Table of Contents

Preface

Chapter 1: Some Issues of Biomimetics Methodology

Advances in Researches on Bionics Y.Q. Gu, T.X. Fan, J.G. Mou, F.Q. Liu, L.F. Jiang and D.H. Wu	3
Scale/Physics/Time Properties and Functions in Bioartificial Systems T.C. Bidone, M.A. Deriu, G. Falvo D'urso Labate, D. Massai, U. Morbiducci and F.M. Montevecchi	12
What is a Physicist Doing in the Jungle? Biomimetics of the Rainforest I.C. Gebeshuber and M.O. MacQueen	18
A Text Mining Analysis of the Biomimetics Research Trend (2000-2010) S.H. Wu and J.J. Guo	29
Chapter 2: Biomimetic Study of Natural Objects	
A Method for Quantitative Analysis of Geometrical Structure of Animal Organs in Meso-Scale: The Dung Beetle Foreleg End Tooth as a Case Example J. Tong, Z.H. Zhang, D.H. Chen, H.C. Wang and Y.H. Ma	35
Hydro-Oleophobic Property of Butterfly Wing Surface and Biomimetic Fabrication of Hydrophobic Silver Film G. Sun and Y. Fang	49
A Model of Sheath of Bovine Horn Coupled Nano-Mechanical Properties and Microstructures	
R.Q. Wang, X.H. Wang, Y.M. Wang, J.H. Gao, J. Tong and J.Y. Sun Research on the Wing Kinematics and Bionic Model of Cicada X.J. Zhang, Q.Q. Huang, X. Luo, Y. Zhao, Z.J. Cheng and Y. Wang	53 58
Anatomical Study of Insect Flight Structure C.B. Ge, A.H. Ji, T. Han and C.L. Li	64
Biomimetics in Energy Systems: Light Transmission in the Window Plant Fenestraria aurantiaca as Inspiration for New Solutions in the Technical World I. Schäfer	70
Insights from the Plant World: A Fractal Analysis Approach to Tune Mechanical Rigidity of Scaffolding Matrix in Thin Films D. Bagchi, A. Dasgupta, A.D. Gondaliya and K.S. Rajput	76
Structure and Properties of Selected Natural Materials P. Zubko, I. Zahornacký, D. Kroisová, M. Vojtko and L. Pešek	84
Biomimetic Model of Articular Cartilage Based on <i>In Vitro</i> Experiments P.A. Smyth, I. Green, R.L. Jackson and R.R. Hanson	89
Application Research of Reverse Engineering in the Bionic Structure Design Y.Y. He Reconstruction of Geometrical Structure of Claw of Mole Rat (Scaptochirus moschatus) and	106
Finite Element Analysis of Claw against Soil W.F. Ji, J. Tong and D.H. Chen	110
Biomimetic Studies of the Beetle Forewing in China C.L. He and J.X. Chen	116
Grasshopper [Chondracris rosea rosea (De Geer)] Incisors Cutting Edge Contour Data Extraction and Quantitative Analysis C.Y. Li, H.L. Jia, Z.H. Zhang, G. Wang and H.C. Wang	132
A Comparative Study on the Wettability between Butterfly and Locust Wing Surface G. Sun and Y. Fang	140
Bionic Jump Mechanism Analysis Based on Locust Hind D.H. Chen, H. Xie, S.B. Ye, T. Wu, X. Lu and Z.Y. Chang	144

The Morphological Characteristics and Composition of Body Surface of Ant and its Relation to Reducing Soil Adherence	
D.W. Zhang, Y.X. Wang, Y.Q. Tang and W. Zeng	151
Structure of Patinopecten Yessoensis Shell is a Biomimetic Example of Composite A.G. Lin, X.F. Ding, Z.D. Xie, X.Y. Ma and C.X. Mu	156
Self-Cleaning Characteristic of the Insect (<i>Lepidoptera</i>) Wing Surfaces G. Sun and Y. Fang	160
Study on the Shock Isolation Performance of the Woodpecker's Head H.B. Mao and Q.B. Huang	164
Antifouling Performance of Surface Microtopographies Based on Sea Star <i>Luidia quinaria</i> J.Y. Zheng, C.G. Lin, J.W. Zhang, L. Wang, F.L. Xu, J. Zhou, D.X. Duan and H.H. Liu	169
The Structure and Mechanical Properties of Turtle Shell and Biomimetic X.F. Ding, L. Jiang, Y. Liang and C.W. Wu	175
Three Dimensional Measurement of Shark Body Based on Monocular and Binocular Vision X. Han, J. Wang and L.F. Wang	179
Mechanical Performance Tests of Bamboo Beetles <i>Otidognathus davidis fairs'</i> Abdominal Shells	
Y. Song, Z.Y. Wang, A.H. Ji and Z.D. Dai	185
Effects of Phase Relation between Forewing and Hindwing on Aerodynamic Performance in Dragonfly Flight J.Z. Yan, M.Z. Zheng, Z.P. Li and Q.S. Li	191
Structure and Mechanical Properties of Water Buffalo Horns P. Surakamhang and C. Sangsubun	191
