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Technical Program

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Wednesday, May 28

Session W-1-A Wednesday, May 28, 9:00 - 10:45 a.m.

Session	**W-1 Room A: Statler Auditorium**
Title	**Opening and Plenary Lectures**
Chairs	**John ABEL, Gregory HULBERT**
9:00 - 9:15 a.m.	**Opening Remarks** John ABEL, Organizing Chair & President of IASS Gregory HULBERT, President of USACM Robert BUHRMAN, Senior Vice Provost for Research,
9:15 - 10:00 a.m.	Nanomechanical resonators and nanofluidic systems *Harold G. CRAIGHEAD (Cornell University)*
10:00 - 10:45 a.m.	Large shell structures for power generation technologies *Wilfried B. KRÄTZIG * (Ruhr-University Bochum), Reinhard HARTE (University of Wuppertal), Ralf WÖRMANN (Krätzig & Partner)*

Session	W-2 Room A: Statler Auditorium	W-2 Room B: 196	W-2 Room C: 198	W-2 Room D: 396	W-2 Room E: 398
Title (organized by)	**Nano- and Micro-scale Structures I** (Slava KRYLOV, Alan ZEHNDER)	**Numerical Simulation of Biological Structures I** (Wilkins AQUINO)	**Modeling and Simulation of Discontinua** (Shang-Hsien HSIEH)	**Fracture in Natural and Engineered Systems I** (Robert HABER, Anthony INGRAFFEA)	**Computational Methods for Tension Structures I** (SeungDoeg KIM)
Chairs	Slava KRYLOV, Alan ZEHNDER	Wilkins AQUINO, J. Robert COOKE	Shang-Hsien HSIEH, Herbert HUI	Robert HABER, Anthony INGRAFFEA	SeungDoeg KIM, Juan Gerardo OLIVA SALINAS
11:15 - 11:45	**Keynote Lecture** An atomistic-continuum elastic rod model of carbon nanotubes *Karthick CHANDRASEKER, Subrata MUKHERJEE * (Cornell University)*	**Keynote Lecture** Computational modeling of glucose distribution in hollow fiber membrane bioreactors *G.U. UNIKRISHNAN, V.U. UNIKRISHNAN, J.N. REDDY * (Texas A&M University)*	**Keynote Lecture** The roots of possible chaotic behavior in modeling and simulation of discontinua *Antonio MUNJIZA * (University of London), T. CARNEY, E. KNIGHT, R.P. SWIFT, D. GREENING, D. STEEDMAN (Los Alamos National Laboratory)*	**Keynote Lecture** Assessment of stiffened shell structures using advanced fracture and damage mechanics methods *Karl-Heinz SCHWALBE *, Wolfgang BROCKS, Alfred CORNEC, Wernfried Schönfeld, Ingo SCHEIDER, Uwe ZERBST (GKSS Research Centre)*	**Keynote Lecture** On the development of general purpose computational program for nonlinear analysis of soft/hard structures *SeungDeog KIM (Semyung University)*
11:45 - 12:05	A novel shift-loaded blister test to characterize the multi-scale mechanical properties and adhesion-delamination behaviors of biomembranes *Scott E. JULIEN (Northeastern University), Kuo-Kang LIU (Keele University), Kai-tak WAN * (Northeastern University)*	Characterization of viscoelastic properties of cylindrical vessels using the velocity response produced by an impulsive force *Daniel E. ROSARIO , Wilkins AQUINO* (Cornell University)*	Motion analysis of mixed polyhedral and ellipsoidal particles *Chung-Yue WANG *, Jopan SHENG, Chih-Jung HUANG, Ming-Hong CHEN (National Central University)*	Residual strength characterization of integrally-stiffened structures utilizing novel manufacturing technologies *B. R. SESHADRI , S. W. SMITH*, W. M. JOHNSTON, JR. (NASA Langley Research Center)*	Lateral buckling load formulation for multi-strut beam string structures *Jaeyeol KIM * (Hyupsung University), Minger WU (Tongji University)*
12:05 - 12:25	Hybrid sensing procedure for mass and position detection with nano and macro resonant cantilevers *Nicolae LOBONTIU * (University of Alaska Anchorage), Iulian LUPEA, Rob ILIC, Harold G. CRAIGHEAD (Cornell University)*	Solid versus membrane finite elements in analysis of the mitral valve: A case study *Victorien PROT *, Bjorn SKALLERUD (Norwegian University of Science and Technology)*	A fluid-particle simulation for two-phase granular flow *Li-Pen WANG , Ying-Pao LIAO, Chuin-Shan CHEN*, Fu-Ling YANG, Shang-Hsien HSIEH (National Taiwan University)*	Towards modeling of fragmentation and dynamic delamination interactions in CFRP composites *Jean-Mathieu GUIMARD *, Oliver ALLIX (ENS Cachan), Nicolas PECHNIK (AIRBUS France), Pascal THEVENET (EADS France)*	A simple procedure for the analysis of hyperelastic 3D membrane structures *Vinicius F. ARCARO (UNICAMP, Brazil)*
12:25 - 12:45	Stability analysis of a curved microbeam actuated by a distributed electrostatic force *Slava KRYLOV * (Tel Aviv University), Bojan R. ILIC (Cornell University), David SCHREIBER, Shimon SERETENSKY (Tel Aviv University), Harold G. CRAIGHEAD (Cornell University)*	An inverse problem approach for elasticity imaging through vibroacoustics *Miguel AGUILO , Wilkins AQUINO* (Cornell University)*	Discrete element simulation of a collision-rich solid-liquid flow using a liquid-modified contact model *Fu-Ling YANG *, Wei-Tze CHANG, Shang-Hsien HSIEH, Chuin-Shan CHEN (National Taiwan University)*	A damage-based cohesive model in an adaptive spacetime discontinuous Galerkin method *Reza ABEDI, Robert B. HABER * (University of Illinois at Urbana-Champaign)*	Test on the mechanical properties of architectural membrane *Kang-geun PARK *, Seong-kee YOON (Pusan National University), Woo-hong JEON (Korea Apparel Testing & Research Institute)*

