

**02-3 IUTAM Symposium on Dynamics of Advanced
Materials and Smart Structures,
Yamagata, Japan, May 20 - May 24, 2002**

a) Scientific Committee

U. Gabbert (Germany), A. S. Kovaleva (Russia), N. Noda (Japan), W. Schiehlen, (Germany, IUTAM repres.), V. V. Varadan (U. S. A.), K. Watanabe (Japan, Chair), F. Ziegler (Austria, Co-Chair)

b) Short summary of scientific progress achieved

Smart materials and structures, which have self-sensing, diagnosis and actuating systems, are of growing research interest. Smart materials and structures are inherently equipped with sensors and actuators to achieve their designed performance in the changing environment. They have very complex structural properties and mechanical responses. Many engineering problems, such as interface and edge phenomena, mechanical and electro-magnetic interaction/coupling and sensing and actuating techniques are arising now. Because of the multi-disciplinary nature of these problems, researchers and scientists from a very wide field of science and technology are concerned in these fields. In this symposium a fusion of advanced materials and smart structures is intended towards their intelligence and discussions on mechanical, and thermo/electro-mechanical behavior of the materials and structures and on their shape and stress controllability were addressed by researchers from a sufficiently wide range of different subject disciplines.

While the Proceedings of the related IUTAM Symposium on “Smart Structures and Structronic Systems”, edited by U. Gabbert and H.-S. Tzou, have just been published, the second in a row of IUTAM Symposia in this emerging technology does not only reflect the progress made in the last two years but extends the scope to include Bio-mimetic Structures and important observations of active natural flora. Thus, it was intended not only to keep the consecutiveness to that, but also

to include newly developing areas.

The symposium was held at Yonezawa Conference Hall from May 20-24. All 50 invited and extensively discussed lectures are categorized in five main consecutively held Sessions: (1) Advanced materials, (2) Sensors and actuators, (3) Smart structure concept, (4) Controllability for shape and vibration and (5) Bio-mimetic structures. Nine keynotes, 33 oral lectures and 8 posters were presented. It has become our common understanding that the ultimate smart structure is the living bio-structure, much more work should be performed on the bio-structures and the information drawn from the biological system should be transformed to our technical development.

c) Countries represented and number of participants

Austria (4), Canada (1), China (1), Czech (1), Estonia (1), Germany (3), Italy (3), Japan (42), Korea (1), Malaysia (1), Poland (4), Russia (3), Saudi Arabia (1), Singapore (1), S. Africa (1), UAE (1), UK (1), USA (8).
Total number of registered attendee 78.

d) Publication of Proceedings of the Symposium

A booklet of refereed two-page abstracts was distributed at the Symposium. The Proceedings of the Symposium, edited by K. Watanabe and F. Ziegler, will be published by Kluwer Academic Publishers in late 2002, as a book in the Series of Solid Mechanics and Its Applications.

e) Financial supports

- . International Union of Theoretical and Applied Mechanics
- . Japan Ministry of Education, Culture, Sports and Technology
- . Yamagata Prefecture
- . Yonezawa City
- . Yonezawa Chamber of Commerce and Industry
- . The Asahi Glass Foundation
- . Commemorative Association for the Japan World Exposition (1970)
- . Intelligent Cosmos Academic Foundation

- . The Iwatani Naoji Foundation
- . The Mikiya Science and Technology Foundation
- . Nippon Sheet Glass Foundation for Materials Science and Engineering
- . Suzuki Foundation
- . Yonezawa Kogyo-Kai
- . Yoshida Foundation for Science and Technology

f) Scientific program

Keynote lecture (1) Y. Nyashin and V. Kiryukhin, *Shape and Stress Control in Elastic and Inelastic Structures.*

Sensor and Actuator

G. Jeronimidis, *Smart Actuation from Coupling between Active Polymer Gels and Fibrous Structures.*

J.-J. Lee , S.-H. Kim and D.-C. Seo, *Application of Newly Developed Transmission-type EFPI Optical Fiber Sensors to Smart Structures.*

A. Iwasaki, A. Todoroki and T. Sugiya, *Remote Smart Damage Detection via Internet with Unsupervised Statistical Diagnosis.*

J. Qiu, J. Tani and H. Takahashi, *High-Performance PZT and PNN-PZT Actuators.*

Keynote lecture (2) F. Casciati, Dynamics of Structural Systems with Devices Driven by Fuzzy Controllers.

Active Control of Smart Structures

K. Schlacher and A. Kugi, *Active Control of Smart Structures using Port Controlled Hamiltonian Systems.*

A. Kovaleva, *Control of Structures by Means of High-Frequency Vibration.*

Keynote lecture (3) W. Chang and **V. V. Varadan**, *Model Reduction and Robust Controllers for Complex Adaptive Structures.*

Control and modeling

I.S. Sadek, J.C. Bruch, Jr., J.M. Sloss, and S. Adali, *Integral Approach for Velocity Feedback Control in Thin Plate with Piezoelectric Patches.*

J. Feng, *Large Deviations, Hamilton-Jacobi Equations and Stochastic Modeling of Surface Processes.*

M. Sunar, *Modeling of Piezoelectric/Magnetostrictive Materials for Smart Structures.*

Keynote lecture (4) R. Lerch, *Numerical Modeling of Sensing and Actuating Electromechanical Transducer.*

