

# **Course Title: “AN INTRODUCTION TO BOREHOLE ACOUSTICS”**

## **Summary**

The use of borehole acoustics measurements first came about in the 1960's, where it was applied to the measurement of porosity. Since then, the applications have grown to encompass a wide field of disciplines within geophysics, petrophysics and geomechanics, and the technology has developed from the early first motion tools, to today's complex, full-waveform wireline and LWD devices. Modern borehole acoustics deals with the excitation, detection and interpretation of multiple types of propagating arrivals to determine a diverse set of information about the formations surrounding the borehole including porosity, lithology, fluid typing, rock mechanical properties, anisotropy, stress state, pore pressure, permeability and fracture analysis, to name a few. Recently the information derived from borehole acoustic tools has expanded to include identifying the orientation and distance to reflection events associated with formation features a considerable distance from the wellbore itself.

This class will focus on understanding the basic principle of operation of borehole acoustic tools and the measurements they make. We will review the common borehole acoustic modes used and the concerns associated with each. Processing techniques for all modes will be explored, including the necessary quality control methods that should be applied. Considerations for both wireline and LWD conveyed logging will be discussed. Finally, the applications of correctly obtained acoustics measurements across geophysics, petrophysics and geomechanics domains will be explored, with relevant examples shown in each case.

## **Duration and Training Method**

This course consists of 2, half day virtual lectures, for a total of 8 hours.

Part 1: Monday November 28<sup>th</sup>, 8am-12pm CDT

Part 2: Wednesday November 30<sup>th</sup>, 8am-12pm CDT

## **Expectations**

Participants should leave the class with good understanding of the fundamentals of borehole acoustics and the critical role it can play in geophysics, petrophysics and geomechanics. They will also obtain a good working knowledge of the basic processing involved and how to quality control the results obtained to ensure that valid results are used for the final applications.

## **Lab Exercises**

There will be no formal exercises required as part of the class, but the class will involve open Q&A between the instructors and attendees and questions will be asked of the attendees based on the material covered and the log examples shown.

## **Who Should Attend?**

Petrophysicists, geomechanicists, geophysicists and anyone else who would like to better understand how borehole acoustics measurements are obtained and used.

## Prerequisites

A basic understanding of well logging techniques, operations and log interpretation will be assumed

## Course Instructor Bio(s)



**Adam Donald** is the Technical Director for Geomechanics and Wellbore Acoustics with Reservoir Performance Division, Schlumberger, based in Dubai, UAE. He joined Schlumberger in 1998 as a wireline field engineer has held field, technical & management positions in Canada, USA, Norway, Malaysia, France, Romania, and United Arab Emirates. His area of focus has been on applications of wellbore sonic and image data on geomechanics, geophysics and petrophysics workflows. He received his Bachelors in Geological Engineering from University of Waterloo in Ontario, Canada (1998) and a Masters in Mining Engineering from Dalhousie University in Nova Scotia, Canada (2004). Adam holds 8 patents in areas of borehole acoustics and geomechanics and is a registered Professional Engineer in Canada. He is an active publishing member of SPWLA, SPE, ARMA and SEG with over 50 industry and scientific articles.



**Matthew Blyth** is the LWD Acoustics, Geophysics and Geomechanics Domain Head with Schlumberger Well Construction. Since joining Schlumberger in 1997, he has filled a variety of roles, all within the field of logging while drilling. He is currently involved in the long-term technical development plan for LWD acoustic and seismic technology within Schlumberger and their applications. He has authored and co-authored multiple papers on LWD technology and its uses. Matthew graduated in 1996 from Cambridge University with Bachelors and Masters degrees in Engineering. He is a member of the SPWLA, SPE, SEG, and ASA and has served as both a vice president and as President of the Houston SPWLA chapter. He is the current SPWLA NA2 Regional Director, he is on the board of the SPWLA Sonic SIG, was on the committee organizing the 2019 SPWLA Symposium, and was a 2016/2017 and 2020/2021 SPWLA Distinguished Speaker. He is also on the committee for the upcoming 2023 SPWLA Annual Symposium.