

## INTERVIEW

# Ear to the ground

Ernst and Young's Entrepreneur of the Year in Energy, Peter Duncan, speaks to *InnovOil* about his pioneering work with MicroSeismic and his thoughts on industry innovation and entrepreneurship

2013 has been a landmark year for Peter Duncan and MicroSeismic. Alongside the company celebrating its 10th anniversary, he was also recognised as a pioneer and notable "disruptor" in his field, the winner of the National EY Entrepreneur Of The Year™ 2013 Energy, Cleantech and Natural Resources Award.

This is, Duncan is quick to point out, a long way from the spare bedroom in which the company began a little over 10 years ago. With a career in both geophysics and company start-ups, MicroSeismic was Duncan's third venture, but his first in passive seismic monitoring. What made the technology interesting to him was the way in which it seemed to meet a swathe of industry requirements, utilising a mixture of technology that already existed. To monitor drilling and well completions with geophones was, he says, "more of an engineering problem, taking the science of earthquake location and re-engineering it to oilfield scale – all of that resonated with me."

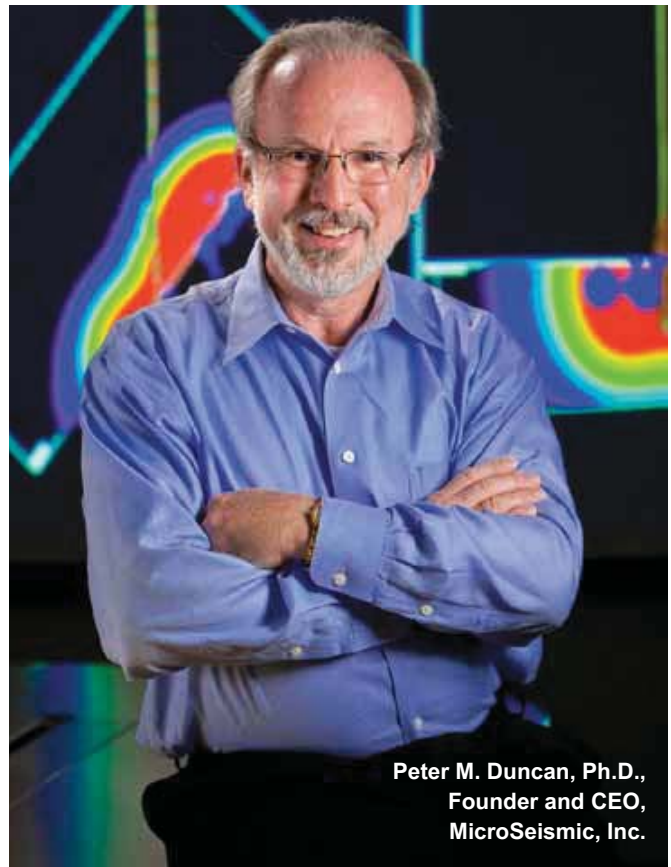
Passive seismic emission tomography (PSET) along with proprietary surface-based monitoring arrays made it possible to measure rock movements within reservoirs thousands of metres down – the key to MicroSeismic's business. In the early days, this mainly involved monitoring flow rates, until a client asked Duncan to measure a hydraulic fracturing operation alongside the traditional sensing method, using a monitoring well. As word spread that they could perform frack-monitoring from the surface – without the costly approach of drilling additional monitoring wells – the procedure eventually grew to become 99% of the company's business.

Now MicroSeismic has a 40% market share of the overall frack-monitoring sector and the majority of the surface frack-monitoring sub-sector.

## Charts and minds

This is not to say that the company's fortunes changed overnight. While some were happy to approach MicroSeismic, it had to work hard to alter the mindset of the wider industry. This is, Duncan says, typical of the oil and gas world in general, which has a notoriously slow uptake of new technology, even when it can be proved effective. "[Although] the first frack monitor was probably in 2005, we didn't really start to see a more general acceptance of our methodology until 2009, so there were three to four years there of hard labour, honing the technique, honing our understanding," he says.