Assessing the Effects of Natural Variations in Microstructure for the Biomimetic Modeling of Cuttlebone	170
J. Cadman, Y.H. Chen, S.W. Zhou and Q. Li	202
Surface Texture and Mechanical Behavior of Claw Material in Beetle <i>Dorcus titanus</i> (Coleoptera: Lucanidae) Z.X. Yang, Z.H. Liu and Z.D. Dai	206
Dynamics of Flower Head Movement in Bio-System M. Shiono, K. Kitadera and S. Sudo	214
Modeling of Fish Adaptive Behaviors in Unsteady Flows Z.W. Ma, T.J. Hu, H. Zhou, G.M. Wang and D.B. Zhang	218
Senile Coconut Palm Hierarchical Structure as Foundation for Biomimetic Applications O.M. Gonzalez, B.P. Gilbert, H. Bailleres and H. Guan	225
Wettability of Polymeric Bionic Surface Replicated from Ginkgo Leaves X.L. Zhao, W.W. An, J.C. Yan, H.C. Yu and L.Q. Wang	231
Microstructure and Wettability on the Elytral Surface of Aquatic Beetle M.X. Sun, A.P. Liang, G.S. Watson, J.A. Watson, Y.M. Zheng and L. Jiang	237
Simulation on the Wear Behavior of the Wear-Resistant Surfaces Using Discrete Element Method	
R. Zhang, G.M. Chen, W.F. Fan and J.Q. Li	247
Friction and Wear Properties of the Tergum Surface of Mole Cricket, <i>Gryllotalpa orientalis</i> Y. Zhang, H. Huang, J.X. Zhang, S.B. Zhang and L.Q. Ren	252
Design and Supporting Force Experimental for the Bionic Water Strider Model Q.C. Wang, X.D. Yang and Z.J. Yang	257
Experimental Study on Ultra-Structure and Frictional Properties of Zaocys Dhumnades's Ventral Scale Z.L. Zhang, J.N. Ding and J.C. Yang	261
Structural Color Bio-Engineering by Replicating Morpho Wings Y.P. Liu, L. Huang and W.Z. Shi	267
Critical Problems when Analyzing the Flight Force of Insect by its Wing Distortion X.Y. Jin	276
Observing of Surface Microstructure Pearl in Bionic Materials by Scanning Electron	2,0
Microscopy W.L. Shi, Y.F. Jin and Q. Xu	282

The Correlation Research of Insects Song Sound Quality and Nano-Mechanical Characteristics	
J. Xie, Z.Y. Chang, H.W. Wang and J. Liang	286
Biomimetic Insights: Structure-Toughness Relations in Spider Silk Nanocrystals P. Alam	290
Research on Optimization of Kinematic Parameters of Pectoral Fin Q. Liu and Z.C. Ji	294
Wing Kinematics of Long Eared Owl and Sparrow Hawk in Flapping Flight K. Chen, Q.P. Liu, W.L. Sun, G.H. Liao and L.Q. Ren	300
Study on Foot Pad of Tree Frog and Design of Bionic Surface X. Shen and L.F. Zhuang	308
Flexible Wedge-Effect for Insect Flying and Fishtail-Effect for Fish Swimming X.Y. Jin, N. Lu, B. Zhang and J.P. Yan	313
Chapter 3: Bio-Inspired Technical Surfaces	
Inadhesion Property of Aluminum Surfaces with Bionic Morphology J. Li, Q. Li, F. Du, W. Zhang and C.M. Shang	321
Overview of the Mechanisms of Drag Reduction by Means of Flexible Surfaces Y.Q. Gu, D.S. Dai, J.G. Mou, S.H. Zheng, L.F. Jiang, Z.Z. Sun and E. Wang	325
Overview of the Technology of Bionic Surface Drag Reduction Y.Q. Gu, D.S. Dai, J.G. Mou, S.H. Zheng, D.H. Wu and E. Wang	331
Effect of Detachment Speed on Adhesion Strength of Gecko Inspired Adhesive Devices Y. Sekiguchi and C. Sato	339
Research on Biomimetic Preparation Technology Based on Surface Microstructure of Shell G.T. Xie, X.Q. Bai, H. Fan, S.M. Guo and H. Xie	344
Effect of Jet Hole Size on Drag Reduction Performance of Bionic Jet Surface Z. Gang, F. Li, W.X. Liu, S. Zhang, H.S. Bi and X.X. Zhang	350
A Review of Bionic Technology for Drag Reduction Based on Analysis of Abilities the Earthworm	254
Y.Q. Gu, T.X. Fan, J.G. Mou, L.F. Jiang, D.H. Wu and S.H. Zheng Study on the Manufacturing Method of the Biomimetic Drag Reducing Morphology Replication Mold	354
X. Li, J. Cai and D.Y. Zhang Anisotropic Wetting Behavior on Injection Molded Polypropylene Parts Inspired by	363
Surface Structure of Moss M. Boruvka	368
Adhesive Evidence for Gecko-Inspired Biomimetic Fiber: Combination of Experiments and Modeling	2.70
H.J. Wang, S.F. Chen and J.Y. Liu Drog Podystion Study shout Bird Feether Henringhene Biblete	372
Drag Reduction Study about Bird Feather Herringbone Riblets H.W. Chen, F.G. Rao, D.Y. Zhang and X.P. Shang Existing Residual Residual Studies Studies Studies Studies Residual Residual Studies Studi	378