Session	W-3 Room A: Statler Auditorium	W-3 Room B: 196	W-3 Room C: 198	W-3 Room D: 396	W-3 Room E: 398
Title (organized by)	**Nano- and Micro-scale Structures II** (Slava KRYLOV, Alan ZEHNDER)	**Numerical Simulation of Biological Structures II** (Wilkins AQUINO)	**Advances in Shell Finite Elements I** (Christopher EARLS)	**Fracture in Natural and Engineered Systems II** (Robert HABER, Anthony INGRAFFEA)	**Membrane and Tension Structures**
Chairs	Slava KRYLOV, Alan ZEHNDER	Wilkins AQUINO, J. Robert COOKE	Christopher EARLS, J. N. REDDY	Robert HABER, Anthony INGRAFFEA	Slade GELLIN, Subrata MUKHERJEE
2:00 p.m.	**Keynote Lecture** On the accuracy of compliant mechanical MEMS/NEMS lumped-parameter modeling *Nicolae LOBONTIU (University of Alaska Anchorage)*	Proper orthogonal decomposition model reduction for inverse problems in acoustic-structure interaction *John C. BRIGHAM, Wilkins AQUINO * (Cornell University)*	**Keynote Lecture** Stressing thermo-mechanical analysis of FGM shells *J.N. REDDY * (Texas A & M), Román A. ARCINIEGA (ABAQUS)*	A unified potential-based cohesive model of mixed-mode fracture *Gláucio H. PAULINO *, Kyoungsoo PARK, Jeffrey ROESLER (The University of Illinois at Urbana-Champaign)*	Realistic modeling of tensioned fabric structures *Julio B. PARGANA , David LLOYD SMITH, Bassam A. IZZUDDIN* (Imperial College London)*
2:20 p.m.		Shell analysis of elliptical guard cells in higher plants: A review		Surface and embedded cracks in offshore pipelines subjected to plastic strains	Vaccumatics: Vacuumatically prestressed (adaptable) structures
2:30 p.m.	The response of a cantilever microbeam with a plate attached to its tip to mechanical shock	*J. Robert COOKE *, Richard RAND (Cornell University), Herbert MANG (TU Vienna), Josse DeBAERDEMAEKER (Katholieke Universiteit Leuven), Jae Young LEE (Chonbuk National University)*	An investigation of the isogeometric approach from the viewpoint of finite element technology	*Espen BERG *, Bjørn SKALLERUD, Kjell HOLTHE (Norwegian University of Science and Technology)*	*Frank HUIJBEN *, Frans van HERWIJNEN (Eindhoven University of Technology)*
2:40 p.m.	*Hassen OUAKAD (Binghamton University), Haider N. ARAFAT (Cessna Aircraft Company), Mohammad I. YOUNIS* (Binghamton University)*	*In vivo* ultrasound bone property determination through inverse finite element modeling	*Ralph ECHTER *, Manfred BISCHOFF (University of Stuttgart)*	Automated finite element based predictions of simultaneous crack growth and delamination growth in multi-layers in advanced metallic hybrid stiffened panels using the Alcoa ASPAN-FP tool	Wrinkling evaluation of membrane structures
2:50 p.m.	Switch triggered by mass threshold	*Mija HUBLER *, Wilkins AQUINO, Christopher EARLS (Cornell University)*	Locking-free formulation for the stabilized enhanced strain solid-shell element (SHB8PS): Geometrically non-linear applications	*Henry SKLYUT *, Michael KULAK, Marcus HEINIMANN, Mark JAMES (Alcoa Technical Center), Olexander V. GONDLIAKH, Roman PASHINSKIJ (KPI, Kiev, Ukraine)*	*Lu GUO (Cybernet Systems Co.)*
3:00 p.m.	*Mohammad I. YOUNIS *, Fadi M. AL SALEEM (Binghamton University)*	Finite element analyses of palm leaf petiole-sheath junctions in simple bending and twisting and in dynamic (oscillatory) flexure	*Farid ABED-MERAIM * (LPMM), Alain COMBESCURE (LaMCoS)*	Crack trajectory prediction in thin shells using finite element analysis	Wrinkling of stretched elastic films via bifurcation
3:10 p.m.	Adhesion of freestanding beams and its application to micro- and nano-structures	*Karl NIKLAS *, J. Robert COOKE (Cornell University), Jae Young LEE (Chonbuk National University)*	New prismatic solid-shell element: Assumed strain formulation and evaluation of benchmark problems	*Jake D. HOCHHALTER *, Ashley D. SPEAR, Anthony R. INGRAFFEA (Cornell University)*	*Ron-Bin CHENG *, Tim HEALEY (Cornell University)*
3:20 p.m.	*Kai-tak WAN (Northeastern University)*	Modeling pipette aspiration of biological membranes	*Vuong-Dieu TRINH*, Farid ABED-MERAIM (LPMM), Alain COMBESCURE (LaMCoS)*	Analysis of localized failure in metal beams and plates	A comparison of four flattening methods for tensioned fabric structures
3:30 p.m.	Modeling and dynamics of coupled dome-shaped micromechanical oscillators	*Philip BUSKOHL (Cornell University)*	Evolution of the new rotation-free finite element shell triangle using accurate geometrical data	*Jaka DUJC , Boštjan BRANK* (University of Ljubljana), Adnan IBRAHIMBEGOVIC (ENS Cachan)*	*Slade GELLIN (Buffalo State College)*
3:40 p.m.	*Tuhin SAHAI , Alan ZEHNDER* (Cornell University)*	A new model for nucleation in two-phase lipid bilayer membrane vesicles	*Pere-Andreu UBACH *, Eugenio OÑATE (CIMNE, UPC)*		On the calculation of elastic systems having blocks and sagging cables
3:50 p.m.	Fully Lagrangian dynamics of thin MEMS beam *Ranajay GHOSH *, Subrata MUKHERJEE (Cornell University)*	*Sanjay DHARMAVARAM*, Timothy HEALEY (Cornell University)*			*Vadym GORDEIEV *, Oleksandr OGLOBLYA, Maryna SHYMANOVSKA (V. Shimanovsky UkrRDIsteelconstruction)*

