

Proceedings of the



at

**Ypsilanti Marriott Hotel
& Eastern Michigan University's
Corporate Education Center
Ypsilanti, Michigan U. S. A.**



Mechanical Dynamics, Inc.
2301 Commonwealth Blvd.
Ann Arbor, MI 48105

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Printed May 1996 in the United States of America.

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1996 International ADAMS User Conference

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Doug Willoughby, Systems Engineering Manager - SUN Microsystems

May 15, 1996 Keynote Luncheon: "Hardware, Wetware and Software"

Dr. John Mashey, Director of Engineering - Silicon Graphics Computer Systems

MDI Welcome Address & ADAMS Product Update

James Price & Patrick Turner - Mechanical Dynamics, Inc.; Bob Pascarella - Ford Motor Company

Testing and Modeling of Tire Behavior: DELFT-TYRE

Joop Pauwelussen - TNO

Dynamic Analysis of an Automotive Timing Chain System

Sheng-Jiaw Hwang & Pete Pandolfi - Ford Motor Co.; Yeongching Lin, Sam McDonald, & Jason Weidman - MDI

Analysis of Automatic Transmission Line Pressure Control

Jan Tripp - General Motors Corporation; Yeongching Lin & Jason Weidman - Mechanical Dynamics, Inc.

Virtual Prototyping of a Tamrock Drilling Boom

Janne Ojala - Tamrock Oy

Training of Neural Networks of Flexible Robot

Asko Rouvinen & Heikke Handroos - Laappeenranta University of Technology

Vehicle Dynamics & NVH Trade-off Studies Using ADAMS

Joe Juan - Ford Motor Company; Yeongching Lin & Todd DePauw - Mechanical Dynamics, Inc.

Personalized Musculoskeletal Human Models for Use in Dynamic Gait Simulation for Clinical and Sports Applications

Shawn McGuan, Mechanical Dynamics West Coast Consulting

Virtual Prototyping of Vehicle Control Systems

Michael Hoffmann, Mechanical Dynamics GmbH

Using ADAMS for Predicting Dynamic Force Histories for Fatigue Analysis of a Log Crane

Aki Mikkola, Heikke Handroos & Erkki Niemi, Laappeenranta University of Technology

A Torsional Model to Predict Gear Rattle

Basil Joseph, New Venture Gear

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Neil McGowan, Mechanical Dynamics Limited & Kevin Allin, Land Rover Cars

Integrated Approach to Fatigue Life Predictions & ADAMS

Volker Koettgen, TECMATH GmbH & Michael Hoffmann, Mechanical Dynamics GmbH

Strategies for Using the ADAMS Integrators

Michael Steigerwald - Mechanical Dynamics, Inc.

Structural Flexibility Influence Using ADAMS/FEA

Dan Kmiec - Ford Motor Company & James McConville - Mechanical Dynamics, Inc.

ADAMS Generic Engine: A Tribo-Elastodynamic Analysis Tool

Homer Rahnejat - University of Bradford, United Kingdom

Shipboard Buoy/Cable Deployment System in ADAMS

Tom Skeen - Lucent Technologies; Samuel McDonald & Todd DePauw - Mechanical Dynamics, Inc.

ADAMS Partners: Integration with Complementary Software

Brant Ross & Stacey Hamill - Mechanical Dynamics, Inc.

Applications of MECHANISM/Pro at John Deere

David Smith - John Deere

Modeling Friction-Induced Dynamic Instabilities Using Flexible Multibody Dynamics with ADAMS

Ragnar Ledesma - Rockwell International

Window Regulator System Analysis Using ADAMS/View Parametric Modeling

Yong Kong - EDS; Brett Harris & Jason Weidman - Mechanical Dynamics, Inc.

A Multibody System Approach to Piston Liner Interaction Dynamics

Mathias Lidberg & Gisli Ottarsson - Mechanical Dynamics, Inc.

ADAMS/WT (Wind Turbine) Advanced Development

Andrew Elliott & Todd DePauw - Mechanical Dynamics, Inc.

