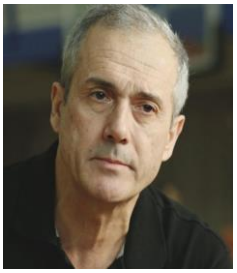
15th International Green Energy Conference

(IGEC XV) | July 10-13, 2023 | In-person & online

Name	Adrian Bejan	
Affiliation	J.A. Jones Distinguished Professor, Duke University	
Invited Plenary Lecture		
Presentation Title	**Predicting Design Evolution**	
Abstract (Approximately 200 words)	Porous materials are usually thought of as amorphous mixtures of two or more things, solids, fluids, and voids. The research field started that way, and so did my own activity in it. Along the way, I was drawn to the part of nature (the physics) that was missing from the amorphous view: the structure, flow, configuration, drawing (design), purpose, and evolution. The lecture is pictorial. It begins with defining the terms, because words have meaning: vascular, design, evolution, and prediction (theory). Next, the lecture shows that vascular (tree shaped) architectures flow more easily than parallel channels with only one length scale (the wall to wall spacing). Transport across channels is facilitated when the spacing is such that the channel flow length matches the entrance (developing) length of the flow. The tendency to evolve with freedom toward flow configurations that provide greater access is universal in nature, bio, and non-bio. This tendency is the Constructal Law, which empowers us to predict the evolution toward flow access, miniaturization, high density of heat transfer, and the scaling up (or down) of an existing design. Multiscale vasculatures occur naturally because they flow more easily than their counterparts with a few length scales. The future of evolutionary design everywhere points toward vascular, hierarchical flow architectures that will continue to morph with freedom and directionality.	
Biographical Sketch (Approximately 200 words)	Adrian Bejan was awarded the 2018 Benjamin Franklin Medal for "his pioneering interdisciplinary contributions in thermodynamics and constructal theory, which predicts natural design and its evolution in engineering, scientific, and social systems." He earned all his degrees from the Massachusetts Institute of Technology: B.S. (1971, Honors Course), M.S. (1972, Honors Course) and Ph.D. (1975). He is the J.A. Jones Distinguished Professor at Duke University. Prof. Bejan's research is in applied physics, thermodynamics, theoretical biology, and design and evolution everywhere in nature, bio, and non-bio. He created original methods of theory, modeling, analysis, and design: entropy generation minimization, scale analysis, intersection of asymptotes, heatlines, constructal law, vascular and evolutionary design.He is the author of 30 books and 700 peer-refereed journal articles. Google Scholar: h = 108, total citations 86,000. According to the 2019 'citations impact' world rankings, he is 9th among all Engineering authors in the world, all disciplines. He is honorary member of the ASME and member of Academia Europaea.	