

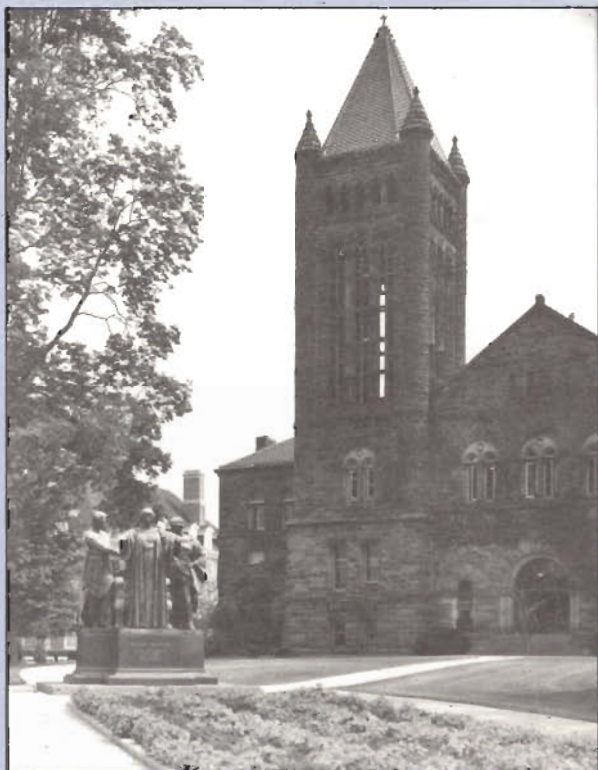


**North American
Manufacturing Research
Institution of SME
announces...**

**SIXTEENTH
NORTH AMERICAN
MANUFACTURING
RESEARCH
CONFERENCE**

NAMRC XVI

**May 25-27, 1988
University of Illinois
at Urbana-Champaign
Urbana, Illinois, USA**



Society of Manufacturing Engineers
NAMRI/SME
One SME Drive, P. O. Box 930
Dearborn, Michigan, 48121 USA



NAMRC XVI
May 25-27, 1988
University of Illinois
at Urbana-Champaign
Urbana, Illinois

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SIXTEENTH NORTH AMERICAN MANUFACTURING RESEARCH CONFERENCE (NAMRC XVI)

REGISTRATION AND GENERAL INFORMATION



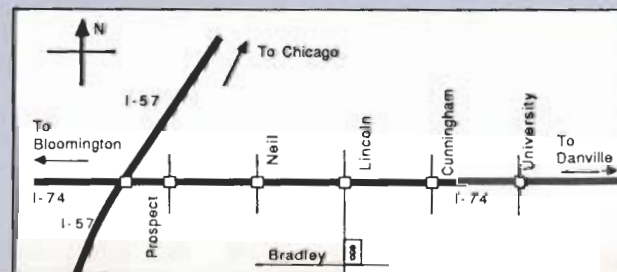
CONFERENCE PROSPECTUS

The sixteenth North American Manufacturing Research Conference (NAMRC XVI) is designed to provide a forum for the timely presentation and critical discussion of results of basic and applied research in metalworking (machining and forming) and related manufacturing systems. The papers presented at this conference will describe research in the fields of metal forming, metal machining, grinding, non-traditional processes, machine tools, manufacturing systems, robotics, and related controls. All papers presented at the conference are contained in the bound conference *Proceedings* and document the research and development activities conducted in many of the important manufacturing research centers around the world.

The conference will consist of three paper tracks: forming, material removal, and manufacturing systems. The paper sessions will consist of the formal presentation of the papers plus a discussion period that encourages interaction with the attendees. We urge you to attend and actively contribute.

CONFERENCE LOCATION

The conference will be held at the University of Illinois at Urbana-Champaign. All conference sessions, except the General Session and the evening reception, will be held in the Illini Union building, corner of Green and Wright Streets, Urbana, Illinois. The General Session will be held in the Festival Theater at the Krannert Center for Performing Arts on Goodwin Street and the reception will be held at the Levis Faculty Center, on West Illinois Street.