Friction Performance of the Bionic Surfaces with Convex Domes H. Sun, L.J. Xiao and Z.Y. Fu	383
Study on the Micro-Replication Precision of Shark Skin Y.H. Luo and D.Y. Zhang	387
Research on the Mechanism between No-Smooth Surface, Desorption and Friction Increasing Based on Bionic X. Shen, Z.Y. Fu, C.J. Su and Z.Y. Sun	394
Research on the Friction Performance of Bionic Surface Based on the Clamber Animal Foot Pad	
C.J. Su, Z.Y. Fu, H. Sun and X. Shen	399
Direct Pattern Transfer of the Surface Structures of Shark Skin onto Thermoplastic Polymers X. Han and J. Wang	403
Coupling Function and Mechanism of the Bionic Coupling Functional Surface (BCFS) Caused by the Dual Factors of Form and Flexible Material	
L.M. Tian, Y.C. Wang, Z.H. Gao, Z.G. Bu, L.Q. Ren and J.H. Gao	408

Biology Inspired Superhydrophobic Surfaces J.J. Victor, D. Facchini, G. Palumbo and U. Erb	417
Hydrodynamics Analysis of Air Flow over Pitted Surface X.P. Zhang, Y.H. Wang and L. Shi	423
Fabrication of Bionic Silicon Surfaces with Lotus Effect and their Micro Tribological Performance X.Q. Fan	436
Influence of Convex Hull Density on Friction Contact of Bionic Surface L.J. Xiao and L.F. Zhuang	442
Numerical Simulation of Micro Flow Field on Biomimetic Sharkskin Micro-Grooved Surface	
Y.H. Luo and Y.F. Liu Design on the Dwag Reduction Surface of an Ara Shaped Revolution Reduction Reduction for the Dwag Reduction Surface of an Ara Shaped Revolution Reduction	449
Design on the Drag Reduction Surface of an Arc-Shaped Revolution Body with the Phyllotactic Pattern H.P. Huang, Y.S. Lu and J. Wang	453
Research on the Relationship between Bionic Surface Friction Coefficient and Interface Medium	
B. Xu, Z.Y. Fu and Z.Y. Sun	459
Chapter 4: Biomimetic Approaches in Design of Tools, Equipment and Machines	
Bionic Column Design Inspired by Macro and Micro Characteristics of Bamboo Y.X. Li, F.H. Wu and P. Wu	465
A New Bionic Elastic Mandrel for Application in the Spatial Consecutive RDB with no Straight Line	
L.F. Jiang, W.M. Lin, D.H. Wen, H. Liu, C.D. Lu and Y. Gu	473
Study on Wear of Bionic Roller Based on Arca Subcrenala Lischke F.M. Teng, X.W. Zhang, F.Y. Liu and Q. Cong	480
Fog Collection by Mimicking Nature Z. Ahmad, I. Ahmad and F. Patel	487
Development of a Novel Biomimetic Dental Wear System K.R. Mehzabeen, A. Sureshkumar, A. Thangavel, B. Chong, M. Guazzato, A.J. Ruys and P.C. Boughton	496
Nanostructured Bionic PVD-Coatings for Forming Tools W. Tillmann, E. Vogli, J. Herper and M. Haase	509
Fabrication of the Electroplated CBN Wheel for Cylindrical Grinding with Abrasive Phyllotactic Pattern	
Z.Ž. Liu, J. Wang, Y.S. Lu, F. Ma, L. Xiang and S. Zhang	517
Non-Smooth Surface Flow Drag Reduction Characteristics of Centrifugal Pump Impeller Y.Q. Gu, Z.Z. Shi, J.G. Mou, H.S. Wang and P.J. Zhou	523
Effects of Bionic Geometric Structure Press Rollers on Reducing Rolling Resistance and Adhesion against Soil	
J. Tong, Q.Z. Zhang, D.H. Chen, Y. Chang and H.C. Wang	536
3D Model of the Picks Configuration on the Cutting Head Based on Phyllotaxis Theory Y.J. Ji and M. Wan	546
Material Removal Distribution of Chemical Mechanical Polishing by the Bionic Polishing Pad with Phyllotactic Pattern Y.S. Lu, J. Wang, N. Li, T. Zhang, M. Duan and X.L. Xing	550
The Research on Noise Reduction Device Based on Micropore Structure of Honeycomb Y.M. Yao, S.A. Liu, T. Shang, Y. Lu, L.H. Yang and X.H. Zhou	556
The Bionic Vibration Damping Technology and its Inspiration for the High Speed Milling	•
Cutter H.Q. Lv, W.X. Tang, Q.H. Song and S.S. Sun	562
Design and Analysis on the Increasing Friction Mechanism of the Convex-Hull-Typed	
Bionic Driving Drum H. Sun, L.J. Xiao and C.J. Su	566

Bionic and Reconfigurable Force Amplifiers Based on the Length and Angle Effect of Bars C.Y. Wang, Y.X. Dou and K.M. Zhong	572
