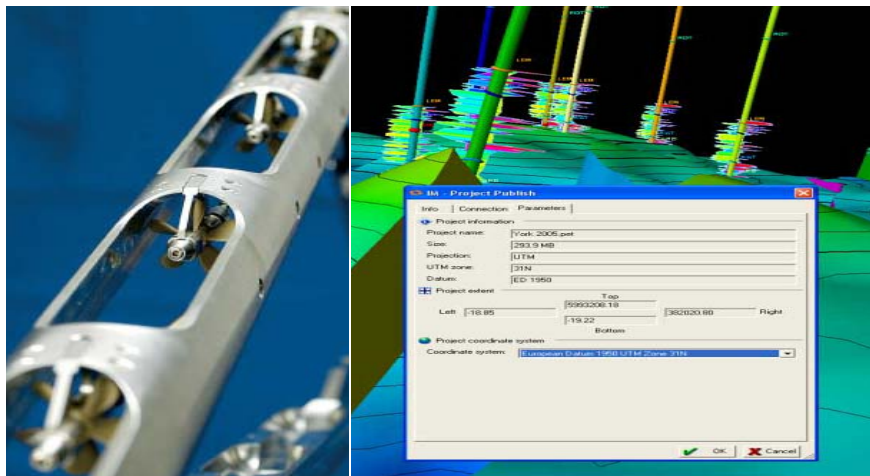
Known Reserves



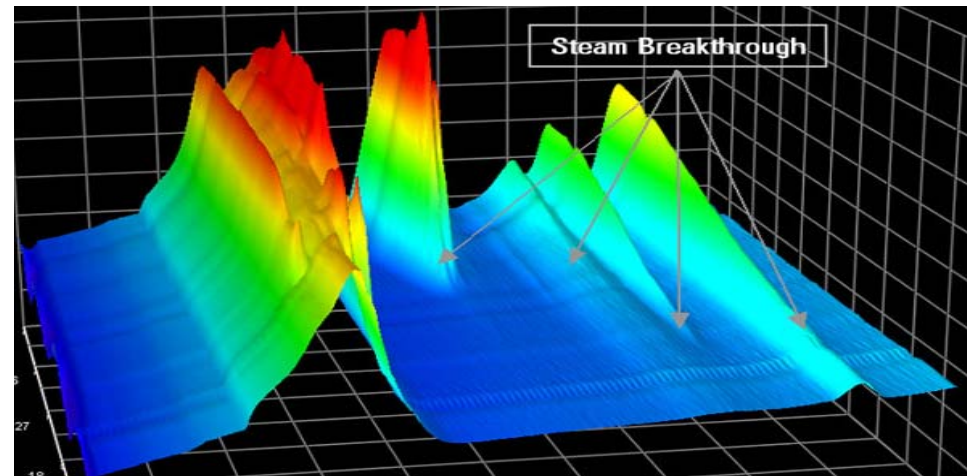
Yet to be Explored



Deep and Harsh Environments



Unconventional Hydrocarbons

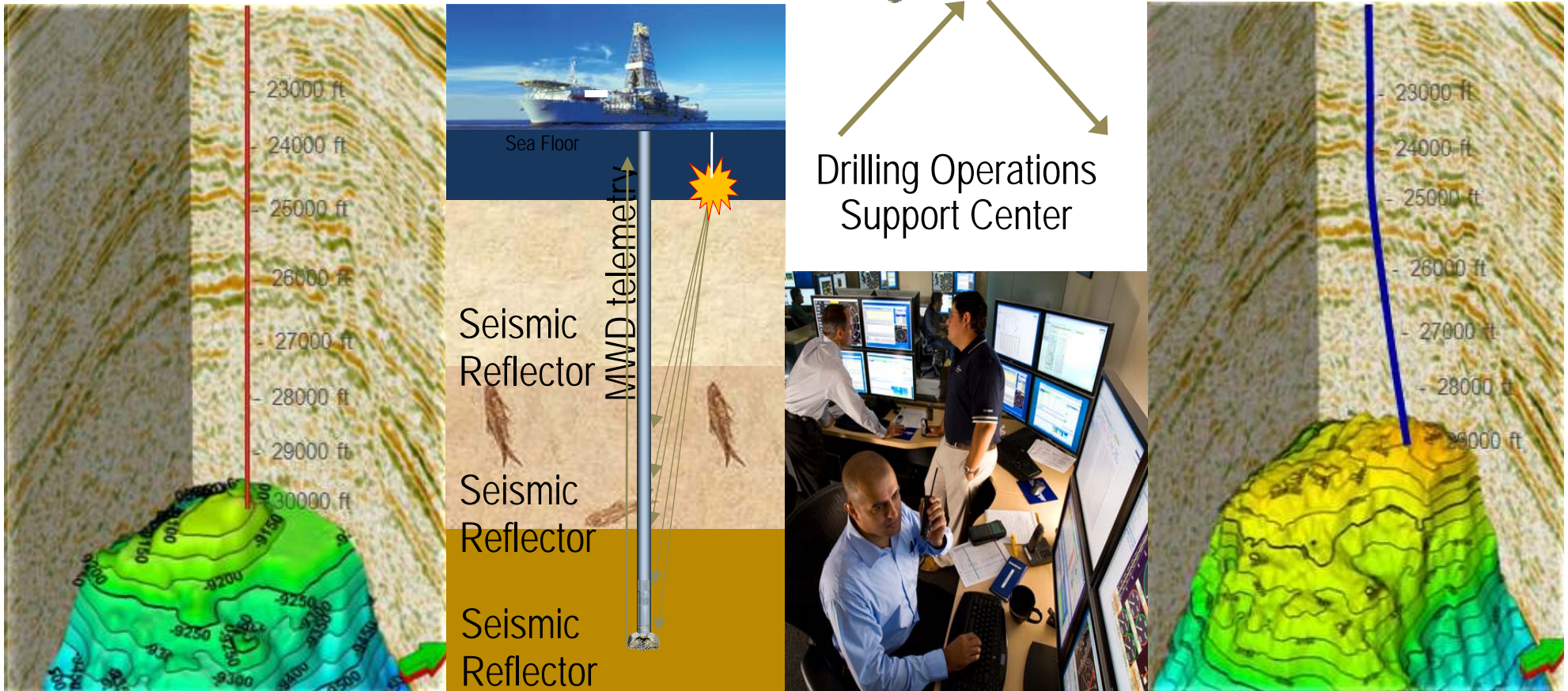


# The Value of Technology Integration

Pre-Drill Prognosis

