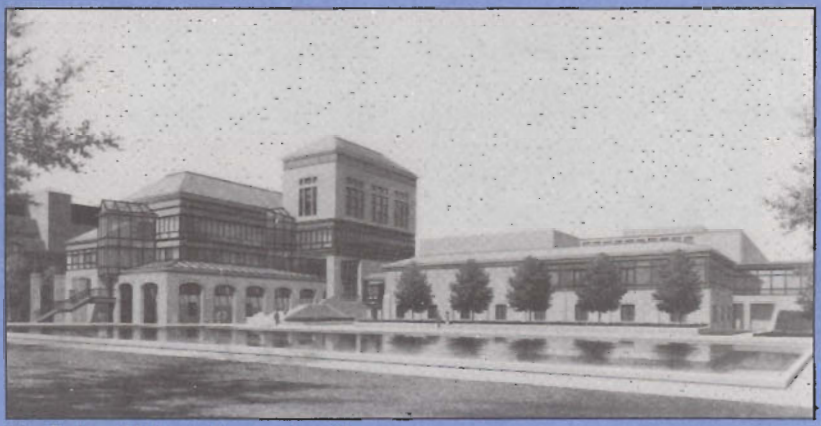
The North American Manufacturing Research Institution of
the Society of Manufacturing Engineers Invites You to Attend the

Twenty-Fourth North American Manufacturing Research Conference



The Robert H. Lurie Engineering Center

NAMRC XXIV
May 21-23, 1996

including the

Second S.M. Wu Symposium
on Manufacturing Science—U.S.A. Venue
May 24, 1996

Hosted by
The University of Michigan
Ann Arbor, Michigan, USA

Sponsored by
the North American Manufacturing Research Institution
of the Society of Manufacturing Engineers

The University of Michigan
Department of Mechanical Engineering and Applied Mechanics
and the Program in Manufacturing
College of Engineering
Ann Arbor, Michigan

Dear Friends,

The University of Michigan is delighted to host the Twenty-Fourth North American Manufacturing Research Conference. The conference continues its historic role of providing a forum for the discussion of basic and applied research in material removal, material forming and manufacturing systems.

This year, there will be more than 80 papers presented at the conference from universities, research institutes and industrial research laboratories from around the world. All the papers have been accepted based on a peer review conducted by the NAMRI/SME Scientific Committee. Featured speakers include Mr. Dennis Pawley, Executive Vice President for Manufacturing at Chrysler Corporation, who will provide some new ideas on university-industry interactions, and Professor Jiri Tlusty, who will tell us about the history of machine tool research.

Immediately following the conference, there will be a symposium in honor of the late Professor S.M. Wu and his many contributions to manufacturing research and education. The conjunction of NAMRC and the Wu Symposium presents a unique opportunity for practitioners to discover what is going on in the manufacturing research community.

We wish especially to encourage our colleagues in industry to attend one or both events. Your input is a valuable and necessary component to the dialogue that takes place at these events. Be assured that we will do our best to provide a warm welcome and a productive environment.

We look forward to meeting you in Ann Arbor at NAMRC XXIV and the Wu Symposium. We believe that you will both enjoy and profit from the experience.

Sincerely yours,

Elijah Kannatey-Asibu, Jr. and Yoram Koren, Co-Chairs
NAMRC XXIV Organizing Committee

Program-at-a-Glance

NAMRC XXIV

Tuesday, May 21

13:00 - 17:00
Plant Tours
1. FOCUS:Hope
2. Chrysler Jefferson North Assembly Plant

17:00 - 19:00
NAMRC Registration and Reception

19:00 - 21:00
Laboratory Tour

Wednesday, May 22

07:00 - 08:00
NAMRC Registration and Continental Breakfast

08:00 - 08:45
Opening Ceremony

08:45 - 09:30
Plenary Address

09:30 - 09:45
Break

09:45 - 10:30
Concurrent Keynote Sessions

10:30 - 12:00
Concurrent Technical Sessions

12:00 - 13:30
Founders Lecture Luncheon
"Machine Tool Research"

13:30 - 15:00
Concurrent Technical Sessions

15:00 - 15:30
Break

15:30 - 17:00
Concurrent Technical Sessions

17:30 - 19:00
Reception at the Art Museum

19:00 - 20:00
NAMRI/SME Membership Meeting

20:00 - 21:00
ASME Production/Manufacturing Engineering Division Meeting

Thursday, May 23

07:00 - 08:30
NAMRC Registration and Continental Breakfast

08:30 - 10:00
Concurrent Technical Sessions

10:00 - 10:30
Break

10:30 - 12:00
Concurrent Technical Sessions

12:00 - 13:30
NAMRI/SME Award Luncheon

13:30 - 15:00
Concurrent Technical Sessions

15:00 - 15:30
Break

15:30 - 17:00
Concurrent Technical Sessions

18:30 - 22:00
Conference Banquet
Summit Restaurant
Renaissance Center
Detroit

S.M. Wu Symposium

Friday, May 24

07:00 - 08:00
Registration and Continental Breakfast

08:00 - 09:30
Plenary Session

09:30 - 09:40
Break

09:40 - 11:40
Concurrent Technical Sessions

11:40 - 13:00
Buffet Luncheon with NAMRC Attendees

13:00 - 15:00
Concurrent Technical Sessions

15:00 - 15:15
Break

15:15 - 17:15
Concurrent Technical Sessions

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.

What Is the Wu Symposium?

The Wu Symposium on Manufacturing Science is similar to NAMRC in program content and format. It was first held in 1994 to honor the late Professor S.M. (Sam) Wu who devoted more than 30 years of his professional life to the introduction and refinement of innovative approaches to the design, analysis, optimization and control of manufacturing processes and systems. A prolific writer and advisor to innumerable graduate students, Professor Wu continues to contribute to the world of manufacturing research through the legacy he passed on to all of those he touched.

