

The North American Manufacturing Research Institution of the Society of Manufacturing Engineers invites you to attend the

Twenty-Sixth North American Manufacturing Research Conference

NAMRC XXVI

May 19-22, 1998



The Fuller E. Callaway, Jr.
Manufacturing Research Center
at the Georgia Institute of Technology

Photo by Gary Meek

Hosted by the Georgia Institute of Technology



Sponsored by the

North American Manufacturing
Research Institution of the
Society of Manufacturing Engineers



Dear Friends,



The Georgia Institute of Technology is pleased to host the Twenty-Sixth North American Manufacturing Research Conference (NAMRC) this year on May 19-22. NAMRC was organized in 1973 as a major international forum for the discussion and dissemination of research results in the field of manufacturing science and technology. NAMRC provides a unique forum for active academic and industry researchers to exchange and discuss recently completed research or in-progress research in manufacturing technology and productivity.

This year, over eighty papers will be presented at the conference from universities, research institutes, and industrial research laboratories from around the world. All of these papers have been accepted based on a peer review process conducted by the NAMRI/SME Scientific Committee.

The Conference will begin on Tuesday, May 19, with a **welcoming** reception in the Renaissance Atlanta Hotel Downtown. **On** Wednesday, May 20, the Conference Opening Ceremony will feature a keynote **address by William B. Bullock**, President of Lockheed Martin Aeronautical Systems. **The traditional** Founder's Lecture will be given **during the Wednesday luncheon** by Dr. John G. Bollinger of the University of Wisconsin, Madison.

Each year, NAMRC attracts over 250 manufacturing research engineers and scientists, research and development managers, production engineers and managers, design specialists, metallurgists, manufacturing managers, research professors, graduate students, research assistants, manufacturing educators, and industry representatives.

We are looking forward to renewing acquaintances with you, our colleagues, at NAMRC XXVI. We believe the conference will be both an intriguing and beneficial one for you.

Cordially yours,

Steven Y. Liang and Thomas R. Kurfess
Co-Chairs
NAMRC XXVI Organizing Committee

What is NAMRC?

NAMRC is an international forum for the presentation and critical discussion of the results of basic and applied research in material forming, material removal, and manufacturing systems and controls. It is one of only a few events of its kind where technical innovations, new methods and applications of leading-edge technology from throughout the world are shared between manufacturing research, design, engineering, and production professionals from academia and industry. Because NAMRC takes place every year, the findings and breakthroughs presented here are topical and of current interest.

Why Should You Attend?

By attending NAMRC XXVI you will:

- Gain insight on the most recent developments in material removal and forming processes, automation and control of processes and systems, equipment accuracy and precision, and many other manufacturing-related topics.
- Participate in a dialogue between industry and academia on future needs for manufacturing processes and applications.
- Enhance your knowledge of alternative manufacturing processes and applications.
- Make valuable contacts with other leading manufacturing researchers and professionals.

About NAMRI/SME

The North American Manufacturing Research Institution of the Society of Manufacturing Engineers (NAMRI/SME) is an organization dedicated to manufacturing research and technology development. Its mission is to advance manufacturing engineering by promoting research and its application in industry.

	Morning				Afternoon		Evening
Tuesday May 19							Registration/Welcoming Reception Renaissance Atlanta Hotel Downtown 25th floor 5-9 p.m.
Wednesday May 20	Registration & Continental Breakfast GT Center for the Arts 7:30-8:30 a.m.	Opening Ceremony GT Center for the Arts 8:30-10 a.m. Guest Program The World of Coca-Cola Tour Meet at 10:00 a.m.	Concurrent Sessions GT Student Success Center 10:30 a.m.-12 p.m.	Luncheon & Founder's Lecture GT Student Success Center Festival Area 12-1:30 p.m.	Concurrent Sessions GT Student Success Center 1:30-5 p.m.	Wine & Cheese Reception GT Alumni/Faculty House 5-6:30 p.m. NAMR/SME Member Meeting GT Student Success Center Theater 6:30-7:30 p.m. ASME MED Meeting GT Student Success Center Theater 7:30-8:30 p.m.	
Thursday May 21	Registration & Continental Breakfast GT Student Success Center 7:30-8:30 a.m.	Concurrent Sessions GT Student Success Center 8:30 a.m.-12 p.m. Guest Program Cable News Network Tour Meet at 10:30 a.m.		NAMR/SME Awards Luncheon GT Student Success Center Festival Area 12-1:30 p.m.	Concurrent Sessions GT Student Success Center 1:30-3 p.m. Georgia Tech Laboratory Tours 3:30-5 p.m.	Conference Banquet Georgia Stone Mountain Park Boat Ride 6:30-9:30 p.m.	
Friday May 22	Registration & Continental Breakfast GT Student Success Center 7:30-8:30 a.m.	Concurrent Sessions GT Student Success Center 8:30 a.m.-12 p.m. Industry Tour: Lucent Technologies, Norcross, GA 8:00-12:00 noon		Light Lunch GT Student Success Center 12-1:30 p.m. Conference Adjournment			

Conference Site

Georgia's capital city of Atlanta will be the site of NAMRC XXVI. Atlanta is the 12th largest city in the United States with a metropolitan population of 3 million. The city is home to Cable News Network (CNN), The Coca-Cola Company, the Centers for Disease Control, the High Museum of Art, and the 1995 World Series Champion Atlanta Braves baseball team. Atlanta was also the host city for the 1996 Centennial Summer Olympic Games.

