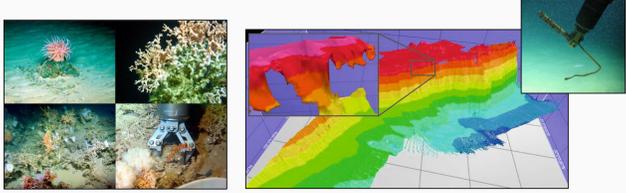


## Marine

This includes our marine-related research involving 3 main Targeted Projects: (i) Marine Acoustics, (ii) Enhancing knowledge and understanding of Ireland's seabed and (iii) Marine remote sensing applications. Acoustic methods provide an important means of characterising and studying of the sea bed and it's subsurface. This spoke will form an integrated broad band perspective on the acoustic noise field of the marine, will identify associated impacts of anthropogenic noise and will use the noise field as a subsurface imaging tool. Using associated methods, this spoke will provide strategic evaluations of Ireland's seabed pertinent to industries needs and evaluate seabed geohazards. New remote sensing software tools for industry will be developed which will support the economic development of Ireland's offshore regions and provide baselines for assessing 'Good Environmental Status (GES)'.

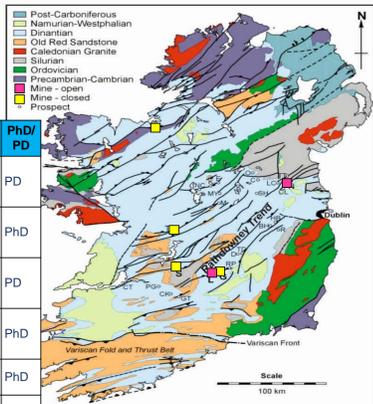


| PI                      | Project title   | PhD/PD |
|-------------------------|---|--------|
| Chris Bean (DIAS)       | Novel applications of broad band near sea floor pressure/acoustic monitoring for time lapse remote sensing of sea-bed processes | PD     |
| Andy Wheeler (UCC)      | Quaternary Seismostratigraphies of Irish Shelf Seas (QuSIS)   | PD     |
| Andy Wheeler (UCC)      | Coral Carbonate Mound Archives for Submarine Canyon Exchange Processes (CoMA_CoP)   | PhD    |
| Timothy McCarthy (NUIM) | Marine Observation Platform & Slick Feature Mapping   | PD     |
| Peter Croot (UCC)       | Influence of natural biogeochemical controls on primary productivity on the optical properties of surface seawater              | PD     |
| Peter Croot (NUIG)      | Application of CDOM optical properties for tracing natural and manmade surface slicks.  | PhD    |

## Raw Materials

More than 50% of the world's hydrocarbon reservoirs are in limestones. A major component of iCRAG's raw materials research concentrates on the world class Zn-Pb Irish Orefield, in which mineral deposits are entirely hosted by limestones. This spoke therefore provides an excellent basis for examining fluid flow with limestones, with a variety of potential implications for hydrocarbon studies including:

- Fault/fracture controlled fluid flow.
- Regional dolomitisation
- Fault/fracture geometries within limestones.

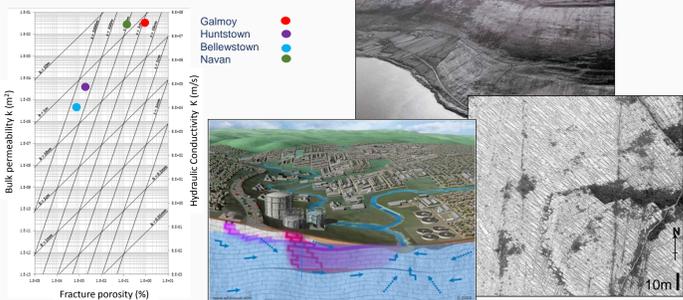


| PI                     | Project title  | PhD/PD |
|------------------------|--|--------|
| John Walsh (UCD)       | Structural evolution of Lower Carboniferous faulting and its links to fluid flow and mineralization          | PD     |
| Sean McClenaghan (TCD) | Delineating hydrothermal Zn-Pb signatures along fault structures of the Rathdowney Trend, Southwest Ireland. | PhD    |
| Julian Menuge (UCD)    | Origin and discovery of Irish-type orebodies: new isotopic methods   | PD     |
| Pat Meere (UCC)        | Metallogenesis of Cu deposits in Upper Palaeozoic sedimentary rocks, southern Ireland                        | PhD    |
| Balz Kamber (TCD)      | The systematics of ECE and ITN element incorporation into Zn and Cu ore                                      | PhD    |
| Sean McClenaghan (TCD) | Characterizing orogenic vein systems to promote gold exploration across Irish terranes.                      | PhD    |