Data Acquisition While Drilling

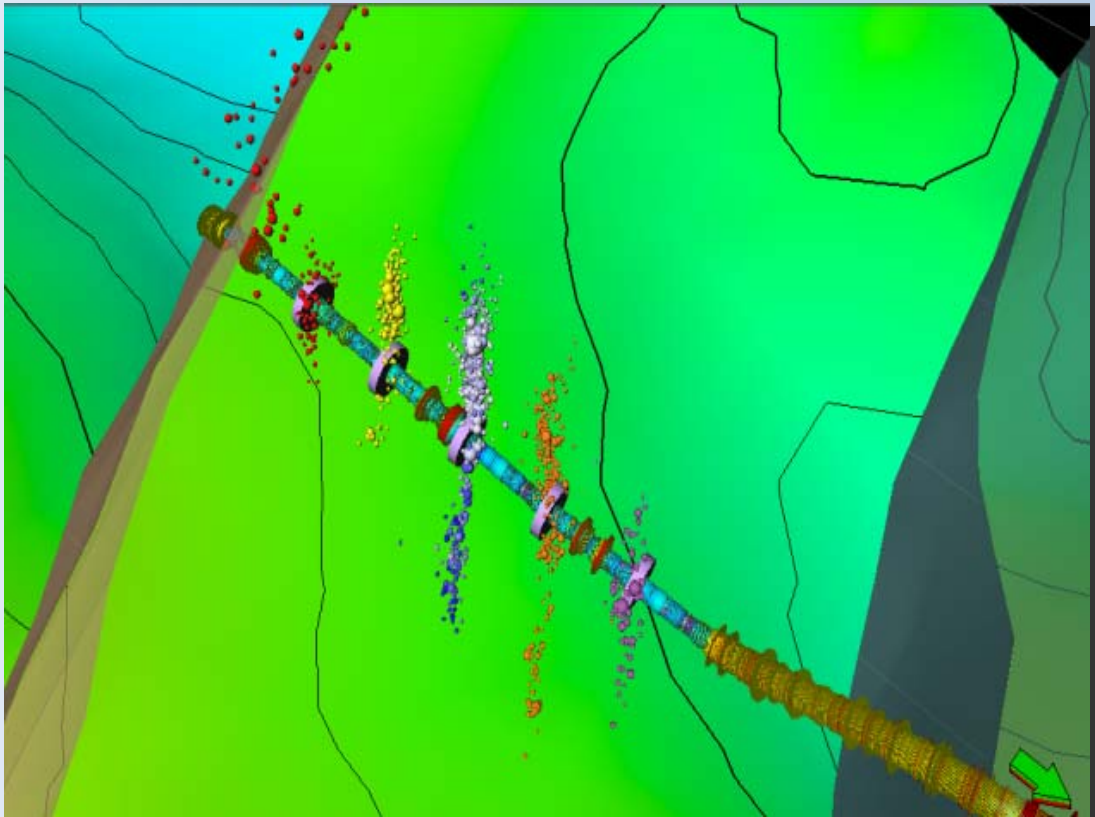
Integrated Drilling Update



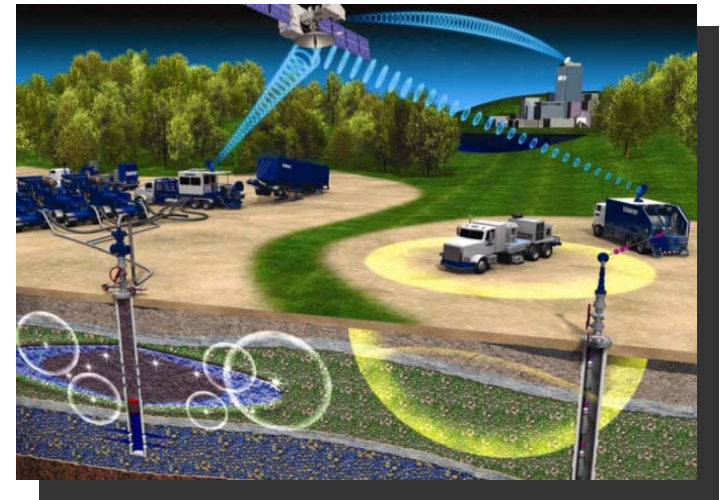


# Integration of Resources & Data

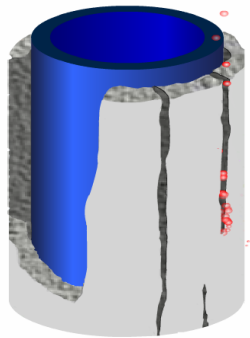