The Georgia Institute of Technology has a tradition of excellence in technological research and education, and is one of the world's premier technology-oriented universities. Georgia Tech boasts a superb faculty of world-class teachers, researchers, and consultants, and an excellent undergraduate and graduate student body.

Georgia Tech is consistently listed among the best universities in the nation. In *U.S. News & World Report's* 1998 annual ranking of graduate schools in the United States, the College of Engineering at Georgia Tech is currently ranked number four, and has the *number one* academic program in industrial engineering/manufacturing in the U.S.

Facilities

Several facilities have been chosen for NAMRC XXVI. The Renaissance Atlanta Hotel Downtown will be the site for the Tuesday evening Registration and Welcoming Reception. All conference technical sessions will be held at the Georgia Tech Student Success Center, located on campus. The Opening Ceremony on Wednesday, May 20 will take place at the Robert Ferst Center for the Arts.

Sponsor Recognition

The NAMRC XXVI Organizing Committee thanks the following organizations for their sponsorship supporting this year's conference: the Manufacturing Research Center at Georgia Tech, The George W. Woodruff School of Mechanical Engineering at Georgia Tech, Ford Motor Company, General Motors Research and Development Center, The Torrington Company, and Extrude Hone Corporation.

Special Activities

NAMRC special activities begin with the Welcoming Reception on the evening of Tuesday, May 19, at the Renaissance Hotel. The hotel is located at 590 West Peachtree Street in downtown Atlanta.

The Wednesday evening wine and cheese reception on May 20 will take place in Georgia Tech's Alumni/Faculty House, located at 190 North Avenue, directly across the street from the Georgia Tech campus. The reception precedes the NAMRI/SME membership and ASME MED meetings which will be held across the street in the Student Success Center Theater.

On Thursday, May 21, the Annual NAMRC Banquet will feature an exciting paddlewheel riverboat three-hour cruise on Stone Mountain Lake. The lake is part of the 3,200-acre Stone Mountain Park, located due east of Atlanta. The lake is located at the base of Stone Mountain, an 825-foot-high dome-shaped granite rock. Transportation to and from the Banquet will be provided. Buses will depart from the Manufacturing Research Center Building.

Laboratory Tours: May 21, 3:30-5:00 p.m.

Tour Coordinator: Jonathan S. Colton, Georgia Institute of Technology

The tours will highlight three Georgia Tech laboratories in the facilities of the George W. Woodruff School of Mechanical Engineering and the Manufacturing Research Center. The tour of the Precision Machining Laboratory will focus on metals and hard materials processing, metrology, and machine tool design and control. The tour of the Composites and Polymer Processing Laboratory will focus on the development of advanced polymer-based composites materials and novel processing techniques. The tour of the Center for Board Assembly Research will focus on the development of new materials and attachment techniques for the assembly and direct attachment of chips and electronic circuits directly to circuit boards.

Industry Tour:

Tour Coordinator: Thomas R. Kurfess, Georgia Institute of Technology

A special industry tour of Lucent Technologies has been arranged for NAMRC attendees on Friday, May 22. Transportation will be provided. The bus will depart at 8:00 a.m. and return approximately at 12:00 noon. Participants will visit Lucent's Fiber Optic Production Facilities in Norcross, Georgia. Indicate your interest to attend the tour on the conference registration form. The Lucent tour is limited to 50 persons.

Panel Discussions

Future Prospects for Manufacturing Engineers (Session 5-D)

This session is designed to provide students and new engineers with an overview of the various challenges that are faced by engineers in the manufacturing sector. Seven representatives from industry, academia, and the government will discuss the opportunities available in manufacturing engineering. The discussions will present the various exciting challenges of today's modern engineer that far exceed the traditional duties of manufacturing personnel.

Electronics Manufacturing Research (Session 6-D)

The electronics industry has grown at an average rate of approximately 15 percent annually over the past three-and-a-half decades, recently surpassing the automotive industry to become the world's largest industry sector. This distinguished panel seeks to address the formidable fundamental and technological barriers facing the electronics manufacturing industry to enable the manufacturing research community to better understand the unique opportunities that exist for research advances and the critical areas that will have the greatest impact over the next decade.

CIRP International Workshop

Planned in conjunction with the NAMRC XXVI will be a one-day CIRP International Workshop on Modeling of Machining Operations. The CIRP Workshop will be held at Georgia Tech prior to the NAMRC conference on Tuesday, May 19, 1998. The CIRP workshop is designed to highlight the present status and future directions in modeling of machining operations through a series of invited presentations, panel discussions, and contributions on selected topics by active researchers, industry representatives, and government agencies.

