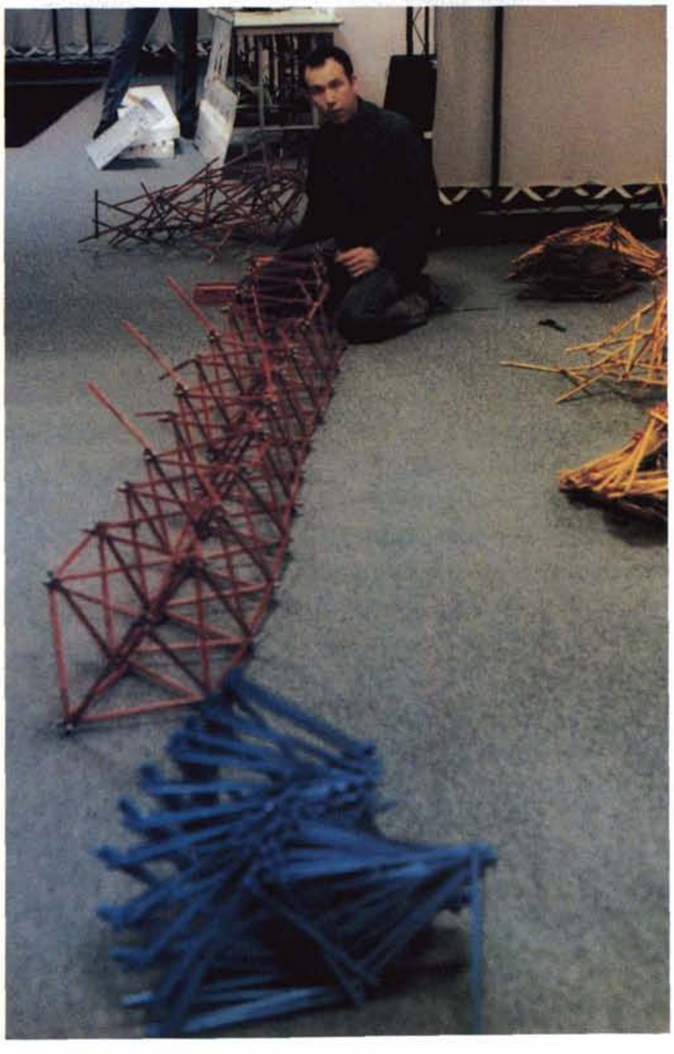
Scientific Toy

American architecht R. Buckminster Fuller spent a lifetime seeking geometric solutions to architectural problems. Fuller's geodesic dome, an assemblage of triangular shapes, became the basis for a great many homes and commercial structures all over the world.

Fuller's "energetic geometry" was based on fundamental principles of attraction and repulsion found in nature. When tension (pull) is the basis for integrity (completeness), as it is in every molecule, these forces are in "tensegrity," a word Fuller coined. The human body, for example, is a tensegrity structure, kept stable by tensional balances among the skeleton, muscles and connecting tissues.



Fuller's concept and the modeling of tensegrity structures by sculptor Kenneth Snelson inspired the development of an erector-set-like toy, or geodesic puzzle, called Tensegritoy. Designed to give students an understanding of the scientific principles of structural stability, it was created by Stuart Quimby and Cary Kittner, shown above with some of the structures that can be built with the Tensegritoy, including a truss-like display based on space technology.

Quimby and Kittner formed Tensegrity Systems Corporation, Tivoli, New York to market the science toys, used by children aged eight or more and also by architects, engineers and academic science and technology instructors.

A Tensegritoy kit consists basically of a number of wooden dowels or sticks and a roughly equal number of elastic cords. The dowels represent the forces of nature that tend to push matter apart; the elastics, used to connect the dowels, represent the forces that draw matter together. By stretching the elastics from dowel to dowel, it is possible to assemble a great variety of intricate structures that teach a science lesson: the outward force of the dowels would destroy the structure were it not for the balance created by the inward force of the elastics, and the inward pull of the elastics would collapse the structure except for the outward push of the dowel. The company offers kits in five sizes, ranging from a small introductory kit to one with 300 dowels and associated elastic cords.

Tensegrity Systems also offers mobile and floor stand point-of-purchase displays to retailers handling the Tensegritoy line (right). The floor stand displays are based on technology developed for Space Station trusses, which must be folded into compact packages for delivery to orbit, then deployed by springs into a large truss segment.

Quimby learned of this technology from Tech Briefs, a NASA publication that informs potential users of technology available for transfer (see page 132). Quimby read two Tech Briefs articles describing deployable geodesic trusses that could be collapsed into small packages for Space Shuttle transport, then unfolded in space into a truss 118 times the volume of the compacted package. Quimby used the technology to create mini-trusses from Tensegritoy kits that can be deployed into sturdy, lightweight display columns four to 12 feet high. As a result, Tensegrity Systems not only developed an attractive display that takes up only one square foot of floor space, it also realized substantial savings in freight costs. The displays are now shipped in a package only 18 inches high; the display deploys partially on release of an elastic cord and the store owner can complete the assembly in minutes.

At left, Quimby has fully extended a red truss display while a blue truss lies partially deployed in the foreground; to finish the assembly job, he must reconnect stick ends that have been undone for compacting.