Australian Government
Australian Research Council

Examples of new *Discovery Projects* in 2010

Physical, Chemical and Earth Sciences

The University of Western Australia (Contact: 08 6488 2806)

Integrated approach to functional carbon based materials (DP1092810)

Summary: Exploiting novel forms of carbon to create new technologies for the energy, health and environmental sectors is a major challenge in nanotechnology. This project will exploit innovative methods such as self-assembly and continuous flow spinning disc processing. Our proposed research will make significant contributions to a fundamental understanding of carbon nanomaterials. We will bring together international expertise with complementary skills, providing a more inventive research culture and excellent opportunities for training young scientists. The attractive low cost of renewable starting materials and small footprint of the ensuing technologies will provide a platform for fostering links with industry.

Chief Investigator: Professor Colin Raston

ARC funding: $1,320,000 over 5 years

Swinburne University of Technology (Contact: 03 9214 5968)

A theoretical understanding of galaxy assembly and black hole evolution across cosmic time (DP1095506)

Summary: This research will establish Australia as a centre for cutting edge galaxy formation modeling. It will make publicly available the world's largest cosmological simulation of dark matter and galaxy evolution. We will design and deploy an online web portal within which custom galaxy formation models can be constructed by anyone in the community for their own work. Support for this project will strengthen theoretical astronomy in Australia at a time when increased theoretical infrastructure is needed to fully capitalise on Australia's significant observational investments.

Chief Investigator: Dr Darren Croton

ARC funding: $725,000 over 5 years

The Australian National University (Contact: 02 6125 5575)

Dynamic permeability and the evolution of fluid pathways in fracture-controlled hydrothermal systems (DP1093774)

Summary: This project will advance knowledge of how fracture-controlled fluid flow at depth in the Earth influences the strength and mechanical behaviour of the crust, earthquake processes, and the formation of hydrothermal ore systems. Fundamental new knowledge of the dynamic variations in fluid transport properties and flow distribution in deep fracture networks also will have application for understanding hydrocarbon migration in fractured reservoirs, controls on seal integrity in geosequestration projects, and for geothermal energy production from hot, fractured rock. The project will develop international collaboration and train young scientists.

Chief Investigator: Professor Stephen Cox

ARC funding: $300,000 over 3 years

The University of Sydney (Contact: 02 9114 0748)

Integrated Ocean Drilling Program (IODP) drilling in the Great Barrier Reef: unlocking the causes, rates and consequences of abrupt sea level and climate change (DP1094001)

Summary: The Great Barrier Reef (GBR) and how it will respond to future global climate changes is of fundamental importance to the nation. The project will address this challenge by investigating the submerged fossil coral reefs in the GBR. This will lead to a better understanding of the natural rates, range and forcing mechanisms that control global sea-level and climate variability (i.e. paleo-ENSO), and geo-biological changes affecting the GBR over the last 20,000 years. This project will provide unique insights into the response of the GBR to past environmental stress and improve predictions about the vulnerability of GBR to future global climate changes.

Chief Investigator: Dr Jody Webster

ARC funding: $372,000 over 3 years

The Australian National University (Contact: 02 6125 5575)

Molecular fossils, the evolution of Earth's early oceans and the origin of the oldest oil (DP1095247)

Summary: Australia retains undiscovered oil reserves. We believe that a change in primitive marine life forms may have fundamentally changed the chemistry of the Earth's oceans and is responsible for the world's oldest oil reserves. While these reserves have been found, and successfully commercialised overseas, similar reservoirs in Australia remain elusive. The project will develop and apply technologies based on hydrocarbon biomarkers to help determine the oil-producing rock types of Precambrian sedimentary rocks. This allows us to estimate the oil's age and predict where petroleum reservoirs may be hidden. PhD students involved in the project will gain valuable knowledge about the link between changes in ecology and the carbon cycle.

Chief Investigator: Dr Jochen Brocks

ARC funding: $655,000 over 5 years

The University of New South Wales (Contact: 02 9385 2864)

Making Silicon Even More Useful: Functionalising Silicon to Produce Stable Electronic Devices in Aqueous Environments (DP1094564)

Summary: Silicon is the wonder material of our time, being the foundation upon which our electronics and device industries are based. Silicon however would be even more useful if it could be stabilised so the surface did not oxidise in air and water. If this oxidation could be prevented, silicon could be used in a whole range of new devices related to biotechnology, molecular electronics and biosensing. The project will develop a viable surface chemistry strategy for achieving this stabilisation and hence will greatly expand the scope of devices which can be fabricated from silicon. This will have significant scientific and economic benefits for Australia. We will exploit this new capability for cancer detection, cell engineering and biosensing.

Chief Investigator: Professor John Gooding

ARC funding: $980,000 over 5 years