Why Should You Attend These Events?

By attending these events 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.
- Learn what researchers are working toward for manufacturing in the 21st century.
- Enhance your knowledge of alternative manufacturing processes and applications.
- Make valuable contacts with other leading manufacturing researchers and professionals in academia and industry.

About NAMRI/SME

The North American Manufacturing Research Institution of the Society of Manufacturing Engineers (NAMRI/SME) is dedicated to manufacturing research and technology development. Its mission is to provide manufacturing professionals with a means to exchange ideas and share findings with leading researchers in the field of manufacturing.

NAMRI/SME is administered through the Society of Manufacturing Engineers, a professional society dedicated to serving its members and the international manufacturing community through the advancement of professionalism, knowledge and learning.

Publications

All the papers to be presented at NAMRC XXIV will be contained in either the hardbound *Transactions of the North American Manufacturing Research Institution of SME-1996* or a soft bound proceedings. All registered NAMRC XXIV participants will receive one copy of each at the time of registration. Additional copies of either document may be purchased at registration for $70 and $30 respectively. After the conference, they may be purchased from the SME Publications Department (call 1-800-733-4763).

A hard-bound proceedings will also be available for the Wu Symposium. It will contain all the papers presented during the symposium, including keynote addresses. All Wu Symposium registrants will receive a copy of the proceedings.

Conference Site

The site for NAMRC XXIV and the Wu Symposium is the University of Michigan in downtown Ann Arbor, Michigan, located 40 miles west of Detroit along the banks of the Huron River. NAMRC will be held in the following University of Michigan buildings: the H. H. Dow Building, the G.G. Brown Laboratories, The Media Union, and the Chrysler Center in Ann Arbor, Michigan. The University of Michigan-College of Engineering is located on the North Campus in Ann Arbor. The Wu Symposium will take place at the Michigan League building at the University of Michigan.

Special Activities

On May 21 at 13:00, tours will be available to FOCUS:Hope, a center for advanced technologies with ultra modern machining facilities, and the Chrysler Jefferson North Assembly Plant. Transportation will be provided.

Tours are reserved for the attendees of the conference and pre-registration on the form at the back of this brochure is required. Separate fees apply.

On May 22, there will be a reception at the Art Museum from 17:30-19:00. The NAMRI/SME awards luncheon will be held on May 23, with the conference banquet following that evening at the Summit Restaurant. The Summit Restaurant is located in the Renaissance Center in Detroit with a view of the Detroit River and Windsor, Canada. Transportation to and from the banquet will be provided. Departure will be from the Horace H. Rackham building at 17:30, with expected return from Detroit at 22:00.

Registration Fees

Registration fees for NAMRC XXIV are $300 for registrations postmarked, faxed or phoned on or before May 10. Registration fees after May 10 will be $360. The one day registration fee is $200. Student and retiree registration is $100. These registrations include all meals, the transactions and proceedings. There are no reduced registrations for authors or session chairs. Cancellations will be refunded except for a $50 service charge. No refunds will be given after the start of the conference.

The registration fee for the Wu Symposium is $150 for the full symposium for registrations postmarked, faxed or phoned on or before May 10. Registration fees after May 10 will be $200. Regsitration fees include a copy of the proceedings, continental breakfast and lunch, and refreshment breaks. A $75 registration fee is available for students and retirees. Registration fees after May 10 will be $100. This includes all of the privileges of the full registration including all meals and a copy of the proceedings. There are no reduced registrations for authors or session chairs. Cancellations will be refunded except for a $50 service charge. No refunds will be given after the start of the conference.

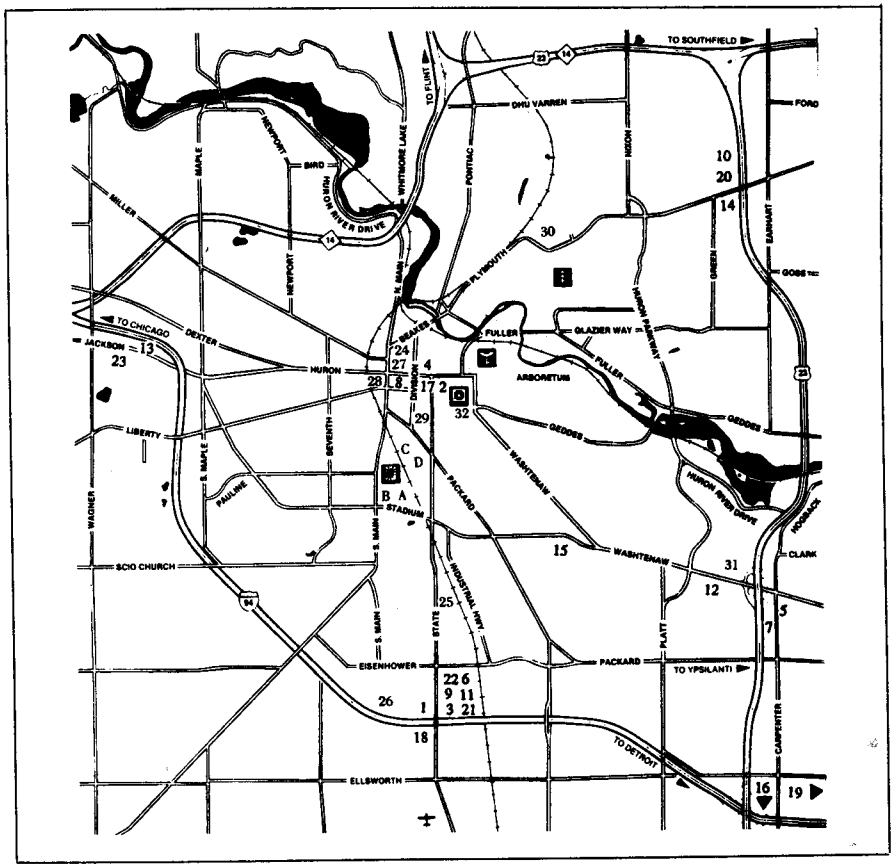
Accompanying Person's Program

A non-technical program will be provided on Wednesday, May 22, and Thursday, May 23, for visiting spouses, guests and others who do not wish to attend the technical sessions. The program will include visits to the Henry Ford Museum, Greenfield Village, the Matthei Gardens, Gandi Dancer (Ann Arbor historic train station), the Art Museum, the Historical Natural Museum and a walk on campus. There will also be time to shop and socialize. The program fee of $200 includes lunches, transportation and admission fees. (We reserve the right to cancel this program due to low participation.)

