Foreword and obituary for Professor Roderick Arthur Smith special issue

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Foreword

Professor Roderick Arthur Smith FREng (1947–2024) was an influential British mechanical engineer whose research, leadership, and advisory roles significantly shaped modern railway engineering, materials science, and public transport policy.

Professor Smith was internationally recognised for his work on **fatigue and fracture mechanics** and in particular its application to railway engineering. What is perhaps less well-known is that Rod's PhD at Cambridge was conducted under the supervision of Keith Miller and explored the boundary between notch behaviour and fatigue crack growth. Rod applied his understanding of crack initiation and growth to many fields, including the fracture of icebergs! In recent years, his insights into fatigue failure mechanisms helped railway operators worldwide enhance inspection regimes and reduce catastrophic failures, contributing directly to safer and more resilient transport systems.

At the University of Sheffield (1988–2000), Professor Smith led the **Advanced Railway Research Centre (ARRC)**, where he expanded research on wheel–rail interaction, vibration analysis, and the behaviour of materials used in rolling stock components. His leadership helped establish Sheffield as a global hub for railway engineering research. Later at Imperial College London, he continued advancing high-speed rail technologies as the Royal Academy of Engineering Network Rail Research Professor, influencing national and international railway standards.

His contributions to **crowd safety engineering** were equally significant. Following the Hillsborough disaster, Smith provided technical analysis to the Health and Safety Executive, shaping reforms in stadium safety and crowd-flow modelling used internationally. He later convened a major international conference on crowd safety engineering, influencing future research directions.

Rod also shaped **national transport policy**. As Chief Scientific Adviser to the Department for Transport (2012–2014), he provided scientific oversight for major programmes including HS2. His earlier analyses of Japan's Shinkansen demonstrated the socio-economic benefits of high-speed rail, informing parliamentary discussions and public-sector investment strategies.

Professor Smith received numerous honours reflecting his global impact:

- **Fellow of the Royal Academy of Engineering (FREng)**, elected 1999, recognising his pioneering contributions to materials and railway engineering.
- **Fellow of the Institution of Mechanical Engineers**, **Institute of Materials, Minerals and Mining**, and **City and Guilds of London Institute**, marking his multidisciplinary influence.

- **Honorary Doctorates** from the University of Sheffield and the University of Lincoln, acknowledging his academic leadership and contributions to engineering education.
- **Honorary Fellow of Queens' College, Cambridge** (2015–), recognising his academic distinction and long-term contributions to the engineering community.

In his long career, Professor Smith made many important contributions to the engineering profession. He served as **President of the Institution of Mechanical Engineers (2011–2012)** and **President of the Engineering Integrity Society (2016–2024)**, guiding professional standards and supporting the engineering community internationally.

Across an exceptional academic and advisory career, Smith held leadership roles that underscore his influence on engineering and public transport sectors.

- **University Leadership:** Served as Head of Department at both the University of Sheffield (1992–1995) and Imperial College London (2000–2005), where he guided research strategy, departmental growth, and academic excellence.
- **Professional Organisations:** Served as President of the Institution of Mechanical Engineers (2011–2012) and President of the Engineering Integrity Society (2016–2024), contributing to the advancement of engineering practice and international collaboration.
- **Government and Industry Advisory Work:** Advised the Health and Safety Executive, British Rail, the UK Department for Transport, Heathrow Airport Advisory Committee, and Singapore MRT, demonstrating his broad influence on transport safety, infrastructure development, and policy-making.
- **Heritage and Public Engagement:** As a Trustee of the Science Museum, he played a key role in securing a Japanese Shinkansen Bullet Train for the National Railway Museum in York—one of only two such trains outside Japan—highlighting his dedication to engineering education and heritage.

Professor Roderick Smith left a lasting legacy through his scientific contributions, his leadership in academia and engineering institutions, and his impact on global railway safety and transport policy. His work continues to influence engineering research, transport infrastructure design, and public-sector decision-making. Colleagues, students, and international collaborators remember him as a dedicated engineer, an inspiring leader, and a passionate advocate for safe, efficient, and sustainable transport systems.

John Yates, David Nowell and Luca Susmel

Obituary: Professor Roderick Arthur Smith FREng (1947–2024)

Professor Roderick Arthur Smith FREng, one of Britain's most respected mechanical engineers and a world-leading expert in railway safety and structural integrity, died on 26 December 2024, his 77th birthday, following a tragic walking accident in the Lake District. His passing marked the loss of a remarkable engineer, educator, adviser, and mountaineer.

Born in Oldham and raised in Greenfield, Saddleworth, Rod's early fascination with engineering grew from family influences and a childhood spent hiking in the hills. He attended Hulme Grammar School before beginning an apprenticeship with the David Brown Corporation in Huddersfield—an early grounding that helped shape his practical and theoretical approach to engineering.

He went on to study Engineering Science at St John's College, Oxford, later completing his PhD at the University of Cambridge under Professor Keith Miller. His academic career began at Cambridge, where he served as a research fellow and later assistant lecturer, before moving in 1988 to the University of Sheffield as Professor of Mechanical and Process Engineering and Head of Department.

In 2000 he joined Imperial College London as Head of Mechanical Engineering, eventually becoming Royal Academy of Engineering Network Rail Professor of Railway Engineering and later Professor Emeritus. His expertise in fatigue and fracture mechanics placed him at the forefront of rail safety research, and he played a key role in the Hatfield Rail Crash Inquiry.

Rod's influence extended well beyond academia. He served as Chief Scientific Adviser to the UK Department for Transport from 2012 to 2014, helping shape national strategy

on high-speed rail, including HS2. He also held major leadership roles, including President of the Institution of Mechanical Engineers, President of the Engineering Integrity Society, and Director of the Forum for Engineering Structural Integrity (FESI).

A devoted mountaineer, Rod climbed all the Lakeland Wainwrights and led expeditions to Greenland, Arctic Norway, the Himalayas, and the Karakoram. He was active in several mountaineering clubs, and his passion for the outdoors remained central throughout his life.

He is survived by his wife, Yayoi, and will be deeply missed by his family, friends, colleagues, and the wider engineering community.