Session	W-4 Room A: Statler Auditorium	W-4 Room B: 196	W-4 Room C: 198	W-4 Room D: 396	W-4 Room E: 398
Title (organized by)	**Educational Software/Structural Monitoring**	**Design-Oriented Modeling of Nonlinear Structures** (Bassam IZZUDDIN)	**Session Title: Advances in Shell Finite Elements II** (Christopher EARLS)	**Computational Models for Fracture and Degradation of Structures I** (Günther MESCHKE, Jan ROTS)	**Computational Methods for Tension Structures II** (SeungDoeg KIM)
Chairs	Wolfgang WALL, Phaedon-Stelios KOUTSOURELAKIS	Bassam IZZUDDIN, William McGUIRE	Christopher EARLS, J. N. REDDY	Günther MESCHKE, Jan ROTS	SeungDoeg KIM, Juan Gerardo OLIVA SALINAS
4:30 p.m.	Finite element implementation for computer-aided instruction of structural mechanics *Jae Young LEE *, Sung-Youll AHN (Chonbuk National University)*	**Keynote Lecture** Simplified modeling of nonlinear structures – "Spanning component to system" *Bassam A. IZZUDDIN (Imperial College)*	New curvature formulation of the SFE rotation-free shell element *Sylvain COUËDO *, Laëtitia DUIGOU, Gérard RIO (LIMATB, UBS)*	Stepwise softening for concrete and masonry structures *Jan G. ROTS *, Max A.N. HENDRIKS, Matt J. DEJONG (TU-Delft), Beatrice BELLETTI (University of Parma)*	**Keynote Lecture** Simplified computer-aided form-finding procedures applied to lightweight structures *Juan Gerardo OLIVA SALINAS *, Eric VALDEZ OLMEDO (UNAM)*
4:50 p.m.	MASTAN2, educational analysis software for the 21st century *Ronald D. ZIEMIAN * (Bucknell University), William McGUIRE (Cornell University)*		Largest geometrically exact nonlinear thin beam, plate & shell elements and c-type FEM *Debabrata RAY (Institute for Dynamic Response, Inc.)*	The multi-scale approach of masonry, paradigm of the clay brick *Konrad J. KRAKOWIAK *, Paulo B. LOURENÇO (University of Minho), Franz-J. ULM (MIT)*	
5:00 p.m.		Limit analysis of slabs revisited with finite element models *Edward MAUNDER *, Angus RAMSAY (University of Exeter)*			Shape formation of ETFE film cushion by heat and pressure considering visco-plastic characteristics *Masaya KAWABATA *, Kaoru NISHIKAWA (Yokohama National University)*
5:10 p.m.	Spot monitoring and time-dependent analysis of high-rise building construction process *Shenwei ZHANG* (Shandong University), Qilin ZHANG, Xin LOU (Tongji University)*		A new shell element for elasto-plastic finite strain analysis: Application to the collapse and post-collapse analysis of marine pipelines *Rita TOSCANO * (University of Buenos Aires), Eduardo DVORKIN (SIM&TEC)*	Simplified modeling strategies for non linear dynamic calculations of RC structural walls including soil-structure interaction *Panagiotis KOTRONIS *, J. MAZARS, S. GRANGE, C. GIRY (Grenoble Universités)*	
5:20 p.m.		Effects of boundary conditions on the non-linear long-term behavior of spherical shallow concrete domes *Ehab HAMED *, Mark A. BRADFORD, R. Ian GILBERT (University of New South Wales)*			Shape finding of membrane structures by the natural force density method *Ruy M.O. PAULETTI *, Paulo M. PIMENTA (University of São Paulo)*
5:30 p.m.	A model-based framework for real-time structural monitoring in uncertain environments *Phaedon-Stelios KOUTSOURELAKIS (Cornell University)*		A finite element analysis of axially crushed corrugated frusta *Mahmoud M. A. YOUNES (M.T.C. Cairo)*	Modeling mixed-mode crack propagation in reinforced concrete *Rena C. YU *, Gonzalo RUIZ, Jacinto R. CARMONA (University of Castilla-La Mancha)*	
5:40 p.m.		A local failure model for shallow spherical concrete domes subjected to uniform external radial pressure *Zhen-Tian CHANG, Mark A. BRADFORD*, R. Ian GILBERT (University of New South Wales)*			Topology and shape of tensegrity structures *Jingyao ZHANG *, Makoto OHSAKI (Kyoto University)*
5:50 p.m.	Prediction of maximum deflection of double layer grid space structure using neural networks *Reza KAMYAB MOGHADAS * (Iranian Academic Center for Education, Culture and Research), Kok Keong CHOONG, Sabarudin MOHD (Universiti Sains Malaysia)*			Limit-analysis based identification of fracture and degradation mechanisms in two-phase composite materials *Josef FÜSSL * (TU Vienna), Roman LACKNER (TU Munich)*	
6:00 p.m.		Probabilistic analysis of steel silo's cylindrical shell with random geometric imperfection *Ganping SHU *, Chong ZHANG, Jian GU (Southeast University)*			

For multiple-author papers: Contact author designated by * and Presenting author designated by underscore

Session T-1-A Thursday, May 29, 9:00 - 10:30 a.m.