Workshop Notes

AGENDA

Tuesday, May 14, 1996

User Paper Presentations: Auditorium 1		Hands-On Workshops: Conference Room C	Drop-in Testing & Exhibits:
7:30 - 8:30 Registration & Continental Breakfast in Corporate Education Center Lobby area			
8:30 - 9:00	MDI Welcome Address & ADAMS Product Update <i>James Price & Patrick Turner - Mechanical Dynamics, Inc.; Bob Pascarella - Ford Motor Company</i>		
9:00 - 9:30	Testing and Modeling of Tire Behavior: DELFT-TYRE <i>Joop Pauwelussen - TNO</i>		
9:30 - 10:00	Dynamic Analysis of an Automotive Timing Chain System <i>Sheng-Jiaw Hwang & Pete Pandolfi - Ford Motor Co.; Yeongching Lin, Sam McDonald, & Jason Weidman - MDI</i>		
10:00 - 10:15	Morning Break		
10:15 - 10:45	Analysis of Automatic Transmission Line Pressure Control <i>Jan Tripp - General Motors Corporation; Yeongching Lin & Jason Weidman - Mechanical Dynamics, Inc.</i>		ADAMS 9.0 Testing 9:00 am - 12:00 noon <i>Conference Room B</i>
10:45 - 11:15	Virtual Prototyping of a Tamrock Drilling Boom <i>Janne Ojala - Tamrock Oy</i>	Magic Formula Tire Modeling Workshop 10:00 am - 12:00 noon	Virtual Reality on HP Workstations by Division Inc. 9:00 am - 12:00 noon <i>GEC Lobby</i>
11:15 - 11:45	Training of Neural Networks of Flexible Robot <i>Asko Rouvinen & Heikki Handroos - Laappeenanta University of Technology</i>		
12:00 - 1:30 Lunch in Salons at the Ypsilanti Marriott Hotel	Keynote Luncheon: "Magellan" <i>Rod Wilson, MDA Program Manager - Hewlett Packard Company</i>		
1:45 - 2:15	Vehicle Dynamics & NVH Trade-off Studies Using ADAMS <i>Joe Juan - Ford Motor Company; Yeongching Lin & Todd DePauw - Mechanical Dynamics, Inc.</i>		ADAMS 9.0 Testing 1:45 pm - 5:00 pm <i>Conference Room B</i>
2:15 - 2:45	Personalized Musculoskeletal Human Models for Use in Dynamic Gait Simulation for Clinical and Sports <i>Shawn McGuan, Mechanical Dynamics West Coast Consulting</i>	Creating Multimedia Presentations with Showcase & ADAMS/Animation 1:45 - 3:15 pm	ADAMS on Windows/NT 1:45 pm - 5:00 pm <i>Seminar Room 1</i>
2:45 - 3:15	Virtual Prototyping of Vehicle Control Systems <i>Michael Hoffmann, Mechanical Dynamics GmbH</i>		
3:15 - 3:30	Afternoon Break		
3:30 - 4:00	Using ADAMS for Predicting Dynamic Force Histories for Fatigue Analysis of a Log Crane <i>Aki Mikkola, Heikki Handroos & Eirkki Niemi, Laappeenanta University of Technology</i>		Virtual Reality on HP Workstations by Division Inc. 1:45 - 5:00 pm <i>GEC Lobby</i>
4:00 - 4:30	A Torsional Model to Predict Gear Rattle <i>Basil Joseph, New Venture Gear</i>	9.0 Usability Workshop 3:30 - 4:30 pm	
4:30 - 5:00	Use of Design of Experiments for Driveline Vibration Analysis of a Land Rover Four-Wheel Drive <i>Neil McGowan, Mechanical Dynamics Limited & Kevin Allin, Land Rover Cars</i>		
5:00 - 5:30	Integrated Approach to Fatigue Life Predictions & ADAMS <i>Volker Koeltgen, TECMATH GmbH & Michael Hoffmann, Mechanical Dynamics GmbH</i>	ADAMS & Biomechanics Workshop 4:30 - 5:30 pm	
6:00 - 8:00 in Salons at the Ypsilanti Marriott Hotel	Hewlett-Packard Evening Reception Sponsored by: Hewlett Packard		- Many hors d'oeuvres and cocktails - Prizes given out every 15 minutes - HP demo workstations

