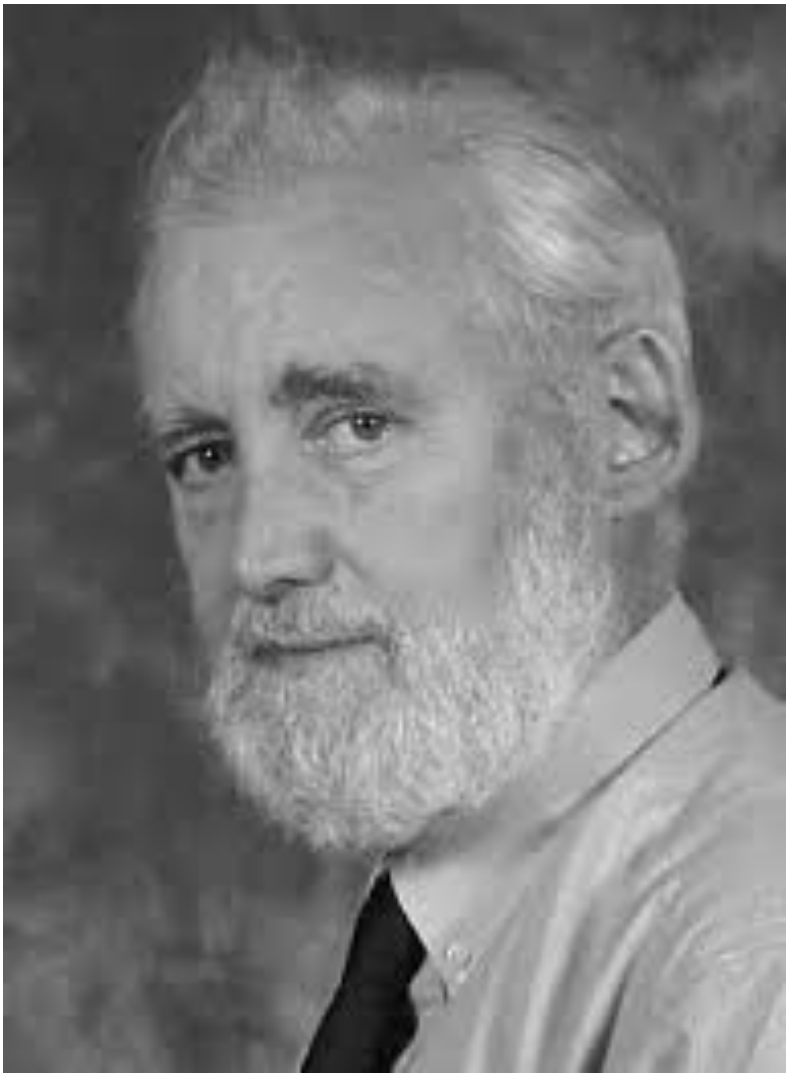

Professor Michael Anthony Crisfield (1942 – 2002)

http://www.worldcat.org/identities/lccn-n88-659444
http://65.54.113.26/Author/54059431/m-a-crisfield

(from The Guardian, 20 March, 2002, by Glyn Davies
http://www.guardian.co.uk/news/2002/mar/20/guardianobituaries.obituaries)

Brilliant mathematician who applied computer skills to a problem faced by structural engineers since Brunel

Even before the era of Isambard Kingdom Brunel, structural engineers were using models to test the strength of complex structures, such as bridges. But they were, and remain, inadequate substitutes for the real thing.

In the 1960s, as the digital computer came of age, the mathematician Professor Mike Crisfield, who has died of cancer aged 59, was a young researcher. It was then that a new tool, finite element analysis (FEA), changed the

way of analysis forever. It became possible for designers and engineers to predict the stress fields in the most complicated structures - such as the Sydney Opera House or the Boeing 747 - and crude approxima tion of their shapes and features was no longer necessary.

A big problem remained, however: what to do with the answers, since structural failure can be triggered by a complicated series of events. Crisfield became a leading figure in the specialised branch of applied mathematics known as non-linear computational mechanics, the modern software tool that can simulate the strength and failure mode of engineering structures from a variety of materials, from steel to concrete. He was among the select band who developed the strategies and algorithms to do this successfully.

Born in Wimbledon, south London, Crisfield developed his interest in mathematics and science at Haileybury school, along with a passion for jazz and blues. Had he been a good enough jazz pianist to earn a living, he said, he would have foregone his academic career. As it was, he graduated in civil engineering from Queen's University, Belfast, in 1965, receiving his doctorate for research on the FEA of skew bridges in 1970. After a year in the bridge section of the Northern Ireland Ministry of Development, he moved to Camberley, Surrey, to work in the bridges division of the transport and road research laboratories (TRRL).

In the 1970s, a series of spectacular failures occurred to box girder bridges in Milford Haven, Germany and Australia, often during the course of erection before the full design loading. These bridges were revolutionary, since they used massive, but thin-walled, steel boxes instead of the usual open-braced frameworks, not unlike lightweight aircraft wing-boxes. Their behaviour was not adequately covered by British standard codes, and it took several years of theoretical research and testing to explain their failure modes, as part of the Merrison inquiry (1973). It turned out that the box girder failure behaviour was a complex interaction between buckling and metal yielding, culminating in an unstable and dynamically rapid collapse.

Between 1974 and 1980, Crisfield developed a series of techniques to explain and simulate this behaviour. The use of computer simulation of non-linear phenomena frequently caused the available computers to crash or - even worse - deliver the wrong solution. The world of structural engineers was sceptical, but Crisfield improved the techniques and applied the same methods to concrete. His methods are still used in software codes today.

By then, he had become deputy chief scientific officer at TRRL and head of the structural analysis section. In 1989, he was appointed as first holder of the FEA chair in computational mechanics in the aeronautics department at Imperial College, London, the department that had pio neered FEA in the 1950s and 1960s. He warmed to the challenges of advanced aircraft structures, including the behaviour of carbon fibre composite materials, without which high-speed military aircraft could never have met their specification. These materials have a stiffness and lightness without equal, but they are brittle and unforgiving of bad designs. As laminated constructions, they can open up like a telephone directory. Crisfield rapidly built up an enthusiastic research team, and developed methods for predicting the behaviour of complex composite structures.

Mike was an extrovert, whose boundless enthusiasm left academic audiences breathless. He played rugby scrum-half well into his 40s, and made his appointment at Imperial College a reason for moving house to Twickenham.

He faced cancer as another challenge, even planning a novel with this battle as a feature. He leaves a legacy of three books and countless scientific papers, many of them seminal. His computational strategies and algorithms

are part of today's finite element codes, used to predict structural performance and failure, and the professions have come to accept "virtual testing".

He is survived by the three children of his first marriage, to Sarah, who died in 1977, and by his second wife, Kiki, their daughter, two stepdaughters and a stepson.