Improved Tool Surfaces for Incremental Bulk Forming Processes of Sheet Metals P. Sieczkarek, L. Kwiatkowski, A.E. Tekkaya, E. Krebs, D. Biermann, W. Tillmann and J. Herper	579
Analysis on the Contact Pressure Distribution of Chemical Mechanical Polishing by the Bionic Polishing Pad with Phyllotactic Pattern Y.S. Lv, N. Li, J. Wang, T. Zhang, M. Duan and X.L. Xing	585
The Optimization Design of the Rotary Worktable for Vertical Lathe Based on Structural	
Bionic Method Q. Zou, X.B. Wang, X.G. Liu and G.N. Shi	591
Research of Bionic Design on Tools with Chewing Mouthparts of Insects K. Zhang, B.Z. Ji, S.W. Liu and Z.H. Qing	596
The Role of Bionic Modifications in Reducing Adhesion and Draft of Agricultural and Earthmoving Machinery R. Qaisrani, J.Q. Li and M. Iqbal	601
Design and Analysis of the Bio-Inspired Rear Under-Run Protection Devices for Heavy	001
Truck B.H. Sun, J. Zhao, Z. Yang, L.Q. Ren and B. Zhu	610
Structural Design of Groove and Micro-Blade of the End Mill Based on Bionics Z.X. Jiang, J. Sun and J.F. Li	617
Bionic Sawblade Based on Grasshopper Incisor for Corn Stalk Cutting C.Y. Li, H.L. Jia, Z.H. Zhang and G. Wang	624
Local Laser Bionic Blocking Experimental Study of Hot Work Mould Surface Cracks K.P. Zhao, L.J. Liu, X.C. Zhang, Z.X. Jia, J.Q. Li and W.H. Yang	632
Application of Bionic Non-Smooth Theory in Solid Expandable Tubular Technology B.R. Shi, X.H. Pei, S.B. Wei, T. Li, Y.L. Li and T.M. Shao	636
Dynamic Analysis of Bionic Vibration Isolation Platform Based on Viscoelastic Materials H.Q. Lv, W.X. Tang and Q.H. Song	642
Bionic Joint Surface Shape's Influence on Coating Tool's Bonding Strength between Coating and Substrate F. Xie, X.B. Lei and X.Y. Wang	647
Simulation Analysis on Wear-Resistance of Roller with Concave Surface Z.J. Yang, Y.Q. Chen and X.D. Yang	653
ANSYS Analysis on Thermal Structure of Bionic Brake Discs L.X. Wang, Y.Y. Gao, L.Q. Peng and L.G. Zhai	658
Micronano Structure and Mechanics Behavior of Mosquito's Proboscis Biomaterials with Applications to Microneedle Design	661
X.Q. Kong and C.W. Wu Biomimetic Design of Lightweight Vehicle Structures Based on Animal Bone Properties	664
Y. Rui, A. Subic, M. Takla, C.H. Wang, A. Niehoff, N. Hamann and G.P. Brueggemann	668
Chapter 5: Research and Design of Bionic Wings	
Generic Modeling and Parametric Study of Flapping Wing Micro-Air-Vehicle H. Djojodihardjo, A.S.S. Ramli and S. Wiriadidjaja	683
Biomimetic Wings G. Sisinni, D. Pietrogiacomi and G.P. Romano	691
The Effect of Morphing Force on Aerodynamic Performances of TM Wing N.I. Ismail, A.H. Zulkifli, M.Z. Abdullah, M.H. Basri and M.M. Mahadzir	697
Bionic Flexible Wings Design of the Flapper B.Z. Dong, C.L. Li and A.H. Ji	702
High-Lift Mechanism of a Bionic Slat C.J. Ge and M.C. Ge	708
Bionics - Natural but Innovative Methods Improve the Aeroacoustic Engineering J.M. Kopania	718
The Investigation of the Small Bionic Wind Turbine Based on the Seagull Airfoil R. Gu, J.L. Xu and Y.B. Yang	728

Experimental Research on SLS for Bionic Small Wing H.T. Cen, J.L. Liu and X.L. Wang	735
Simulation Design of Bionic Blade on Wind Turbine	
H.F. Zhou, C.H. Du and Y.Q. Huang	739
The Bionic Wing with Winglet in Near Space Aerodynamic Analysis H. Xin, Z. Ji and M. Lei	746
Validated Unsteady Computational Fluid Dynamic Analysis of an Oscillating Bio-Inspired Airfoil	
T. Flint, W.H. Ho, T.H. New and M. Jermy	754
Chapter 6: Biomimetic Approaches in Mechatronics and Robotics	
Statics Analysis and Design of the 6-DOF Lower Limb Bionic Leg L.W. Chen, B.Y. Cui, Z.J. Wang, L.C. Meng and Z.X. Li	765
Design, Implementation and Analysis of 3D Printed Grasshopper Robot for Jumping Mechanism	777
T.L. Khuong Grasshopper Knee Joint – Inverse Kinematic Modeling and Simulation of Ionic Polymer	777
Metal Composites (IPMC) Actuators	790
M. Farid, Z. Gang, T.L. Khuong, Z.Z. Sun and N. Ur Rehman Design of Bionic Prototype for Autonomous Mobile Robot Visual System Cleaning	790
Apparatus B.P. Bagus, H. Xu, Z.J. Liu and X.L. Huang	801
