

# Research Centre of Excellence

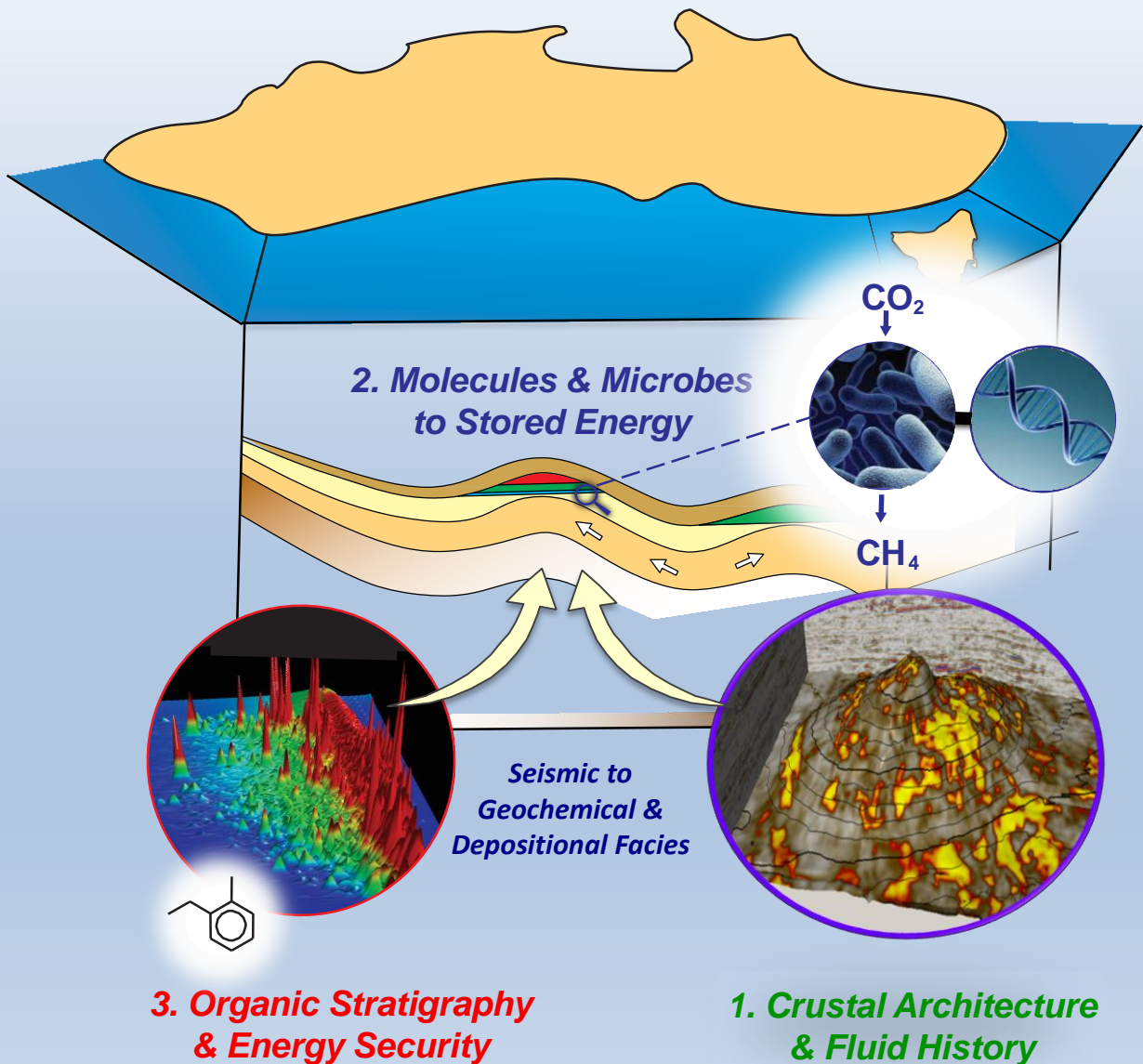
## SAFE- *Securing Australia's Future Energy*

### *Microbes to molecules: unlocking our energy resources*

We propose a new research Centre of Excellence to help secure Australia's future energy requirements. The Centre will combine new biogeochemical analytical techniques with the vast quantities of multi-dimensional subsurface data from sedimentary basins and develop new tools to reduce exploration, development and production risk by better prediction of:

- The occurrence, type and maturation of hydrocarbon source rocks in undrilled sedimentary basins
- The quality, distribution and effectiveness of hydrocarbon source rocks in proven, multi-phase basins
- The facies, tie to seismic and productivity of hydrocarbon source rocks in mature basins.

An international team of leading researchers, industry partners and government bodies has been assembled to investigate the following three overlapping strands of science: crustal architecture and fluid history; molecules and microbes to stored energy; and imaging organic stratigraphy for energy security.



## 1. *Crustal Architecture & Fluid History*

In many mature sedimentary basins vast quantities of seismic, well log and core data have been collected, allowing us complete 3D coverage of the subsurface to answer the following questions

- How can we relate **geochemical and depositional parameters to seismic signatures** at field and basin scales?
- Can we integrate new technology to **trace and date the poly-phase history** of fluid evolution and transport?
- What is happening to organic matter/ fluids **during maturation and migration**- and how do we measure and fingerprint this process?

## 2. *Molecules & Microbes to Stored Energy*

The interaction of organic matter and material deposited in sedimentary basins can drastically influence the nature and characteristics of the sedimentary rock that inevitably forms. Fundamentally, this process controls the ability and potential for hydrocarbon generation and migration.

Integration of our greater understanding of basin-scale processes, fluid migration and the formation of source rock deposition, will allow us to address the micro-scale processes that occur within sediment during its deposition, conversion to rock and hydrocarbon generation. This strand will focus on:

- **Microbes and minerals** - How does inorganic material interact with organic matter during transformations?
- **Organics to oil**- What is the role of microbes in the transformation of organic matter into hydrocarbons?
- **Reducing risk with microbial fingerprints** - Can we identify controls and characterize source rocks using biomarkers and microbial signatures?
- **Penalties to production: Microbial interactions and future energy generation** - Can our understanding of microbes and their processes be used to create new energy sources or maximize recovery and optimize processing?

## 3. *Organic Stratigraphy & Energy Security*

A better understanding of the known high quality source rocks, especially their geographic distribution, organic matter type and their maturity level would greatly assist prediction of Hydrocarbon productivity and phase (oil, condensate, gas or CO<sub>2</sub>). This strand would also focus on finding new source rock intervals.

- Can we predict new global source rock **intervals without drilling source-rocks**?
- What methods can we develop to **quantify volume and phase of generated hydrocarbons**?
- Can we determine the **depositional architecture of source rocks**?

**The aim of this strand is to de-risk presence and effectiveness of source rocks from frontier to mature basins**

### Contacts:

#### **Kliti Grice**

K.Grice@curtin.edu.au;

#### **Andrew Bell**

Andrew.Bell@curtin.edu.au