These years of honing have led to significant advantages for operators using hydraulic fracturing. The technique means, as Duncan explains, "being able to tell more about not just when and where the rock is breaking when we frack it, but also the nature of the break that the rock undergoes and the nature of that break informs reservoir properties that are important to production." This precision, with the economic and



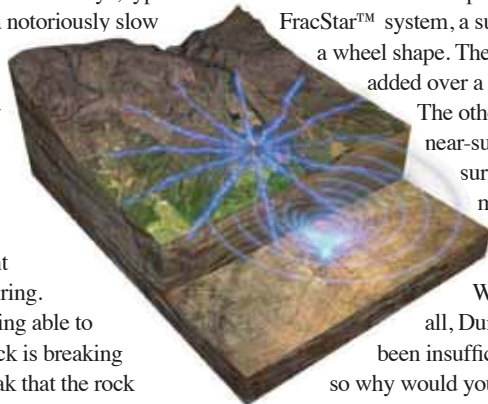
Peter M. Duncan, Ph.D.,  
Founder and CEO,  
MicroSeismic, Inc.

environmental benefit of surface monitoring and the extended range surface monitoring offers (over 3,000 metres as opposed to 500 metres with monitoring wells), all means that he and MicroSeismic have proven the value of surface microseismic in a fracking environment.

One method for deploying the technology is MicroSeismic's FracStar™ system, a surface-laid network of geophones deployed in a wheel shape. These form a dish-like array – the more stations added over a larger area, the more wells can be monitored.

The other acquisition method, the BuriedArray™ is a near-surface array buried at a shallow depth from the surface. With BuriedArrays, clients can monitor multiple wells from two to three, all the way up to the company record of 240 separate wells.

However, the industry is not won over yet. With only 3-4% of fracks using monitoring at all, Duncan still feels adoption of the technology has been insufficient: "You wouldn't drill a well and not log it, so why would you frack a well and not monitor it?" He freely admits his own bias from a provider's point of view, but his argument carries weight: every well encounters different successes and problems, ►►



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- ▶ so it makes sense to be as sure as one can be about what you encounter and where these movements are occurring.

### Innovation and ideas

Duncan is positive about the industry's ability to encourage and nurture entrepreneurship. One thing the industry has – and that Duncan himself has experienced when starting MicroSeismic with help from Anadarko and Chevron – is the willingness of investors and companies to support new ideas financially. But, conversely, the task of convincing the industry to accept and use your ideas takes practice and courage: “Getting out there and finding the people who can function as employees in a very uncertain environment ... that takes some getting used to.”

It is also a business that keeps him learning, innovating and improving technology. In terms of where MicroSeismic and the fracking sector can go, Duncan has a good idea of where the next generation of innovators and entrepreneurs can find their place: “I think we are doing very well with the data acquisition and with the data processing, but where we haven't even begun to scratch the surface is extracting the knowledge from the data that we do acquire today.” The information collected through these arrays is useful to operators, but with more detail and analysis, even more can be extracted in the future using the same methods.

This next step will allow for more accurate modelling in future operations. Duncan says that “we need to take all of the engineering data, conventional seismic data and our data ... and begin to integrate them together in an understanding which will allow us to predict how rocks are going to fail when they do the next well.” This involves more integration of technology and skills – and more challenges for MicroSeismic: “The really innovative stuff is being done with other kinds of observations of the process, like magnetic and digital acoustic sensing on the wellbore ... and we're only beginning to understand how to put them together.”

### Efficient entrepreneurs

Moving forward, the next big step for MicroSeismic is its movement into Productive-Stimulated Reservoir Volume (Productive-SRV). The aim of this technology is to answer some of the most common demands brought to the company by its clients. Duncan explains: “The biggest question our clients ask us – and this goes for both the future entrepreneur and what we're doing today – is: ‘I need to know how many wells do I have to put in this section to develop it correctly?’”

The problem is as old as the industry itself: if a company drills too many wells, the profits are diluted, but too few and the reservoir may not yield enough hydrocarbons. Where microseismic monitoring can help is in the manner by which engineers “can understand exactly how much the well is going to drain so that they can size their exploitation programme – and the advantages of that are huge.”

Looking ahead, the name of the game is efficiency. Duncan believes that where microseismic monitoring can benefit everyone is in its promotion of efficient fracking. By minimising the environmental and surface impact (and economic overheads if one includes the cost of drilling additional monitor wells) and maximising the potential yield of the reservoir, the whole process becomes smarter, cleaner and more efficient.

This improvement for all, Duncan says, is something that he remains passionate about. With MicroSeismic's technique and business still in its relative infancy, the potential for improvement and innovation is still exciting and remains the driving force behind what the company does – and can do. Long live the disruptors. ■

Web: [www.microseismic.com](http://www.microseismic.com)



**Microseismic and Discrete Fracture Network Productive-SRV uses microseismic data to determine what proportion of the total stimulated rock volume is propped.**