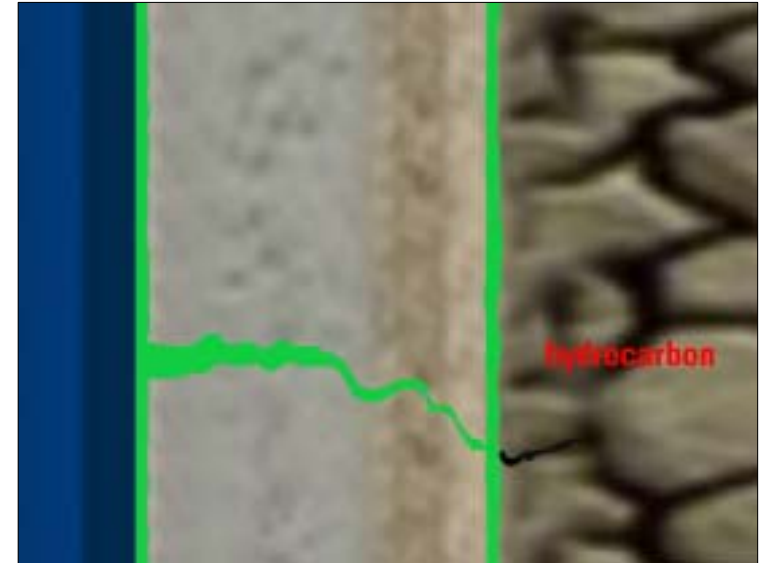
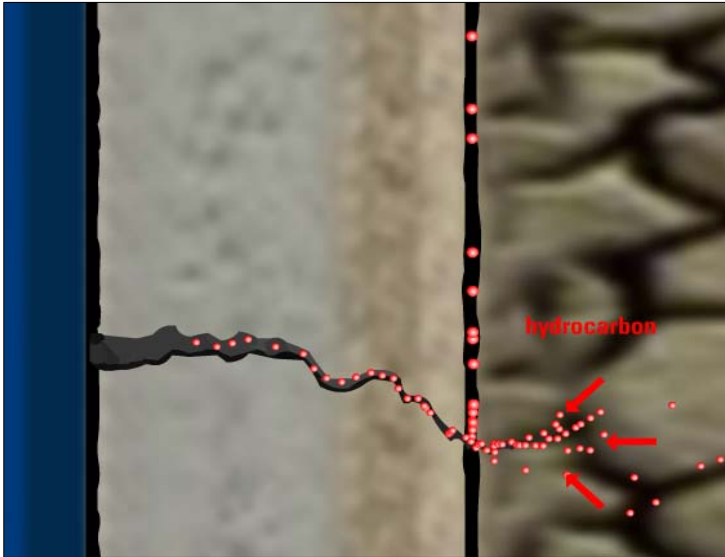
## Maximizing Reservoir Contact – Multi-Stage Frac with Microseismic Monitoring



- Major enabler for Unconventional Gas
- Greater understanding of Frac Treatments
  - Fracture length
  - Fracture orientation