The CIRP Workshop will consist of approximately three hours of invited presentations, two hours of contributions/discussion on selected topics in parallel streams, and an hour-and-a-half analysis/conclusions session. For more information, please visit CIRP's web site at <http://www.engr.uky.edu/~jawahir/CIRP>.

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Publications

All papers presented at NAMRC XXVI will be contained in either the hard bound "Transactions of the North American Manufacturing Research Institution of SME, Volume 26, 1998" or the soft cover "Technical Papers of the North American Manufacturing Research Institution of SME, Volume 26, 1998" Participants who have paid the registration fee will receive copies of each at the time of registration. Additional copies of the publications may be purchased after May 22. Contact the SME Customer Service at (313) 271-1500 ext. 629 or 1-800-733-4763.

Additional Information

Vegetarian meals will be provided at each meal for those who request it. Please indicate your dietary requirements on the registration form. Also, those who require accommodations for disabilities should inform Georgia Tech through the registration form.

Registration Fees

Registration fees for the full conference are \$300 (U.S. Funds) for registrations postmarked or faxed (with credit card information) on or before April 19, 1998, and \$350 after that date. The one-day registration fee is \$200, the student/retiree registration is \$100, and the guest registration fee is \$80. All registration fees except the guest registration fees include all NAMRC meals and conference publications. Included in the guest registration fees are conference breakfasts, the conference banquet, and two receptions. There are no reduced registrations for authors or session chairs.

Cancellation Policy

If you need to cancel your conference registration, you must notify Georgia Tech Distance Learning, Continuing Education and Outreach by calling 404-894-2401 at least ten (10) business days prior to the program's start date to receive a refund (less a \$50 administrative fee). Please allow three weeks to receive a refund. Substitutions are permitted at any time. Please note that "no shows" do not receive refunds. No refunds will be given after the start of the conference.

Guest Program

A non-technical program will be provided on Wednesday, May 20 and Thursday, May 21 for visiting spouses, guests and others who do not wish to attend the technical sessions. The program will include visits to The World of Coca-Cola, a museum showcasing the Coca-Cola Company's history and memorabilia (fee: \$6.00), and Underground Atlanta for lunch and shopping on May 20. On May 21 guests may attend a Studio Tour of Cable News Network (CNN) (fee: \$7.00), and a walk through Centennial Olympic Park.

The guest registration fee of \$80 includes conference breakfasts, the welcoming reception, the wine and cheese reception and the conference banquet. Additional expenses such as admission fees, subway fares, and lunches on the outings will vary depending on the activities. Participants will be asked to cover these additional charges on their own. Participants will meet at the NAMRC Conference Registration Desk in the Student Success Center on the morning of the outing (see program at a glance for time).

Travel

Atlanta and Georgia Tech are conveniently located off Interstate 75/85. Approaching from the south, you will see a sign for Exit 100 – West Peachtree Street shortly after passing through downtown Atlanta. Approaching from the north, take the North Avenue/Georgia Tech exit.

All hotels are easily accessible from the Atlanta Airport. The Atlanta Airport Shuttle services both of the recommended hotels with frequent runs between the hotels and airport daily. The shuttle service is located at the TAXI stand at the Airport. The fee is \$17.00 round trip. The Atlanta Airport Shuttle phone number is (404) 768-7600. The airport has a taxi service as well.

Amtrak train service to Atlanta is available once a day from Washington, New Orleans, Birmingham and some other cities. The station is located at 1688 Peachtree Street N.W., not far north of Georgia Tech. The reservations number for Amtrak is 800-872-7245.

Directions will be included in your registration packet, or you can access the information directly off the SME homepage at <http://www.sme.org/namri>, or the Georgia Tech Precision Machining Site at <http://precision.me.gatech.edu>

Many domestic and international carriers serve the Atlanta Hartsfield International Airport. Atlanta is in the Eastern Time Zone.

Travel Discounts

Delta Air Lines offers special fares to attendees of Georgia Tech programs. Certain restrictions may apply. For information and reservations, call 1-800-241-6760 and refer to file U0175 (for domestic flights only). We recommend that you do not purchase a non-refundable airline ticket.

Visa & Health Insurance

All international participants are requested to make arrangements for their U.S. Visa and health insurance.

Parking

On-campus parking is very limited and driving to the conference sessions is discouraged. The conference hotels offer parking, and are a short walk to campus.

Lodging

Both the Renaissance Atlanta Hotel Downtown and the Holiday Inn Express on North Avenue have been selected as primary lodging sites for the conference. Both are located in downtown Atlanta and are only a short walk to the Georgia Tech campus and Student Success Center, the site of many of the conference's activities and sessions.

Renaissance Atlanta Hotel Downtown

590 West Peachtree Street
Atlanta, Georgia USA 30308
Phone: 404-881-6000 (for
reservations)
Fax: 404-815-5010
Web Site: www.renaissancehotels.com
Single/double occupancy: \$99.00,
Deadline: April 24, 1998
Code: request the Georgia Tech
MARC-NAMRC rate.
Parking: \$7.50 per day

Holiday Inn Express on North Avenue

244 North Avenue, N.W.
Atlanta, Georgia USA 30313
Phone: 404-881-0881 (for
reservations)
Fax: 404-874-8838
Single/double occupancy: \$79.00
Deadline: May 5, 1998
Code: request the Georgia Tech -
NAMRC rate
Parking: no charge

Weather

Spring in Atlanta is likely to be warm during the day. Participants should plan to bring a windbreaker or jacket for the evenings and appropriate clothing for the possibility of rain. Overall, the weather should offer a nice opportunity to enjoy evening activities and excursions. Guests will enjoy experiencing spring's show of flowers in Georgia.

