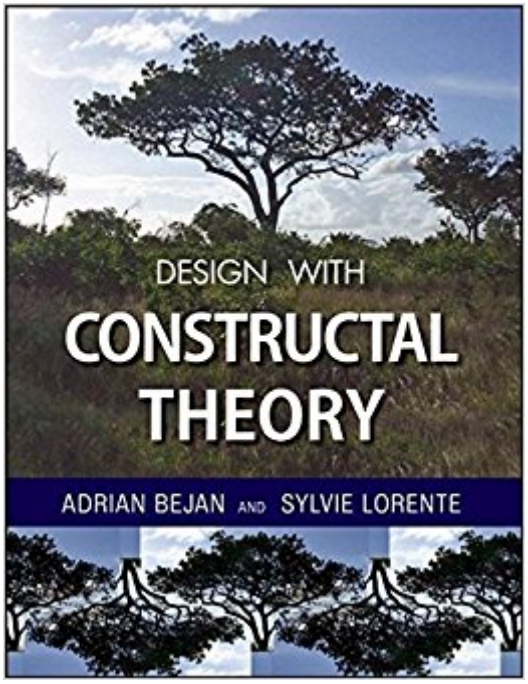
Design With Constructal Theory



Synopsis

Design course on the universal principle of configurations in nature and engineering-the constructal law Design with Constructal Theory offers a revolutionary new approach based on physics for understanding and predicting the designs that arise in nature and engineering, from the tree and the forest to the cooling of electronics, urban design, decontamination, and vascular smart materials. This book shows how you can use the method of constructal theory to design human-made systems in order to reduce trial and error and increase the system performance. First developed in the late 1990s, constructal theory holds that flow architecture arises from the natural evolutionary tendency to generate greater flow access in time and in flow configurations that are free to morph. It unites flow systems with solid mechanical structures, which are viewed as systems for the flow of stresses. Constructal theory unites nature with engineering, and helps us generate novel designs across the board, from high-density packages to vascular materials with new functionalities (self-healing, self-cooling), and from tree-shaped heat exchangers to svelte fluid-flow and solid structures. Design with Constructal Theory starts with basic principles and then shows how these principles are applied to understanding and designing increasingly complex systems. Problems and exercises at the end of each chapter give you an opportunity to use constructal theory to solve actual design problems. This book is based on a design course developed by the two authors for upper-level undergraduates and graduate students at Duke University and other universities all over the world. With the authors' expert guidance, students and professionals in mechanical, civil, environmental, chemical, aerospace, and biomedical engineering will understand natural systems, and then practice design as science, by relying on constructal strategies to pursue and discover novel and effective designs.

Book Information

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Customer Reviews

"This book represents the outcome of over 12 years of research and teaching by the authors on constructal theory and its application. It provides comprehensive and elegant discussion of a revolutionary new approach for understanding and predicting the designs that arise in both nature and engineering, from theÃ Â tree and the forest to the cooling of electronics, urban design, decontamination, and vascular smart materials. This book is highly recommended for everyone, especially students and professionals in mechanical, civil, environmental, energy and power, chemical, aerospace, and biomedical engineering, as well in geophysics and biology." (International Journal of Energy Research, 2010) "The constructal law provides a broad coverage of "designedness" everywhere, from engineering to geophysics and biologyÃ¢â ¬Â¦it provides the student with strategy for how to pursue and discover design-the configurations or patterns-in both space and time. Constructal theory pushes design thinking closer to science and away from art. It tears down the walls between engineering and natural sciences." (Mechanical Engineering, September 2009) "A balance between individual and institutional approaches is the best idea, according to a new theory by a Duke University engineer Adrian Bejan, who thinks institutions benefit most from the co-existence of large groups that self-organize naturally and lone scientists coming up with brilliant new ideasÃ¢â ¬Â¦ big thinkers didn’t disappear. Bejan argues they continued to thrive. He thinks his "constructal theory," which he began describing in 1996, might explain why. The theory states that so-called flow systems evolve to balance and minimize imperfections, reducing friction or other forms of resistance, so that the least amount of useful energy is lost. Examples in nature include rivers and streams that make up a delta or the intricate airways of the lungs. In research done by humans, Bejan sees two main flows: those of ideas in the form of scientific findings, and those of support, measured by tangible factors such as funding and lab space." (Robert Roy Brit, LiveScience.com, Yahoo.news.com, December 2008) "Design with Constructal Theory offers a revolutionary new approach to design based on physics for understanding and predicting the designs that arise in nature and engineeringÃ¢â ¬Â¦This book shows how you can use the method of constructal theory to design human-made systems in order to reduce trial and error and increase the system performance. It is beautifully illustrated, in color and black & white. This book is highly recommended to professors, students and professionals in

mechanical, civil, environmental, chemical, aerospace and biomedical engineering. It is recommended to all the readers interested in design in nature, and in design as science, strategy, and novel and effective designs." (International Journal of Heat and Mass Transfer, 11/12/08)