Session	T-1 Room A: Statler Auditorium
Title	Plenary Lectures
Chairs	Wilfried KRÄTZIG, Sergio PELLEGRINO
9:00 - 9:45 a.m.	Analysis and design of materials and structures for attenuating vibration and acoustic response *Gregory M. HULBERT *, E. M. DEDE, C. YILMAZ, Z.-D. MA, Noboru KIKUCHI (University of Michigan)*
9:45 - 10:30 a.m.	Modeling of shells with three-dimensional finite elements *Manfred BISCHOFF (University of Stuttgart)*

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Title	**Alexander Scordelis Memorial Session: Thin Shell Concrete Structures I**	**Dynamic Analysis of Spatial Structures I**	**3D Modeling of Thin-Walled Structures**	**Innovative Analysis Topics**	**Composites I**	**New Advances in Topology Optimization I**
(organized by)	(Maria GARLOCK, John ABEL)	(Su-Duo XUE)	(Manfred BISCHOFF, Ekkehard RAMM)			(Gláucio H. PAULINO, Emílio SILVA)
Chairs	John ABEL, Phillip GOULD	Su-Duo XUE, Shiro KATO	Manfred BISCHOFF, Yuri BAZILEVS	Günther MESCHKE, Wilkins AQUINO	Rigoberto BURGUEÑO, S. Leigh	Gláucio H. PAULINO, Emílio SILVA
11:00a.m.	**Keynote Lecture** Alexander Scordelis: Friend, colleague and mentor *David P. BILLINGTON (Princeton University)*	**Keynote Lecture** Seismic risk analysis of large lattice dome supported by buckling restrained braces *Shiro KATO *, Shoji NAKAZAWA (Toyohashi University of Technology)*	**Keynote Lecture** Modeling and mesh error estimates for plates and thick shells *Uros BOHINC, Boštjan BRANK (University of Ljubljana), Adnan IBRAHIMBEGOVIC*, (ENS-Cachan)*	The stability of plane shape under bending of elastically-plastic finite rigidity tendons, having non-symmetrical cross-section *Oleksandr SHYMANOVSKYI *, Valeryi SHALYNSKYI (V. Shimanovsky UkrRDIsteelconstruction)*	Multiscale analysis of delamination in composites laminate *Pierre KERFRIDEN *, Olivier ALLIX, Pierre GOSSELET (ENS Cachan)*	**Keynote Lecture** Topology optimization with adaptive mesh refinement *Eric DE STURLER * (Virginia Tech), Gláucio H. PAULINO, Shun WANG (University of Illinois at Urbana-Champaign)*
11:20a.m.				Internal forces and displacements in polynomial-shaped arches *Lazaro GIMENA *, Pedro GONZAGA, Faustino GIMENA (Public University of Navarre)*	Modeling and simulation of bio-based polymer/clay nanocomposites through a multilevel FE approach *Mahmoodul HAQ, Rigoberto BURGUEÑO* (Michigan State University)*	
11:30a.m.	**Keynote Lecture** Alexander C. Scordelis and concrete shells *Christian MEYER (Columbia University)*	A parameter study on dynamic buckling of spatial arch trusses under seismic action *Hai-Wang LI *, Jian-Xian LI, Fei ZHI, Fu MA, Dong-Qi QIN (Taiyuan University of Technology)*	Physical applications for a nonlinear micropolar formulation on shells *Ingo MÜNCH *, Werner WAGNER (Universität Karlsruhe), Patrizio NEFF (TU Darmstadt)*	Decision of initial shape and stress from equilibrium shape by structural analysis based on condition for existence of solution *Tetsu-Yuki TANAMI*	Multi-layer composite timber beams: Kinematical modeling and analytical solutions *Thomas MOOSBRUGGER, Werner GUGGENBERGER* (TU Graz)*	Strategies for computational efficiency in continuum structural topology optimization of sparse 3D systems *Colby C. SWAN *, Salam F. RAHMATALLA (University of Iowa)*
11:40a.m.						
11:50a.m.		Static elasto-plastic analysis of long-span rigid spatial structures under vertical earthquake *Yongfeng LUO * (Tongji University), Muwang YANG (East China Normal University)*	Utilization of the assumed natural strain method in a surface-related solid-shell element *Bernd W. ZASTRAU *, Rainer SCHLEBUSCH (TU Dresden)*			Wachpress elements for topology optimization *Cameron TALISCHI *, Gláucio H. PAULINO, Chau H. LE (University of Illinois at Urbana-Champaign)*
noon	**Keynote Lecture** Alex C. Scordelis' great achievements in bridge engineering – From computer programs to the Golden Gate Bridge retrofit *Ekkehard RAMM (Stuttgart University)*			Mistakes and paradoxes in solutions of spatial, geometrically nonlinear problems and equilibrium stability problems *Anatoly V. PERELMUTER * (SCAD Soft), Vladimir I. SLIVKER (JSC Giprostroymost)*	Reduced order anisotropic micro-mechanical creep model for composite materials *Erez GAL *(Ben-Gurion University), Jacob FISH (RPI)*	
12:10 p.m.		Problems in the research of multi-dimensional and multi-support seismic analysis *Pengfei ZHAO *, Jihong QIAN, Rongwei TANG (China Academy of Building Research)*	Dimensional adaptivity in finite element simulation of sheet metal forming *Dmitry LEDENTSOV *, Alexander DÜSTER, Ernst RANK (TU München), Ingo HEINLE, Wolfram VOLK, Marcus WAGNER (BMW Group, München)*			Topology optimization technique considering both static and dynamic characteristics of the structures *S. J. LEE *, J. E. BAE (Gyeongsang National University)*

For multiple-author papers: Contact author designated by * and Presenting author designated by underscore