To Register

Register by mail or Fax

Complete the registration form at the back of this brochure and mail or fax it with payment to:

Georgia Institute of Technology
Distance Learning, Continuing Education, and Outreach-R
P.O. Box 93686

Atlanta, Georgia USA 30377-0686

Fax: 404-894-8925

Email: register@conted.swann.gatech.edu

Register On-line:

See our home page at http://www.conted.gatech.edu/other/online_reg.html on the World Wide Web.

Additional Information

For more information on registration, please contact the Department of Distance Learning at the FAX number provided. All other inquiries should be directed to Pam Rountree at The Manufacturing Research Center, Georgia Tech,
Phone: 404-894-1740.

Special Note to Authors

Each conference meeting room will contain an overhead projector and 35 mm slide projector. If you require additional audio visual equipment, please advise Georgia Tech Department of Distance Learning as listed above, or note your requirements on the registration form. Please be specific in the type of equipment needed, including format and hardware/software requirements.

NAMRC XXVI Technical Sessions and Programs

Tuesday, May 19, 1998

5:00 - 9:00 p.m.

Conference Registration & Welcoming Reception: The Renaissance Atlanta Hotel - Downtown, 25th Floor

Wednesday, May 20, 1998

7:30 - 8:30 a.m.

Registration and Continental Breakfast: Robert Ferst Center for the Arts

8:30 - 10:00 a.m.

Opening Ceremony: Robert Ferst Center for the Arts

Opening Remarks: Thomas R. Kurfess, Co-Chair, NAMRC XXVI
Organizing Committee

Steven Y. Liang, Co-Chair, NAMRC XXVI
Organizing Committee

Welcoming Remarks: Steven Danyluk, Director, Manufacturing Research
Center, Georgia Institute of Technology

Ward O. Winer, Chair, George W. Woodruff School
of Mechanical Engineering, Georgia Institute of
Technology

Wayne G. Clough, President, Georgia Institute of
Technology

Invited Remarks: Representative of the State of Georgia

Introductory Remarks: William R.D. Wilson, President, NAMRI/SME
Alan T. Male, President, SME

Keynote Address: Flexible Manufacturing for the Next Generation

William B. Bullock, President, Lockheed Martin
Aeronautical Systems

10:00 - 10:30 a.m.

Coffee and Refreshment Break: Student Success Center

Sponsored by Extrude Hone Corporation

10:30 a.m. - 12:00 noon

Concurrent Technical Sessions (Note: All Technical Sessions will be held at the Student Success Center)

Session 1-A: Grinding and Finishing: Student Success Center Theater

Co-Chairs: William F. Bell, The Torrington Company
Kornel F. Ehmann, Northwestern University

Assessment of Machining Performance of Dental Ceramics, G. Zhang, L. Qi, Y. Cao, University of Maryland at College Park; D.T. Le, Lanxide Corporation

Analysis and Simulation of Double Disc Grinding, N. Shanbhag, M. Rajan, J. Manjunathaiah, S. Krishnamurthy and S. Malkin, University of Massachusetts

High Efficiency Superfinishing of Bearing Rings with CBN, I.D. Marinescu, G. Dontu, The University of Toledo; E. Bordeianu, Jacobs-Chuck Manufacturing Company

Session 1-B: Sheet Forming: President's Suites C & D

Co-Chairs: Ken-Ichiro Mori, Toyohashi University of Technology, Japan
Kim A. Stelson, University of Minnesota

Modeling and Evaluation of Superplastic Forming of Weldalite™ 049 Sheet Products, G.T. Kridli, University of Michigan-Dearborn; A.S. El-Gizawy, University of Missouri-Columbia

An Analytical Model for Predicting Flange Wrinkling in Deep Drawing, X. Wang and J. Cao, Northwestern University

Modeling, Simulation and Optimization of Sequential Bending Process, Y. Wang and S. Shabeer, University of Maryland

Session 1-C: Systems: Press Suite A

Co-Chairs: Bruce M. Kramer, National Science Foundation
K. Subbu Subramanian, Norton Company

Twenty-Five Years of NAMRC and Beyond - A Brief History and Outlook, K.J. Weinmann, Michigan Technological University

CYBERCUT: A Networked Machining Service, P. Wright and D.A. Dornfeld, University of California at Berkeley

A Case-Based Approach for Cost Estimating in Net-Shape Manufacturing, M. El-Mehalawi and R.A. Miller, The Ohio State University

12:00 noon - 1:30 p.m.

Luncheon: Student Success Center Festival Area
Sponsored by Ford Motor Company

Founder's Lecture

Visioneering Manufacturing for the Twenty-First Century
Dr. John G. Bollinger
University of Wisconsin, Madison

1:30 - 3:00 p.m.

