

IMPLAST 2010

A Symposium on Plasticity and Impact (including Blast) Mechanics

Plenary



*Blast Impact Survivability:
(From Providence to Providence – A Personal Journey
resulting in some exciting developments)*

GERALD N. NURICK

Blast Impact and Survivability Research Unit (BISRU)
Department of Mechanical Engineering, University of Cape Town, South Africa

Tuesday, October 12, 2010, 8:30 AM

A blast/impact event consists of several processes taking place in a very short time interval, but each taking place in different time scales. These processes include the loading mechanism measured in micro/milli-seconds; the structural response measured in milli/unitary seconds and finally the human response which takes place in seconds. Researching this entire process requires knowledge of material properties; and significant relevant experience in numerical applications. Most research laboratories investigate some components of the entire process. BISRU is amongst a few fortunate research groups who are able to research the interrelated mechanisms that occur in the entire process.

This presentation will focus on recent and current research activities (2005-2010) which are under investigation at BISRU, and in addition a special recognition to the many colleagues and students that I have had the privilege to work with.

Topics include (amongst others)

- blast loading mechanisms (detonics), which include throttling mechanisms to minimise the blast pressures, the electromagnetic field generated by explosions, different shapes of explosive resulting in different structural effect, and confined explosions;
- structural response to blast and impact loading, presenting issues such as welded joints subjected to blast loads, the recent focus on fibre metal laminates and sandwich structures using nano-fibres, honeycomb, aluminium foams and specially designed lattice structures, and the effects of buried charges;
- material characterisation of steels, foams and, bovine bones; and development of methods to incur constant strain rates;
- impact biomechanics, particularly the effects of loading of the lower leg (due to blasts in a land mine protection vehicle), and numerical modelling of hands and legs.

Gerald Nurick received his PhD in Mechanical Engineering from the University of Cape Town in 1987. He holds a Professorship in the Department of Mechanical Engineering at the University of Cape Town, and concurrently is the Director of the Blast Impact and Survivability Research Unit (BISRU) – a University of Cape Town accredited research entity, which over the years had a consortium of between 20 and 30 researchers per year from both academia and industry.

Professor Nurick's research interests range from detonics, structural response from impact and blast events, material characterisation and human impact response. Research investigations are supported through both computational and extensive experimental facilities. Professor Nurick has facilitated the expansion of the High Strain Rate Laboratory which now hosts a blast chamber; drop testers (up to 25KJ); several forms of Hopkinson bars; and a sled tester (generating accelerations/decelerations up to 55g) – all in one footprint. He has authored and co-authored over 150 publications in refereed journals, conference proceedings, invited presentations and book chapters.

Professor Nurick is a past President of the South African Institution of Mechanical Engineers (SAIMEchE) (1995-97), of which he is an Honorary Fellow. He has also served on the Engineering Council of South Africa (ECSA) on both the University Accreditation and the Professional Registration Committees. He is a Fellow of the South African Academy of Engineering (SAAE), a Member of the American Society of Mechanical Engineers (ASME) and Member of the Society for Experimental Mechanics (SEM).