



Editor's corner

Dear readers,

We are excited to launch a new regular column in GEOHORIZONS, which will feature current news and updates gathered in the months leading up to the publication of each issue. Our goal is to keep you informed and provide content that will be of interest to all.

We are kicking off this column with two questions that I was recently asked during a podcast recording, amongst others. I am sure you will find the answers to these questions both insightful and engaging. Following that, we will share three news items.

Q. What are the most significant challenges in advancing reservoir characterization techniques further, and how might the industry address them?

A. There are several challenges in advancing reservoir characterization techniques, which can be categorized into technological and practical aspects. As mentioned earlier, the complex nature of subsurface reservoirs requires highly accurate methods for their characterization. Technological challenges pertain to improving techniques, while the practical challenges relate to data acquisition, processing, interpretation, and integration.

1. *Data integration across disciplines:* As previously mentioned, we must integrate multidisciplinary data that may span different temporal and spatial scales. To achieve this, we need to develop more accurate techniques and workflows for integration. This will help generate more reliable reservoir models that align with existing production data, allowing for more accurate predictions for future reservoir exploitation.
2. *Data quality and availability:* A significant challenge is the absence of, or the presence of sparse or poor-quality data, which hinders effective reservoir characterization. For example, when generating seismic discontinuity attributes, image log data is often unavailable. Similarly, AVO

analysis or prestack impedance inversion is frequently performed without shear logs or using empirical relationships. Additionally, when characterizing reservoirs, the lack of available or shared production data compromises the quality of the work.

3. *Application of ML/AI techniques:* More effort should be focused on applying Machine Learning (ML) and Artificial Intelligence (AI) to sift through large volumes of seismic data. For instance, automating fault interpretation and other tasks can greatly improve efficiency and accuracy.
4. *Geochemical data for unconventional shale plays:* For unconventional shale resource plays, geochemical data is essential to establish relationships such as TOC (Total Organic Carbon) versus impedance. This can then be used to generate a 3D TOC volume, enhancing our understanding of these complex reservoirs.
5. *Automation of seismic data processing:* Currently, the processing of large seismic surveys is time-consuming and requires significant manual effort. Efforts should be made to automate these processes to improve efficiency and reduce processing time.
6. *Seismic imaging with FWI:* Full-Waveform Inversion (FWI) provides high-resolution subsurface images, leading to more accurate interpretations. While advancements are being made, further progress is needed to optimize this technique.
7. *Managing large datasets:* The increasing volume of data generated from seismic surveys, well logs, core samples, production data, etc., poses significant challenges in terms of collecting, processing, and managing these large datasets for effective reservoir characterization. While efforts are underway, this issue will require continued attention and innovation.

In conclusion, addressing these challenges will depend on advancements in technology, data management, and ongoing interdisciplinary collaboration.

Q. What skill or perspective do you think is undervalued in your profession?

There are several important skills and perspectives that are often undervalued or overlooked in our geoscience profession:

1. *Collaboration across disciplines:* Many geoscientists tend to focus on their own narrow specialties. While this expertise is valuable, broader objectives often require collaboration across various disciplines such as geophysics, geology, petrophysics, geochemistry, and engineering, to name a few. When professionals from diverse fields collaborate, complex problems are typically solved with creative and comprehensive solutions.
2. *Creative problem-solving with data:* In our work with real data and software, geoscientists often expect certain quality results. When those results don't materialize, we may be quick to fault the data itself. However, there is more to be done by thinking creatively and working responsibly. This involves understanding the assumptions behind the software modules we use and determining whether they are valid for the task at hand. If not, what alternative approaches can be explored? In these cases, collaborating closely with a research consortium can be invaluable.
3. *Quantifying and addressing uncertainty:* Effectively quantifying and addressing uncertainty in our results is crucial, as it allows us to use the data with greater confidence and precision.
4. *Effective communication:* Finally, communicating our findings is key. This includes sharing results with decision-makers as well as the broader community. Whether through published articles, talks, webinars, or group discussions, presenting our findings in accessible and meaningful ways is essential.

