



Seismic images are most critical in our understanding of subsurface geology and potential hydrocarbon reservoirs. However, the process of interpreting these images is complex and plays out in a combination of technical challenges, geologic analysis techniques and interpreters' experience and training.

This workshop provides a comprehensive and multidisciplinary approach to the process of seismic interpretation in a unique format that combines critical disciplines, strategies, workflows and case studies which would be commonly taught in a number of different courses. The goal is for participants to gain confidence and understanding in the underlying principles, best practices and practical applications that are key to the interpretation process.

A team of experts will share their expertise and experience and discuss successful strategies and techniques for high-quality and high-confidence interpretations. A significant focus is on validating the quality of seismic interpretation and putting it to the test to minimize uncertainty and risk. Understanding pitfalls and limitations are as important as proven best practices and deliberate decision-making processes.

The workshop will give participants an understanding of the concepts and processes leading to the final seismic images and attributes. The seismic expression of structural and stratigraphic features within their tectonic context will form the core of the workshop. Numerous examples, exercises and case studies of representative seismic lines will highlight a variety of tectono-stratigraphic settings and hydrocarbon basins worldwide.

Time is set aside to encourage participants to bring their own examples and challenges to discuss with the experts.

- Instructors:** Erik Scott, PhD; John F. Karlo, PhD; Katie Joe McDonough, PhD; Catalina Luneburg, PhD; Bryan DeVault, PhD
- Schedule:** Public schedule **April 19 – May 7, 2021** and **Oct 18 – Nov 5, 2021 (tentative)**
Custom schedule for multi-client and inhouse options
- Logistics:** Live-online workshop taught in ½ day sessions of 3-4 hrs via online meeting platform. Teaching times will be adjusted as much as possible to accommodate participant time zones.
- Level:** Medium to advanced level. Basic knowledge in Geosciences is recommended. For all geologists, geophysicists, and engineers who use seismic data in their E&P workflows.
- Included:** Certificates on request, literature list, manuals, consulting sessions
- Pricing:** Single participant – regular USD 2,225; discount USD 2,125
Multi-client option – small group, open access USD 7,800 TBD
Inhouse option – exclusive, customizable USD 9,000 – 12,000 TBD
- Registration:** Register using the following link and indicate time and pricing option. [REGISTER HERE](#)

COURSE CONTENT

The workshop is taught in ½ day online sessions Monday – Thursday over three weeks. Online sessions will consist of expert presentations, hands-on exercises, group discussion and real-world case studies.

FREE CONSULTING FRIDAYS

Fridays are used for special topics per participants choice as well as mentoring of participant data. Participants are encouraged to bring forward specific issues on seismic data they are working on to discuss with the experts to move them forward on their interpretation.

WEEK 1 “Seismic Imaging and Interpretation”

The first week will introduce the principles and basic concepts leading to the seismic images we use for our interpretation workflows. We will also cover fundamentals of seismic interpretation and outline the process and the workflows.

- Introduction to Seismic Exploration
- Seismic wave propagation
- Taxonomy of underground sound: body and surface waves, reflections, refractions
- Data acquisition
- 2D and 3D seismic
- Seismic processing
- Velocity Model Building
- Seismic Imaging Techniques
- Fluid substitution and forward modeling
- AVO
- Multicomponent seismic techniques
- Seismic attributes
- Poststack and Prestack
- Inversion
- Horizon interpretation
- Horizon attributes
- Fault interpretation
- Pitfalls

WEEK 2 “Structural Interpretation and Validation”

In the second week of the workshop we will focus on the seismic expression of structures in a variety of tectonic regimes and hydrocarbon basins from compression and strike-slip scenarios to extensional rift and passive margin settings and associated salt tectonics. A focus of structural interpretation is the process of validation using restoration and balancing techniques.

