



**Figure 1.** Structural analysis of the mineralized silica skeleton of *Euplectella* sp., a deep sea sponge from the Pacific Ocean. (A) Photograph of the entire skeleton, showing the cylindrical glass cage. (B) Fragment of the cage structure showing the square-grid lattice of vertical and horizontal struts with diagonal elements arranged in a chessboard manner. Orthogonal ridges on the cylinder surface are indicated by arrows. (C) Scanning electron micrograph (SEM) showing that each strut (enclosed by a bracket) is composed of bundled multiple spicules (the arrow indicates the long axis of the skeletal lattice). (D) SEM of a fractured and partially HF-etched single beam revealing its ceramic fiber-composite structure. (E) SEM of the HF-etched junction area showing that the lattice is cemented with laminated silica layers. (F) Contrast-enhanced SEM image of a cross section through one of the spicular struts, revealing that they are composed of a wide range of different-sized spicules surrounded by a laminated silica matrix. (G) SEM of a cross section through a typical spicule in a strut, showing its characteristic laminated architecture. (H) SEM of a fractured spicule, revealing an organic interlayer. (I) Bleaching of biosilica surface revealing its consolidated nanoparticulate nature. Reprinted with permission of AAAS, from Aizenberg et al. (2005), *Science*, Vol. 309, Fig. 1, p. 275-278.