Addressing these aspects—whether through skill development or a shift in perspective—will significantly enhance our work and impact as geoscientists.

Quantum teleporting

In late December 2024, the engineering world was

buzzing with excitement as researchers at Northwestern University in Evanston, Illinois, successfully demonstrated quantum teleportation for the first time over a fiber-optic cable that was already transmitting internet traffic. The breakthrough was led by Dr. Prem Kumar, a professor of electrical and computer engineering at Northwestern's McCormick School of Engineering, alongside his Ph.D. student, Jordan Thomas. They managed to teleport the quantum state of light, specifically a photon, across more than 30 km of fiber-optic cable while it was simultaneously carrying internet data.

This achievement marks a significant step toward revolutionizing optical communication, which includes transmitting information via light through fiber-optic cables, as well as free-space communication like laser beams used in satellite communications. Optical communication has one major advantage: its ability to carry vast amounts of data at incredibly high speeds with minimal interference.

Quantum teleportation refers to the transfer of quantum states between two distant particles, usually photons, without physically moving the particles themselves. This is made possible by quantum entanglement, a phenomenon where two particles become so deeply linked that the state of one instantly affects the state of the other, regardless of the distance between them.

One current limitation of optical communication, even in fiber-optic systems, is signal loss over long distances. Quantum teleportation could potentially overcome this challenge by utilizing entangled photons, which may extend the range over which quantum states can be transmitted. Since quantum teleportation operates at the speed of light, it offers the potential for nearly instantaneous communication.

As quantum computing continues to evolve, quantum teleportation is expected to form the foundation of future communication networks, particularly for long-distance communication between quantum computers.

Though still in its early stages, quantum teleportation is poised to transform how information is exchanged in the years to come.

2024 Nobel Prize in physics

Geoffrey Hinton, Professor Emeritus at the University of Toronto, was awarded the 2024 Nobel Prize in Physics alongside John Hopfield of Princeton University for their groundbreaking work that laid the foundation for machine learning and the development of artificial neural networks, a key subset of AI. This recognition is a testament to their lifelong dedication to advancing research in this transformative field.

Hinton, often referred to as the "Godfather of AI," has become a prominent figure in recent years for his warnings about the rapid development of AI. While he acknowledges the tremendous benefits AI could bring to healthcare and workplace productivity, he has expressed concern that AI may soon surpass human intellectual capabilities. These fears led him to resign from his position at Google Brain in May 2023, a role he had held since 2013, balancing his time between Google and the University of Toronto. Hinton's departure from Google allowed him the freedom to speak openly about the risks associated with AI development.

Now, as a vocal advocate for responsible AI development, Hinton emphasizes the need for cooperation between competing companies in the AI space. He calls for safeguards to ensure that AI systems do not surpass human intelligence in harmful ways. Hinton also stresses that digital intelligence should

never replace human or biological intelligence, urging a careful and balanced approach to AI's future.

AI eliminating jobs

With advancements in AI, concerns about job security have been growing. These concerns were further fueled by comments made by Mark Zuckerberg, CEO of Meta, in a recent interview. He suggested that AI might soon be capable of performing tasks traditionally carried out by human employees. He explained that AI has now reached a point where it can write code, which powers apps, websites, and software platforms.

Zuckerberg also mentioned that "by 2025, Meta, along with other companies in the industry, will likely have an AI that functions as a mid-level engineer, capable of writing code." However, he followed up with the statement, "It's too early to say whether this will lead to significant job losses." This last remark could have been an attempt to avoid backlash, considering that Meta employs over 70,000 people.

Additionally, Zuckerberg hinted that as AI takes on more responsibilities, hiring processes may slow down, implying that job losses could follow. On the other hand, some experts believe that jobs may not be entirely lost, but human workers might be shifted into more creative and strategic roles. For more information, check out [Mark Zuckerberg Says AI Could Replace Human Jobs by 2025](#). 

- Chief Editor