- Introduction to structural styles and hydrocarbon basins
- The process of structural validation
- Interpolating and extrapolating data in areas of poor or missing seismic
- Balancing and restoration concepts and tools
- Fold- and Thrust Belts
- Duplexes, stacks, horsts
- Fault propagation, fault bend faults
- Strike-slip faults
- Transpression/transension
- Flower structures
- Extensional systems
- Rift- Passive Margin
- Planar/listric faults
- Rollover anticlines
- Ramp structures
- Growth faults
- Basin inversion
- Gravitational Systems
- Salt Basins examples worldwide
- Salt unique properties
- Salt tectonics and validation techniques
- Autochthonous and allochthonous structures
- Salt imaging challenges

WEEK 3 “Stratigraphic Interpretation and Validation”

The third week of the workshop will focus on the sedimentological and depositional processes that shape the sequence stratigraphic packages that we can recognize in seismic images. We will also analyze sequence stratigraphy in the context of petroleum systems and hydrocarbon reservoirs. The workshop will conclude with case studies and exercises on classic seismic lines from different tectono-stratigraphic settings around the world.

- Process sedimentology overview process – Siliciclastics and Carbonates
- Walther’s Law, Fundamental cycles
- Facies Successions across the depositional system spectrum
- Accommodation and Sediment Supply
- A/S & 1D to 3D Cycle stacking patterns
- Data-driven approach to sequence stratigraphy:
- Clinoforms, stratal geometries, terminations, bounding surfaces
- Sequences & their hierarchies
- Seismic facies & seismic attributes
- Seismic facies and systems tracts in different depositional systems
- Petroleum Systems in highstand, transgressive & lowstand systems tracts
- Quantitative Interpretation (QI and lots of other acronyms) in interpretation workflows
- Case histories from a variety of settings e.g. Gulf of Mexico and West Africa Passive Margin

EXPERTS SHARE THEIR STRATEGIES

“Use balancing and restoration techniques to validate your interpretation and reduce risk and uncertainty – if you get it right from the start, you save time and dollars down the road.”

Catalina Luneburg, PhD

“Everything you see on a seismic line is related to geology. Even subtle variations in amplitude or reflector continuity can provide insight into stratigraphic and structural interpretations.”

Erik Scott, PhD

“Mapping a seismic amplitude is the easy part of prospecting for direct hydrocarbon indicators. Determining whether or not that funny looking thing is prospective--and how risky it is--requires a lot of thankless work.

Often-overlooked but crucial comparisons between the strength of the prospect amplitude and analogs derived from models or nearby production and study of its AVO behavior make the difference between a prospect with a 70% chance of success and an avoidable dry hole.”

Bryan DeVault, PhD

“All major lookback studies of dry holes find that unfamiliarity with the basic details of structural styles is a major cause of dry holes.

One study concluding that even with having 3D seismic that mapping commonly "does not allow an optimal understanding of the trap and a proper focus on the main weak points of a prospect".

A Best Practice for any project is to first review the characteristic structural elements of some type examples for your style of prospect before beginning mapping.”

John F. Karlo, PhD

“Keep It Simple: Cycles, Packages, Facies

1. Define your fundamental cycle/para sequence (keeping perspective on context of your scale of investigation and position in the basin)
2. Define your stratigraphic packages
3. Interpret the sedimentology/facies of the package interiors”

Katie Joe McDonough, PhD

Contact TerraEx Group with any questions or requests.

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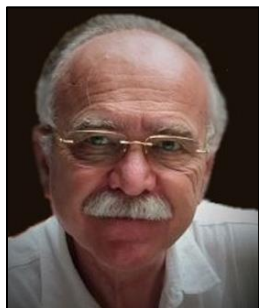
TerraEx Group - Team of Experts



Erik received his Ph.D. in Sedimentology from Louisiana State University working with Dr. Arnold Bouma. He has over 25 years' experience understanding petroleum systems working across the full life cycle of the industry; from regional geology, acreage evaluation, prospect maturation, discovery delineations, appraisal and development studies through to late field life recompletion evaluation and near field exploitation across six continents. He is a recognized industry expert in sedimentology, particularly in clastic depositional settings, and has expertise in the geologic analysis of seismic data and integrated petroleum systems evaluation. Erik is routinely called upon for peer reviews/assists evaluating all aspects of the petroleum system, volumetric inputs/calculations and geologic risk assessment for exploration, development and production projects. He is an active coach and mentor of all experience levels of technical staff through informal and formal settings and is a short course / workshop instructor and field trip leader. Erik is an Adjunct Professor at Rice University teaching seismic interpretation and sedimentology at the graduate level.