REGISTRATION FEES

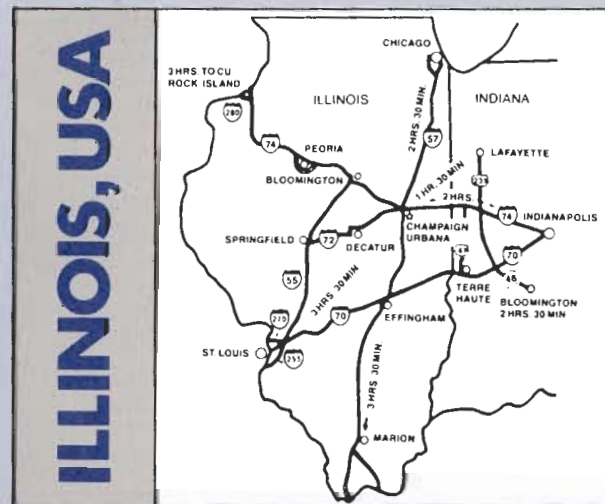
The registration fee for NAMRC XVI is \$225 (U.S. currency) for advance registration, and \$250 (U.S. currency) for on-site registration on May 24, 25, and 26. The fee includes entrance to all technical sessions, refreshments, two luncheons, the conference banquet, and a bound copy of the conference *Proceedings*. There will be no one-day registration fees nor will there be any reduced fees for authors or session chairs.

The student registration fee is \$60 (U.S. currency) in advance or \$75 (U.S. currency) at the door. This fee is a special rate to encourage attendance by students, and includes all technical sessions, and a bound copy of the conference *Proceedings*. Additional banquet and luncheon tickets will be available for purchase at the registration area.

For additional information, contact Professor Shiv Kapoor at (217) 333-3432 or Joan Chenoweth at (217) 333-2883.

TO REGISTER

Complete and return the registration form with the proper fee. Checks, money orders or purchase orders should be made payable to the **University of Illinois** and should be mailed to Cashiering Operations, Room #162, Administration Building, 506 South Wright Street, Urbana, IL 61801. Federal Employees Identification Number (F.E.I.N.) must be included on purchase orders. All payments should be in U.S. currency.



TRANSPORTATION TO CONFERENCE

LODGING

The primary hotel for the conference is the Illini Union, located on campus. A block of rooms has been reserved for conference participants until **April 25, 1988**. Other lodging is also available to meet the individual needs of registrants. The following is a listing of available lodging alternatives. Conference attendees are urged to make their own reservations as early as possible. To receive the special conference room rates (where applicable) be sure to mention that you will be attending the North American Manufacturing Research Conference.

Illini Union 1401 West Green Street Urbana, IL 61801 (217) 333-1241	Rates: \$42.00 Single \$48.00 Double (Plus Tax)
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The following hotels also have rooms available for the conference:

Jumer's Castle Lodge 209 South Broadway Urbana, IL 61801 (217) 384-8800 Toll free (800) 525-8637 in Illinois Toll free (800) 545-8637 outside Illinois	University Inn 302 East John Street Champaign, IL 61820 (217) 384-2100 Toll free (800) 252-1368 in Illinois Toll free (800) 322-8282 outside Illinois
Rates: \$50.00 Single \$56.00 Double (Plus tax)	Rates: \$43.00 Single \$50.00 Double (Plus tax)

PROCEEDINGS

All registered conference participants will receive one bound copy of the NAMRC XVI *Proceedings* at conference registration. Additional copies may be purchased at the conference or, after June 1, by mail order through the Society of Manufacturing Engineers, One SME Drive, P.O. Box 930, Dearborn, Michigan 48121 USA. Phone (313) 271-1500, Ext. 418. The cost per copy is \$60 for NAMRI/SME and SME members, \$70 for non-members.

PARKING

Conference parking is available at the Illini Union only for those guests who are staying at the Union. Parking for all other

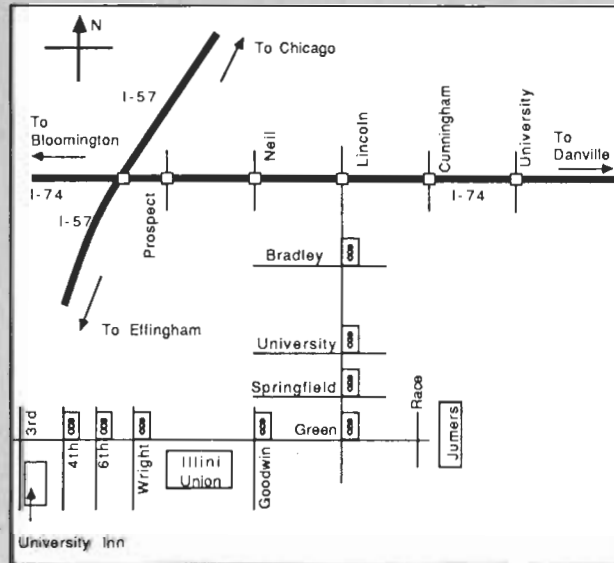
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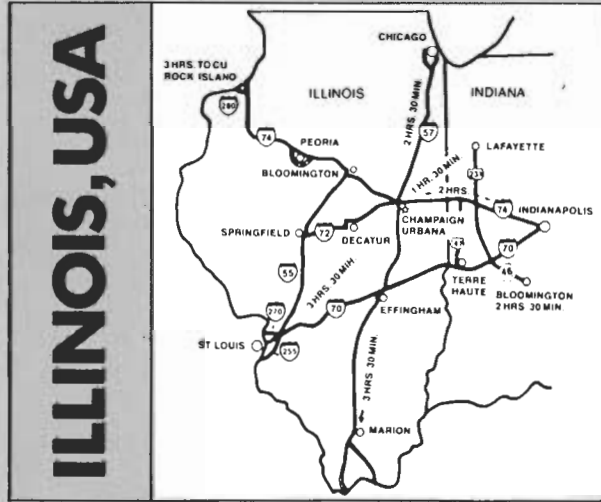
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TRANSPORTATION TO CONFERENCE