1996 International ADAMS User Conference

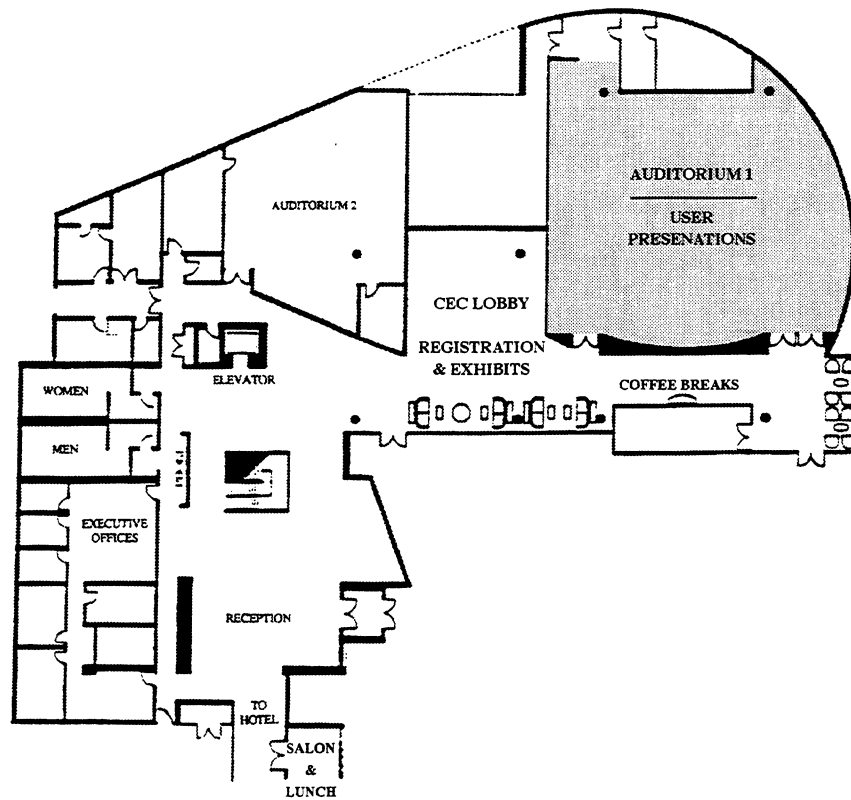
Revised
5/10/96

AGENDA

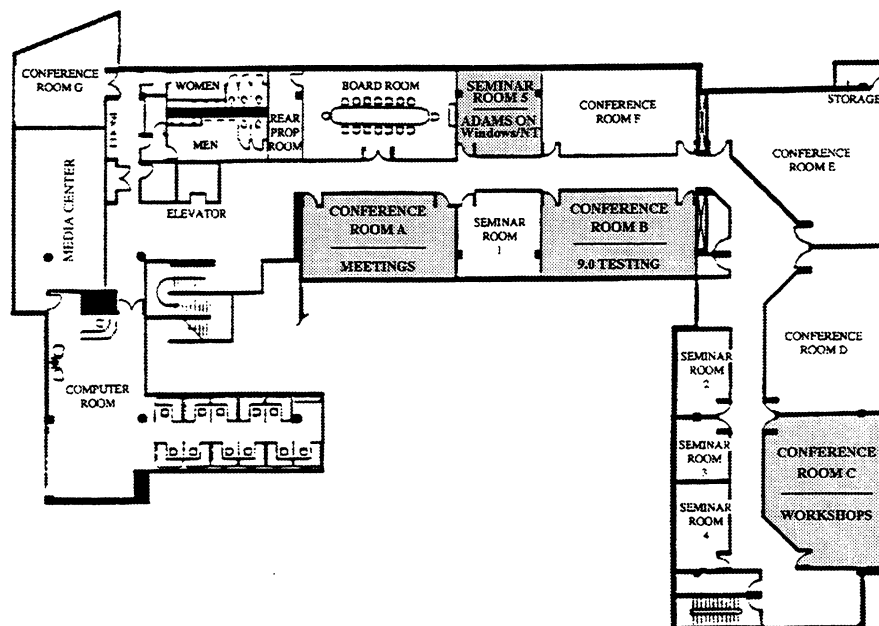
Wednesday, May 15, 1996				
TIME	User Paper Presentations Auditorium 1	Hands-On Workshops: Conference Room C	Drop-In Testing & Exhibits:	
7:45 - 9:15	in Salons at the Ypsilanti Marriott Hotel			
9:30 - 10:00	Keynote Breakfast: "Java and the Internet in Manufacturing Industry" <i>Doug Willoughby, Systems Engineering Manager - SUN Microsystems</i>			
10:00 - 10:30	Strategies for Using the ADAMS Integrators <i>Michael Steigerwald - Mechanical Dynamics, Inc.</i>	Creating Multimedia Presentations with Showcase & ADAMS/Animation 9:30 - 11:00 am	ADAMS 9.0 Testing 9:30 am - 12:00 noon <i>Conference Room B</i>	
10:30 - 10:45	Structural Flexibility Influence Using ADAMS/FEA <i>Dan Kmiec - Ford Motor Company & James McConville - Mechanical Dynamics, Inc.</i>			
10:45 - 11:15	ADAMS Generic Engine: A Tribo-Elastodynamic Analysis Tool <i>Homer Rahnejat - University of Bradford, United Kingdom</i>	9.0 Usability Workshop 11:00 am - 12:00 noon	Visual Simulation on SGI Workstations by Prosolvia Research & Tech. Inc. 9:30 am - 12:00 noon <i>CEC Lobby</i>	
11:15 - 11:45	Shipboard Buoy/Cable Deployment System in ADAMS <i>Tom Skeen - Lucent Technologies; Samuel McDonald & Todd DePauw - Mechanical Dynamics, Inc.</i>			
12:00 - 1:30	Lunch in Salons at the Ypsilanti Marriott Hotel			
1:45 - 2:15	Keynote Luncheon: "Hardware, Wetware and Software" <i>Dr. John Mashey, Director of Engineering - Silicon Graphics Computer Systems</i>			
