From Nature to Innovation: Tensegrity is Bridging the Gap Between Art, Science, Technology, and Biology in Modern Engineering

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A tensegrity structure is a structural system that combines isolated compressive elements (typically bars or struts) with a continuous network of tensile elements (often cables or tendons). These components are configured so that the compressive elements do not connect to each other, while the tensile elements form the overall shape of the structure. Tensegrity structures find various applications across civil, art & architectural, and mechanical engineering. In civil engineering, they are used to create lightweight, yet strong and resilient bridges and towers. In architecture, tensegrity principles enable the design of innovative and aesthetically attractive buildings and pavilions that maximize space and material efficiency. In mechanical engineering, tensegrity structures are employed in the development of flexible and adaptive robotic systems, as well as in the design of deployable structures for aerospace and other high-tech industries.

Biotensegrity applies the principles of tensegrity to biological systems, illustrating how muscles, bones, fascia, ligaments, and tendons collaborate through a balance of tension and compression to form a stable and efficient structure of living organisms. A eukaryotic cell, rather than being filled with a liquid ‘protoplasm’ contains an intricate molecular framework, the cytoskeleton, composed of interconnected microfilaments, microtubules, and intermediate filaments within their viscous cytosol. Cytoskeletal filaments both generate and resist mechanical loads, and they are largely responsible for the cell’s ability to resist shape distortion. The concept elucidates the mechanical functionality and resilience of living organisms, providing insights into movement, posture, overall cell structure, and hierarchical systems biology.

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Experience:

Professor, Department of Architecture, College of Engineering, Nihon University, Koriyama, Japan. (April 2015 - Present)

Project Manager, Civil Engineering, US Navy, Far East Division, US Naval Base Yokosuka, Japan. (April 2003 - March 2006)

Project Engineer, Technology Development Section, Fudo Construction Co., Ltd., Tokyo, Japan. (October 1994 - March 2003)

M. Eng., & D. Eng., Civil Engineering, University of Tokyo, Tokyo, Japan. (October 1989 - September 1994)

B. Eng., Civil Engineering, Institute Teknologi Bandung, Bandung, Indonesia. (October 1984 - September 1988)