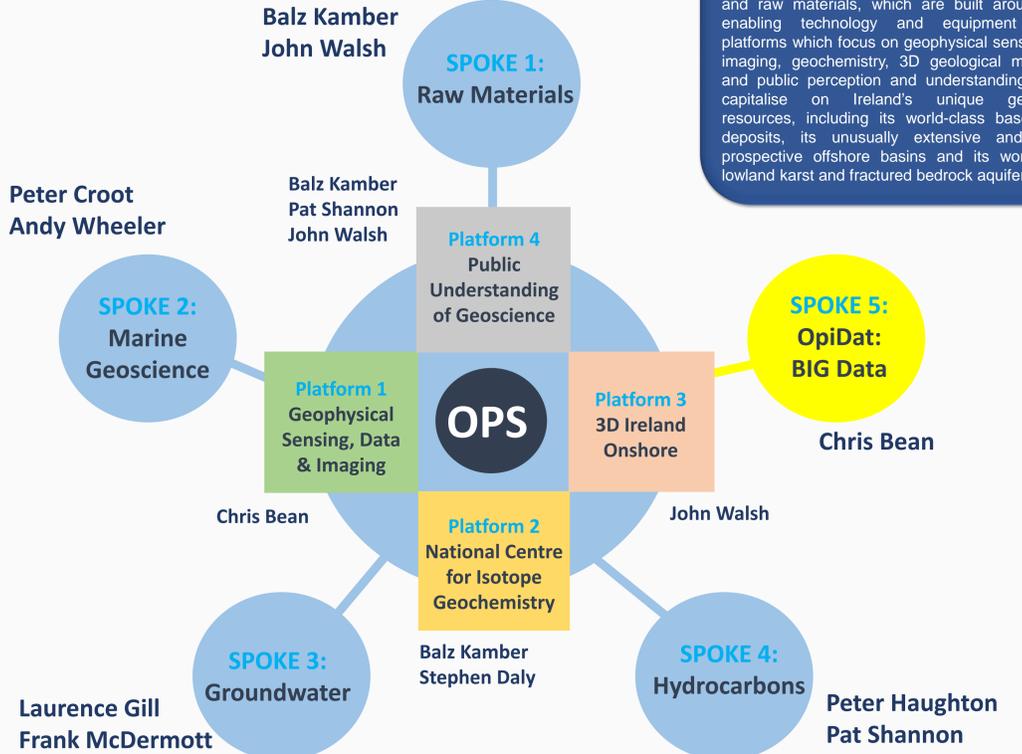
## Groundwater

Nearly 20% of Ireland's water requirements are derived from subsurface groundwater. This reflects the predominance of limestone bedrock in Ireland, characterised by strong fracture and karst controlled groundwater flow. This permits investigation of the oftentimes highly heterogeneous nature of flow within limestones, both from qualitative and quantitative perspective, using methods which are sometimes applied in the hydrocarbon industry. Amongst the issues which will be examined are:

- Quantitative parameterisation of fault/fracture controlled fluid flow within limestones.
- Development of karst within limestones.
- Karst-controlled groundwater flow.



| PI                    | Project title   | PhD/PD |
|-----------------------|---|--------|
| Laurence Gill (TCD)   | Prediction of response (and solutions) of lowland karst areas prone to flooding to climate change                   | PhD    |
| Bruce Misstear (TCD)  | Impacts of changing climate on groundwater recharge in low storativity fractured-rock aquifers                      | PhD    |
| John Walsh (TCD)      | Quantitative assessment of the impact of faults, fractures and related karst networks on groundwater flow           | PhD    |
| Frank McDermott (UCD) | An investigation of arsenic sources, speciation and mobilization processes in selected Irish aquifers               | PhD    |
| Catherine Coxon (TCD) | Emerging organic contaminants arising in rural environments: investigations in karst and fractured bedrock aquifers | PhD    |



### iCRAG Structure & Co-PIs

iCRAG's research programme consists of four cohesive topics or 'spokes' in the areas of groundwater, hydrocarbons, marine geoscience and raw materials, which are built around four enabling technology and equipment based platforms which focus on geophysical sensing and imaging, geochemistry, 3D geological modelling and public perception and understanding. It will capitalise on Ireland's unique geological resources, including its world-class base metal deposits, its unusually extensive and highly prospective offshore basins and its world-class lowland karst and fractured bedrock aquifers.