  - Zonal differences
  - Asymmetry
- Real-time interpretation and control

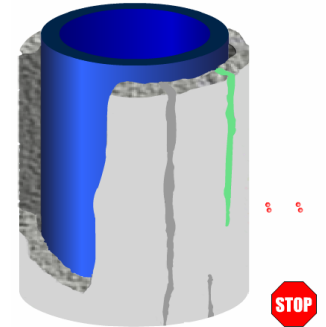


# Smart Materials that Respond to their Environments

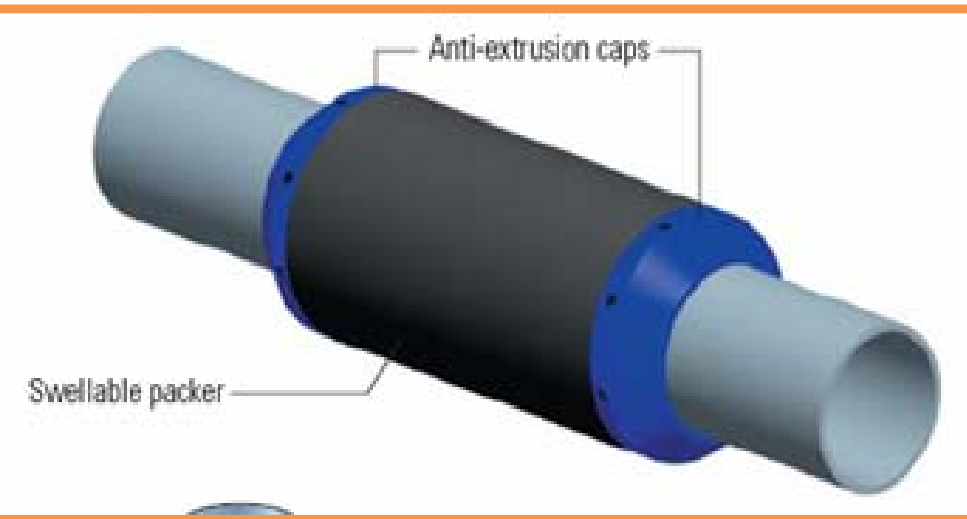


To go from  
a leaking  
well to....