2:15 - 2:45	ADAMS Partners: Integration with Complementary Software <i>Brian Ross & Stacey Hamill - Mechanical Dynamics, Inc.</i>	Magic Formula Tire Modeling Workshop 1:45 - 3:45 pm	ADAMS 9.0 Testing 1:45 pm - 5:00 pm <i>Conference Room B</i>	
2:45 - 3:15	Applications of MECHANISM/Pro at John Deere <i>David Smith - John Deere</i>			
3:15 - 3:30	Modeling Friction-Induced Dynamic Instabilities Using Flexible Multibody Dynamics with ADAMS <i>Flagnar Ledesma - Rockwell International</i>		Visual Simulation on SGI Workstations by Prosolvia Research & Tech. Inc. 1:45 pm - 5:00 pm <i>CEC Lobby</i>	
3:30 - 4:00	Window Regulator System Analysis Using ADAMS/View Parametric Modeling <i>Yong Kong - EDS; Brett Harris & Jason Weidman - Mechanical Dynamics, Inc.</i>			
4:00 - 4:30	A Multibody System Approach to Piston Liner Interaction Dynamics <i>Mathias Lidberg & Gisli Ottarsson - Mechanical Dynamics, Inc.</i>			
4:30 - 5:00	ADAMS/WT (Wind Turbine) Advanced Development <i>Andrew Elliott & Todd DePauw - Mechanical Dynamics, Inc.</i>			
5:00 - 5:30	Wrap-Up and Closing Comments <i>Jim Price - Mechanical Dynamics, Inc.</i>			
Thursday, May 16, 1996				
Event:				
7:30 - 8:30	Registration & Breakfast			
8:00 - 1:30	Huron Golf Course			- Win an Indy workstation with an ADAMS license in the "Hole-in-One" contest on Hole #6 - Longest Drive on Hole #13 - Closest to the Pin on Hole #14
1:30 - 3:30	Huron Clubhouse			
				Silicon Graphics & Mechanical Dynamics 18-Hole Golf Tournament Tee times will vary Grilled Luncheon & Awards Banquet

