



Arabian Institute For Training

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# Applied Biostratigraphy and Sequence Stratigraphy in Oil Exploration & Development

## INTRODUCTION

- Biostratigraphy is often run as a service in oil exploration & development for age and palaeoenvironmental interpretation. But the power that can be provided by critical insight of the data generated for detailed sequence analysis including unconformities and sequence breaks plus the identification of flooding and condensed surfaces and its use for facies identification (reservoir to non- reservoir) are often not optimally achieved. Subsequently neither are the desired high resolution stratigraphical correlations.
- The integration of biostratigraphical data with seismic interpretations and sedimentological and petrographical data utilizes its power most efficiently. This Applied Biostratigraphy and Sequence Stratigraphy in Oil Exploration & Development training seminar sets out to illustrate this best use. The pitfalls with the use of biostratigraphical data will be discussed, which often relates to the geological context in which formations were deposited. By identifying them and often then utilizing them with regards to understanding the geology, this helps to unlock the tool and with it a realization of the possibilities that optimum use of this technique can bring.
- This training seminar will introduce the applied use of biostratigraphy and sequence stratigraphy in both an exploration and development context with working examples from Africa, the Middle East, Southeast Asia and Europe, and will also cover both marine and non-marine sediments.

### This training seminar will include:

- An introduction to the different microfossil groups
  - A discussion on the laws of stratigraphy and how biostratigraphy can be used to determine a chronostratigraphy
  - Which microfossil groups to use for which age of sediments and how they are used as palaeoenvironmental indicators
  - What pitfalls to look for and how these can lead to a better geological understanding
  - How to use biostratigraphy and bio facies to identify key seismic markers
  - How to integrate biostratigraphical data with other geological data (sedimentological, petrographical, geochemical) to maximize its use
  - How to use integrated biostratigraphical data to build a high-resolution sequence stratigraphy
  - How biostratigraphy can be used in play definition and for play based exploration
  - Working examples of applied stratigraphy for exploration and development from Africa, Asia and Europe
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## OBJECTIVES

By the end of this training seminar, participants will be able to:

- Have knowledge of the different microfossil groups and in which ages of sediment and palaeoenvironment of deposition they can be utilized
- Develop an understanding of how biostratigraphical data can be integrated with other geological data to optimize its use as an interpretative tool
- Develop an enhanced interpretation skill to recognize key seismic markers and how to interpret these as a geological sequence by integrating biostratigraphical data
- Interpret palaeoenvironment of deposition by using biostratigraphical assemblages
- Use biostratigraphy as a predictive tool in exploration and development

## TRAINING METHODOLOGY

- This Applied Biostratigraphy and Sequence Stratigraphy in Oil Exploration & Development training seminar will be based around PowerPoint presentations for each module followed by interactive and participative individual and team exercises. There will also be workshop sessions based around real exploration and development examples to get participants to actively become aware of the predictive capabilities of applied biostratigraphy and sequence stratigraphy. Training seminar participants are also encouraged to bring along biostratigraphic data, logs and seismic where appropriate from their own companies so that real working examples can be interpreted.

## ORGANISATIONAL IMPACT

For the organisation, the benefits will include:

- Optimum use of biostratigraphical data that is often acquired by an organisation but not fully utilized
  - Planning of biostratigraphical analyses and programs for best results at a minimum cost
  - Higher resolution reservoir correlations from exploration through to development situations (flow unit correlations for static models)
  - Sequence and then facies interpretations and better reservoir prediction capabilities after integration with the seismic
  - New play definitions and ultimately to new lead and prospect determination
  - Rejuvenation of mature exploration areas with new ideas to find missed oil accumulations
  - Generation of new exploration plays and concepts for wildcat drilling
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## PERSONAL IMPACT

- The non-specialist geoscientist is often at a loss with how to best use biostratigraphical data from company reports. This Applied Biostratigraphy and Sequence Stratigraphy in Oil Exploration & Development training seminar will provide the necessary technical know-how for the individual to feel comfortable with the utilization and the integration of this data into their everyday work flows. This will aid their efforts in both the exploration for new hydrocarbons and in the development of existing fields.
- Provision of a practical working knowledge of different biostratigraphical techniques
- Understanding of how to plan and optimize a biostratigraphical program from which microfossils to process for, to optimum sample spacing
- Learn how to use best use biostratigraphical data in well to well correlations
- Learn how to identify the pitfalls in the use of biostratigraphical data and therefore to optimize its use in sediments of different ages and in different palaeoenvironments
- Learn how to use biostratigraphical data to identify sequences and sequence boundaries and how to integrate it with other geological and seismic data
- Learn how to use biostratigraphical data for new play definitions in exploration areas and how also it can be used for facies interpretations and reservoir correlations in appraisal and development situations

## WHO SHOULD ATTEND?

This training course is suitable to a wide range of professionals but will greatly benefit:

- Exploration Geologists
- Development Geologists
- Seismic Interpreters
- Sedimentologists
- Petrographers
- Upstream subsurface professionals who are interested in optimally utilizing geological data as a predictive tool in sedimentary basins and for identifying hydrocarbon plays in active petroleum systems

## Course Outline

### Stratigraphy and an Introduction to Micropaleontology

- The Laws of Stratigraphy
  - Age Dating Methods for Sediments and Igneous Rocks
  - The Stratigraphical Column and Chronostratigraphy
  - The Different Microfossil Groups and Preparation Techniques
  - Organic Microfossils (Palynomorphs) including Acritarchs, Chitinozoans, Dinoflagellates, Pollen and Spores
  - Inorganic Microfossils including Microforaminifera and Ostracoda
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## Biostratigraphy

- Microfossil Evolution through the Stratigraphical Column
- Building Stratigraphical Range Charts
- First Downhole occurrence, Last Downhole occurrence, Fossil Assemblages
- Numerical Methods, Frequency Polygons, Abundance increases and Maxima
- Index Fossils
- Stratigraphical Type Sections and the relation between Biostratigraphy and Chronostratigraphy

## Biostratigraphical Correlations and Correlation Techniques

- Building a Biostratigraphical Cross Section, Datum Selection
- Pitfalls using Biostratigraphical Data, Downhole Caving, Reworking, Contamination
- Definition of Biozones
- Integration of Sedimentological and Petrographical Data
- The Integration of Geochemical Information
- Identification of Unconformities / Hiatus in the sequences

## Biostratigraphy, Palaeoenvironment's and Seismic Sequence Stratigraphy

- Using Micropalaeontology for Palaeoenvironmental Interpretation
- Marine Microfossils vs. Non-marine Microfossils
- Preservation of Microfossil groups and Different Lithology's
- Definition of Water Depth from the Different Fossil Groups
- The Identification of Sequence Boundaries using Biostratigraphical Data
- Using Biostratigraphical Data to Identify Condensed Sequences and Maximum Flooding Surfaces
- Using Biostratigraphical Data to Identify Lowstand System and High Stand System Tracts
- Integration of Biostratigraphical Data and Seismic Sequence Stratigraphy
- The Pitfalls, Understanding the Resolution related to the Geology and the Limitations

## Play Definition using Play Based Exploration Techniques

- Hydrocarbon Play Definition – What is a play?
  - Integrated Biostratigraphy and its use in Play Based Exploration Techniques
  - The Deltaic to marine Cretaceous Alagamar Play in Potiguar Basin, Equatorial Marginal of Brazil
  - The Cenozoic deepwater turbidites and associated salt play, Lower Congo Basin, Angola
  - The Early Silurian Hot shales of the Arabian plate, source rock characterization
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