General Information

Travel

The University of Michigan is located north of Interstate Highway I-94 in Ann Arbor, Michigan. From Detroit Metropolitan Airport, take the I-94 entrance that reads West to Ann Arbor/Chicago. Airport shuttle service is available to the University of Michigan Union building and to major Ann Arbor Hotels (07:00 - 24:00 daily), $15 one way, $27 round-trip. For reservations, contact Commuter Transportation at 1-800-351-5466.



Lodging

Blocks of rooms have been reserved for event participants at area hotels. A schedule of rates and phone/fax numbers is listed below. Some rooms are available from May 18, 1996.

Please make your own reservations directly with the hotel of your choice by specified date to guarantee specified rate. Mention the "group name" to be included in the reduced rate room block.

Hotel	Single	Double
Campus Inn Phone: 1-800-666-8693 Fax: 313-769-6222 Group Name: 2291 Reservations by April 21, 1996 Attn: July Ranspach	$67.00	$79.00
Sheraton Inn Ann Arbor Phone: 1-800-848-2770 Fax: 313-996-8136 Group Name: North American Manufacturing Research Conference Reservations by April 12, 1996	$72.00	$72.00
The University of Michigan League Phone: 313-764-3177 Fax: 313-936-2505 Group Name: NAMRC Reservations by April 18, 1996	$72.00	$72.00
Red Roof Inn Phone: 1-800-874-9000 Group Name: NAMRC B045000194 Reservations by May 11, 1996	$46.99	$54.99
Oxford House Phone: 313-763-3480 Fax: 313-764-0091 Group Name: U of M/NAMRC Reservations by April 21, 1996 Attn: Melinda	$62.00	$70.00

Cambridge House Phone: 313-764-5297 Fax: 313-764-1557 Group Name: NAMRC Reservations by April 21, 1996 Attn: Guen Tandg	$52.50	$71.00
Hampton Inn (North) Phone: 313-996-4444 Fax: 313-996-0196 Group Name: U of M/NAMRC Reservations by May 1, 1996 Attn: Linda Williams	$55.00	$55.00
Holiday Inn North Phone: 313-769-9800 Fax: 313-761-1290 Group Name: NAMRC Reservations by May 7, 1996 Attn: Gail Gray	$66.00	$66.00

Note: Prices do not include tax.

Parking

All the hotels have parking available for their guests. Shuttle services are available from each hotel to the Conference location. The University parking structures on Fletcher Street (N-13 Lot), Thayer Street (N-04 lot) and North Campus Commons on North Campus (NC-27) are available for daily parking. If you choose to park in these structures you will need a parking permit. Please specify on your registration form the number of days you will need the permit for. A parking permit will be forwarded to you with your registration confirmation. In case of loss, you may purchase a replacement permit for $5.75 per day.

Climate

The average temperature during the month of May is 60° F/17° C.

On the Internet

Current information on the NAMRC XXIV and the Second S.M. Wu Symposium is available on the Internet through the World Wide Web at the following addresses:

http://www.engin.umich.edu/prog/pim/general/namrc.html
http://www.sme.org

To Register

To register, complete the registration form at the back of this brochure and send with check, money order (U.S. funds) or credit card number to the address below. You may fax the form if your are paying by credit card. The Registration Office may be contacted from now until the end of the conference and symposium with any questions, requests or information required.

Attn: Ms. Cindy Sakstrup
NAMRC XXIV / Second S.M. Wu Symposium
U of M Conference and Seminars
G121 SQ, 600 E. Madison
Ann Arbor, MI 48109-1372
Phone: 313-764-5305 or Fax: 313-764-1557

Sponsors

We would like to thank the following sponsors for their generous support:

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Joel D. Tauber Manufacturing Institute - U of M

Acknowledgement

We would like to acknowledge the Program in Manufacturing for its assistance in organizing the conference.

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William R. D. Wilson	Northwestern University
Paul K. Wright	University of California-Berkeley

NAMRC XXIV

Technical Sessions and Programs

Tuesday, May 21

13:00 - 17:00	**Plant Tours in Detroit Area** (1) FOCUS:Hope (2) Chrysler Jefferson North Assembly Plant	
17:00 - 19:00	**Registration and Reception**	*Media Union*
19:00 - 21:00	**Laboratory Tours** North Campus G.G. Brown, EECS	

Wednesday, May 22

07:00 - 08:00	**Registration and Continental Breakfast**	*Chrysler Center Lobby*
08:00 - 08:45	**Opening Ceremony** *Opening Remarks:* Elijah Kannatey-Asibu, Jr., Conference Co-Chair Yoram Koren, Conference Co-Chair *Welcoming Remarks:* James J. Duderstadt, President The University of Michigan *Introductory Remarks:* Alvin M. Sabroff, NAMRI/SME President	*Chrysler Center Auditorium*
08:45 - 09:30	**Plenary Address** "Partnering for World Class Manufacturing: The Changing Role of the Educator" Dennis Pawley, Executive V.P. Manufacturing Chrysler Corporation	*Chrysler Center Auditorium*
09:30 - 09:45	**Break**	*Chrysler Center Lobby*
09:45 - 10:30	**Three Concurrent Keynote Sessions** Taylan Altan, Ohio State University Joseph Kovach, Eaton Corp. Yoram Koren, University of Michigan	*H. H. Dow* Room 1017 Room 1013 Room 1005

