conventional streamer seismic data. As a result, Equinor and partners acquired OBS data over a large number of their North Sea fields for improved P-wave imaging. In addition, Lasse has followed several large development projects with external partners.

To many, Lasse is best known as one of the pioneers in seabed seismic acquisition and processing. His 1993 seminal paper in Geophysics lays the foundation for the up-down deconvolution method for source designature and free-surface demultiple of ocean-bottom node data. The breadth of his work is impressive. He has made major contributions in a variety of areas in seismic and electromagnetic data processing and analysis including modeling, inversion, multiple attenuation, fast 3D tau-p transform, reciprocity, amplitude variation with offset/amplitude variation with angle, deghosting, up/down decomposition, P/S splitting, particle velocity-pressure relationship, 2D to 3D geometrical spreading correction (Abel transform), *Q*-factor estimation, wavelet estimation, source array signature estimation, Scholte wave attenuation, potential scattering, asymptotic airwave modeling, airwave attenuation, and transverse-electric-transverse-magnetic splitting.

In addition to his technical achievements, Lasse has focused on writing and teaching for the geophysical industry. He has authored three books, 200 articles and expanded conference papers, and 100 science papers. His coauthored book, *Introduction to Petroleum Seismology, second edition*, is widely used as a reference and as a text in the classroom of many universities. Lasse's most recent coauthored book, *From Arrhenius to CO_2 Storage*, is a great compilation of articles for anyone interested in understanding the physics and impact of the greenhouse gas effect on our planet.

Lasse's exceptionally extensive and always innovative and impactful contributions to geophysics, along with his endless interest in novel geophysical ideas, is recognized through the Reginald Fessenden Award.

REGINALD FESSENDEN AWARD
Andrey Bakulin

The Reginald Fessenden Award recognizes Andrey Bakulin, presently associated with Aramco and formerly associated with Shell and Schlumberger, for his exceptional contributions to seismic acquisition and imaging under complex near surface and overburden. Bakulin significantly advanced interferometry theory and pioneered several industrial applications of imaging and monitoring using virtual sources beneath challenging overburden. His innovations include developing techniques to enhance prestack seismic data affected by near-surface scattering and implementing efficient methods for data acquisition, near-surface calibration, and imaging using distributed acoustic sensing. He has also demonstrated a permanent industrial system with buried receivers for monitoring below complex and changing near-surface conditions. Bakulin's contributions have been recognized by many awards, including serving as SEG's Distinguished Lecturer (2011), the J. Clarence Karcher Award (2005), and several SEG Best Paper and Honorable Mention awards. The Reginald Fessenden Award acknowledges his ongoing contributions to the field and significant industry impact.

by Boris Gurevich and Yi Luo

It is a privilege to write this citation for Andrey Bakulin, a recipient of the 2023 Reginald Fessenden Award. Andrey stands out with his exceptional ability to integrate solid theoretical knowledge with practical application to solve complex problems. In the 1990s, he made a mark with his important contributions to theoretical rock physics. In 1999, he joined the petroleum industry, working at leading research centers such as Schlumberger Cambridge Research and Shell. Currently, he leads the data acquisition and robotization focus area at EXPEC Advanced Research Center at Saudi Aramco. Andrey's tenure at the leading research centers in the industry has provided him with valuable opportunities to apply his theoretical knowledge and skills to a diverse array of geophysical challenges, yielding remarkable outcomes.

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One of Andrey's key contributions is the development of the virtual source method, a groundbreaking approach coinvented with Rodney Calvert. This method employs time-reversal focusing without needing a velocity model, transforming each downhole receiver into a virtual source and mitigating the impact of overburden. The sustained collective efforts of Andrey and colleagues during the 2000s significantly advanced velocity estimation, imaging, and monitoring in exploration geophysics. His exceptional achievements in this area have been widely recognized, including being selected as the SEG Distinguished Lecturer on this topic, receiving two SEG Best Paper awards, and earning numerous other industry accolades.

In the challenging context of desert seismic data acquisition, Andrey has played a pivotal role in enhancing and despeckling prestack land seismic data. Recognizing the role of scattering noise in processing data from small arrays and single sensors, he pioneered supergrouping, nonlinear beamforming, and despeckling techniques, pushing the boundaries of traditional digital group forming. By showcasing the importance of data enhancement in improving reflection processing, first-break picking, and full-waveform inversion, Andrey's advancements have made a profound impact on oil and gas exploration, CO_2 sequestration, and near-surface geophysics.