### iCRAG Overview

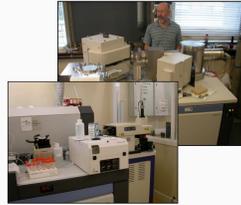
iCRAG is a newly formed national research centre which brings together Ireland's leading geoscience experts focussing on a range of issues all of which underpin economic development - from safe and secure groundwater supplies through to the discovery of mineral/aggregate deposits, and from the de-risking of oil and gas exploration to ensuring that the Irish public is educated and informed on these issues. The principal goal is to embed the outcomes of high quality research within industry practice in Ireland and overseas.

Supported by Science Foundation Ireland and industry partners for the next 6 years (with ca €25M cash funding), iCRAG is one of only 12 SFI Research centres, and the first national geosciences initiative to be supported by SFI's flagship funding scheme. iCRAG is a collaboration between 150 researchers within UCD, TCD, NUIG, UCC, NUIM and DIAS and more than 50 industry partners who will work in partnership with government agencies involved in the geosciences sector.

This poster describes some of the non-hydrocarbon research conducted in iCRAG which is pertinent to technical issues confronted by the petroleum industry - another poster outlines our hydrocarbon-related research.

## Geochemistry

Support the geochemical analytical requirements of iCRAG research, and develop analytical methods to support research in the Raw Materials and Hydrocarbon spokes including petrographic/spatial geochemical characterisation of rock and mineral samples (ores, reservoir sandstones etc.).



## Public Perception

Since public perception and understanding can be a major challenge to geoscience sector projects, this platform will investigate this issue and provide support and information on geosciences to facilitate decision making by the public and by policy makers.

- Education and training for geoscientists.
- Improved geosciences information to decision makers and the general public.

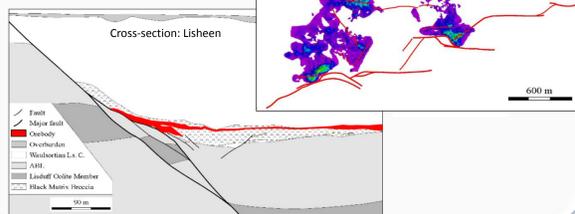


## Platform Research

| Platform              | PI                    | Project title   | PhD/PD |
|-----------------------|-----------------------|---|--------|
| Geophysics Platform   | Sergei Lebedev (DIAS) | Seismic imaging with massive datasets using sparsifying transformation methods  | PD     |
| Geophysics Platform   | Chris Bean (DIAS)     | Development of noise correlation methods in the marine environment, GeophysicsPD2   | PD     |
| Geophysics Platform   | John Walsh (DIAS)     | Provide IT Support for Platform and Spoke projects involving Seismic interpretation and 3D modelling (Geophysics and 3D Modeling) | IT     |
| Geochemistry Platform | Balz Kamber (DIAS)    | Method development in chemical fingerprinting and laser-ablation analysis   | RA     |
| 3D Ireland            | John Walsh (DIAS)     | 3D modelling of the NW Irish Carboniferous Basins from regional down to mineral deposit scale                                     | PD     |
| 3D Ireland            | John Walsh (DIAS)     | 3D modelling of the Irish Carboniferous Basins from regional down to mineral deposit scale  | PD     |
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## 3D Ireland

Common datasets are unique national archives for research in different sectors (e.g. groundwater and mineral deposits are in the same rocks). Using archive mineral exploration/production data, together with geological and geophysical data supplemented by Geological Survey of Ireland (GSI) and Exploration and Mining Division (EMD), we will generate a 3D Geological Model of the Irish Carboniferous on a broad range of scales.



## Geophysics

Perform research and provide support on a broad range of geophysical techniques, though specialising in seismic methods in particular.

- Developing new imaging methodologies.
- Yielding Ireland's first ultra high resolution shallow (top 1km) passive seismic images.
- Compare Geological and Geophysical models directly.