LEGEND
C: Cutting Sessions F: Forming Sessions S: Systems Sessions

10:30 - 12:00 Four Concurrent Technical Sessions H. H. Dow

C1: Machining Special Materials — Room 1017

Co-Chairs: R. Stevenson, General Motors Corporation
M. Miller, Michigan Technological University

Turning (Ti-6Al-4V) Alloy with Cryogenic Cooling, Z. Y. Wang, K. P. Rajukar, and J. Fan, University of Nebraska

Influence of Reinforcements on the Machining of Fiber Reinforced Plastics, R. Ramulu, University of Washington and C. W. Wern, Portland State University

Full-Density Processing of Advanced Particulate Composites, W. Tong, University of Nebraska

F1: Drawing Operations — Room 1013

Co-Chairs: Z. Pavlov, Allied Tube and Conduit Company
J. Brevick, Ohio State University

Investigation of Zipper Defects in the Floating Mandrel Drawing of Small Diameter Copper Tubes, D. Damodaran, F. Wibowo and R. Shivpuri, Ohio State University

The Effect of Variation in Incoming Tube and Lubrication on the Scratch Problem in Stainless Tube Drawing, P. S. Bist and R. Shivpuri, Ohio State University

Wall Thickness Distribution Analysis of a Drawn-Redrawn Can, D.-F. Chang and J. E. Wang, Weirton Steel Corporation

S1A: Machining Systems Measurement — Room 1005

Co-chairs: J. Sheridan, National Center for Manufacturing Sciences
P. M. Ferreira, University of Illinois at Urbana-Champaign

Contact Force Control for Continuous Scanning Coordinate Measuring Machines, C. T. Gallagher and T. R. Kurfess, Georgia Institute of Technology

Computational Metrology for the Set of Candidate Datum Reference Frames, R. G. Wilhelm and B. Chui, University of North Carolina-Charlotte

An Investigation of Machine Tool Accuracy for Fixed Load Cycles, S. Chatterjee, University of Tennessee

S1B: Production Systems — Room 1010

Co-chairs: A. Herman, Ford Motor Company
J. Raja, University of North Carolina-Charlotte

Application of Tabu Search to the Group Technology Clustering Problem, R. Prasad and V. N. Rajan, Wichita State University

Automatic Guided Vehicle Flowpath Design Using Genetic Algorithms, P. Kanwar and C. Han, Florida Atlantic University

A Framework for Production Planning and Control in a Virutal OKP Company, Y. Tu, City University of Hong Kong, Hong Kong

12:00 - 13:30 **Founders Lecture Luncheon** *EECS Atrium*
"Machine Tool Research"
Jiri (George) Tlusty
University of Florida

13:30 - 15:00 Four Concurrent Technical Sessions H. H. Dow

C2: Machining Processes — Room 1017

Co-Chairs: P. Bandyopadhyay, General Motors Corporation
S. Y. Liang, Georgia Technological University

Flute Geometry Generation and Severity Ratio Analysis in Helical Groove Machining, H.-C. Chyan and K. F. Ehmann, Northwestern University

The Use of High Speed Machining for the Manufacture of Hardened Steel Dies, R. C. Dewes and D. A. Aspinwall, University of Birmingham

Some Advantages of Down Milling, M. Pogacnik and J. Kopac, University of Ljubliana, Slovania

F2: Finite Element Analysis — Room 1013

Co-Chairs: E. L. Exner, Ford Motor Company
J. Strenkowski, North Carolina State University

Development and Validation of a 3D Finite Element Models for Radial Forging and Comparison with a 2D Model, P. Pauskar and R. Shivpuri, Ohio State University

An Investigation of Drawbead Control in Rectangular Box Forming by Finite Element Modelling, S. G. Xu and K. J. Weinmann, Michigan Technological University

Prediction of Forming Limit in Deep Drawing by Combination of Finite Element Simulation and Criterion for Ductile Fracture, K. Mori, Osaka University, Japan, H. Takuda, Kyoto University, Japan

S2A: Stamping Process Diagnostics — Room 1005

Co-Chairs: J. A. Pale, Mascotech Forming Technologies - Braun
K. Stelson, University of Minnesota

Analysis of Tonnage Signature Attribute for Stamping Process, C.K.H. Koh, J. Shi and J. Black, University of Michigan

Multi-stations Sheet Metal Assembly Modeling and Diagnostics, B.W. Shiu, D. Ceglarek and J. Shi, University of Michigan

Effect of Cylinder Diameter on Quenching Induced Residual Stress, P. R. Woodward, Purdue University, H.T.Y. Yang, University of California-Santa Barbara, S. Chandrasekar and T. N. Farris, Purdue University.

S2B: Monitoring Probes — Room 1010

Co-chairs: W. R. DeVries, Rensselaer Polytechnic Institute
B. E. Klamecki, University of Minnesota

A Pretravel Model for Touch Trigger Probes with Straight Styli, Part I: Vertical Probes, Y.-L. Shen and X. Zhang, CMEE, George Washington University

A Pretravel Model for Touch Trigger Probes with Straight Styli, Part II: Horizontal Probes, Y.-L. Shen and X. Zhang, CMEE, George Washington University

Surface Classification and Model Construction Based on Processing Position Vectors and Unit Normal Vectors, H. Aoyama and I. Inasaki, Keio University, Japan

15:00 - 15:30 **Break** *H. H. Dow Lobby*

15:30 - 17:00 Five Concurrent Technical Sessions H. H. Dow

C3A: Machining Operations — Room 1017

Co-Chairs: S. Wayne, Valenite Inc.
M. A. Elbestawi, McMaster University

A Quantitative Energy-Based Method for Predicting Stability Limit as a Direct Function of Spindle Speed for High-Speed Machining, W. J. Endres, University of Michigan

Chip-Groove Effects on Multiple Tool-wear Parameters in Machining, P. X. Li and I. S. Jawahir, University of Kentucky, X.D. Fang, Iowa State University, E. L. Exner, Ford Motor Co.