DESIGN COURSE ON THE UNIVERSAL PRINCIPLE OF CONFIGURATIONS IN NATURE AND ENGINEERINGÃ¢â ¬â •THE CONSTRUCTAL LAW Design with Constructal Theory offers a revolutionary new approach based on physics for understanding and predicting the designs that arise in nature and engineering, from the tree and the forest to the cooling of electronics, urban design, decontamination, and vascular smart materials. This book shows how you can use the method of constructal theory to design human-made systems in order to reduce trial and error and increase the system performance. First developed in the late 1990s, constructal theory holds that flow architecture arises from the natural evolutionary tendency to generate greater flow access in time and in flow configurations that are free to morph. It unites flow systems with solid mechanical structures, which are viewed as systems for the flow of stresses. Constructal theory unites nature with engineering, and helps us generate novel designs across the board, from high-density packages to vascular materials with new functionalities (self-healing, self-cooling), and from tree-shaped heat exchangers to svelte fluid-flow and solid structures. Design with Constructal Theory starts with basic principles and then shows how these principles are applied to understanding and designing increasingly complex systems. Problems and exercises at the end of each chapter give you an opportunity to use constructal theory to solve actual design problems. This book is based on a design course developed by the two authors for upper-level undergraduates and graduate students at Duke University and other universities all over the world. With the authors' expert guidance, students and professionals in mechanical, civil, environmental, chemical, aerospace, and biomedical engineering will understand natural systems, and then practice design as science, by relying on constructal strategies to pursue and discover novel and effective designs.

This book formulates in a graceful and unique way a brand-new and valuable approach for design based on a general physics law- constructal law on flow configration generation (in nature and engineering). I like the book because the approach is very useful and efficient and the writing is very interesting.The book covers thermodynamics and design, single flow configurations, networks with distribution and collection, multiscale configurations, multi-objective configurations, dendritic heat exchangers, configurations for thermal and mass distribution, combined mechanical and flow

configurations, vascularized smart materials etc. The latest advances are reported in many chapters.I strongly recommend this book to university students, engineers, researchers and those who may be interested in improving their "design". It’s a must-read and deserves 5 stars!

Interesting theory to improve flow in design. Used as a textbook for a course taught by author Adrian Bejan. Makes explanations clear and easy to understand; not as dense as other textbooks in engineering curriculum.

This is a textbook rather than research reference. Didn’t fit my intentions, but a valuable background if I ever get that deep into engineering practice.

Since its inception by 1996, Constructal Theory is delivering more things than it ever promised - a trait of a good theory, as can be verified from the History of Science.Over the last decade the theory has been successfully applied in giving a theoretical framework for some empirical notions in many fields - road transport, heat sink design, electrical networks, tree shapes, bird flight, animal allometric laws, social networks, pyramid shapes, Zipf function, the list is growing.Guided with a simple coupled optimization technique, the gamut of things the theory predicts and explains is amazing. I bought the book to keep myself abreast of these exciting ramifications. The book details constructal theory in clear and rich (contrast with muddled and flowery) language - the hallmark of any of the books by the author.The book is a must for those who are curious to explore new design paradigms that is firmly based on analytical and predictive theory. In fact, if not for the design utility, the book should deck our library simply for what it represents - the Joy of Theory.

This is an excellent book. It is full of new ideas that inspire us in the direction of pursuing better designs, and of understanding design in nature. I will use it as a textbook for my Constructal Theory and Design class in the Computational Modeling Graduate Program at Federal University of Rio Grande. I strongly recommend it to all engineering professors who teach DESIGN.

Understanding and Learning Music Theory Effortlessly (Music Theory Mastery Book 1) Recursion Theory, Godel's Theorems, Set Theory, Model Theory (Mathematical Logic: A Course With Exercises, Part II) CRC Handbook of Lubrication: Theory and Practice of Tribology, Volume II: Theory and Design Universal Principles of Design, Revised and Updated: 125 Ways to Enhance Usability, Influence Perception, Increase Appeal, Make Better Design Decisions, and Teach through Design Org Design for Design Orgs: Building and Managing In-House Design Teams Best Magazine Design Spd Annual: 29th Publication Design (Society of Publication Designers' Publication Design Annual) (v. 29) 2012 Wood Design Package - including the National Design SpecificationÃ Â® for Wood Construction (NDSÃ Â®) & NDS Supplement: Design Values for Wood Construction (4 volumes set) Abundance by Design: Discover Your Unique Code for Health, Wealth and Happiness with Human Design (Life by Human Design Book 1) Immaterialism: Objects and Social Theory (Theory Redux) Mastering the Ukulele: Ukulele Techniques and Theory for Beginners (Ukulele Theory, Ukulele Songbook Book 1) Garage Band Theory Ã¢â ¬â œ GBTool 17 Triad Inversions for Guitar, Mandolin and Banjo: Music theory for non music majors, livingroom pickers * working musicians ... Tools the Pro's Use to Play by Ear Book 18) Contemporary Music Theory - Level One: A Complete Harmony and Theory Method for the Pop and Jazz Musician Fretboard Theory: Complete Guitar Theory Including Scales, Chords, Progressions, Modes, Song Application and More. Guitar Scales Handbook: A Step-By-Step, 100-Lesson Guide to Scales, Music Theory, and Fretboard Theory (Book & Videos) (Steeplechase Guitar Instruction) Music Theory: from Absolute Beginner to Expert: The Ultimate Step-by-Step Guide to Understanding and Learning Music Theory Effortlessly Music Theory: From Beginner To Expert - The Ultimate Step-By-Step Guide to Understanding and Learning Music Theory Effortlessly