Michael O’Rourke is Professor of Medicine (Emeritus) at the University of New South Wales, and Cardiologist at St. Vincent’s Hospital in Sydney. He has a background in Anesthesiology and Physiology as well as Cardiology. For 20 years he was Director of Coronary Care at St. Vincent’s Hospital in Sydney and assisted in the introduction of many new advances, including the NSW Ambulance paramedic system, mechanical heart support, cardiac transplantation, airliner and airport defibrillation and thrombolysis. His research interest is in the function and dysfunction of the arterial system in humans, and the effects of aging in man. He has assisted in the development of new technology including applanation tonometry for non-invasive measurement of the arterial pulse, and holds US patents for a system of analysis of the radial artery pressure pulse waveform. He received the Order of Australia (AM) for clinical activities and MD and DSc from the University of Sydney for research. For research in hypertension, Prof O’Rourke was awarded the Bjorn Folkow Prize by the European Society of Hypertension in 2000. Since 1963 he has worked with pioneers in arterial hemodynamics including two years at Johns Hopkins Hospital and one at the Brigham and Women’s Hospital in Boston. He has published over 400 research papers and eight books including the 3rd, 4th, 5th and 6th editions of “McDonald’s Blood Flow in Arteries” (generally viewed as the standard text) with Wilmer Nichols of U. Florida, “Arterial Vasodilation” with Michel Safar and Victor Dzau, “The Arterial System in Hypertension” and “Arterial Stiffness in Hypertension” with Michel Safar, “Arterial Function in Health & Disease” and “The Arterial Pulse”. He is a Member of the Council of Clinical Cardiology of the American Heart Association, a Fellow of the American College of Cardiology, a Fellow of the European Society of Cardiology, and a Member of the Cardiac Society of Australia and New Zealand. He serves on the editorial board of the American College of Cardiology and American Heart Association and has also served on the editorial boards of a number of other major overseas journals and was Editor in Chief of the Australian and New Zealand Journal of Medicine for the Royal Australasian College of Physicians for 8 years (1982-90). He was Director of Training for St. John Ambulance from 1999 to 2002. He has a strong belief that the arterial pulse carries information that is overlooked by clinicians who depend solely on a cuff sphygmomanometer, and even by intensivists and anaesthetists who have the arterial pulse waveform displayed at a patient’s bedside.

He is based at St Vincent’s Hospital where he heads the Vascular-Ventricular interaction unit for the Victor Chang Cardiac Research Institute.
The provocative article by Stone et al. proposes that the cerebral damage seen in Alzheimer’s disease is caused by repetitive cardiac pulsations of increasing magnitude which cannot be cushioned by the stiffened, aged aorta and ascend up to the small delicate cerebral arteries. It further proposes a mechanism (wave reflection) which normally optimises cardiac/vascular interaction, but with advancing age, becomes detrimental by magnifying ill-effects of cardiac pulsations. This proposal fits with many of the mechanisms known to predispose to Alzheimer’s disease and dementia, including repetitive blows to the head suffered by an athlete or a boxer with dementia pugilistica – hidden blows to the brain from within rather than obvious blows from without.

The proposal emerges from basic research conducted in the Physiology Department at Sydney University, under the supervision of two luminaries whose portraits hang in the main hall of the Anderson Stuart building – Michael Taylor and Peter Bishop. It was here that I first met Jonathan Stone some 50 years ago. Taylor was my mentor, Bishop was his. Jonathan went on to collaborative studies of the pathology of neurodegeneration in animal models and human post-mortem material. I was to study engineering principles applied to pulsatile phenomena in the arteries of a variety of animals with the hope that this could eventually be applied to humans.

My talk today will describe the physiological and pathophysiological information uncovered, first with Michael Taylor, then with colleagues around the world to whom I was introduced. This confirmed the relevance of wave reflection to normal cardiovascular function in animals and humans and how this could be simulated by a heart assist device, could be sped up or slowed down, enhanced or reduced, but how with aging in man, wave reflection came to injure the tissues supplied with blood from the heart and even the heart itself. Such self destructive behaviour has a precedent in the extreme vasoconstriction, and kidney death of persons trapped in buildings during the London blitz of World War II. It appears to confound principles of evolution, but not when one considers that in eons past, few men and women lived beyond age 40.

Our article summarises available evidence that the neuropathology of age-related dementia (Alzheimer’s disease) can be traced to small haemorrhages in cerebral vessels. The vessel defects appear to be caused by the fatiguing effects of cyclic stress, which dominates the aging change of inanimate structures, such as aircraft, ships, bridges. Even in a living animal, human or tree, inanimate materials such as elastin and wood account for structural integrity and lifespan – independently of the cells within.