...the  
*automatic*  
sealing of the  
well from leaks



# Nano-Composites




**standard elastomer**

**with embedded CNT**




# Wireless Power



Wireless Electricity Delivered Over Distance

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- WiTricity Blog (coming soon) ▾



Imagine a future in which wireless electricity makes everyday products more convenient, reliable, and environmentally friendly.


Cell phones, game controllers, laptop computers, mobile robots, even electric vehicles capable of re-charging themselves without ever being plugged in. Flat screen TV's and digital picture frames that hang on the wall—without requiring a wire and plug for power. Industrial systems and medical devices made more reliable by eliminating trouble prone wiring and replaceable batteries. WiTricity Corp. is working to make this future a reality, developing wireless electricity technology that will operate safely and efficiently over distances ranging from centimeters to several meters—and will deliver power ranging from milliwatts to kilowatts.

WiTricity Corp.'s vision is to develop a family of wireless electric power components that will enable OEM's in a broad range of industries and applications to make their products truly "wireless." Wireless electric power delivered over room scale distances, and with high efficiency. Wireless electric power that is safe for people and animals. Wireless electric power—imagine no more... it's here!

**News Coverage**


"Though WiTricity uses bee cells — one powered, one not, just like a Coupled's system — it differs radically in the following way: Solajali's coils don't have to be close to each other to transfer energy. Instead, they depend on so-called magnetic resonance. Like acoustical resonance, which allows an opera singer to break a glass across the room by vibrating it with the correct frequency of her voice's sound waves, magnetic resonance can launch an energetic response in something far away."

- *Fast Company*, February/March, 2009, "Wireless Electricity is Here (Seriously)"




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**Powercaster transmits common radio waves**



**Wirelessly powered devices with embedded Powerharvester module**

**TRUE WIRELESS POWER**

Powercast's products deliver true wireless power for continuous charging and power-over-distance for one or multiple devices. Enable your device to become **finally untethered**.

[Read More »](#)

**MICRO-POWER CHARGING SYSTEM**

Powercast components integrate seamlessly with power distribution and storage systems for micro-power electronic devices such as wireless sensors (WSN) by delivering **MICROWATTS to MILLIWATTS** without wires.

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**INTEGRATE OUR TECHNOLOGY**

Powercast technology enables unique product enhancement, product differentiation, and market extensions. We are continually building a roster of strategic collaborations that benefit from wireless power and continuous charging.

