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| Nota di contenuto | CONTENTS; Glossary; Preface; Chapter One; What's in This Book; Introductory Note; Why Study Bees?; Vector Competency; Role of Circulation in Disease; Insect Circulation Differs From Ours; Millions of Years of Research and Development; Prototypes; Masters of Small; Bee Fluid Dynamics; How Can Bees Be So Small?; The Non-incredible Non-shrinking Woman; Printer Analogy; Organs Float in a Barrel of Blood; Open Pumps Slosh Insect Blood; The Insect Pump: The Dorsal Vessel; Unidirectional Flow in the Dorsal Vessel; Where Does Her Blood Go?; A Marxian Distribution<br>Blood Paths Stay Short and Mostly Outside TubesLow Blood Pressure Promotes Longevity; Hemocoels Adjust to Changes in Volume; Zoom In; Control Points; A Mobile Service Economy; Hemocoels Shrink But Still Coordinate; Why Model Hemocoels?; Sorting; Diffuse Control; Hemocoel as Microprocessor; Safety Factors; New Models and New Control Systems; Shrinking Increases Efficiency; Our Bottom Line: Hemocoels Adapt to Changes That Would Block Closed Pump Tube Systems; Three D Becomes Two D; Now You Have It; Chapter Two; Bees and Devices; |

Overview; Why Bees?; Dissect to Learn?; Silk Dreams
What We Can DoDNA Computer; Devices, Bees and Philosophy; Emergent Systems; A Monkey Watches The Red Sox; The Monkey's Question?; Emergence; What Do We Mean by Understanding?; Understanding is Relative; Enter Chaos; Shape; Reproduction; Bees and Devices Integrated Within a Common Manifold; Microfluidic Chip; Porous Monolithic Polymers; Scale and Size; Here's the Rub; Scaling; Shape Implies Forces; Condensation and the 'C' Word; It's All in the Edge; Microns or Nanometers?; Insect Units; Micrometers Visualized; Nanometer Analogy; Scale Difficulties; Complexity Magnified
Divisive Devices: Our Smallest Parts Still StickCorralling Molecules; Nanotech?; Limits? What Limits?; Chip Realities; Bottom Up or Top Down?; Shrinking Big to Small Doesn't Work; What is MEMS?; NEMS; Generalities; A Generic MEMS System; First Simulate; Then Again and Again; VLSI Devices Obey Simple Laws; Bulk Controls Electrons; Diaphragm Pump Compares Unfavorably With a Bee's Heart; Acceleration Sensor Compares Unfavorably With a Bee's Mechanoreceptors; Example of a Sequenced Array; Miniature Parts; Energy; Foreshadowing: Emergent Levels of Metabolism
The Monkey's Problem: Analyze Emergent Functions?Comparisons: Bees; Devices; Manufacture; Chip Manufacture: A Dirty Problem; Manufacture Close on the Bee's Knees; Showcase Bee Manufacturing: Chitin; What is Chitin?; Growth; Contained Energy Supplies?; Webs of Levels; Neural Coordination; Copper, Iron and Ordered Structure; When You Are Small Your Rules Are Different; Bees as MEMS: A Summary; Chapter Three; Beauty Before the Beast; A. GRAPHS; Graphs Before Models; Graphs in General; Order and Size; The World Wide Web: A Graph; Properties of Graphs; Restricted Representations; What Graphs Show
Postman Problem

Sommario/riassunto

Because vertebrate circulations do not work when shrunk to insect sizes, insects may help us design our smallest machines. Within small bodies, bees separate diffusing substances in an open cavity assisted by locomotion and the beat of the heart. The open arthropod circulation, however, is most efficient when shrunk until its large three-dimensional volume of blood turns into a two-dimensional film of fluid covering only the internal surfaces. This transformation increases the chances to near-certainty that molecules can diffuse from one point to another without getting lost.The Incredible Shr