Concurrent Technical Sessions

Session 2-A: Turning: Student Success Center Theater

Co-Chairs: Vivek Chandrasekhran, Caterpillar, Inc.
Mike J. Shorr, Lucent Technologies

Process Effects on White Layer Formation in Hard Turning, Y.K. Chou and C.J. Evans, National Institute of Standards and Technology

Modeling of Thermo-Elastic Workpiece Deformation for Compensation of Dimensional Errors in Turning of Hard Metals, D. Bähre, R. Dollmeier and G. Warnecke, University of Kaiserslautern, Germany

A New Performance-Based Criterion for Optimum Cutting Conditions and Cutting Tool Selection in Finish Turning, Z.J. Da, J.P. Sadler and I.S. Jawahir, University of Kentucky

Dynamics of the Simultaneous Turning Process, I. Lazoglu, M. Vogler, S.G. Kapoor and R.E. DeVor, University of Illinois at Urbana-Champaign

Session 2-B: Forming Systems: President's Suites C & D

Co-Chairs: Goverdhan Lahoti, The Timken Co.
Rajiv Shivpuri, The Ohio State University

On Strains and Forming Limits of Metal Flow in the Drawbead Region of A Draw Die, S.G. Xu and K.J. Weinmann, Michigan Technological University

Incremental Hammering Forming of Sheet Metal Automated Using CCD Camera and Database, K. Mori, Toyohashi University of Technology, Japan; M. Otsu, N. Fujiwara and K. Osakada, Osaka University, Japan

Modeling and Control of Hydraulic Forming Equipment, W.G. Frazier, Air Force Research Laboratory, Wright-Patterson Air Force Base; E.A. Medina, Austral Engineering and Software, Inc.

Session 2-C: Systems: Press Suite A

Co-Chairs: Ronald A. Bohlander, Georgia Tech Research Institute
Ming C. Leu, National Science Foundation

Modeling Gradual Process Variables in Path Planning, N. Balasubramanian and S. Raman, University of Oklahoma

Adaptive Tool Path Planning by Machining Strip Evaluation for 5-Axis Complex Surface Machining, Y-S Lee, North Carolina State University

Simulation and Optimization System for Design of Multi-Stage Material Processes, E.A. Medina, Austral Engineering and Software, Inc.; J.C. Malas and W.G. Frazier, Air Force Research Laboratory, Wright-Patterson Air Force Base

3:00 - 3:30 p.m.

Coffee and Refreshment Break: Student Success Center

3:30 - 5:00 p.m.

Concurrent Technical Sessions

Session 3-A: Turning: Student Success Center Theater

Co-Chairs: David A. Dornfeld, University of California at Berkeley
Richard J. Furness, Ford Motor Company

Basic Study on Step Vibration Cutting, M. Jin, K. Ogasawara, M. Murakawa, Nippon Institute of Technology, Japan

Turning of Beta-Titanium Alloys by Means of Ultrasonic Vibration, M. Murakawa and M. Jin, Nippon Institute of Technology, Japan

Hard Turning of Steel, M.C. Shaw and A. Vyas, Arizona State University

Session 3-B: Environmentally Conscious Manufacturing: President's Suites C & D

Co-Chairs: Jonathan S. Colton, Georgia Institute of Technology
Walt W. Olson, University of Toledo

Integration of Environmental Factors in Surface Planning: Part 2 — Multi-Criteria Hazard Evaluation, S. Thurwachter, D.J. Bauer and P.S. Sheng, University of California at Berkeley

Integration of Environmental Factors in Surface Planning: Part 1 — Mass and Energy Modeling, D.J. Bauer, S. Thurwachter and P.S. Sheng, University of California at Berkeley

Economical Cryogenic Milling for Environmentally Safe Manufacturing, S.Y. Hong, X. Qu and A. Lee, Columbia University

Environmental Conscious Design Support Model Using Fuzzy Analytic Hierarchy Process, Y. Yu and H-C Zhang, Texas Tech University

Session 3-C: Systems: Press Suite

Co-Chairs: Barney E. Klamecki, University of Minnesota
Radha Sarma, Iowa State University

Using Single Significant Factor in Due-Date Assignment Rules for Dynamic Job Shops, F-C. R. Chang, Southern Illinois University at Carbondale; J. Lyu, National Cheng Kung University, Taiwan

Development of Large Knowledge-Based Systems for a Manufacturing Setting, J.M. Twomey, Wichita State University; M. Littell, Boeing Commercial Airplane Group

Automated Yarn Creeling for the Fabric and Carpet Industry, M.L. Reaff, R. Braga, H. Lipkin, Y. Wang, W. Holcombe and G. McMurphy, Georgia Institute of Technology

5:00 - 6:30 p.m.

Wine and Cheese Reception: Alumni/Faculty House
Sponsored by The Torrington Company

6:30 - 7:30 p.m.

NAMRI/SME Membership Meeting: Student Success Center Theater

7:30 - 8:30 p.m.

