

SUPERCOMPUTER HELPS PREMATURE INFANTS

Doctors at Nepean Hospital in Sydney's west are using a new supercomputer to help health specialists care for premature infants during their first hours and days of life.

Staff specialist in neonatology at Nepean hospital, Dr Mark Tracy, believes one way to improve health outcomes for pre-term babies is to train staff to resuscitate newborn infants with a computerised 'virtual' baby.

"A lot of health problems in acute neonatal medicine can be life-threatening situations," he said. "For health carers, these can be stressful and rare scenarios, which make them difficult to perform successfully, for even experienced staff.



The Hon Kim Yeadon, NSW IT Minister and Minister for Western Sydney, along with Penrith Councillor Karyn Paluzzano at the opening of the **ac3** regional supercomputer at Penrith.

"We're aiming to build a training environment akin to airline pilot training. A virtual baby is displayed on a computer monitor. The trainee then works through the correct sequence of diagnosis and treatment so that they are better able to deal with the problem in the real world," according to Dr Tracy.

The supercomputer is based at the Centre for Advanced Systems Engineering at the University of Western Sydney's Kingswood Campus. The machine is the equivalent of 50-60 standard laptops, with 40 gigabytes of memory and 800 gigabytes of fixed disk storage, according to Associate Professor George Bryan.

"The supercomputer is optimised for visualisation projects and plans are underway at UWS to use it to develop a bushfire modelling system to visualise fire behaviour under different weather and terrain conditions," he said.

Other projects in the pipeline include developing a powerful data collection project to monitor prematurely born babies, and assisting the Sydney Catchment Authority to run a number of water demand and flow models.

Funded by **ac3** and the University of Western Sydney, the purpose of the GWS Node is to provide cheap access to advanced computing facilities and expertise for industry in Western Sydney.

AC3 RESEARCH PORTFOLIO LAUNCHED

A portfolio of some of **ac3**'s principal researchers has been compiled, and may be downloaded from http://www.ac3.com.au/reports/ac3_Research_Portfolios.pdf.

Some 13 research projects are highlighted, ranging from the pragmatic areas such as designing better braking systems to simulating the origin of life!

The portfolio has been written for a non-technical audience, and is also available in gallery format at <http://www.ac3.com.au/gallery/>.

INDUSTRY MANAGER TO ASSIST REGIONAL INDUSTRY

ac3 has appointed Ian Stone as Industry Development Manager to encourage industry, particularly in regional NSW, to make better use of advanced computing.

Noting Mr Stone's appointment, **ac3** chief executive, Dr Philip McCrea, said: "The appointment of our industry manager will help industry, particularly SMEs, to be much more competitive internationally by harnessing the benefits of advanced computing."

Mr Stone has a strong background in the development and application of software for manufacturing in local and international markets. He has extensive knowledge of business and industrial processes and how advanced computing can lead to competitive advantage.

"In manufacturing, for example, the ongoing tasks of developing, testing and refining prototypes have long been highly variable production costs", Mr Stone said. "But with appropriate use of advanced computing, better quality products can be developed more reliably, cheaply and quickly."



Ian Stone, **ac3**'s Industry Development Manager

RESEARCH PORTFOLIO: A LOOK AT SOME RESEARCHERS WHO USE AC3'S COMPUTERS

COMPUTERS AT THE COALFACE

Greg Perkins is a long way from the coalface, but his computer models might be the mining industry's best bet for turning coal into serious money.

For more than a century, miners have been converting coal into gas for power generation and chemicals manufacture. But digging the black stuff out of the ground is a dirty, expensive business, so miners are turning to *underground* coal gasification (UCG).

As the term suggests, UCG 'gasifies' coal by treating it underground, but so far no one has figured out how to do this and turn a profit. UCG has the potential to exploit coal resources long regarded as inaccessible or uneconomic due to depth, geology and safety factors.

"There are several challenges to UCG's commercial adoption," said Greg Perkins of the School of Materials Science and Engineering at the University of New South Wales. "They include uncertainty about where to locate and operate an underground reactor, and what its likely performance might be."

"The uncertainties are part of the reason for the lack of commercialisation, but economic factors are important too. You need a high economic driver for higher risk projects to get off the ground," he said.

For the past three years Greg Perkins has been building computer models aimed at reducing the commercial risks of developing Australia's first full scale UCG operation. "The modelling work using the supercomputers at **ac3** can help a company choose between several potential UCG sites by combining site survey data with economic data about the potential plant to be developed.

"The work I'm doing will be a valuable tool for designers, energy and chemical companies, government planners and researchers considering any potential Australian UCG project."



The computer models created by Greg Perkins from UNSW on **ac3**'s computers enables companies to determine the economic viability of underground coal 'gasification'.

RISKY BUSINESS NO LONGER A GAMBLE

Fischer Black and Myron Scholes will never be household names, but in the arcane world of financial markets their names are spoken with hallowed reverence. Since its 1973 publication, the financial duo's *Option Pricing Model* has enabled an unprecedented growth in the financial derivatives market that trades five trillion dollars worth of options daily.



Researchers at the **ac3** Centre of Expertise in Computational Finance use **ac3**'s computers to gain a better understanding of risk in financial markets.

Fischer and Scholes built a model to calculate the fair market value of an option, which is the right (but not the obligation) to buy or sell an asset (such as a stock, commodity or currency) at a specific price during a defined time-period. Its effect was to change the way investors value risk and it gave rise to the field of risk management and valuation of corporate liabilities.

Like Black and Scholes, Professor Tony Hall from the University of Technology Sydney is spearheading research aimed the financial markets. "We are doing basic research into computational finance – solving problems that so far, people haven't been able to solve.

"We are doing that with the aid of **ac3**'s supercomputers," said Professor Hall, who heads the **ac3** Centre of Expertise in Computational Finance.

The Centre, which has been established within the Capital Markets Cooperative Research Centre, has a grant from the Australian Partnership for Advanced Computing (APAC) to demonstrate the usefulness of the supercomputing for financial market applications.

While financial institutions continually track their risk exposure, Professor Hall said their ability is challenged by the growing size and complexity of global markets.

"Banks have to keep track of the credit risk and risk exposure. However, while they do financial deals throughout the day their risk exposure is always changing.

"At the same time, a lot of problems in financial markets are computationally intensive," he said. "In a perfect world they ought to be able to get an updated picture of what their risk exposure looks like but that's not possible given the sort of technology they use currently.

"What we are doing is showing that we can deliver rapid, accurate results that are not possible on standard personal computers."

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