Katie-Joe McDonough, PhD., is a geological/geophysical consultant specializing in sequence stratigraphic and seismic interpretation. She began her career as a geophysicist with Exxon USA in Denver. As seismic stratigraphy burgeoned in the 80s, she turned to the Colorado School of Mines, earning her Ph.D. in 1997 working the seismic-scale carbonate outcrops in the Southern Alps. Her areas of expertise in sedimentology and depositional systems form the foundation of her work in stratigraphic basin analysis, exploration play assessment and reservoir-scale development. Dr. McDonough launched her consulting practice in 1995, and has enjoyed consulting/advisory/mentoring gigs working diverse, integrated data sets for the international and domestic U.S. petroleum industry for over 25 years. She works continental to deep marine strata in conventional and unconventional plays in North and South America, East/West Africa, Europe, Indonesia and the Arctic. Dr. McDonough has also served as adjunct faculty teaching Stratigraphy at Colorado School of Mines, and currently serves as an industry mentor to RMAG YPs and CSM graduate students in the Reservoir Characterization Project.



John has a BA from Rutgers, an MA from Univ. Missouri and a Ph.D. in structure and tectonics from S.U.N.Y. He taught structure and geophysics at Central Michigan University before joining industry. He spent 30 years with Shell followed by 5 years with Maersk Oil and 2 years with Repsol. He has had positions in play development and prospect evaluation, regional teams, deepwater exploration, merger and acquisition and for 10 years was a senior advisor in Quality Assurance overseeing rigor in structural interpretation. He has worked in rifts, passive margins, fold belts and turbidites in over 25 basins worldwide. Some of the high points in his career include the first regional synthesis of the Dutch North Sea tectonics, groundbreaking work on Gulf of Mexico salt tectonics and deepwater exploration leading to world class discoveries in Nigeria. His current focus is on the complex subject of seal evaluation - how to risk seal and consider potential column height - which he sees as the weakest links in many exploration projects.



Catalina Luneburg is the owner and director of TerraEx Group LLC and responsible for developing and promoting the new services model as well as daily operations. She is a recognized Structural Geology expert in the validation of a variety of basins and petroleum systems worldwide, focusing on geologic interpretation and validation, Structural Geology modeling, cross section balancing and 2D/3D time-step restorations as well as HC reserve estimates, 3D framework building and fracture prediction analyses. Previously, Luneburg was a Product Manager and Senior Scientist at Landmark/Halliburton developing geomodelling workflows and managing/designing software applications such as LithoTect and DecisionSpace. She has also held positions with GeoLogic Systems and Midland Valley, and spent many years in academic teaching and research. Luneburg holds a doctorate in Natural Sciences from the Swiss Federal Institute of Technology in Zurich, Switzerland, and a master's degree (Diploma) in Geology/Paleontology from the Ludwig-Maximilian University in Munich, Germany. She has published extensively in her field including several books, and has authored a number of patents. She is fluent in English, German, Spanish, and proficient in French and Italian.



Bryan DeVault received B.S. degrees in physics and mathematics from the University of Houston in 1990 and a Ph.D. in geophysics from the Colorado School of Mines in 1998. He was an exploration geologist/geophysicist for Shell International from 1998 to 2001 in the Netherlands and a senior exploration geophysicist at Anadarko Petroleum Corporation in Houston from 2001 to 2003. He is currently President and CEO of Vecta Oil & Gas Ltd. in The Woodlands, Texas, where he has worked since 2003. His professional interests include seismic data processing and inversion, sequence stratigraphy, amplitude vs. offset (AVO) analysis, and reservoir prediction using multicomponent seismic data. He is an active member of AAPG and the Society of Exploration Geophysicists.