ASME MED Meeting: Student Success Center Theater

Thursday, May 21, 1998

7:30 - 8:30 a.m.

Registration and Continental Breakfast: Student Success Center

8:30 - 10:00 a.m.

Concurrent Technical Sessions (Note: All Technical Sessions will be held at the Student Success Center)

Session 4-A: Grinding and Finishing: Student Success Center Theater

Co-Chairs: David A. Stephenson, General Motors Corporation
Chen Zhou, Georgia Institute of Technology

Deformability of the Flexible Grinding Stone in a New Abrasive Machining Process for Three-Dimensional Geometry, H. Yamaguchi and J.R. Gilmore, Extrude Hone Corporation

Material Removal Asymmetry in the Double-Sided Polishing Process, B.E. Klamecki, University of Minnesota

A Vacuum-Hydrostatic Shoe for Centerless Grinding, Y. Yang, Carten Controls, Inc.; B. Zhang, University of Connecticut

Session 4-B: Bulk Forming and Casting: President's Suites C & D

Co-Chairs: Delcie R. Durham, National Science Foundation
Klaus J. Weinmann, Michigan Technological University

A Method for Identifying and Reducing the Geometric Variability of Injection Molding Die Sets, S.E. Ebenstein, V. Kiridena, Y.M. Rodin, G.H. Smith, Ford Motor Company; M.S. Claar and D.M. Hildreth, Visteon

Robust Design of Horizontal Pressure Die Casting Shot Sleeves, Y.K. Park, Catholic University of Taegu-Hyosung, Korea; J.R. Brevick, The Ohio State University

Numerical Modeling of Erosive-Corrosive Wear of Molds in Permanent Mold Casting of Aluminum Clutch Housing for Trucks, M. Ranganathan, R. Shivpuri and S. Balasubramaniam, The Ohio State University

Session 4-C: Tools: Press Suite A

Co-Chairs: Warren R. DeVries, Iowa State University
Gloria J. Wiens, University of Florida

Critical Assessment of Carbide and PCBN Tool Performance in High Speed Milling of Dies and Molds, M. Dumitrescu, M.A. Elbestawi, McMaster University, Canada; T.I. El-Wardany, L. Chen, United Technologies Research Center

Thermal Characterization of the Chip-Tool Interface When Using Coated Turning Inserts, W. Grzesik and P. Nieslony, Technical University of Opole, Poland

Vitreous Bond CBN Wheel for High Speed Grinding of Zirconia and M2 Tool Steel, A.J. Shih, M.B. Grant, T.M. Yonushonis, Cummins Engine Company, Inc.; T.O. Morris and S.B. McSpadden, Oak Ridge National Laboratory

10:00 - 10:30 a.m.

Coffee and Refreshment Break: Student Success Center
Sponsored by Extrude Hone Corporation

10:30 a.m. - 12:00 noon

Concurrent Technical Sessions

Session 5-A: Drilling: Student Success Center Theater

Co-Chairs: Chi-Hung Shen, General Motors Corporation
John W. Sutherland, Michigan Technological University

Integration of CAD of Drill with FEA of Drilling Burr Formation, Y.B. Guo, Purdue University; D.A. Dornfeld, University of California at Berkeley

Machinability Characterization in Drilling Graphite Fiber-Reinforced Composites, U.E. Enemuoh, A.S. El-Gizawy, University of Missouri-Columbia; A.C. Okafor, University of Missouri-Rolla

Finite Element Analysis of Drilling Burr Minimization with a Backup Material, Y. Guo, Purdue University; D.A. Dornfeld, University of California at Berkeley

Session 5-B: Bulk Forming: President's Suites C & D

Co-Chairs: George Kardomateas, Georgia Institute of Technology
William R.D. Wilson, Northwestern University

Plane Strain Indentation of Thick Blocks Between Opposed Flat Rigid Punches of Unequal Width, Two at the Top and One at the Bottom - II, S. Mardanpour and N.R. Chitkara, University of Manchester Institute of Science and Technology, United Kingdom

Roll Pass Design Optimization Applying Fuzzy Reasoning Techniques, S.D. Kini and R. Shivpuri, The Ohio State University

An Improved Upper Bound Method for Flow Analysis in Streamline Converging Extrusion Dies, H.A. Ghulman, J.S. Gunasekera and B.V. Mehta, Ohio University

Session 5-C: Materials: Press Suite A

Co-Chairs: Hodge E. Jenkins, Lucent Technologies
Robert E. Williams, University of Nebraska-Lincoln

Single Asperity Plowing of a 3004 Aluminum Alloy in the Presence of Boundary Additives, S.R. Schmid, University of Notre Dame; L.G. Hector, S.M. Opalka, R.R. Reich, J.M. Epp, ALCOA Corporation

Effect of Hardness on Flow Stress of Aluminum, J.T. Black and R. Krishnamurthy, Auburn University

Modeling Microstructural Evolution and Phase Transformation in Shape Rolling, P. Pauskar, S. Phadke and R. Shivpuri, The Ohio State University

Session 5-D: Panel Discussion: Press Suite B

Future Prospects for Manufacturing Engineers

Moderator: Thomas R. Kurfess, Georgia Institute of Technology

Panelists: William F. Bell, The Torrington Company
Richard E. DeVor, University of Illinois at Urbana-Champaign
Delcie R. Durham, National Science Foundation
Dave E. Hardt, Massachusetts Institute of Technology
David A. Stephenson, General Motors Corporation
Paul K. Wright, University of California at Berkeley
Matthew J. Zaluzec, Ford Motor Company

12:00 noon - 1:30 p.m.

