



TRK -JAPON  
BİLİM VE TEKNOLOJİ NİVERSİTESİ

**Konu:** TJU Seminer Daveti

**25.04.2023**

niversitemiz tarafından 3 Mayıs 2023 tarihinde saat 16.00’da çevrimii olarak dzenlenecek olan Prof. Adrian Bejan’ın “*Vascular Design: Freedom, Evolution, Hierarchy*” konulu seminerine ait bildiri zeti ve seminer afii ekte ilgilerinize sunulmutur.

Sz konusu seminer duyurusunun niversiteniz ilgili akademik personeline ve ğrencilerine duyurulması hususunda gereęini bilgilerinize rica ederim.

Kayıt Linki: [https://tju-edu-tr.zoom.us/webinar/register/WN\\_xgft6lFBSZu2AaaBr5oI2Q](https://tju-edu-tr.zoom.us/webinar/register/WN_xgft6lFBSZu2AaaBr5oI2Q)

Tarih: 3 Mayıs 2023 (aramba)

Saat: 16.00 (İstanbul)

Ek:

- 1- Seminer Afii
- 2- Prof. Adrian Bejan zgemi
- 3- Seminer zeti

Prof. Dr. Bekir Sami Yılba

Trk-Japon Bilim ve Teknoloji niversitesi

Rektr



TÜRK-JAPON BİLİM VE TEKNOLOJİ ÜNİVERSİTESİ  
TURKISH-JAPANESE SCIENCE AND TECHNOLOGY UNIVERSITY  
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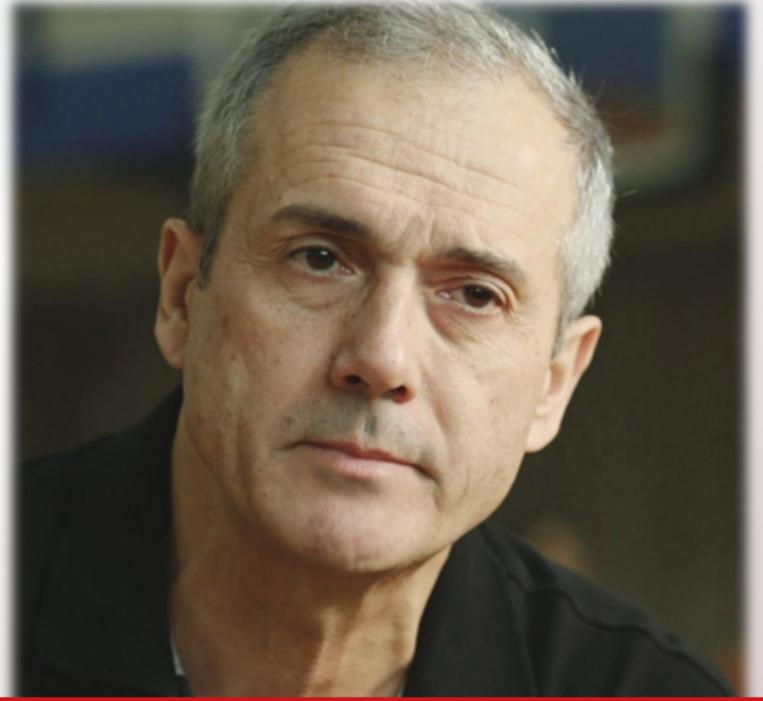
SEMINAR

# Vascular Design: Freedom, Evolution, Hierarchy

 ZOOM (Online)

 Wednesday,  
May 3rd, 2023

 4 PM (Istanbul Time)



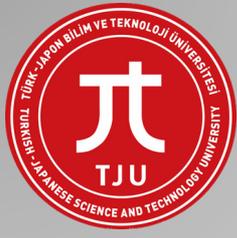
**Adrian Bejan**

J.A. Jones Distinguished Professor  
Duke University, USA

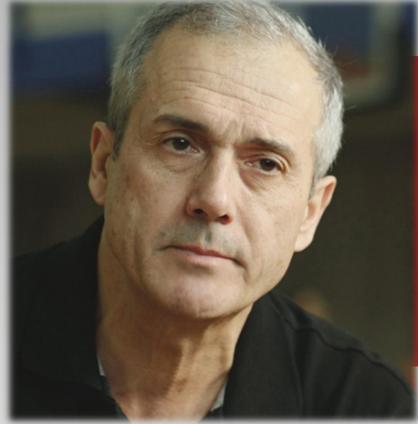
Zoom-Online Joining Information

Webinar Registration Link:

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## Adrian Bejan

J.A. Jones Distinguished Professor  
Duke University, USA

### **BIOGRAPHY**

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 87,000. 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.



## ABSTRACT

# Vascular Design: Freedom, Evolution, Hierarchy

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, 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.

Vascular designs are icons of the design feature called hierarchy. Vasculatures occur naturally because they flow more easily than one-size designs. The movements in society are hierarchical, from city traffic to global air traffic, fuel consumption, and wealth. The future of evolutionary design everywhere points toward vascular, hierarchical flow architectures that will continue to morph with freedom and directionality.

### To read more

- HEAT TRANSFER: Evolution, Design, and Performance, Wiley 2022.
- FREEDOM AND EVOLUTION: Hierarchy in Nature, Society and Science, Springer 2020.
- CONVECTION HEAT TRANSFER, 4th ed, Wiley, 2013.