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Title	**Alexander Scordelis Memorial Session: Thin Shell Concrete Structures II**	**Dynamic Analysis of Spatial Structures II**	**Spanning Between Theory and Practice I**	**Computational Models for Fracture and Degradation of Structures II**	**Developments and Applications of Beam and Rod Models I**	**New Optimization Techniques**
(organized	(Maria GARLOCK)	(Su-Duo XUE)	(Hiroki TAMAI)	(Günther MESCHKE, Jan ROTS)	(Carlos LÁZARO)	(Andrew BORGART, Edgar STACH)
Chairs	Powell DRAPER, Phillip GOULD	Su-Duo XUE, Shiro KATO	Hiroki TAMAI, Christopher EARLS	Günther MESCHKE, Jan ROTS	Carlos LÁZARO, Timothy HEALEY	Andrew BORGART, Edgar STACH
2:00 p.m.	3-D pushover analysis of a collapsed reinforced concrete chimney *Wei HUANG (KPFF Consulting Engineers), Phillip L. GOULD * (Washington University)*	Dynamic field test on elliptical suspen-dome *Jie QIN *, Bin SHEN, Guoli LI (Beijing Building Construction Research Institute)*	**Keynote Lecture** Numerical tools in structure optimization *William BAKER, Alessandro BEGHINI *, Juan CARRION, Aaron MAZEIKA, Arkadiusz MAZUREK (Skidmore, Owings & Merrill LLP)*	Fracture analyses of fiber-reinforced concrete structures *John BOLANDER (University of California, Davis)*	**Keynote Lecture** Finite rotation parameters in statics and in dynamics *Adnan IBRAHIMBEGOVIC * (ENS Cachan), Boštjan BRANK (University of Ljubljana)*	Computational structural form finding and optimization of pneumatic structures *Andrew BORGART * (TU Delft), Edgar STACH (University of Tennessee)*
2:20 p.m.	Structural optimization of concrete hyperbolic paraboloid umbrella shells	Simulating blast effects in steel lattice structures		Crack-centered enrichment for debonding in two-phase composite applied to textile reinforced concrete		Responsive building envelopes: Optimization for environmental impact
2:30 p.m.	*Powell DRAPER *, Maria E. Moreyra GARLOCK, David P. BILLINGTON (Princeton University)*	*Emily LEIGH *, Christopher EARLS (Cornell University)*	Design process, detailing and examples of non-traditional structures	*Rostislav CHUDOBA *, Jakub JEŘÁBEK, Frank PEIFFER, Joseph HEGGER (RWTH Aachen)*	An adaptive finite element code using linear Timoshenko beam elements and its applications	*Patrick TEUFFEL (University of Leeds)*
2:40 p.m.	Tenerife and Cuernavaca: A comparative critical analysis	Dynamic analysis of single layer lattice shell with BRBs	*Christian STUTZKI *, Hiroki TAMAI, Joshua BUCKHOLT (Illinois Institute of Technology)*	Three-dimensional higher order X-FEM model for multifield durability and failure analysis of concrete structures	*Daigoro ISOBE (University of Tsukuba)*	Using evolutionary computation to explore geometry and topology without ground structures
2:50 p.m.	*Sinéad C. MAC NAMARA (Syracuse University)*	*Xiuli WANG *, Jiyun CHEN, Chang WU (Lanzhou University of Technology)*	Opportunities and risks with free-form design	*Stefan JOX, Christian BECKER, Günther MESCHKE * (Ruhr University Bochum)*	The concept of hyper-beams in the analysis of slender members	*Peter VON BUELOW (University of Michigan)*
3:00 p.m.	Testing, modeling and constructing wood-plastic composite Catalan vaults	Nonlinear dynamic analysis of space frame structures	*Hans SCHOBER *, Stefan JUSTIZ, Kai KUERSCHNER (Schlaich Bergermann and Partner LP)*	From multi-scale to multi-grid FE analysis of concrete fracture	*Salvador MONLEÓN *, Fernando IBÁÑEZ, Carlos L ÁZARO, Alberto DOMINGO (Universidad Politécnica de Valencia)*	Structural morphology and self-organization
3:10 p.m.	*Edmond SALIKLIS *, Kyle WHITE (Cal Poly)*	*Chung-Yue WANG* (National Central University, Taiwan), Ren-Zuo WANG (National Center for Research on Earthquake Engineering, Taiwan)*	Novel space frame system based on Golden Ratio, 5-fold symmetry, and the fractal HyperFrame system	*Chris J. PEARCE *, Łukasz KACZMARCZYK, Nenad BIĆANIĆ (University of Glasgow)*	A generalized concept of slenderness in the analysis of straight beams with constant cross-section	*Edgar STACH (University of Tennessee)*
3:20 p.m.	Concrete vaulting in Imperial Rome: A structural analysis of the Great Hall of Trajan's Markets	Dynamic behaviors of two large spatial structures	*Chris KLING *, Hiroki TAMAI, Nicola D'SOUZA (Aurodyn, Inc.)*	Analysis of thin layer ductile concrete as a seismic retrofit for masonry infill walls	*Salvador MONLEÓN*, Fernando IBÁÑEZ, Alberto DOMINGO, Carlos L ÁZARO (Universidad Politécnica de Valencia)*	Feasibility of free-forms
3:30 p.m.	*Renato PERUCCHIO *, Philip BRUNE (University of Rochester)*	*Jinzhi WU *, Yigang ZHANG, Xiaobing GENG (Beijing University of Technology)*	Computation and design of the antenna structure – Tower One	*Marios A. KYRIAKIDES, Sarah L. BILLINGTON * (Stanford University)*	Element-free solution of geometrically exact rod elastostatics based on intrinsic (material) field variables	*Ivan MARKOV (The Chinese University of Hong Kong)*
3:40 p.m.	Numerical study of steel corrosion in concrete shell members *O. Burkan ISGOR *, Mohammad POUR-GHAZ, Pouria GHODS (Carleton University)*	Investigation into the dynamic behaviour of double layer tensegrity systems *Behzad SHEKASTEHBAND *, Karim ABEDI (Sahand University of Technology, Tabriz)*	*Ajmal AQTASH *, Neil KATZ (Skidmore, Owings & Merrill LLP)*	Mesoscopic failure simulation of concrete and life-cycle computation of concrete structures *Kohei NAGAI *, Koich MAEKAWA (University of Tokyo)*	*Carlos L ÁZARO *, Salvador MONLEÓN, Alberto DOMINGO (Universidad Politécnica de Valencia)*	From nanostructure to mega stadiums *Gordana JAKIMOVSKA (Kohn Pederson Fox Associates)*

