David Crighton Medal - long citation

The David Crighton Medal for 2003 for services to Mathematics and to the mathematics community is awarded to Professor John Ball, F.R.S., Sedleian Professor of Natural Philosophy in the University of Oxford.

John Ball is an outstanding mathematician of international standing. At the same time he has exerted himself both nationally and internationally for the good of Mathematics and its community. In particular, his activity internationally has done much to raise the profile of UK Mathematics, especially of Applied Mathematics. He has an exceptional record of getting things done and making things happen - in this he demonstrates the qualities of David Crighton himself.

Nationally, he was very effective in pressing for and establishing an Institute for Mathematical Sciences in Scotland, and was one of the founders of the the International Centre for Mathematical Sciences, which was set up in Edinburgh more than 10 years ago. Over the years it has been, and remains, an important national asset and one whose programmes are complementary to those of the Isaac Newton Institute.

John Ball was President of the London Mathematical Society from 1996-1998, and led the Society's moves throughout that period to increase its activity and influence in its promotion of mathematics and its links with other bodies.

He has been a member of the Council of the EPSRC, acting as a liaison with the Royal Society and speaking up for mathematics as well as for the sciences and engineering. He chaired the 1998 EPSRC review of the Isaac Newton Institute and served on the board of BRIMS (Hewlett-Packard) at Bristol.

Internationally, John Ball has been for some years prominent in the activities of the International Mathematical Union (IMU), in particular as a member of the Fields Medal Committee and of the Programme Committee for the 2002 Beijing International Congress. At the 2002 Shanghai IMU General Assembly he was elected President of the IMU for the next four years, bringing distinction to the UK mathematics community. He was one of the five members of the Abel Prize committee which awarded its first international prize in June 2003.

Much of John Ball's research focuses on the calculus of variations and applications to solid mechanics, bringing to bear an armoury of knowledge and techniques of mathematical analysis and algebra.

In one of his earliest papers he discussed "discontinuous equilibrium solutions and cavitation in non-linear elasticity". The discussion centred on the emergence of a hole, cavity or void in a solid material subject to traction, and brought into play mathematical concepts of singular solutions, weak solutions, energy-minimisers and Lyapunov functions. This paper illustrates in many ways his fine qualities in linking mathematics with mechanics.

In later work with RD James, John Ball developed a non-linear theory of martensites, materials with a fine structure in which the concept of an energy infimum can be used in the way that is different from the rubberlike materials; for martensites there is no true minimiser,

no true infimum, but the minimiser-infimum can be approached indefinitely closely by a sequential development of finer and finer structure.

His work indicates how mathematical concepts can be brought to bear to explain phenomena of real importance. At the EPSRC-IMA-LMS conference in 2001, on ‘Connectivity between Mathematics and Engineering’, Ball's contribution was a highlight, showing how the choice of the space of functions is of such importance in the construction of numerical/computational schemes that converge to physically relevant solutions.