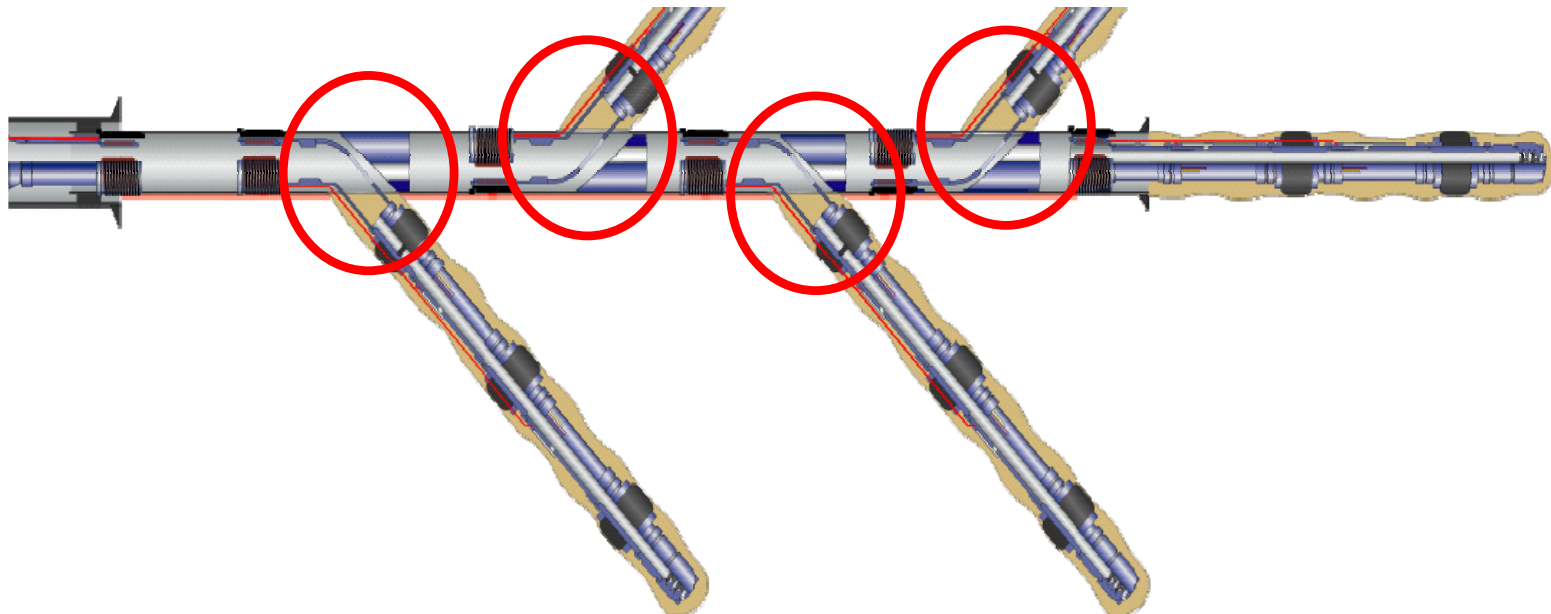
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**EXPERIENCE THE FUTURE**