Reverse Kinemics of Bionic 6-RSS Chewing Robot for Food Mechanical Properties	801
Measuring J.H. Yu, G. Pei and Y.Z. Zhang	824
Analysis of Statics and Design of Structur Parameters for a Bionic Robot Hip Joint B.Y. Cui, L.W. Chen, Z.J. Wang, Y.H. Zhao, L.Z. Xian and Z.L. Jin	833
Grasshopper Knee Joint - Torque Analysis of Actuators Using Ionic Polymer Metal Composites (IPMC)	
M. Farid, Z. Gang, T.L. Khuong and Z.Z. Sun	843
Fabrication of Bionic Linear Actuator and Application Study Based on 3D Printing G. Zhao, Z.Z. Sun, L.L. Li and Y. Ge	854
Research on Vibration Reduction Mechanism for Robot Joints by Imitating the Owl Surface Characteristics	0.60
S.M. Sun, D.S. Ye and X. Wu Analysis of Take-Off Performances for a Double-Joint Hopping Leg	860
S.H. Hu, K.X. Deng, W. Fu and L. Li	865
One Actuator and Several Sensors in One Device with only Two Connecting Wires: Mimicking Muscle/Brain Feedback	070
T.F. Otero, J.G. Martinez, L. Valero, K. Asaka and Y.A. Ismail Actuation Properties Investigation: A Muscle like Linear Actuator Based on Biopolymer	870
Material: Ionic Polymer Metal Composites G. Zhao, Z.Z. Sun, Y. Ge and L.L. Li	880
Prototype Model of Walking Robot T. Mikolajczyk, T. Fas, T. Malinowski and Ł. Romanowski	886
Analysis of Kinematics and Design of Structure Parameters for a Bionic Parallel Leg B.Y. Cui and L.W. Chen	894
Use of Textile Friction to Mimic Hill's Model in Dynamic Contraction of Braided Artificial Muscles	005
B. Tondu A Comprehensive Review of the Biomimetic Applications of Ionic Polymer Metal	905
Composite M.U. Haq, Z. Gang and H. Muhammad Waqas	911
Propulsive Efficiency Analysis on C-Start of Robot Fish	711
H. Chen, J.C. Peng and G. Xu	923

Forward Kinematic Analysis of IPMC Actuated Three Link Mechanism for Fin Actuation of Fish Like Micro Device	
M.U. Haq, Z. Gang, S. Usman, A. Ur Rehman and S.M. Aftab	929
Novel Design for a Biomimetic Water-Jetting Propulsion Vehicle Actuated by SMA Wires Y.W. Wang, Z.L. Wang, J. Li and F. Gao	938
Development of CyberFish – Polish Biomimetic Unmanned Underwater Vehicle BUUV M. Morawski, M. Malec and J. Zajac	943
Experimental Study and Hydrodynamic Performance Analysis of a Bio-Tail Fin Propellant System	0.50
Y.M. Su, S.Q. Zhao and L. Yang Modeling and Analysis of the Biorobotics Mechanism	950
L. Kárník	954
The Analysis of Possibility of Using Electromagnetic Drive for Autonomous Biomimetic Underwater Vehicle G. Grzeczka	964
Dynamic Analysis of IPMC Actuated Fin of a Micro Fish Like Device M.U. Haq, Z. Gang, F.E. Ahad, M. Hussain and S.M. Aftab	970
Numerical Study of Batoid with Asymmetrically Undulating Pectoral Fins Z.J. Wu, W.S. Chen, J.K. Liu and S.J. Shi	985
Bionic Research of Turtle Hydrofoil Propulsion J.A. Xu, L.N. Sun, W.D. Zhao, X.B. Liu and N. Yan	993
Deflection Analysis of IPMC Actuated Fin of a Fish Like Micro Device M.U. Haq, Z. Gang, H.M. Waqas, A. Ur Rehman and S.M. Aftab	997
Problem of Biomechanical Grippers Identifications Et's Properties J. Smrcek and P. Tuleja	1005
Dynamic Analysis and Simulation for Bionic Power-Assisted Legs of Hill Area Agricultural Machinery	1012
K.D. Zhou, J.G. Wang, J.M. Li and J.M. Liao Control-Oriented Model of Biomimetic Underwater Vehicle Motion	1013
P. Szymak and T. Praczyk	1017
An Investigation of Undulating Shape Adaptation Characteristics of a Hydraulic-Driven Bionic Undulating Robot H.J. Xu, L. Zhang, C.Y. Pan and X. Zhang	1024
Conception of Research on Bionic Underwater Vehicle with Undulating Propulsion P. Szymak, M. Morawski and M. Malec	1031
Design, Fabrication and Analysis of Microrobotic Insect Wings and Thorax with Different Materials by MEMS Technology	
P.C. Chi, W.P. Zhang, W.Y. Chen, H.Y. Li and K. Meng	1039
Structural Design and Research of the Bionic Snake-Like Robot T.L. Song, Y.P. Lu and Z.Y. Li	1043
Fusion Algorithm for Multi-Gait of Hexapod Bionic Rescue Robot R.Q. Guan, J.Y. Liu and J.L. Liu	1047
Research on the Hydrodynamics of a Horizontal Trigonal Pectoral Fin Propulsor Actuated by SMA Wires	