Champaign-Urbana is served by the following airlines: TWA, Piedmont, Continental Express, Comair, Midway Commuter, and Allegheny Commuter. Local taxicab companies provide limousine service at a reasonable cost from the Willard University Airport to the University of Illinois campus (7 miles) and will meet all incoming flights. Travel time from the airport to the Illini Union is just fifteen minutes. AMTRAK service is available from Chicago and points south. Located in east central Illinois, Champaign-Urbana is almost equidistant from three major midwestern cities: Chicago (134 miles), St. Louis (175 miles), and Indianapolis (120 miles). Each is conveniently linked via interstate highways I-57, I-72, and I-74 respectively.

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FURTHER INFORMATION

For additional conference information, please call Joan Chenoweth at the office of Conference and Institutes (217) 333-2883 or Professor Shiv Kapoor (217) 333-3432. Incoming messages for conference attendees will be accepted at (217) 333-0692 and will be posted on a bulletin board near the registration area.

SIXTEENTH NORTH AMERICAN MANUFACTURING RESEARCH CONFERENCE (NAMRC XVI)

TECHNICAL SESSIONS AND PROGRAM

TUESDAY, MAY 24

5:00-8:00 p.m.

REGISTRATION AND RECEPTION

Illini Union

NAMRI/SME BOARD OF DIRECTORS

MEETING Illini Union, General Lounge

WEDNESDAY, MAY 25

8:00-8:45 a.m.

REGISTRATION Krannert Center

8:45-10:00 a.m.

GENERAL SESSION

Krannert Center, Festival Theater

INTRODUCTIONS

Shiv Kapoor, Chairman of the Organizing Committee

WELCOMING REMARKS

M. Van Valkenburg, Dean, College of Engineering

R. Berdahl, Vice-Chancellor for Academic Affairs, University of Illinois at Urbana-Champaign

T. Altan, President, NAMRI/SME *German History*

Professor and Director, Engineering Research Center

Ohio State University

KEYNOTE ADDRESS:

*BSEFC ME
PND*

"Advanced Technology Needs in Manufacturing", Dr. Frode Maaseidvaag, Manager, Manufacturing Systems Department, Research Staff, Ford Motor Company, Dearborn, Michigan

10:00-10:30 a.m.

COFFEE BREAK

267 Prep Room

10:30-12:00 noon

SESSION 1

Illini Union

ABC

A. Co-Chairmen: T. Altan, Ohio State University and L. Kaisand, General Electric Corporation, R&D, Schenectady, New York.

1. "Deformation Behavior and Force Analysis of Sheet Metal Drawn Between Circular Drawbeads", L. R. Sanchez, K. J. Weinmann, and J. C. Gerdeen, Michigan Technological University

2. "Prediction of History-Dependent Forming Limits Using a Generalized Anisotropic Yield Function", Z. Lu and D. Lee, Rensselaer Polytechnic Institute, New York

3. "Characterization of Plastic Deformation of Sheet Metals with Square Perforations", F. K. Chen, C. Hung,

3. "A Geometric Model for Determining Sheet Metal Forming Tool Profiles" R. L. LaBarge, Alcoa Laboratories, Alcoa Center, Pennsylvania, J. L. Duncan, University of Auckland, New Zealand, and S. C. Biondich, Alcoa Laboratories, Alcoa Center, Pennsylvania

B. Co-Chairmen: R. Komanduri, National Science Foundation, Washington, D.C. and S. M. Copley, University of Southern California