Testing of Turning Inserts in Relation to Efficient Chip Control, W. Grzesik and P. Bernat, Technical University, Poland

C3B: Non-Conventional Machining — Room 1013

Co-Chairs: S. Athavale, Ford Motor Company
D. A. Lucca, Oklahoma State University

The Influence of Abrasive Grain Size Distribution Parameters on the Abrasive Water Jet Machining Process, A. W. Momber, WoMA Apparatebau GmBH, Germany, R. Kovacevic, University of Kentucky, D. Pfeiffer and R. Schunemann, Chemnitz University of Technlogy, Germany

A Study on Deep Hole Metal Boring with Abrasive-Waterjets, M. Hashish, Quest Integrated, Inc.

Estimation of Cutting Forces in Band Sawing Metals, W. E. Henderer, J. D. Boor and J. R. Holston, American Saw & Mfg. Co.

F3: Numerical Simulations — Room 1005

Co-Chairs: G. Lucas, Alcan Rolled Products Company
T. R. Chandrupatha, Rowan College of New Jersey

Numerical Simulation of Cladding Process in Bimetallic Rod Extrusion, M. Yoshino and T. Shirakashi, Oklahoma State University

Application of the Linearized Perturbations Technique to Finite Element Results for the Prediction of Localized Necking in Sheet Metalforming Simulation, N. Boudeau and J. C. Gelin, Universite de Franche-Comte, France

Inhomogeneity of Deformation in Plane Strain Bulk Metal Forming Processes, D.-F. Chang , Weirton Steel, W. R. D. Wilson, Northwestern University

S3A: Environmental Manufacturing — Room 1010

Co-Chairs: J. M. Panetta, Ford Motor Compamy
G. Wiens, University of Florida-Gainesville

Disassembly Model for Recycling — Personal Computer, H. C. Zhang and T.-C. Kuo, Texas Technological University

Use of a Reprocessability Index System for the Environmental Scoring of Rotational Parts, C. J. Wentland, W. W. Olson and J. W. Sutherland, Michigan Technological University

Shearing of Automotive Grade Polypropylene and Acrylonitrile-Butadiene-Styrene to Facilitate Recycling, K. K. Philipps, Ford Motor Company, W. W. Olson and J. W. Sutherland, Michigan Technological University

S3B: Measurement and Inspection — Room 1014

Co-Chairs: N. Weil, National Center for Manufacturing Sciences
S. N. Melkote, Georgia Institute of Technology

Tolerance Synthesis in a Product Design System, U. Roy and B. Bharadwaj, Syracuse University

Automated Inspection of Coaxiality Requirements, C. Waters and U. Roy, Syracuse University

17:30 - 19:00	**Reception at the Art Museum**	Art Museum
19:00 - 20:00	**NAMRI/SME Membership Meeting**	Iacocca Auditorium
20:00 - 21:00	**ASME Production/Manufacturing Engineering Division Meeting**	Iacocca Auditorium

Thursday, May 23

07:00 - 08:30	**Registration and Continental Breakfast**	*H. H. Dow Lobby*

08:30 - 10:00 Four Concurrent Technical Sessions — H. H. Dow

C4: Drilling — Room 1017

Co-Chairs: J. Agapiou, General Motors Corporation
E. Salisbury, Iowa State University

Influence of Workpiece Exit Angle on Burr Formation in Drilling Intersecting Holes, J. Stein, D. Dornfeld and I. Park, University of California-Berkeley

A Calibration Procedure for Fundamental Oblique-Cutting Model Coefficients Based on a Three-Dimensional Mechanistic Drilling Force Model, V. Chandrasekharan, S. G. Kapoor and R. E. DeVor, University of Illinois at Urbana-Champaign

Development, Testing and Deployment of a Low Cost Via Drilling Process for Printed Wire Board Manufacturing, G. Johnson, V. Johnson, G. Sathyanarayanan, K. Gardiner, M . Bickham and O. Sparkman, International Business Machines (IBM)

F4: Forging — Room 1013

Co-Chairs: L. G. Hector, Alcoa Laboratories
K. Weinmann, Michigan Technological University

Determination of Fatigue Properties of Die Steels for Hot Forging, V. Vazquez, M. Knoerr, T. Altan and R. Shivpuri, Ohio State University

Increasing Tool Life Quantity in Die Forging: Chances and Limits of Tribological Measures, E. Doege, C. Romanowski and R. Seidel, University of Hannover, Germany

Multi-stage Cold Forging Process Design with A* Searching Algorithm, H.-S. Kim and Y.-T. Im, KAIST, Korea

S4A: Process Planning and Scheduling — Room 1005

Co-Chairs: T. S. Babin, Motorola
M. Philpott, University of Illinois at Urbana-Champaign

Intelligent Scheduling and Control of Flexible Manufacturing Systems, F. F. Chen, D. Wu, Florida International University, and R. R. Henry, University of Louisiana

Computer Aided Process Planning System for Block Assembly Shop Using Case-Based Reasoning, K. K. Cho, K. R. Ryu, Pusan National University, H. R. Choi, Dong-A University, J. Oh, Pusan National University, S. T. Yun, Hyunday Heavy Industries Co. Ltd., Korea

An Approach to Dynamic Mesh Adjustment for Finite Element Analysis of Machines, L. Wang, Toyohashi University of Technology, and T. Moriwaki, Kobe University, Japan