Z.L. Wang, J. Li, Y.W. Wang and Y.K. Wang	1052
Design of a Flexible Bending Biomimetic Octopus Arm Unit with Embedded SMA Wires Y.K. Wang, C. Guo, J. Li and Z.L. Wang	1057
Design and Analysis of Hydraulic-Driven Bionic Joint for Undulating Thruster H.J. Xu, C.Y. Pan, D.B. Zhang and X. Zhang	1062
A Biologically Motivated Flight Control System for PAVs Y. Yu, Z.J. Wang and M.F. Guo	1068
Design and Mechanical Property of a Biomimetic Pulsatile Jet Propeller Inspired by Cuttlefish Actuated by SMA Wires	
Z.L. Wang, F. Gao, Y.K. Wang and Y.W. Wang Modeling of Biomimetic Robotic Fish Propelled by Passive Tail with Suitable Rigidity	1075
Q.S. Hu, J. Chen and H. Zhou	1080
Design and Kinematics Analysis of a Bionic Mechanical Goat Hoof Q. Zhang, X.L. Ding, K. Xu and H. Chen	1085

A Biomimetic Squid Funnel Actuated by Shape Memory Alloy Wires Z.L. Wang, F. Gao, Y.K. Wang and C. Guo	1095
Design and Simulation of the Biomimetic Flexible Fish Fin Propeller on Submarine Z. Lan and S.J. Jiang	1100
Robotic Fish Technology and its Applications to Space Mechatronics I. Yamamoto, N. Shin, T. Oka and M. Matsui	1104
Aerodynamic Simulation and Analysis for Biomimetic Flapping-Wing Robot J. Xu, L. Chen and W. Sun	1110
Development of IPMC Actuator for Flapping Motion of Dragonfly T.H. Cheng, D.J. Xuan, Z.Z. Li and Y.D. Shen	1116
Design and Kinematics Analysis of Locust-Like Jumping Mechanism Z. Zhen and J. Mi	1120
A Hexapod Walking Micro-Robot with Compliant Legs I. Doroftei and F. Adăscălitei	1125
Polarization Imaging Target Detection Method by Imitating Dragonfly Compound Eye LF-SF Mechanism	
M.X. Xu, X. Wang, X.J. Yan, G.F. Lv, S.N. Zheng and H.B. Wang	1133
Moving Object Detection Based on Bionic Compound Eye X.M. Wang, L. Yan, X. Qian, B.R. Luo and X. Jing	1137
The Ball Screw Installation Position Parameter Decisions and Simulation K.J. Kim, C.D. Wu, F. Wang and S.G. Wen	1142
Single Cell Traffic of Swimming Green Paramecia on Microchips with Micro-Flow Channels Fabricated by Micro-Casting	1146
K. Otsuka, S. Maruta, A. Noriyasu, K. Nakazawa and T. Kawano Design of a Piezoelectrically Actuated Jumping Robot	1146
T. Ho and L.L. Xin	1151
Flower Robot – A Product of Biomimetic Technology N. Sy Hung, P.D. Anh Tuan, P. Nguyen Ngoc and N. Truong Thinh	1155
Dynamic Analysis and Simulation for a Bionic Intervention Robot C.X. Liu, J.H. Zhang and D.X. Zhao	1161
Analysis, Design and Simulation of the Biomimetically Facial Material on the Humanoid Robot	1167
C.K. Wang Estimating the Power Requirement of a Design of Fish Robot Based on <i>Teleost</i> Specie of	1167
Fish - Mackerel M.O. Afolayan, D.S. Yawas, C.O. Folayan and S.Y. Aku	1171
A New Design of Underwater Robot Fish System Using Shape Memory Alloy P.H. Huang and J. Wang	1180
New Design, Kinematic and Static Force Modeling of a Bio-Inspired Leg Mechanism for Rough Terrain	
L. Zhang, D.W. Ma, Z.L. Zhu and J. Hu	1187
Research on Structure and Kinematics of Hexapod Robot Based on the Pneumatic Flexible Joint	
D.X. Geng, H. Peng, J.T. Zhang, Y.W. Zhao and G.B. Wu	1196
Influence of the Obliquity of Fin Ray on Propulsion Performance for Biorobotic Underwater Undulating Propulsor Y.H. Zhang, J.H. He and G.Q. Zhang	1201
Analysis of Parameters of Traveling Wave Impact on the Speed of Biomimetic Underwater Vehicle	
M. Morawski, M. Malec, P. Szymak and A. Trzmiel	1207
Research on Kinematic Modeling of Octopus-Like Arm Manipulator Composed with Mixed Joints	
J.H. Zhao, X.D. Ye and W.H. Qian	1214
A Novel Design and Implementation of a Lightweight Energy-Efficient Robotic Fish Q. Yan, W. Shang, J. Zhong and Q.X. Zhu	1220
The Construction of a Biomimetic Mobile Underwater Robot M. Giergiel, T. Buratowski, P. Niestój and M. Wacławski	1228

Structural, Kinematic and Static Modelling of a Pneumatic Muscle Actuated Gripper System	
T. Deaconescu and A. Deaconescu	1239
Experiments and Modeling of a Rotatable-Direction-Valve in Bionic Undulating Propeller H.J. Xu, C.Y. Pan, Q. Li and F.D. Gao	1244