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Title (organized	**Dynamics of Shells**	**Dynamic Analysis of Spatial Structures III** (Su-Duo XUE)	**Spanning Between Theory and Practice II** (Hiroki TAMAI)	**Geometry and Mechanics** (Kai-Uwe BLETZINGER, Fehmi CIRAK)	**Beam and Rod Models II || Composites II** (Carlos LÁZARO)	**New Advances in Topology Optimization II** (Gláucio H. PAULINO, Emílio SILVA)
Chairs	Karl-Heinz SCHWALBE, Robert HABER	Su-Duo XUE, Shiro KATO	Hiroki TAMAI, Christopher EARLS	Kai-Uwe BLETZINGER, Fehmi CIRAK	LÁZARO, HEALEY || BURGUEÑO, PHOENIX	Gláucio H. PAULINO, Emílio SILVA
4:30 p.m	A seismic analysis of a modular shell system *Youssef BELMOUDEN *, Pierino LESTUZZI, Souad SELLAMI (École Polytechnique Fédérale de Lausanne)*	**Keynote Lecture** Advances on seismic isolation in spatial structures *Su-Duo XUE *, Xiong-Yan LI (Beijing University of Technology)*	Determination of warping deformation limits for insulating glass units in cable net facades *Hiroki TAMAI *, Chris STUTZKI, Joshua BUCKHOLT, Mathew WEGLARZ (Stutzki Engineering, Inc.)*	**Keynote Lecture** Modeling and computation of patient-specific vascular fluid-structure interaction using Isogeometric Analysis *Yuri BAZILEVS *, Victor M. CALO, Thomas J. R. HUGHES (University of Texas at Austin), Yongie ZHANG (Carnegie Mellon University)*	Adding local rotational degrees of freedom to ANC beams *Ignacio ROMERO*, Juan J. ARRIBAS (Universidad Politécnica de Madrid)*	**Keynote Lecture** Topology optimization method utilizing iterative solvers with subspace recycling applied to high-resolution electrical impedance tomography *Luís Augusto Motta MELLO*, Emílio Carlos Nelli SILVA (University of São Paulo), Eric DE STURLER (Virginia Tech), Gláucio H. PAULINO (University of Illinois at Urbana-Champaign)*
4:50 p.m.	Earthquake analysis of cylindrical roof shells		Optimal design of unitized structures with curvilinear stiffeners		Finite element modeling of Kirchhoff rods	
5:00 p.m.	*Shadi OSTAVARI DAILAMANI*, James G. A. CROLL (University College London)*	Dynamic analysis of cable roof networks under transient wind	*Rakesh K. KAPANIA *, Pankaj JOSHI, Manav BHATIA, Thi DANG (VPI&SU)*	**Keynote Lecture** Optimal shapes of mechanically motivated surfaces	*Juan VALVERDE , Francisco ARMERO* (University of California, Berkeley)*	Topology optimization considering fabrication errors and length scale constraints
5:10 p.m.	Interpretation of seismic response of cylindrical roof shells	*Sayed Ali GHAFARI OSKOEI *, Ghyslaine McCLURE (McGill University)*	Buckling analysis of Wuhan Railway Station	*Kai-Uwe BLETZINGER *, Matthias FIRL, Johannes LINHARD, Roland WÜCHNER (TU Munich)*	Material layout optimization of natural fiber composite cellular panels	*James K. GUEST (Johns Hopkins University)*
5:20 p.m.	*Shadi OSTAVARI DAILAMANI *, James G. A. CROLL (University College London)*	Wind-induced responses of Beijing National Stadium	*Rongwei TANG *, Pengfei ZHAO, Yong TAO, Guohua PAN, Jihong QIAN, Yixin DU (China Academy of Building Research)*		*Rigoberto BURGUEÑO *, Christina ISAAC (Michigan State University)*	A simple and effective inverse projection scheme for void distribution control in topology optimization
5:30 p.m.	Dynamic cylindrical shell equations by power series expansions	*Qing-Shan YANG *, Yu-Ji TIAN (Beijing Jiaotong University)*		Subdivision shells for nonsmooth and branching geometries	Lamination parameter constraints for stacking sequence optimization of frp composites	*Gláucio H. PAULINO * (University of Illinois at Urbana-Champaign), Sylvia ALMEIDA (Universidade Federal de Goiás), Emílio Carlos Nelli SILVA (University of São Paulo)*
5:40 p.m.	*Anders M. HÄGGLUND, Peter D. FOLKOW * (Chalmers University of Technology)*	Theoretical analyses for wind vibration response of reticulated shell structures		*Quan LONG , Fehmi CIRAK* (University of Cambridge)*	*Rigoberto BURGUEÑO *, Jun WU (Michigan State University)*	Design of dynamic laminate piezoelectric sensors and actuators using topology optimization
5:50 p.m.	Dynamic equations for a homogenous, fully anisotropic, elastic plate	*De-min WEI *, Jian-feng BIAN (South China University of Technology)*		Water landing analyses with explicit finite element method	Modeling biocomposites using laminate plate theory	*Paulo Henrique NAKASONE*, Emílio Carlos Nelli SILVA (University of São Paulo)*
6:00 p.m.	*Karl MAURITSSON *, Anders BOSTRÖM, Peter D. FOLKOW (Chalmers University of Technology)*			*John T. WANG (NASA Langley Research Center)*	*Sarah SCHRASS-CHRISTIAN*, Sarah BILLINGTON (Stanford University)*	
6:10 p.m.				On a geometrically exact contact description for shells: From linear approximations for shells to high-order FEM *Alexander KONYUKHOV, Karl SCHWEIZERHOF * (University of Karlsruhe)*		

Session F-1-A Friday, May 30, 9:00 - 10:30 a.m.