Eastern Michigan University's Corporate Education Center

FLOOR MAP



First Floor



Second Floor

1996 International ADAMS User Conference

ATTENDEE LIST

- as of May 10, 1996 -

Abe, Toshiro	Estech
Allport, John M.	Holset Engineering Co., Ltd.
Baba, Hotsumi	ISI - Dentsu, Ltd.
Bae, Dae-Sung	Hanyang University
Barber, Andy	MTS
Barten, Louis	Speed Control Inc.
Besselink, Igo	TNO
Bigot, Bill	MTS
Boersma, Stacey	Ford Motor Company
Boulden, Larry	Computer-Aided Engineering
Calash, Dr. Antown	Navistar International
Chen, Hsinchi	Taiwan Auto-Design Co.
Deshmukh, Rajindera	NIIT
Dodds, Iain J.	EG&G Structural Kinematics
Dropik, Marty	Fisher Price
Effendi, Zee	Hewlett Packard Company
Eichinger, Michael	Sydac Software
Emkie, Charlie	Lockheed Martin
Eng, Norman	Grumman
Engstrom, Johnny	Volvo Car Corporation
Eom, Tai-Moon	SeoMoon Technologies
Erlandson, Paul	Ford Motor Company
Fancello, Angelo	3-M Austin Center
Fett, Jurgen	Mechanical Dynamics GmbH
Fisher, Bill	MTS
Gerould, Bill	SUN Microsystems
Gillund, Eric	Multimatic Inc.
Graham, Greg	Hewlett Packard Company
Granat, Kevan	Ford Motor Company
Groff, Mary	Square D Company
Gupta, Suresh	Mechanical Dynamics Limited
Habermann, Anja	Mechanical Dynamics GmbH
Handroos, Heikki	Lappeenranta University of Technology

ATTENDEE LIST (CONT.)

Hanson, Rex	John Deere Industrial Equipment
Hewitt, Tony	Hewlett Packard Company
Hoffman, Michael	Mechanical Dynamics GmbH
Hummell, John	Borg-Warner Automotive
Hunsader, Leonard J.	Komatsu America International Company
Hwang, Sheng-Jiaw	Ford Motor Company
Jankowski, Krystof P.	FFD-Ricardo
Jeong, Woong-Sang	SeoMoon Technologies
Johansson, Mats	Prosolvia Research & Technology Inc.
Johnson, Perry	Ford Motor Company
Joseph, Basil	New Venture Gear
Juan, Joe	Ford Motor Company
Juengst, Dan	Silicon Graphics Computer Systems
Keeney, Chris	Rockwell International, Automotive
Kelkar, Manish	NIIT
Kellogg, Bridgette	Silicon Graphics Computer Systems
Kim, Sung-Ho	HanKook Tire
Kmiec, Dan	Ford Motor Company
Koettgen, Volker	TECMATH
Kong, Yong	EDS
Krouse, John	Krouse Associates
Ledesma, Ragnar H.	Rockwell International, Automotive
Li, Fenglong	IMAG
Liang, Cwo Gee	General Motors Corporation
Lippitt, Elizabeth	Silicon Graphics Computer Systems
Lofgren, Bjorn	Forestry Research Institute of Sweden
Lukens, Charlie	Silicon Graphics Computer Systems
Lung, Rick	Ford Motor Company
Maiwald, Helmut	TRW
Marchena, Patrick	Ford Motor Company
Marth, Christopher	Quantum Consultants, Inc.
Martin, Jeff	Ford Motor Company
Mashey, Dr. John	Silicon Graphics Computer Systems
McGowan, Neil	Mechanical Dynamics Limited

ATTENDEE LIST (CONT.)

McGuire, Sandra	Hewlett Packard Company
McLain, David L.	General Motors Corporation
Mikkola, Aki	Lappeenranta University of Technology
Mikosz, Richard	S&C Electric Company
Monkaba, Vince	Ford Motor Company
Moscatelli, Peter	MTS
Newby, Clark	Silicon Graphics Computer Systems
Niemi, Erkki	Lappeenranta University of Technology
Nogueira de Souza, Fatima Maria	SMI
Ojala, Janne	Tamrock Technology Center Oy
Pandolfi, Pete	Ford Motor Company
Pascarella, Bob	Ford Motor Company
Pauwelussen, Joop	TNO
Peterson, Carl M. III	TRW Vehicle Safety Systems
Putney, Gordon A.	Snap-On Tools, Inc.
Rahnejah, Homer	University of Bradford
Raub, Jonathan H.	Cummins Engine Company, Inc.
Rintala, Roger	Silicon Graphics Computer Systems
Rodriguez, Sergio Ricardo	SMI
Rouvinen, Asko	Lappeenranta University of Tech.
Saadetian, Haig	H. G. Engineering
Sajdak, Anthony	Whirlpool Corporation
Sato, Junishi	Estech
Shimizu, Hiroshi	Estech
Singh, Digvijay	General Motors Corporation
Skeen, Tom	Lucent Technologies
Slattengren, Jesper	Mechanical Dynamics Sweden
Smith, Dave	John Deere
Soundrapandian, Ken	Ford Motor Company
Stackpole, Michael J.	Goodyear Tire & Rubber Company
Starnes, John	Hewlett Packard Company
Staschke, Ronald	Staschke Consulting
Stastny, Dr. Ted	AAI Corporation
Sundaram, Sam V.	Goodyear Tire & Rubber Company
Sung, Whal-Kyung	Changwon National University