1. "Investigation of the Effect of a Gas Jet in Laser Grooving", G. Chryssplouris, W. C. Choi, S. B. Kyi, and P. Sheng, Massachusetts Institute of Technology

2. "Surface Layer Damage in the Grinding of Advanced Engineering Ceramics", G. Spur and T. H. Tio, Technical University of Berlin, West Germany

3. "Mechanisms of Material Removal in the Lapping of Non-Oxide Ceramics", G. Spur and I. Sabotka, Technical University of Berlin, West Germany

C. Co-Chairmen: A. Taube, John Deere, Moline, Illinois and T. C. Chang, Purdue University, Indiana

① "Capacity and Cost Analysis of Sheet Metal Fabrication Systems", P. F. Oswald University of Colorado and J. L. Funk, Westinghouse Electric Corporation, Pittsburgh, Pennsylvania

2. "Pattern Recognition Approach for Group Technology Implementation", E. V. Goncalves, C. P. Han, and I. Ham, Pennsylvania State University

3. "Automatic Group Technology Classification from Feature Models", J. J. Shah and A. Bhatnagar, Arizona State University

6:00 p.m.

COCKTAILS

Illini Union Ballroom

7:00-9:00 p.m.

CONFERENCE BANQUET

Illini Union Ballroom

THURSDAY, MAY 26

8:30-10:00 a.m.

SESSION 4

Illini Union

A. Co-Chairmen: S. Kalpakjian, I.I.T., Chicago, Illinois and H. Yaguchi, Inland Steel Company, East Chicago, Indiana

1. "Entrapment of Laminated Solid Lubricant Films in Plane Strain Upsetting", H. G. Malkani and W. R. D. Wilson, Northwestern University, Illinois

2. "Flexible Cold Forging", B. G. Hansen and T. Wanheim, Technical University of Denmark, Denmark

3. "A Study of the Influence of Press Speed, Contact Time, and Heat Transfer in Non-Isothermal Upset Forging of Ti and Al Alloy Rings", Y-T. Im and G. S. Shen, Ohio State University

4. "Investigation of a New Upset Test to Study the Formability of Steels for Cold Forging" B. Shivraj,

2. "An Integrated AI/OR Approach to Operation Planning Using Process Performance Models", S. Subramanyam and S. C-Y. Lu, University of Illinois at Urbana-Champaign

3. "The Flexible Process-Planning by Combining the Advanced CAPP, CAM and Measuring System", S. Kanai, M. Sugawara, T. Kishinami, and K. Saito, Hokkaido University, Japan

12:00-1:30 p.m.

NAMRI/SME LUNCHEON

Illini Union Ballroom

1:30-3:00 p.m.

SESSION 6

Illini Union

A. Co-Chairmen: A. E. Bayomi, Washington State University and A. T. Male, Westinghouse Electric Corporation, Pittsburgh, Pennsylvania

1. "An Analysis of the Piping Defect at the End of the Stroke in Direct Extrusions", W. A. Gordon, The Torrington Company, Torrington, Connecticut and C. J. Van Tyne, Lafayette College, Pennsylvania

2. "Ultrasonic Vibrated Punching of Glass - Epoxy Printed Wiring Board", Y. Okazaki, K. Kawaguchi, and K. Hayashi, Mitsubishi Electric Corporation, Amagasaki, Japan

3. "An Analytical and Experimental Study of the Inflation Stage in the Blow Molding of Polymers", H. K. Jorgensen, J. C. Gerdeen, K. J. Weinmann, and M. G. Hansen, Michigan Technological University

B. Co-Chairmen: J. A. McGeough, University of Edinburgh, United Kingdom and J. Smitkamp, Caterpillar Inc., Peoria, Illinois

1. "Sensing Parameters for Erosion Rate and Tool Wear in EDM", K. P. Rajurkar and J. E. Springer, University of Nebraska-Lincoln

2. "The Phase Shift Between Cutting Force and Tool Displacement During Turning with Vibrating Tool", L. A. Medeksza, Gannon University, Pennsylvania

3. "Drilling Dynamics - A Fundamental Base for Drill-Life Monitoring", C. Nedess and T. Himburg, Technical University Hamburg-Harburg, West Germany

C. Co-Chairmen: W. A. Kline, Kenametal Inc., Raleigh, North Carolina and M. Groover, Lehigh University, Pennsylvania

1. "Liquid-Coupled Acoustic Emission Measurement for Milling Operations", Q. Yu, and D. V. Hutton, Washington State University

