Nonlinear Dynamic Phenomena in Mechanics
Jerzy Warminski, Stefano Lenci, Matthew P. Cartmell, Giuseppi Rega and Marian Weircigroch, Editors
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Aimed at engineers and researchers in structural vibrations and students in mechanical, aerospace and civil engineering, this book is relatively easy to read for those experienced in applied mathematics. Five multi-author monographs on nonlinear material and dynamic mechanical phenomena are presented. These achieve the objective of informing the audience of treatments to date.

1. ***Pendulum and magnetorheological damping*** treats rotating components experiencing full rotation and chaotic motion, suggesting a nonlinear spring for remediation. Harmonic balancing, the inverted pendulum, and magnetorheological damping are modeled, including a discussion on instability regions.
2. ***Pedestrian induced lateral vibrations in footbridges*** includes a literature review and parameter estimates for critical time and pedestrian numbers for synchronization that may drive resonances in narrow footbridges.
3. ***Shape memory alloys*** (SMA), especially for wires and plates, considers Active Property Tuning (APT) and studies Martensite (cold) to Austenite (warm) transitions (elongation events) in nickel–titanium alloy Flexinol wires. Active Strain Energy Tuning (ASET) is modeled. These can be implemented in beams and plates to decrease lateral deflections and increase the critical compression buckling load limit. SMA elements applied to flexible rotors and antagonistic actuation control in large plates are modeled.
4. ***Nonlinear vibrations of sagged electrical cables*** studies the resulting finite amplitude motions. These are analyzed only for planar motions and for amplitudes through a quasi-periodic transition to chaos.
5. ***Non-smooth dynamics*** is treated by joining short segments of local solutions, leading to a set of nonlinear algebraic equations. Examples are percussive (mole) drilling, crack growth in fatigue testing and the chaotic dynamics of a rotor system with a bearing clearance.

Missing is an index of words and acronyms used in the specialties treated. The main service of this book is to orient the reader to achieved treatments of the nonlinear mechanics problems identified. Each of these seminal monographs has an extensive reference list which will guide the reader to specific treatments by others.

Angelo Campanella
Campanella Associates
3201 Ridgewood Drive,
Hilliard, OH 3026 USA
a.campanella@att.net