ATTENDEE LIST (CONT.)

Sural, V.	EASi Engineering
Talmo, Tom	MTS
Tangri, Rohit	TRW Vehicle Safety Systems
Tripp, Jan	General Motors Corporation
Tussing, Mark A.	Cummins Engine Company, Inc.
Venugopal, Madan	Silicon Graphics Computer Systems
Vinayak, Harsh	BF Goodrich - Aerospace
Werner, Katarina	Technical Outlook
Wielenga, Thomas J.	Chace and Associates Engineering
Willoughby, Doug	SUN Microsystems
Wilson, Rod	Hewlett Packard Company
Wurgler, Thomas J.	Goodyear Tire & Rubber Co.
Xia, Xunmao	Continental General Tire, Inc.
Yang, Sung-Mo	Samsung Motors Inc.
Zimmer, Bernd	Mechanical Dynamics GmbH

Tuesday, May 14, 1996
Keynote Luncheon:



Magellan

Keynote Speaker

Rod Wilson
Solutions Marketing Manager
Mechanical Design Automation
Workstation Systems Division

Since joining Hewlett-Packard in 1985, Mr. Wilson has held a variety of positions in workstation marketing including business development and product marketing. Most recently, he was responsible for HP's Strategic OEM program. Prior to that role, he spent two years in Boeblingen, Germany as the European Product Marketing Manager for workstations.

Mr. Wilson began his current position in October, 1994. His current role is focused on growing Hewlett-Packard's leadership position in the Mechanical Design Automation Market. Mr. Wilson manages a team of people who ensure the success of all major mechanical software supplies on Hewlett-Packard's family of computer systems. In February, 1996, Dataquest confirmed HP's dominance of the UNIX hardware portion of the mechanical design market with 27% market share and a growth rate twice that of the nearest competitor.

Wednesday, May 15, 1996
Keynote Breakfast:



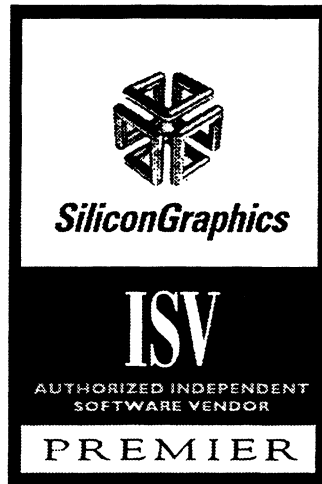
Java and the Internet in Manufacturing Industry

Keynote Speaker

Douglas A. Willoughby
Area Systems Engineer

Douglas A. Willoughby has been a member of Sun Microsystems Central Area technical staff since 1991. He specializes in distributed and object technologies. Previously he served as one of the company's Senior Technical Consultant. Before joining Sun Microsystems, Mr. Willoughby developed real-time process control and plan monitoring systems. Willoughby holds a BS degree in Computer Science from Michigan State University, and earned his Masters in Business Administration from Wayne State University.

Wednesday, May 15, 1996
Keynote Luncheon:



Hardware, Wetware, & Software

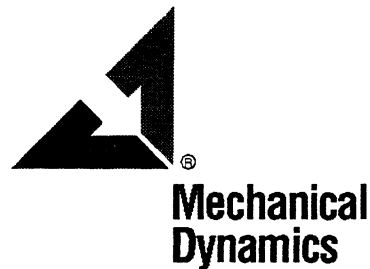
A look at technology trends and how they interact with human beings.