S4B: Multi-Axis Machining Systems — Room 1010

Co-Chairs: W. M. Faitel, Lamb Technicon
J. I. Mou, Arizona State University

CAM System for Multi-Axis Machining with Non-Rotating Tools, M. Kohya, Fukuoka Industrial Technolgy Center, M. Shimada, Toyota Central Research and Development Labs., Inc., H. Suzuki, Kyushu Institute of Technology, and M. Sato, Makino Milling Machining Co., Ltd., Japan

Design of the 5 Axis Machining Center, C. H. Kahng, H. Tanaka and T. Ishida, Tong-il Heavy Inc. Co. Ltd., Korea

Block Removal Method for Rough Cutting with a Multi-Axis CNC Machine Tool, H. Koresawa, N. Yasuhara, A. Hayashi and H. Suzuki, Kyushu Institute of Technology, Japan

10:00 - 10:30 **Break** *H. H. Dow Lobby*

10:30 - 12:00 Four Concurrent Technical Sessions H. H. Dow

C5: Grinding - I — Room 1017

Co-Chairs: M. D. Elwell, Caterpillar Inc.
R. Kovacevic, University of Kentucky

Effect of Wheel Wear in Grinding of Structural Ceramics, K. Li and T. W. Liao, Louisiana State University, G. P. Fang and J. E. Mayer, Jr., Texas A&M University

A Correlation Between Cutting Process and Dynamics of the Machine-Tool-System in Grinding, C. David and G. Warnecke, Institute of Manufacturing & Production Engr., Germany

Development of Advanced Grinding Technology for Structural Ceramics, J. A. Kovach, M. A. Laurich and K. R. Ziegler, Eaton Corporation

F5: Sheet Metal Forming — Room 1013

Co-Chairs: M. L. Devenpeck, Alcoa
J. Cao, Northwestern University Laboratories

Dimensional Control in Sheet Metal Forming via Active Binder Force Adjustment, A. Adamson, A. G. Ulsoy, University of Michigan, and M. Demeri, Ford Motor Company

Modeling the Influence of Plastic Strain on Boundary Friction in Sheet Metal Forming, H-C. Shih, P. K. Saha and W. R. D. Wilson, Northwestern University

A New Concept for Hydro-mechanical Press Conversion for Sheet Metal Forming Research, M. L. Bohn and K. J. Weinmann, Michigan Technological University and J. R. Michler, Marquip, Inc.

S5A: Process Control — Room 1005

Co-Chairs: R. Furness, Ford Motor Company
G. M. Zhang, University of Maryland-College Park

Adaptive Feedforward Control for Periodic Disturbance Rejection with Application to Machining Processes, A. R. Kashani, University of Dayton, J. W. Sutherland, Michigan Technological University

An On-Line Estimation of the Transfer Function for the Cutting Process, S. Dolinsek and J. Peklenik, University of Ljubjana, Slovania

Mathematical Modeling of the High Velocity Oxy Fuel Systems to Optimize Their Thermally Sprayed Coatings, H. H. Tawfik, State University of New York at Farmingdale, C. C. Berndt and C. Herman, State University of N.Y., Stonybrook and F. Zimmerman, NASA/Marshall Flight Center

S5B: Fixture Design — Room 1010

Co-Chairs: G. Romito, Saginaw Machine Systems, Inc.
E. C. DeMeter, The Pennsylvania State University

Optimal Fixture Configuration Design for Sheet Metal Assembly with Springback, W. J. Cai and S. J. Hu, University of Michigan

Application of Simultaneous Engineering Concept to the Development of a Co-Operative Fixture Design System, U. Roy and J. Liao, Syracuse University

An Object Oriented Concept for Generic Robotic Gripper Design and Application, Z. Katz and J. Huang, Rand Afrikaans University, South Africa

12:00 - 13:30 **NAMRI/SME Award Luncheon** *Media Union*

13:30 - 15:00 Four Concurrent Technical Sessions H. H. Dow

C6A: Surface Texture — Room 1017

Co-Chairs: C. H. Shen, General Motors Corporation
R. Williams, University of Nebraska-Lincoln

A 3-D Surface Texture Model for Peripheral Milling with Cutter Runout Using Neural Network Modules and Splines, G. A. Stark and A. R. Thangaraj, Michigan Technological University

Characterization of the Surface Texture Formed During the Machining of Ceramics, G. M. Zhang, S. J. Ng, D. T. Le and L. S. Job, University of Maryland-College Park

Machining of Parametric Surfaces Using De Casteljau-type Subdivision, M. A. E. Gadalla, University of Western Ontario, Canada, and W. H. ElMaraghy, University of Windsor, Canada

C6B: Machining Complex Contours — Room 1013

Co-Chairs: R. P. Khetan, General Motors Corporation
K. S. Moon, Michigan Technological University

Simulation and Verification of CNC Tool Path for Sculptured Surfaces, K. I. Kim, Y. J. Chon and K. Kim, University of Illinois at Chicago

Tool Interference Detection and Correction in CNC Tool Path Planning for Sculptured Surfaces, J. H. Cho, Samsung Electro-Mechanics Co., Ltd., Korea, and K. Kim, University of Illinois at Chicago

Tool Path Optimization For Finish Milling of Die and Mold Surfaces-Software Development, T. Bergs, Technical University of Aachen, Germany, C. A. Rodriguez, T. Altan, Ohio State University, and Y. Altintas, The University of British Columbia, Canada

S6A: Laser Machining — Room 1005

Co-Chairs: W. R. Haukkala, Chrysler Corporation
J. Rice, Marquette University

Laser Machining for Secondary Finishing: Steady-State Analysis, P. Sheng and L. Cai, University of California-Berkeley