Dynamics of Advanced Materials

V. Kafka and **D. Vokoun**, *Shape Memory: Heterogeneity: Thermodynamics.*

L. Faravelli, *A Model for the Constitutive Law of Shape Memory Alloy Structural Components under Dynamic Loading.*

N. Rajapakse and S. X. Xu, *Energy Release Rate Criteria for Piezoelectric Solids.*

S. Biwa, Y. Watanabe, S. Idekoba and N. Ohno, *Wave Scattering and Attenuation in Polymer-Based Composites: Analysis and Measurements.*

R. Heuer, *Free Large Vibrations of Buckled Laminated Plates.*

H. Liu, **Z. B. Kuang** and Z. M. Cai, *Application of Transfer Matrix Method in Analyzing the Inhomogeneous Initial Stress Problem in Prestressed Layered Piezoelectric Media.*

Poster presentation

N. Sumi, *Wave Propagation in Piezoelectric Circular plate under Thermo-Electro-Mechanical Loading.*

Y. Ootao and Y. Tanigawa, *Transient Piezothermoelasticity for Cylindrical Composite Panel.*

M. Ishihara, O. P. Niraula and N. Noda, *The Analysis of Transient Thermal Stresses in Piezothermoelastic Semi-infinite Body with an Edge Crack.*

S. Itou, *Transient Dynamic Stress Intensity Factors around a Rectangular Crack in a Nonhomogeneous Interfacial Layer Between Two Dissimilar Elastic Half-Spaces.*

K. Watanabe and T. Takeuchi, *A Green Function for a Radially Inhomogeneous Elastic Solid.*

F. Ashida and T. R. Tauchert, *Exact Solution for a Thermoelastic Problem of Wave Propagations in a Piezoelectric Plate.*

T. Hata, *Stress-Focusing Effect in a Spherical Inclusion Embedded in an Infinite Medium Caused by Instantaneous Phase Transform.*

M. Kurashige, H. Kato, C. Matsunaga and K. Imai, *Anisotropy in Packing Structure and Elasticity of Sintered Spherical Particles.*

Keynote lecture (5) H. Murakami and Y. Nishimura, *Infinitesimal Mechanism Modes of Tensegrity Modules.*

Biomimetic Smart Structures

T. Kosawada, *Mechanics of Plasma Membrane Vesicles in Cells.*

H. Kobayashi, M. Daimaruya and H. Fujita, *Unfolding of Morning Glory Flower as A Deployable Structure.*

S. N. Gorb, *Bio-Mimetic Smart Microstructures: Attachment Devices in Insects as Possible Source for Technical Design.*

V. Kiryukhin and Y. Nyashin, *Application of Stress and Strain Control Theory to Living Tissues.*

Keynote lecture (6) T. R. Tauchert and F. Ashida, *Control of Thermally-Induced Structural Vibration via Piezoelectric Pulses.*

Control of Thermal Vibration

Y. Tanigawa, R. Kawamura and R. B. Hetnarski, *Thermally Induced Vibration of an Inhomogeneous Beam due to a Cyclic Heating.*

S. S. Vel and **R. C. Batra**, *Exact Solution for Cylindrical Thermoelastic Deformations of Functionally Graded Thick Plates.*

X. Wang and N. Hasebe, *Complex Variable Solution of Plane Problem for Functionally Graded Materials.*

B. Sapinski, *Non-Parametric Representation of MR Linear Damper Dynamic Behaviour.*

Keynote lecture (7) U. Gabbert, H. Koppe, F. Seeger, and T. N. Trajtkov, *Overall Design and Simulation of Smart Structures.*

Simulation of Smart Structures

Y. Shibuya and S. Watanabe, *Numerical Simulation for Control of Progressive Plastic Buckling with Defects on Axisymmetric Shell Structure.*

A. Chattopadhyay, R. P. Thornburgh and A. Ghoshal, *Transient Analysis of Smart Structures Using a Coupled Piezoelectric- Mechanical Theory.*

A. Berezovski and G. A. Maugin, *Simulation of Impact-Induced Martensitic Phase-Transition Front Propagation in Thermoelastic Solids.*

Keynote lecture (8) G. R. Liu, C. Cai, K. Y. Lam and V. K. Varadan, *A Review of Simulation Methods for Smart Structures with Piezoelectric Material.*

Modeling of Advanced Materials

F. Ubertini, *Finite Element Models for Linear Electroelastic Dynamics.*

S. Govindjee, *Application of Quasi-Convexity in Evolutionary Modeling and Simulation of Shape Memory Alloys.*

Keynote lecture (9) **H. Irschik** and U. Pichler, *Maysel's Formula for Small Vibrations Superimposed upon Large Static Deformations of Piezoelastic Structures.*

Active Damping

A. Tylikowski, *Active Damping of Parametric Vibrations of Mechanical Disturbed Systems.*

J. Holnicki-Szulc, *High-Performance Impact Absorbing Materials- The Concept, Design Tools and Applications.*

M. A. E. Kaunda, *A Self-Sensing Active Constrained Layer Damping Treatment for Composite Structures and Determination of Lamé's Constants.*

P. M. Przybyłowicz, *Active Damping of Torsional Vibration in a Piezoelectric Fiber Composite Shaft.*

Report composed by K. Watanabe and F. Ziegler