Session	**F-1 Room A: Statler Auditorium**
Title	**Plenary Lectures**
Chairs	**Yeong Bin YANG, J. Robert COOKE**
9:00 - 9:45 a.m.	Computational morphogenesis: Its current state and possibility for the future *Hiroshi OHMORI (Nagoya University)*
9:45 - 10:30 a.m.	Answers to three not quite straightforward questions in structural stability *Andreas STEINBOECK, Gerhard HOEFINGER, Xin JIA, Herbert A. MANG* ***** *(TU Vienna)*

Session	F-2 Room A: Statler Auditorium	F-2 Room B: 196	F-2 Room C: 198	F-2 Room D: 396	F-2 Room E: 398
Title (organized by)	**Structural Stability I** (Herbert MANG)	**Computational Morphogenesis I** (Makoto OHSAKI, Hiroshi OHMORI)	**Multiphysics Simulation Environments for Shell and Spatial Structures I** (Fehmi CIRAK, Ekkehard RAMM)	**Finite Element Technology**	**Structural Morphology**
Chairs	Herbert MANG, William McGUIRE	Makoto OHSAKI, Hiroshi OHMORI	Fehmi CIRAK, Ekkehard RAMM	Jan ROTS, Phaedon-Stelios KOUTSOURELAKIS	Gláucio PAULINO, Anthony INGRAFFEA
11:00 a.m.	**Keynote Lecture** Limit-point and postbuckling behavior of steel trusses under thermal and mechanical loadings *Yeong Bin YANG *, T.J. LIN (National Taiwan University)*	**Keynote Lecture** Linear mixed integer programming for topology optimization of trusses and plates *Makoto OHSAKI *, Ryo WATADA (Kyoto University)*	**Keynote Lecture** Advanced approaches for fluid-shell interaction *Wolfgang A. WALL *, Axel GERSTENBERGER, Ursula M. MAYER, Ulrich KÜTTLER (TU Munich)*	On the propagation of pyrotechnical shocks into complex structures, taking medium frequencies into account *Pierre LADEVÈZE*, Guillaume BÉZIER, Hervé RIOU, Hugo LECLERC (ENS Cahcan)*	Shape and size optimization of shell structures with variable thickness *Saartje ARNOUT *, David DOOMS, Guido DE ROECK (K. U. Leuven)*
11:20 a.m.				Non-intrusive coupled global/local analysis of localized plasticity problems *Lionel GENDRE *, Olivier ALLIX, Pierre GOSSELET (ENS Cachan), François COMTE (Snecma Villaroche)*	Topological representation of natural and man-made structural forms *Waldemar BOBER, Romuald TARCZEWSKI * (Wroclaw University of Technology)*
11:30 a.m.	Modeling thin-walled cold-formed steel members and systems *Benjamin W. SCHAFER*, R. H. SANGREE, Cristopher MOEN, M. SEIF, Y. SHIFFERAW, V. ZEINODDINI, Z. J. LI, O. IUORIO, Y. GUAN (Johns Hopkins University)*	Optimal design of glass grid shells with quadrilateral elements by means of a genetic algorithm *Mario SASSONE *, Alberto PUGNALE (Politecnico di Torino)*	Numerical simulation of fluid-structure interaction for wind-induced dynamic response of the 3rd Jinan Yellow River cable stayed bridge *Qi-Lin ZHANG *, Zhen-Hua LIU (Tongji University), Ying ZHOU (Shandong University)*		
11:40 a.m.				Re-triangulation of existing surface meshes with high curvatures *Antonio Carlos MIRANDA, Luiz Fernando MARTHA * (PUC-Rio), Paul WAWRZYNEK, Anthony INGRAFFEA (Cornell University)*	The polyhedric configurations in spatial structures *Dimitra TZOURMAKLIOTOU (Democritus University of Thrace)*
11:50 a.m.	Multi parametrical instability of straight bars *Jan B. OBREBSKI (Warsaw University of Technology)*	Development of intelligent truss optimization system *Seung-Chang LEE *, Jung-Keun OH (Samsung Corporation)*	A consistent finite element approximation for piezoelectric shell structures *Dieter LEGNER *, Sven KLINKEL, Werner WAGNER (University of Karlsruhe)*		
noon				Mapping functions in the eight node elastodynamic infinite element with union shape function (EIEUSF) *Konstantin Savkov KAZAKOV (VSU "Luben Karavelov")*	Analytical and computational form-finding *David M. COOPER (independent)*
12:10 p.m.	The effect of predetermined delaminations on buckling and post-buckling behavior of spatial composite timber beams and frames *Miran SAJE *, Urban RODMAN, Dejan ZUPAN, Igor PLANINC (University of Ljubljana)*	Shell surface with curved fold lines inspired by paper folding art *Rohamezan ROHIM * (Universiti Teknologi MARA), Kok Keong CHOONG (Universiti Sains Malaysia), J. Y. KIM (Hyupsung University)*	Vibration analysis of thin-walled – gas or fluid filled – structures including the effect of the inflation/filling process *Karl SCHWEIZERHOF*, Marc HAßLER (University of Karlsruhe)*		