Design Consideration of Bio-Inspired Contractible Water-Jet Propulsor for Mini Autonomous Underwater Robot	1250
M.F. Shaari, S. Zahurin, M.E.A. Bakar and M. Mariatti Jumping Mechanism Analysis of the Humanoid Robot	1250
Y. Chen Design of a Multi-Locomotion Underwater Robot	1256
T. Ho and L.L. Xin	1261
Bionic Research and it's Application of Artificial Lateral Line System G.J. Liu, H.Y. Gong, R. Yan and W.F. Gao	1266
Kinematic Research of the Multi-Motion Pattern Bionic Mechanism M.J. Song, C.J. Ding, X.L. Wang, H.S. Zhou, Y. Zhou and M.L. Zhang	1271
Design and Modeling of a Biomimetic Stingray-Like Robotic Fish Y.W. Wang, J.B. Tan, B.T. Gu, P.F. Sang and D.B. Zhao	1276
Study on Kinematics-Based Symbolic Computation—Driven Quadruped Robot Gait Simulation System	
H.J. Song, X.W. Rong, Y.B. Li and J.H. Ruan	1281
Design and Realization of a Flexible Claw of Rough Wall Climbing Robot D.L. Chen, Q. Zhang and S.Z. Liu	1287
Design of the Undulating Fin Propulsor with Rajiform Swimming Mode Y.W. Wang, J.B. Tan, B.T. Gu and D.B. Zhao	1292
Derivation of Forward and Inverse Kinematics of 8 - Degrees of Freedom Based Bio- Inspired Humanoid Robotic Arm J. Sudharsan and L. Karunamoorthy	1301
Bionic Integration of the Spherical Parallel Shoulder Joint with the Six-Component Force	1501
Sensor Y.L. Zhou, Y.L. Hou and X.S. Qiu	1309
Design and Simulation of a PAM Based Bionic Elbow Joint L.N. Hao, C.Q. Xiang, Y. Peng, X.Y. Xu and Q.L. Wang	1315
Design Bionic Structure and Analysis of Kinematics for Aircraft Fuel Tank Inspection Robot	
Q.J. Gao, W.J. Wang and G.C. Niu	1323
2D Contractile Water Jet Thruster Characterization for Bio-Inspired Underwater Robot Locomotion	1220
M.F. Shaari and Z. Samad Symmetrical Pneumatic Muscle Actuated Gripper System with Two Mobile Jaws	1328
D. Negrea, T. Deaconescu and A. Deaconescu	1334
Architecture of Software for Biomimetic Autonomous Underwater Vehicle T. Praczyk	1339
Vision Analysis of a Biomimetic Water Vehicle Propeller A. Sioma and W. Lepiarz	1346
Bionic Creeping Motion Study on Non Singular and Redundant Degree Manipulator K. Zhao, X.J. Liu, Y.Z. Yang, L.M. Song and C.G. Wang	1352
Biomimetic Sensors of the Mechanoelectrical Transduction Based on the Polyelectrolyte Gels E. Blyckhauer, A. Safranava and T. Shkhauer.	1256
F. Blyakhman, A. Safronov and T. Shklyar Study on Bionic Principles of the Parasitoid Fly Ormia Ochracea for Sound Source	1356
Localization Q.S. Wang and X.H. Liu	1360
On the Way to the Bionic Man: A Novel Approach to MEMS Based on Biological Sensory	
Systems S.B. Karman, M.O. MacQueen, T.R. Matin, S.Z.M. Diah, J. Mueller, J. Yunas, T. Makaruk and I.C. Gebeshuber	1365
Bio-Inspired Active Electrolocation Sensors for Inspection of Tube Systems M. Gottwald and G. von der Emde	1369

MEMS Bionic Vector Hydrophone G.J. Zhang, C.Y. Xue, J.J. Xiong, W.D. Zhang, X.Y. Wang, L.X. Liu and X.Y. Ge	1375
Mechanism of Bio-Inspired Ultrasensitive Low Frequency Sensor with Mechanics Analysis L.J. Liu and Y. Lei	1379
Biomimetic Polypyrrole with Hierarchical Structures and Investigation of its Bio-Sensing Properties S.M. Zhu, Y.H. Chen, J. Tang and D. Zhang	1384
Optimal Design and Simulation for a Bio-Inspired Micromixer Based on Blood Transport in	1304
Vessel X.Y. Chen and Y. He	1388
Design and Acoustic-Structural Coupling Analysis of Bionic Microphone W. Yang and J.X. Qiu	1393
Flow Field Analysis for Plant Vessel and Bionic Structural Microfluidic Chip C. Zheng, C.Y. Guo, J.W. Xue, S.B. Liu and T. Chen	1399
A Photo-Curing Method to Prepare Biomimetic Micro-Nano Structure of Butterfly Wing	
Scale W. Wang, G. Wang, P. She, H. Sun and Z.N. Liu	1405
Chapter 7: Biomimetic Synthesis and Production of Functional Materials	
Rapid and Clean Biomimetic Synthesis of Bimetallic Au-Ag Nanoparticles Using an otherwise Worthless and Noxious Weed <i>Ipomoea (Ipomoea carnea)</i> S.U. Ganaie, S. Ravindran, T. Abbasi and S.A. Abbasi	1413