His contributions also extend to seismic acquisition, where he has introduced transformative innovations. By modernizing uphole acquisition through fiber-optic distributed acoustic sensing (DAS) recording and high-productivity dual rotary drilling, he revolutionized the efficiency and accuracy of near-surface velocity measurements. Additionally, Andrey pioneered a novel acquisition system known as smart DAS uphole acquisition, connecting multiple vertical DAS arrays using the same fiber. This groundbreaking method bridges the gap between surface seismic and borehole geophysics, offering significant benefits in exploration as well as oil-field and carbon capture, utilization, and storage monitoring in complex near-surface environments.

Andrey's groundbreaking work in monitoring below complex near-surface environments has pushed the envelope of 4D seismic on land. Through extensive field pilots and industrial showcases, he has illuminated the advantages of utilizing shallow buried receivers for sensitive reservoir monitoring. These buried receivers mitigate near-surface variations that obscure small 4D signals while minimizing contamination from ground-roll and near-surface arrivals. His leadership in implementing a hybrid permanent seismic monitoring system with buried sensors and surface vibrators at Aramco's CO_2 enhanced oil recovery project site has showcased exceptional repeatability and monitoring capabilities in complex near-surface environments.

Through his innovative approaches, Andrey has made a profound and enduring impact on seismic acquisition and processing, serving as a catalyst for ongoing advancements in the industry. His contributions have not only revolutionized the way seismic data are acquired and processed, but have also had a transformative effect on the broader field of geophysics. By pushing the boundaries of knowledge, Andrey has paved the way for further breakthroughs, shaping the future of exploration geophysics and inspiring the next generation of researchers and practitioners.

REGINALD FESSENDEN AWARD
Luc T. Ikelle

Luc T. Ikelle was a professor of geophysics at Texas A&M University before joining Statoil and then founding his own company, Imode Energy. He has made major contributions to seismic acquisition and processing, especially through his publications including Coding and Decoding Seismic Data: The Concept of Multishooting, second edition; Introduction to Petroleum Seismology, second edition; *and* Introduction to Earth Sciences: A Physics Approach, second edition.

by Yuefeng Sun

Luc T. Ikelle continues to make important contributions to the advancement of the geosciences, the education of geoscientists, and the development of tools for subsurface exploration through patents, papers, and books. He authored or coauthored *Introduction to Petroleum Seismology, second edition; Coding and Decoding Seismic Data: The Concept of Multishooting, second edition; Introduction to Earth Sciences: A Physics Approach, second edition; Introduction to Multidisciplinary Science in an Artificial Intelligence Age: The Matter in our Universe, Biological Cells, and Plate Tectonics; Introduction to Multidisciplinary Science in an Artificial Intelligence Age: Chemical, Nuclear, and Thermonuclear Reactions and Oxygenic and Anoxygenic Photosyntheses;* and *Introduction to Multidisciplinary Science in an Artificial Intelligence Age: Properties of Matter, Elasticity, Permeability, Porosity, Viscosity, and Wettability.* These books are well structured and organized. They introduce complex concepts such as the inverse scattering problem, multidimensional and multicomponent data decomposition, spontaneous and man-made simultaneous sources of electromagnetic and seismic waves, and nuclear geophysics seamlessly, from the first principles to the most advanced applications.

I found that the second editions of the *Introduction to Petroleum Seismology, Coding and Decoding Seismic Data*, and *Introduction to Earth Sciences: A Physics Approach* are three different books along with their first editions. They were my first encounter with books that are rich in basic and practical numerical codes for the geosciences. One can reproduce almost all of the key figures in the books and even organize the codes into an integrated package for earth exploration. Users of the books, including students and educators, will be enriched and better prepared for modern scientific and technological challenges.

As a geophysics graduate of the Institut de Physique du Globe de Paris, one expects Luc to be a rigorous applied-geophysics mathematician. In our field, he is rare, with his additional knowledge of physics, geochemistry, statistics, data science, and machine learning. He has used this combination to develop the first patent on multishooting acquisition and processing of seismic data, also known as simultaneous seismic sources. He recently remarked that the resemblance of present-day Titan (the largest moon of Saturn with liquid methane lakes) to the early time of earth when oxygen was almost absent may form an alternative explanation for the location of oil and gas fields on earth.