Session	F-3 Room A: Statler Auditorium	F-3 Room B: 196	F-3 Room C: 198	F-3 Room D: 396	F-3 Room E: 398
Title (organized by)	**Structural Stability II** (Herbert MANG)	**Computational Morphogenesis II** (Makoto OHSAKI, Hiroshi OHMORI)	**Multiphysics Simulation Environments for Shell and Spatial Structures II** (Fehmi CIRAK, Ekkehard RAMM)	**Deployable Structures and Biological Morphology** (Hiroshi FURUYA, Hidetoshi KOBAYASHI)	**Advances in the Optimization and Form-finding of Tensegrity Structures** (Gunnar TIBERT)
Chairs	Herbert MANG, William McGUIRE	Makoto OHSAKI, Hiroshi OHMORI	Fehmi CIRAK, Ekkehard RAMM	Hiroshi FURUYA, Hidetoshi KOBAYASHI	Gunnar TIBERT, Ruy Marcelo PAULETTI
2:00 p.m.	**Keynote Lecture** Buckling and sensitivity analysis of imperfect shells involving contact *Karl SCHWEIZERHOF *, Eduard EWERT (University of Karlsruhe)*	Modeling of clothing and interactions with the body using continuum degenerated shell finite elements *Colby C. SWAN *, Xiaolin MAN, Rob W. WILLIAMS (University of Iowa)*	Thin-walled structures interacting with incompressible flows *Ekkehard RAMM *, Malte VON SCHEVEN (University of Stuttgart), Christiane FÖRSTER, Wolfgang A. WALL (TU Munich)*	**Keynote Lecture** Unfolding of potato flower as a deployable structure *Hidetoshi KOBAYASHI *, Keitaro HORIKAWA(Osaka University), Yoshinori MORITA (Kawasaki Heavy Industries, Ltd.)*	**Keynote Lecture** Optimal tensegrity structures in bending *Robert SKELTON *, Mauricio de OLIVEIRA (University of California, San Diego)*
2:20 p.m.		Bifurcation analysis for the multi-folding structures *Ichiro ARIO* (Hiroshima University), Masatoshi NAKAZAWA (Tohoku Gakuin University), Andrew WATSON (Loughborough University)*	Full SPH modeling of the dynamic failure of shells filled with a fluid *Alain COMBESCURE* (LaMCoS), Farid ABED MERAIM (LPMM), Bertrand MAUREL (LaMCoS)*		
2:30 p.m.	**Keynote Lecture** Determining the stability of tensegrities and generic global rigidity *Robert CONNELLY (Cornell University)*			Structural analysis for the multi-folding and deployable structures *Masatoshi NAKAZAWA (Tohoku Gakuin University), Ichiro ARIO* (Hiroshima University), Andrew WATSON (Loughborough University)*	Reciprocal diagrams and stress control of tensegrity systems *Andrea MICHELETTI (University of Rome "Tor Vergata")*
2:40 p.m.		Structural behaviour of shell surface in the form of Möbius strip *Kok Keong CHOONG *, Min Sheng KUAN, (Universiti Sains Malaysia)*	Fluid-shell coupled simulation of supersonic disk-gap-band parachutes *Konstantinos KARAGIOZIS, Ramji KAMAKOTI, Carlos PANTANO (University of Illinois at Urbana-Champaign), Fehmi CIRAK * (University of Cambridge)*		
2:50 p.m.				Deployment schemes for 2-D space apertures and mapping for bio-inspired design *Christopher H. JENKINS *, Jeffery J. LARSEN (Montana State University)*	Bending-stiff tensegrity masts: Do they exist? *Gunnar TIBERT * (KTH, Royal Institute of Technology)*
3:00 p.m.	Initial imperfection identification in shell buckling problems *Christopher J. STULL *, Christopher J. EARLS, Wilkins AQUINO (Cornell University)*	On the interaction between architecture and engineering: the acoustic optimization of a reinforced concrete shell *Mario SASSONE* (Politecnico di Torino), Tomàs MENDEZ (Caracas, Venezuela),*	Strongly coupled approach for the treatment of the fluid-structure interaction problems involving highly deformable solids and shells *Riccardo ROSSI *, P. RYZHAKOV, Eugenio OÑATE (CINME, UPC)*		
3:10 p.m.				Microstructure of foldable membrane for gossamer spacecrafts *Hiroshi FURUYA *, Yasutaka SATOU, Yosuke INOUE, Tadashi MASUOKA (Tokyo Institute of Technology)*	A tensegrity catalogue using point group theory *R. PANDIA RAJ, Simon D. GUEST* (University of Cambridge)*
3:20 p.m.	Buckling phenomena, analysis and design of axially compressed cylindrical shells with co-existent external pressure *Werner GUGGENBERGER *, Medhanye B. TEKLEAB (TU Graz)*	*Alberto PUGNALE (Politecnico di Torino)* Singularities	Numerical simulation of fluid-structure interaction for wind-induced dynamic response of cylindrical steel tanks with a dome roof *Qi-Lin ZHANG *, Zhen-Hua LIU (Tongji University), Ying ZHOU (Shandong University)*	Natural twist buckling in shells: From the hawkmoth's bellows to the deployable *Kresling-pattern* and cylindrical *Miura-ori* *Biruta KRESLING (Experimental Design and Bionics, Paris)*	Form finding analysis of tensegrity membrane structures based on variational method *Mizuki SHIGEMATSU *, Masato TANAKA, Hirohisa NOGUCHI (Keio University)*
3:40 p.m.		Peter MACAPIA* (Pratt Institute/Columbia University), Frank BITONTI, Robert BAKER, Charles KWAN (Pratt Institute) Optimal structural shapes for shells using hybrid GA			
3:50 p.m.					Tensegrity architecture calculation of the cellular cytoskeleton *Bernard MAURIN *, Patrick CAÑADAS, René MOTRO (Université Montpellier 2)*

Session F-4-A Friday, May 30, 4:30 - 6:15 p.m.

Session	**F-4 Room A: Statler Auditorium**
Title	**Plenary Lectures and Closing**
Chairs	**Manfred BISCHOFF, John ABEL**
4:30 - 5:15 p.m.	Rigid mechanics and its role in nonlinear structural analysis *Yeong Bin YANG (National Taiwan University)*
5:15 - 6:00 p.m.	Folding and deployment of stored-energy composite *Sergio PELLEGRINO (Cal Tech)*
6:00 - 6:15 p.m.	**Closing Remarks** John ABEL, Organizing Chair & President of IASS