Laser Shaping for Discontinuous Non-circular Profiles, K. Liu, W. Lee, E. Boucher and P. Sheng, University of California-Berkeley

Reducing the Transient Effects in Laser Cutting via Model-Based Optimization as Applied to Cornering Cuts, P. Di Pietro, Di Pietro & Sons Engineering, NSW, Australia, and Y. L. Yao, Columbia University

S6B: Manufacturing Systems — Room 1010

Co-Chairs: P. Killgoar, Jr., Ford Motor Company
M. DeVries, University of Wisconsin-Madison

Agent-Based Manufacturing Systems, P. K. Wright and D. A. Dornfeld, University of California-Berkeley

FMS and Production Control Integration in CIM Enterprise, Z. Spasic, M. Pilipovic, M. Bucan and M. Kalajdzic, University of Belgrade, Yugoslavia

The Design of Lean Manufacturing Systems, J. T. Black, Auburn University

15:00 - 15:30 **Break** *H. H. Dow Lobby*

15:30 - 17:00 Four Concurrent Technical Sessions H. H. Dow

C7A: Machining Process Monitoring — Room 1017

Co-Chairs: W. A. Kline, Montronix, Inc.
P. Wright, University of California-Berkeley

Infrared Temperature Measurement of Curled Chip Formation in Metal Machining, L. Wang, K. Saito and I. S. Jawahir, University of Kentucky

Feasibility of Tool Breakage Prediction in End-Milling, S. M. Pandit, J. R. Roth and A. M. Godbole, Michigan Technological University

Real-Time Monitoring and Controlling of Chip Form in Turning Processes with Acoustic Emission Using Thin Film Sensors, C. NedeB and C. Pflueg, T-U Hamburg-Harburg, Hamburg, Germany

C7B: Grinding - II — Room 1013

Co-Chairs: K. Subramanian, Norton Company
D. Dornfeld, University of California-Berkeley

Analysis of Hydrodynamic Forces in Grinding, M. Ganesan, C. Guo, A. Ronen and S. Malkin, University of Massachusetts

Effectiveness of Cooling in Grinding, C. Guo and S. Malkin, University of Massachusetts

Relating Bearing Ratio to the Performance of Structured Coated Abrasives, J. J. Gagliardi, 3M Abrasive Systems Division

S7A: Process Planning — Room 1005

Co-Chairs: E. Lu, Kelsey-Hayes Corporation
W. W. Olson, Michigan Technological University

Methodology for Precedence Information Representation and Alternate Task Sequence Generation in CAPP, J. Mani and S. Raman, University of Oklahoma

The Influence of the Production Environment on Process Plan Selection, G. Perrone, M. Piacentini and S. Noto La Diega, University of Palermo, Italy

Integration of Automated Process Planning System with CAM Software, D. N. Sormaz, Ohio State University, B. Khoshnevis and J.-H. Han, University of Southern California

S7B: Laser Processing — Room 1010

Co-Chairs: J. Hurley, Laser and Forge Welding
P. Sheng, University of California-Berkeley

Convection Pattern and Weld Pool Shape During Conduction-Mode Dual Beam Laser Welding, T.-C. Chen and E. Kannatey-Asibu, Jr., University of Michigan

An Experimental Study of Laser Cutting of a Thick Steel Plate Using a Line Beam, G. Venkitachalam and P. A. Molian, Iowa State University

Technology Oriented Off-line Programming for 3D Laser Material Processing, F. Backles, M. Geiger and V. Franke, University of Erlangen-Nuremberg, Germany

18:30 - 22:00 **Conference Banquet** *Summit Restaurant Renaissance Center Detroit*

Second S.M. Wu Symposium on Manufacturing Science—USA Venue

May 24, 1996

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S. Jack Hu	University of Michigan

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R. J. Furness	Ford Motor Company
E. DeMeter	Pennsylvania State University
H. P. B. Wang	Florida A&M and Florida State University

Friday, May 24, 1996 Michigan League

07:00 - 08:00	**Registration and Continental Breakfast**	*Concourse*
08:00 - 09:30	**Plenary Session** Challenges and Opportunities in Manufacturing Research: The Role of Industry, University and Government Collaboration *Dr. John P. McTague* Vice President, Technical Affairs Ford Motor Corporation *Dr. Arati Prabhakar* Director, NIST *K.K. Wang* Sibley Professor, Cornell University	*Michigan*
09:30 - 09:40	**Break**	*Concourse*

09:40 - 11:40 Three Concurrent Technical Sessions

WA1: Manufacturing Process Planning & Simulation Hussey

Co-chairs: S. Jones, Ford Motor Company
D. VandenBossche, Chrysler Corporation

Robust Design for Dynamic Systems - Catapult Analysis, D. Ermer, University of Wisconsin-Madison, and K. Byckovki, General Electric Co.

A Study on a Distributed Simulation for the Evaluation of Large Manufacturing System, S. Fujii, Y. Kidani and A. Ogita, Kobe University, Japan

A Study of a Dual Reasoning CAPP System with Explanation Ability, D. Liu and K. Stelson and S. Benjaafer, University of Minnesota

Sensitivity Analysis in Manufactured Part Modeling for Automotive Space-Frames, Y. Wang and S. Gupta, University of Maryland

WB1: Machining Processes — Michigan

Co-Chairs: C. H. Shen, General Motors Corporation
I. S. Jawahir, University of Kentucky

Effects of a Honed Cutting Edge in Machining, J. Manjunathaiah and W. Endres, University of Michigan

Burr Sensing Using a Capacitance Sensor, S. Lee, D. Park and D. Dornfeld, University of California-Berkeley

Application of a Magnetostriction Based Cutting Tool Micropositioner for Non-Circular Turning, D. Liu, W. Kanizar, K. Moon and J. Sutherland, Michigan Technological University