Bio-Inspired Coloration for Wool Fabrics at Room Temperature L.L. So, L. He, B. Fei, K.K.L. Cheuk and J.H. Xin	1427
Controlled Synthesis of PbWO ₄ Crystals with Good Fluorescence Property by a Novel Duck Egg Membrane	
B.Y. Gong, L. Pan, Q.F. Zhang, H. Zhang, A.J. Xie, C. Li, J.M. Song, S.K. Li and Y.H. Shen	1434
Reinforcing Epoxy Resin with Polydopamine-Coated Al(OH) ₃ : A Biomimetic Method to Constructing Organic-Inorganic Hybrid Materials J. Li, X.M. Wen, W. Zhang, Y.P. Chen, Y. Xiao, C.X. Xiong, W. Zhu and T. Jiang	1445
Biomimetic Synthesis of Nanoparticles Using Aqueous Extracts of Plants (Botanical Species) T. Abbasi, J. Anuradha, S.U. Ganaie and S.A. Abbasi	1449
Role of the Organic Matrix in the Biopolymer-Mediated Synthesis of Platelike YBCO Z.L. Zhang, S.C. Wimbush, A. Kursumovic, H. Suo and J.L. MacManus Driscoll	1514
Biomimetic Synthesis of Zinc Hydroxystannate-Coated Calcium Carbonate and its Application in PVC	
J.Ž. Xu, F. Peng and Y.H. Jiao The Structure Evolution of Biomimetic Silica Directed by Poly(L-lysine)	1519
L. Xia	1523
Biomimetic Water Vapor Barrier Composite Films L. Han, J.J. Wang, J. Shen and C. Gao	1527
Study on the Bionic Preparation and Properties of TiO ₂ as Three-Dimensional Anode Materials for Lithium-Ion Batteries Y.P. Tang, L. Hong, Y.C. Jin, H.L. Zhang and G.Q. Zheng	1531
Replication of Butterfly Scales Nano-Structure with Two-Photon Polymerization Method and the Optical Effect Analysis	1525
L.Y. Wu, Ž.W. Han, Y.Q. Song, S.C. Niu and L.Q. Ren Bionic Study on Structural Solar Absorption Materials Based on Microstructure Pattern of	1535
Butterfly Scales L.Y. Wu, Z.M. Qiu and Y.Q. Song	1539
pH-Induced Cross-Linking of Dopamine-Containing Block Copolymers with Fe ³⁺ to Form Self-Healing Hydrogels W. Hydrog, W. Niy, J. J. Wong, W. Liy, J.S. Chen, and B. Z. Wong.	1511
K. Huang, Y. Niu, L.J. Wang, Y. Liu, J.S. Chen and R.Z. Wang Soft Microorigami: Stimuli-Responsive Self-Folding Polymer Films	1544
L. Ionov, S. Zakharchenko and G. Stoychev	1548

A Numerical Investigation of the Performance of a Nacre-Like Composite under Blast Loading	
A. Ghazlan, T.D. Ngo, N. Lam and P. Tran	1721
Microstructural Model of Enveloping-Core Fiber Distribution of Conifer Wood and Research on Biomimetic Wood Composite	1727
B. Chen, D.G. Yin, Q. Yuan, J. Luo and J.H. Fan Model and Fabrication of Biomimetic Integrated Porous Core Laminated Composite	1727
J.M. Fan	1732
The Bionic Optimization and Analysis and Calculation of the Cast-Steel Joint with Three Branches Z.H. Zhu, W.F. Du, Z.F. Sun and L.M. Zhu	1737
Modeling the Horse's Musculo-Skeletal System: A Step towards the Design of Bionic Motorcycle Frame	1,0,
Y.M. Shao, R.L. Simon and B.H. Gueye	1742
Chapter 9: Architectural Bionics	
Human Body and Intelligent Bionic Architecture Design in Electronic Age Z.S. Wei and S.C. Sun	1751
The Spiral Space Form of Exhibition Buildings Based on Topology and Bionics C.F. Li, J.J. Huang, H.T. Shi and L.Y. Chen	1757
Mathematically Modeling for a Nautilus-Shaped Building P.C. Zhang, Y.X. Gu and S. Zhao	1764
Structural Morphology Design of Muping Sports Center Based on Bionics and Digital Technology C.H. Su and K. Xiang	1768
Biological NanoArchitecture: Architecture in the Age of Biomaterials M. Elsamny	1772
Architectural Design of Bionic Structure and Biomimetic Materials H.J. Huang, Z. Wu and L.H.Z. Zhi	1778
The Application of Bionics Techniques in the Designing of Building Material Skin L.L. Chen	1782
Formation of the Architecture of Developing Business Centers in Special Economic Zones with the Use of the Bio-Similar Modeling Principle O.L. Bantserova and A. Kosta	1786
Bio-Inspired Engineering: A Promising Technology for the Conservation of Historic Stone Buildings and Sculptures Q. Liu, B.J. Zhang and H. Zhu	1793
Photosynthesis of Plant and Photovoltaic Integrated Application of Buildings B.Q. Yin, Y.P. Wang, L. Zhu and Y. Cui	1797
Bionics and Building Structure Q. Zhang, Z.H. Chen and X.D. Wang	1804