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## N477: A Systematic Approach to Defining and Evaluating Stratigraphic and Subtle Combination Traps

Instructor(s): Mark Thompson and Mike Mayall

### Format and Duration

Classroom - 4 Days

Virtual - 8 Sessions

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### Summary

Many stratigraphic and combination traps are discovered serendipitously, throughout a basin's exploration history. They are often perceived as high risk and volumes are commonly underestimated, especially where the column height is larger than the structural spill. In this course we will develop a consistent and systematic workflow for the deliberate identification and evaluation of such traps. This is important as these subtle traps often get risked in an inconsistent manner across organisations but they can contain significant resources.

Course participants will acquire the necessary skills to enhance value for their employers by identifying new prospects, performing robust geological risk assessments, and generating more accurate resource volume assessments. Topics include classification schemes; defining a regional framework; formulation of a geological model; trap domains; regional angular unconformities; stratigraphic edges; risking and volumetrics. Case histories and exercises are taken from a rich variety of tectonic settings and a large variety of depositional environments, both for carbonates and clastics.

### Learning Outcomes

Participants will learn to:

1. Apply a methodical approach, through a systematic workflow, to identify stratigraphic and subtle combination traps within the appropriate tectonic and sequence stratigraphic context.
2. Appreciate the rich set of analogue fields world-wide in various plate tectonic and mega-sequence settings for both carbonates and clastic reservoirs. Deploy these analogues to help guide exploration in similar basins.
3. Evaluate prospects involving stratigraphic and subtle combination traps in terms of risk and resource estimation uncertainties.
4. Work to deliver an efficient exploration screening result in a "learning by doing" scenario, applying the workflow taught on the course.

### Training Method

This is a classroom or virtual classroom course comprising a mixture of lectures, discussion, case studies, and practical exercises.

### Who Should Attend

This Skilled Application level course is aimed at exploration geoscientists with experience of seismic interpretation and a firm grasp of stratigraphic concepts and the fundamentals of petroleum systems. Team leaders and managers of exploration teams could also benefit from participation in this course.

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## Course Content

### Introduction:

- Classification schemes; The importance of stratigraphic and subtle combination traps, globally. Review the track record over last few decades;
- Exercise: Trap description methodology in terms of trap edges

### Regional framework:

- Megasequences
- Location of analogue traps in extensional settings
- Location of analogue traps in compressional settings
- Description by systems tracts
- Trap identification and classification
- Exercise: N Slope Alaska

### Integrated geological model:

- Formulation of a geological model:
  - Role of pre-existing and syn-depositional topography on reservoir GDE's; Growth structures; The importance of sediment entry points and dispersal;
  - Impact of top seal thickness and environment of deposition
  - Effects of early hydrocarbon generation synchronous with quartz cementation
  - Concept of the first carrier; Coupled systems;
  - Migration foci - importance of chasing the molecules
  - Seal effectiveness vs available charge
- Trap domains maps talk

### Regional angular unconformities:

- Super-crop and sub-crop maps, case history North Slope.
- Exercises: SNS and Gippsland.

### Stratigraphic edges – pinch-outs and erosional truncation:

- Defining play-scale pinch out geometries on seismic data
- Exercise: Sergipe
- Defining paralic prospect scale stratigraphic traps
- Exercise: Brookian N Slope
- Defining deep-water prospect-scale stratigraphic traps. Including lobes, channels, MTC's and 'waste zones'



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- Exercises: Various basins worldwide
- Defining carbonate prospect-scale stratigraphic traps

### Aspects of risking and volumetrics:

- Use of seismic attributes and direct hydrocarbon indicators (DHI's)
- Exercise: 3 cases for discussion
- Risking guidelines and pitfalls
- BRV criteria: Importance of defining the geological model(s)
- Exercise: Dependency between column height and available charge volumes
- Learning from well failures using a 'failure criteria lookback methodology' - North Sea case histories
- Exercise: West of Shetland
- Exercise: Portfolio Management

### "The edges of the wedges": a suggested workflow

#### Full day exercise:

- Participants will apply the work flow and lessons from the previous part of the course on a seismic dataset from the North Sea.
- Define the regional setting, construct a play cartoon, draw a trap domain map, and discuss risking and portfolio management of identified stratigraphic traps.