NAMRI/SME Awards Luncheon: Student Success Center Festival Area
Sponsored by General Motors Research and Development Center

1:30 - 3:00 p.m.

Concurrent Technical Sessions

Session 6-A: Milling: Student Success Center Theater

Co-Chairs: Shiv G. Kapoor, University of Illinois at Urbana-Champaign
Karl F. Radune, The Torrington Company

Rear Gouge Detection and Elimination in Five-Axis NC Machining of Sculptured Surfaces, R. Sarma, Iowa State University

Prediction of Chip Formation and Cutting Forces in Flat End Milling: Comparison of Process Simulations with Experiments, T. Özel, M. Lucchi, C.A. Rodriguez and T. Altan; The Ohio State University

Determination of Tool Stiffness Using Neural Network in End Mill, S-L Ko and S-K Lee, Kon-Kuk University, Korea

Session 6-B: Non-Traditional Processes: President's Suites C & D

Co-Chairs: K.P. Rajurkar, University of Nebraska-Lincoln
Ralph Resnick, Extrude Hone Corporation

A Feasibility Study of EDM Tooling Using Metalized Stereolithography Models, M.C. Leu, National Science Foundation; B. Yang and W.L. Yao, New Jersey Institute of Technology

Excimer Laser Micromachining of Nylon, T.C. Chang and P.A. Molian, Iowa State University

Development of an EDM CNC System for Conjugate Machining, B. Zhang, W.M. Wang, K.P. Rajurkar and A. Narayanan, University of Nebraska-Lincoln

Investigation of Electrochemical Parameters into an Electrochemical Machining Process, J.J. Sun, E.J. Taylor, L.E. Gebhart, C.D. Zhou, J.M. Eagleton and R.P. Renz, Faraday Technology, Inc.

Session 6-C: Sensors: Press Suite A

Co-Chairs: I.S. Jawahir, University of Kentucky
Brij B. Seth, Ford Motor Company

Early Prediction of Impending End-Milling Tool Failure Using Acceleration Signals, J.T. Roth and S.M. Pandit, Michigan Technological University

Sensor Fusion Method for Machine Performance Enhancement, J-I Mou, Arizona State University; C. King and R. Hillaire, Sandia National Laboratories; S. Jones and R. Furness, Ford Motor Company

Prediction of Tool Wear and Tool Failure in Milling by Utilizing Magnetostrictive Torque Sensor, H. Aoyama, I. Inasaki, Keio University, Japan; I. Suda and H. Ohzeki, Mitsubishi Materials Corporation, Japan

Session 6-D: Panel Discussion: Press Suite B

Electronics Manufacturing Research

Moderators: Daniel F. Baldwin, Georgia Institute of Technology
Suresh K. Sitaraman, Georgia Institute of Technology

Panelists: Steve Corbett, Poly-Flex Circuits
Jack Fisher, Interconnection Technology Research Institute
Alex Oscilowski, SEMATECH
John R. Thome, Motorola
Rao Tummala, Georgia Institute of Technology

3:00 - 3:30 p.m.

Coffee and Refreshment Break: Manufacturing Research Center Atrium

3:30 - 5:00 p.m.

Laboratory Tours: Georgia Tech Manufacturing Research Center and George W. Woodruff School of Mechanical Engineering

6:30 - 9:30 p.m.

Conference Banquet: Georgia Stone Mountain Riverboat Cruise
Sponsored by The George W. Woodruff School of Mechanical Engineering, Georgia Institute of Technology

Transportation to and from the banquet will be provided. Buses will depart from the Manufacturing Research Center.

Friday, May 22, 1998

7:30 - 8:30 a.m.

Registration and Continental Breakfast: Student Success Center

8:00 a.m. - 12:00 noon

Industry Tour: Lucent Technologies Fiber Optic Production Facilities

8:30 - 10:00 a.m.

Concurrent Technical Sessions (Note: All Technical Sessions will be held at the Student Success Center)

Session 7-A: Milling: Student Success Center Theater

Co-Chairs: Ismail Lazoglu, University of Illinois at Urbana-Champaign
Hitomi Yamaguchi, Extrude Hone Corporation

A Comprehensive Model for the Flank Face Interference Mechanism in Peripheral Milling, S. Ranganath, D. Liu and J.W. Sutherland, Michigan Technological University

Evaluation of Force Control Algorithms for the End Milling Process, B.K. Fussell and A. Gangopadhyay, University of New Hampshire

A Model-Based Approach for Radial Run-Out Estimation in the Face Milling Process, Akshay, Thru-put Technologies; S.G. Kapoor and R.E. DeVor, University of Illinois at Urbana-Champaign