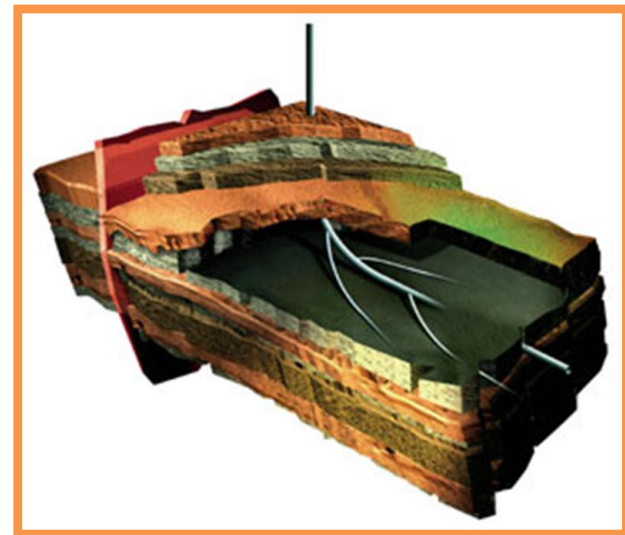
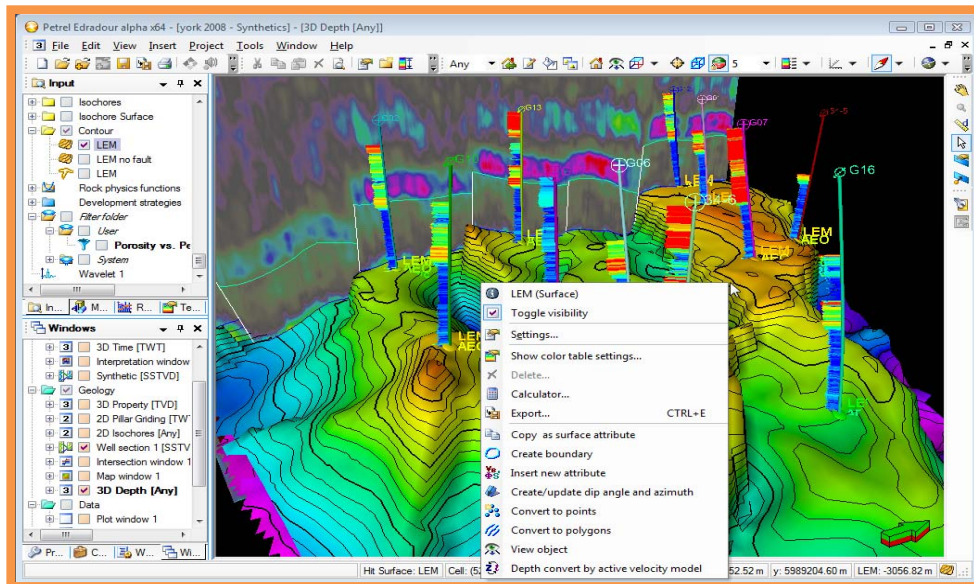
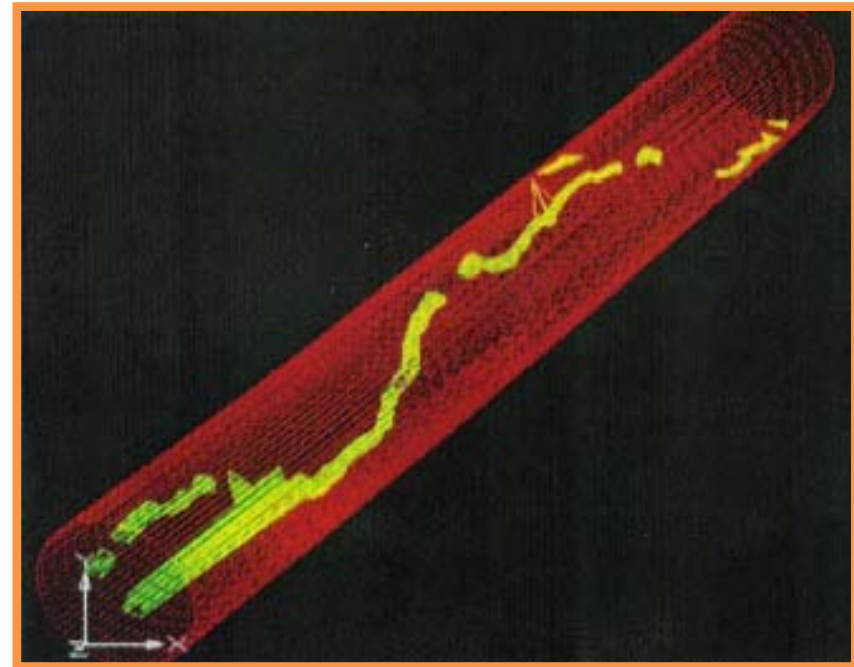
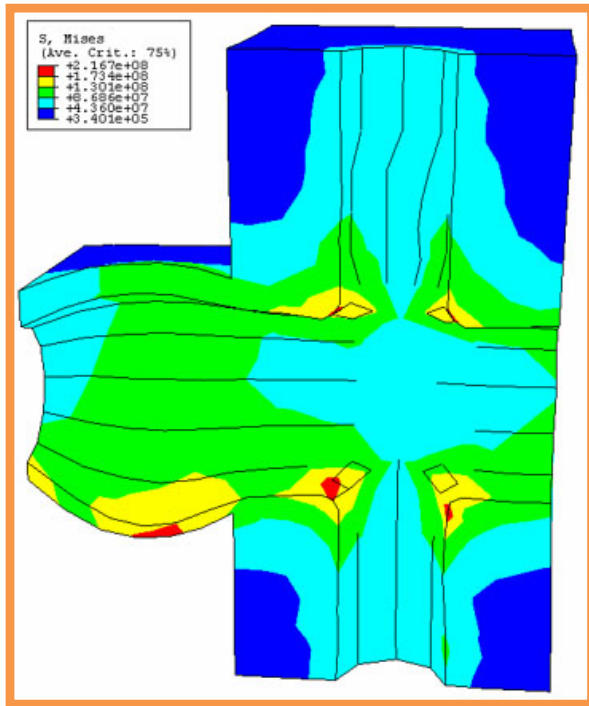
Qualified potential partners can self-discover and rapidly prototype using Powercast's wireless power technology by purchasing a Lifetime Power Evaluation and Development Kit.

