Extreme eXPeditionary Architecture (EXP-Arch): Mobile, Adaptable Systems for Space and Earth Exploration
Guillermo Trotti, Trotti & Associates, Inc.

The Extreme eXPeditionary Architecture (EXP–Arch) proposes self-mobilized, transformable systems that interrelate in ways never before envisioned. EXP–Arch combines robotic systems, deployable lightweight structures, intelligent materials, and mathematical origami techniques to revolutionize human and machine exploration. A paradigm shift for exploration is proposed by creating an architecture, or suite of systems, based on highly mobile, quickly deployable and retractable systems. EXP–Arch is an adaptive exploration architecture for extreme environments (space and earth inaccessible locations) utilizing multi-functional, inflatable, and transforming system components. EXP–Arch attempts to better understand human-robotic synergies during exploration, and offers an educational initiative entitled, 'Virtual EXP–Arch', for students.
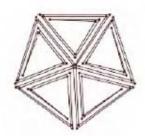
Figure: Preliminary brainstorming ideas of "Puffer Fish" like modules to incorporate inflatable (left), lightweight deployable (middle left), and mathematical origami principles (middle right, right) for a novel Extreme eXPeditionary Architecture systems analysis.