

CENTREFOLD



MARY DUNCAN FAMA

The wedding of an old gym mate took me to the Gold Coast in mid-November and created an opportunity to visit some more mathematical friends and colleagues in Brisbane and Wollongong. High on my priority list was a trip to the Queensland Centre for Advanced Technology at Pinjarra Hills, Brisbane, to catch up with Dr Mary Fama who works there for the CSIRO Division of Exploration and Mining. I had first met Mary (then Mary Duncan) in 1962, when she joined Applied Mathematics Laboratory, DSIR, shortly after graduating BA (First Class) in mathematics at Oxford after a first degree at Canterbury, New Zealand. We collaborated on a major project concerned with the deformation of ceramics during firing cycles and skirmished with haystack and woolbale problems, but Mary's interests gradually drifted towards elastic media problems involving beams, sewer pipes (as Mary says - good for cocktail party conversation) and ice strains. Somewhere along the way, she developed great expertise in programming and finite element analysis. In 1964 she left for Harvard with a Fulbright Travel Grant, a New Zealand Federation of University Women Fellowship and a Harvard Fellowship, completed a PhD in Applied Mathematics presenting a thesis on "The effect of a ring stiffener on the stress in a cylindrical shell with a longitudinal crack", and returned to the DSIR in 1967.

Marriage to Peter Fama and sharing divergent professional opportunities seems to have been raised to an art form from here on. There followed a year as temporary lecturer in the University of Sydney Department of Applied Mathematics in 1969, a year as a Rothman's Research Fellow in their School of Engineering and three years in the Department of Theoretical and Applied Mechanics in the School of Engineering at the University of Auckland, on a research contract concurrently supported by DSIR to work on NZ insulators and their stress strain characteristics. This work received meritorious commendation from Auckland University.

In 1973, Ian Dick, the founder of the Applied Mathematics Laboratory, and at that time head of the Mines Department, persuaded Mary to join his department as a research consultant to work on problems of mine structure and safety. Ian had a genius for finding talent and putting it to work in his organisations. Work here on the analysis of hollow inclusion cells for stress measurement led to a widely acclaimed publication in 1980 concerned with a definitive analysis of the CSIRO Hollow Inclusion Cell. Somewhere in here we need to fit in motherhood and three children (one set of twins) plus three terms as a temporary lecturer in the Mathematics Department at Waikato University in 1980.

In mid-1983, Mary and the family moved to Brisbane where Peter, a forensic psychiatrist, became Deputy Medical Superintendent of Wolston Park Hospital, and Mary joined the Geomechanics Division of CSIRO. A decade of work there on rock stress and elastic deformation analysis has established Mary as a leading international figure. It's not surprising she was invited to contribute a core chapter to Comprehensive Rock Engineering, the definitive work on rock engineering.

Her most notable research achievement is probably the development of a fundamentally new mathematical description of the constitutive behaviour of weak rock, including coal of course. This led to the development of a unique software package, FESOFT used to formulate a new coal pillar design method, in a world first, which was used for the design of the long narrow pillars for a major CSIRO-industry collaborative project for the new (to Australia) highwall mining technique. This involved a major breakthrough concerned with the methodology used to

derive the modelling input parameters.

Let me return to my original story of a visit to CSIRO last month. I rang Mary shortly after arriving in Brisbane and found she had just arrived home from a trip to London to see her son, Chris. My friend (chauffeur) Mabo and I were invited out to have lunch. We were greeted by Mary on arrival and taken into her office where she had been busy on a stress analysis problem which had arrived that morning from a coal mining company. Mary explained that she had designed for the company a system of pillars for the company of minimal volume to be left during the mining process to support the roof. Apparently the pillars were looking so good, the miners, in typical fashion, were planning to rob more coal from the pillars. Fortunately they requested a new analysis (to be done in an afternoon!) - and Mary was able to use the results of a hasty finite element analysis to persuade them not to be so greedy.

I should also mention she has been on the editorial board of Mining Science and Technology (1987-1991), has published over fifty papers, conference and other reports, receives many invitations to participate in and deliver keynote addresses at international conferences and has professional affiliations with five scientific, mathematical, geomechanical and mining societies. During her idle moments, Mary follows her interests in music and books and has developed a new interest in horseriding starting from last year. Her son Mick is doing a BSc, Chris is doing a PhD in relativity at ANU, and Suze has a BA Honours in anthropology and has a particular interest in tool behaviour in primates.

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