[Read More »](#)

Optimize energy consumption with remote sensors + Enable zero stand-by devices + Eliminate batteries and contaminants from landfills = Eco-Friendly Renewable Power



# Complex Multiphase Flows...at all scales

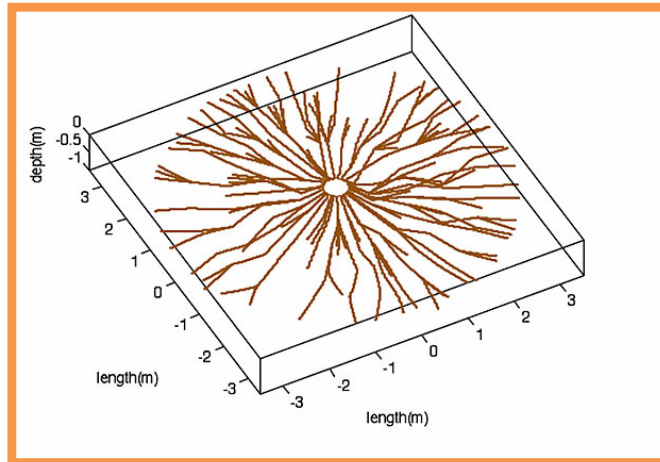


# Biomimetics: Architectures from Nature

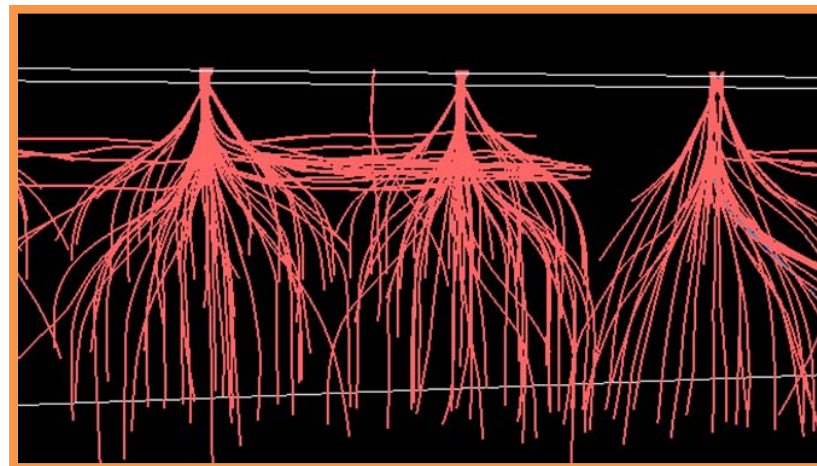
- Conventional tool and sensor architectures face hard limits in size, cost
- Nature achieves sensing and response through very “simple” designs



*Cyanea fleckeri*, a type of box jelly, catches a meal. How this jelly's body is so transparent that it is invisible — the perfect camouflage when in the open water. (Photo courtesy of Paul Land, Other World Images)



Radar Image of Tree roots...



...wells drilled offshore California



# We Need the Best and the Brightest



America's Energy Future



### **Note Accompanying Slide 10**

Biomimetics = “Mimicking Biology”. Why would we want to do this?

We are already going the “miniaturization” route for the conventional “torpedo” geometry of wireline and D&M tools.

But in other Segments, where we may have to deploy in difficult geometries (e.g. WS in fractures), or massive deployment (WG for land seismic), a completely different paradigm may be better.

Nature is pretty smart about doing things with very little complexity; e.g., top right is the Venus Fly Trap, which has one of the fastest response times known (either man made or natural) with very little “general intelligence.” Similarly, jellyfish stingers achieve the fastest response times known, with almost no neurones or brain.

One can imagine jellyfish-like sensors for fracturing which “feel or sense the frac.”

How about steering a streamer with very elementary reflex-like responses, rather than lots of control and AI? Might be a lot more fault-tolerant. Having distributed, basic intelligence might be a lot better than very complicated centralized control.

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