Session 7-B: Controls: President's Suites C & D

Co-Chairs: Elijah Kennatey-Asibu, University of Michigan
Albert J. Shih, Cummins Engine Company

A Simulation Based Optimization Approach to Real-Time Control and Scheduling of Flexible Manufacturing Systems, C. Peng, CGN & Associates/Caterpillar Inc.; F.F. Chen, The University of Toledo

Lyapunov Stability Analysis of Distributed Control in Multiple Machine Heterarchical Manufacturing Cells, V.V. Prabhu, Pennsylvania State University

Using Localized Closed-Loop Force Control to Provide Robustness in Sheet Metal Forming, M.L. Bohn, S.U. Jurthe and K.J. Weinmann, Michigan Technological University

Session 7-C: Sensors: Student Success Center, Press Suite A

Co-Chairs: Shounak M. Athavale, Ford Motor Company
Wayne J. Book, Georgia Institute of Technology

Real-Time Measurement for an Internal Grinding System, D.M. Longanbach and T.R. Kurfess, Georgia Institute of Technology

Vibration Analysis of A Ball Bearing With an Integrated Sensor, B.T. Holm-Hansen and R.X. Gao, University of Massachusetts

Fiber Tool for Noncontact Generation of Ultrasound, S.N. Hopko and I.C. Ume, Georgia Institute of Technology

Session 7-D: Machine Tools: Press Suite B

Co-Chairs: Yuan-Shin Lee, North Carolina State University
Paul S. Sheng, University of California at Berkeley

Analysis of Setting Errors in Precision Ballscrew Machining and Development of the Automatic Adjustable Center, M-Y Yang, J-G Choi and J-H Park, Korea Advanced Institute of Science and Technology

Predicting and Analyzing Misalignment Defects During Product Design, S. Das, New Jersey Institute of Technology; S. Ramachandra, Colovos Company

Generalized Model Formulation Technique for Error Synthesis and Error Compensation on Machine Tools, N. Hai, J. Ni and J. Yuan, University of Michigan

10:00 - 10:30 a.m.

Coffee and Refreshment Break: Student Success Center

10:30 a.m. - 12:00 noon

Concurrent Technical Sessions

Session 8-A: Tools: Student Success Center Theater

Co-Chairs: Yoichi Matsumoto, The Timken Company
Charles Ume, Georgia Institute of Technology

A Comparative Study of Dry Machining of A390 Alloy Using PCD and CVD Diamond Tools, A.P. Malshe, M.A. Taher, A. Muyschondt, W.F. Schmidt, H. Mohammed, H. Mohammed, University of Arkansas

Forces and Wear of PCD Tool in Turning of Granite, C. Wilson, Kansas State University; I.D. Marinescu and G. Dontu, The University of Toledo

Tracing the Morphological Changes of Diamond Abrasives with Lead-Tape Imprints and SEM, T.W. Liao, K. Li, Louisiana State University; S.B. McSpadden, Jr., Oak Ridge National Laboratory

Session 8-B: Fixtures: President's Suites C & D

Co-Chairs: Edward C. DeMeter, Pennsylvania State University
Robin Stevenson, General Motors Corporation

The Impact of Surface Errors on Fixtured Workpiece Location and Orientation, E.J. Salisbury, Varatech, Inc.; F.E. Peters, Iowa State University

Fixturing Surface Accessibility Analysis for Automated Fixture Design, J. Li, W. Ma and Y. Rong, Southern Illinois University at Carbondale

A Model for the Prediction of Reaction Forces in a 3-2-1 Machining Fixture, J.F. Hurtado and S.N. Melkote, Georgia Institute of Technology

Fixture Layout Optimization Considering Workpiece-Fixture Contact Interaction: Simulation Results, Y.J. Liao and D.A. Stephenson, General Motors Corporation; S.J. Hu, University of Michigan

Session 8-C: Machine Tools: Press Suite A

Co-Chairs: Richard B. Mindek, Jr., Pratt & Whitney

Jong-I Mou, Arizona State University

Modeling the Effects of Component Level Geometric and Form Deviations on Machine Tool Slideway Errors, C.M. Daniel and J.W. Sutherland, Michigan Technological University; W.W. Olson, University of Toledo

The Effect of Machine Stiffness on Strength of Ground Silicon Nitride, B. Zhang, F. Yang, J. Wang, Z. Zhu and R. Monahan, University of Connecticut

Calibration of Rotary Table in Multi-axis Machine Tools, S-H Suh, S-Y Jung, POSTECH; E-S Lee, Research Institute of Industrial Science & Technology, Korea

12:00 noon - 1:30 p.m.

Light Lunch: Student Success Center

1:30 p.m.

Conference Adjournment

NAMRC XXVI Registration Form

Georgia Institute of Technology

May 19-22, 1998

X-19-580

MFG-117



North American Manufacturing
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TO REGISTER: Complete the information below and fax or mail the completed form with payment to the Georgia Tech address provided.

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Registration

Full Registration Before April 19, 1998 \$ 300.00

Full Registration After April 19, 1998 \$ 350.00

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One-Day Registration (specify day) \$ 200.00 _____

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