Chip Load in Milling with Radial Cutter Runout, J. Wang, National Cheng-Kung University, and S. Liang, Georgia Institute of Technology

WC1: Control of Machining Systems — Vandenberg

Co-Chairs F. Gu, General Motors Corporation
S. Chen, Power Electric International

Real-Time Compensation System for Cutting-Force Induced Errors, S. Yang, J. Yuan and J. Ni, University of Michigan

Modeling of Machine Tool Axes for Openness, Z. Pasek, Y. Koren, A. Ulsoy, University of Michigan

Collocated Sensor Design for Magnetic Bearing Control, D. Shin, S. Liu and J. Kim, Seoul National University

A 2-D Planar Motor Based Machine Tool Motion System as Applied to Improving Surface Quality in End Milling, M. Soltz, Y. Yao and J. Ish-Shalom, Columbia University

11:40 - 13:00 **Lunch** *Ballroom*

13:00 - 15:00 Three Concurrent Technical Sessions

WA2: Assembly, Disassembly and Tolerance Analysis — Hussey

Co-Chairs: R. Ustruck, Chrylser Corporation
M. Iannuzi, VSA, Inc.

Relating Process and Product Tolerance for Three-Dimensional Tube Bending, K. Stelson and H. Lou, University of Minnesota

Tolerance Design Methodology, T. Chang, University of Wisconsin-Milwaukee

Optimization of Process Distribution Adjustment Based on Measurement Data, D. Khorzad, J. Shi and J. Ni, University of Michigan

Diagnostics in Disassembly Unscrewing Operations, D. Apley, University of Michigan, G. Seliger, L. Voit, Technical University of Berlin, Germany, and J. Shi, University of Michigan

WB2: Drills and Drilling Process — Michigan

Co-Chairs: W. DeVries, Rensselaer Polytechnic Institute
D. Stephenson, General Motors Corporation

An Experimental Study of Exit Burrs and Hole Quality for Twist Drilling, R. Furness and W. Lander, Ford Motor Company

An Experimental Investigation of Chip Morphology in Drilling, S. Batzer, W. Olson and J. Sutherland, Michigan Technological University

A Mechanistic Model to Predict the Cutting-Force System for Arbitrary Drill Point Geometry, V. Chandrasekharan, S. Kapoor and R. DeVor, University of Illinois at Urbana-Champaign

On the Cutting-in Forces of Improperly Mounted Twist Drill, T. Zhijie, University of Palermo, Italy

WC2: Machine Tool Dynamics & Dynamic of System Modeling — Vandenberg

Co-Chairs: F. Tadayon, Boeing Commercial Airplane-Wichita
G. Romito, Saginaw Machine Systems

An Experimental Investigation into the Effect of Joint Conditions on Structural Damping with Application to Machine Tools, T. Cao, Y. Zheng and J. Sutherland, Michigan Technological University

Development of a New Identification and Control Strategy of Dynamic Stability in Turning, C. Nicolescu, The Royal Institute of Technology

Active Vibration Control of Machine Tools, Z. Geng, Robotronics, Inc.

Time Series Modeling in CT Detector Assembly, T. Chou, Chang Gung College and T. Chang, University of Wisconsin-Milwaukee

15:00 - 15:15 **Break** *Concourse*

15:15 - 17:15 Three Concurrent Technical Sessions

WA3: Fixture Design & Analysis — Hussey

Co-chairs: E. DeMeter, Pennsylvania State University
W. Faitel, Lamb Technicon

Effect of Clamping Sequence on the Surface Flatness During Fixturing of Flexible Workpieces, P. Chandra, S. Athavale, R. DeVor and S. Kapoor, University of Illinois at Urbana-Champaign

Quick Estimation of Reaction Forces for Prediction of Machining Fixture Quality, M. Reams and S. Melkote, Georgia Institute of Technology

Visibility Analysis and Synthesis for Assembly Fixture Certification Using Theodolite Systems, H. Chen and S. J. Hu, University of Michigan

Fixture Failure Diagnosis for Sheet Metal Assembly with Consideration of Measurement Noise, D. Ceglareck, University of Michigan

WB3: Non-traditional Manufacturing — Michigan

Co-chairs: D. Holtz, Perceptron Inc.
C. Koh, Nanyang Technical University-Singapore

Modeling of Workpiece Temperature with Plasma Heating for Thermally Enhanced Machining Processes, C. Leshock, Y. Shin, and E. Incropera, Purdue University

Improvement of Chip Breaking in Machining Low Carbon Steel by Cryogenically Precooling the Workpiece, Y. Ding and S. Hong, Wright State University

Analysis and Design of Thermally Excited Leadless Solder Joints Using Finite Element Method, B. Pramod, Utah State University, and S. Bose, University of Texas-Pan American

A Comparative Analysis of 2D and 3D Bearing Area Curves, A. Cellary and M. Wieczorowski, Politechnika Poznanska, Poland, and K. Ehmann, Northwestern University

WC3: Surface & Form Error Evaluation in Machining — Vandenberg

Co-chairs: J. Mou, Arizona State University
J. Bosch, Giddings & Lewis

Rapid Cylindrical Surface Measurement Using Laser Optics, R. Du, Y. Fan, W. North and G. Qin, University of Windsor

Evaluation of Circularity Error Using Optimization, S. Cheraghi and M. Wang, Wichita State University

Probabilistic Regression Models to Predict Surface Finish Parameters in Fine Turning of Steel, A. Shuaib, S. Selim and M. Ahmad, King Fahd University of Petroleum and Minerals

Cutting Error Calculation in NC Machining of Non-Expandable Ruled-Surface, D. Zheng, B. Ren, J. Jiao and Y. Liu, Harbin Institute of Technology

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2nd S.M. WU SYMPOSIUM, MAY 24, 1996

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☐ Wednesday, May 22 ☐ Thursday, May 23

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