Keynote Speaker

Dr. John Mashey
Director, Systems Technology

Dr. Mashey is the Director, Systems Technology in Silicon Graphics R&D. He is an ancient UNIX person, having started work on it at Bell Labs in 1973. He has worked on and managed projects in both commercial and technical computing, has helped design the MIPS RISC architecture, and has chaired technical conferences on operating systems and CPU chips. He was one of the founders of the SPEC benchmarking group. He was an ACM National Lecturer for 4 years, and Guest Editor for IEEE Micro. He has given more than 500 public talks on software engineering, RISC design, performance benchmarking, and supercomputing.

1996
SILICON GRAPHICS & MECHANICAL DYNAMICS
18-HOLE GOLF TOURNAMENT



Thursday, May 16, 1996

at the
Eastern Michigan University's Huron Golf Course
next to the Ypsilanti Marriott Hotel

Breakfast and Registration from 7:45 am - 9:30 am

Tee times range from 8:15 am - 9:54 am

Awards Luncheon immediately following
at the Huron Golf Course Clubhouse

"Hole-in-One" Contest on Hole #6

Longest Drive on Hole #13

Closest to the Pin on Hole #14

**** Locker Rooms available on-site***

Please fax to: Marilyn Lee, 313-994-6418



REVIEW FORM

(Optional)

Name _____

Company/Organization _____

1. Was the Conference worth your time and expense? Yes ____ No ____

2. Please rate the following aspects of the conference:

	Very Good	Good	Average	Poor	Very Poor	N/A
<u>Conference Center</u>						
• Facilities	_____	_____	_____	_____	_____	_____
• Food @ Breaks	_____	_____	_____	_____	_____	_____
• Location	_____	_____	_____	_____	_____	_____
<u>Marriott Hotel</u>						
• Guest Rooms	_____	_____	_____	_____	_____	_____
• Food @ Lunch	_____	_____	_____	_____	_____	_____
• Restaurant / Lounge	_____	_____	_____	_____	_____	_____
Hands-On Workshops	_____	_____	_____	_____	_____	_____
MDI / SGI Golf Outing	_____	_____	_____	_____	_____	_____

3. Please rate each presentation on a 1-5 basis (1 = lowest, 5 = highest):

DAY 1 - Tuesday, May 14, 1996

- _____ MDI Welcome Address & ADAMS Product Update
- _____ Testing and Modeling of Tire Behavior: DELFT-TYRE
- _____ Dynamic Analysis of an Automotive Timing Chain System
- _____ Analysis of Automatic Transmission Line Pressure Control
- _____ Training of Neural Networks of Flexible Robot
- _____ Keynote Luncheon: Magellan
- _____ Vehicle Dynamics & NVH Trade-off Studies Using ADAMS
- _____ Personalized Musculoskeletal Human Models for Use in Dynamic Gait Simulation
- _____ Virtual Prototyping of Vehicle Control Systems
- _____ Using ADAMS for Predicting Dynamic Force Histories for Fatigue Analysis of a Log Crane
- _____ A Torsional Model to Predict Gear Rattle
- _____ Use of DOE for Driveline Vibration Analysis of a Land Rover Four-Wheel Drive
- _____ Integrated Approach to Fatigue Life Predictions & ADAMS

REVIEW FORM (CONT.)

DAY 1 - Tuesday, May 14, 1996

- ___ Keynote Breakfast: Java and the Internet in Manufacturing Industry
- ___ Strategies for Using the ADAMS Integrators
- ___ ADAMS Generic Engine: A Tribo-Elastodynamic Analysis Tool
- ___ Shipboard Buoy/Cable Deployment System in ADAMS
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- ___ Applications of MECHANISM/Pro at John Deere
- ___ Modeling Friction-Induced Dynamic Instabilities Using Flexible Multibody Dynamics
- ___ Window Regulator System Analysis Using ADAMS/View Parametric Modeling
- ___ A Multibody System Approach to Piston Liner Interaction Dynamics
- ___ ADAMS/WT (Wind Turbine) Advanced Development

4. Which presentation do you think was the most beneficial? _____

5. What aspect of the Conference did you like the most? _____

6. What aspect of the Conference did you like the least? _____

7. Did the Conference contain sufficient technical content? Yes ____ No ____

8. What recommendations do you have for improvement to the Conference? _____

9. Any other comments? _____