② "A Vapour Deposited Temperature/Pressure Sensor for Industrial Robots/Automation", W. Nshama and J. Jeswiet, Queen's University, Kingston, Ontario, Canada

3. "Data Dependent Systems Analysis of Machine Vision Data", S. M. Pandit and C. R. Weber, Michigan Technological University

R. Berdahl, Vice-Chancellor for Academic Affairs, University of Illinois at Urbana-Champaign
T. Altan, President, NAMRI/SME
Professor and Director, Engineering Research Center
Ohio State University

KEYNOTE ADDRESS:

"Advanced Technology Needs in Manufacturing", Dr. Frode Maaseidvaag, Manager, Manufacturing Systems Department, Research Staff, Ford Motor Company, Dearborn, Michigan

10:00-10:30 a.m.

COFFEE BREAK

10:30-12:00 noon

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2. "Prediction of History-Dependent Forming Limits Using a Generalized Anisotropic Yield Function", Z. Lu and D. Lee, Rensselaer Polytechnic Institute, New York
3. "Characterization of Plastic Deformation of Sheet Metals with Square Perforations", F. K. Chen, C. Hung, and S. Kobayashi, University of California at Berkeley
4. "An Analytical Relationship Between Acoustic Emission and Stretch Forming Process Parameters", S. Y. Liang, Oklahoma State University and D. A. Dornfeld, University of California at Berkeley

B. Co-Chairmen: T. Lindem, The Ingersoll Milling Machine Company, Rockford, Illinois and K. F. Eman, Northwestern University, Illinois

1. "A Cutting Force Model for Tool Condition Monitoring when Turning with Ceramic Tools", G. Warnecke and A. Jenewein, Universitat Kaiserslautern, West Germany
2. "A Comprehensive Model of the Milling Process for On-Line Tool Condition Monitoring", C. M. Johnston, F. Richter, University of Stuttgart, Germany and S. A. Spiewak, University of Wisconsin-Madison
3. "Investigation on Tool Wear Mechanisms in Milling of Titanium Alloys", M. Wang and Y. Z. Zhang, Nanjing Aeronautical Institute, China

C. Co-Chairmen: R. Srinivasan, T. J. Watson Research Center, IBM, Yorktown, New York and V. C. Venkatesh, Tennessee Technological University

1. "Intelligent Supervisory Control Prototype for Machining Systems", L. A. Kendall, S. Arora, and G. Cross, Washington State University
2. "Development of Software Modules for a Flexible Manufacturing System for Sheet Metal Parts", M. Geiger and U. Geissler, University of Erlangen-Nuernberg, West Germany
3. "Integration and Testing of an Intelligent Feature Extractor Within a Flexible Manufacturing Protocol", B. Kumar, D. K. Anand, and J. A. Kirk, University of Maryland

12:00-1:30 p.m.

LUNCHEON

1:30-3:00 p.m.

SESSION 2

A. Co-Chairmen: K. Komvopoulos, University of Illinois at Urbana-Champaign, and K. F. Kennedy, Alcoa Laboratories, Al

3. "Automatic Group Technology Classification from Feature Models", J. J. Shah and A. Bhatnagar, Arizona State University

6:00 p.m.

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7:00-9:00 p.m.

CONFERENCE BANQUET

THURSDAY, MAY 26

8:30-10:00 a.m.

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3. "A Study of the Influence of Press Speed, Contact Time, and Heat Transfer in Non-Isothermal Upset Forging of Ti and Al Alloy Rings", Y-T. Im and G. S. Shen, Ohio State University
4. "Investigation of a New Upset Test to Study the Formability of Steels for Cold Forging", R. Shivpuri, A. Tietmann, E. Kropp, and B. Lilly, Ohio State University

B. Co-Chairmen: J. Tlustý, University of Florida, and K. Arnold, Allied Signal Inc.

1. "Acoustic Emission Reveals Information About the Metal Cutting Process and Tool Wear", Y. Naerheim and M-S. Lan, Rockwell International, Thousand Oaks, California
2. "Acoustic Emission Sensing with an Intelligent Insert and Tool Fracture Detection in Multi-Tooth Milling", S. Ramalingam, T. Shi, D. A. Frohrib, and T. Moser, University of Minnesota
3. "Fracture Detection of Cutting Edge in Multi-Point Tools", T. Ishikawa and Y. Yamada, Komatsu Ltd., Manufacturing Engineering Research Center, Japan

C. Co-Chairmen: N. Duffie, University of Wisconsin-Madison and C. Wu, Ford Motor Company, Dearborn, Michigan

1. "Geometric Modeling for Automated Manufacturing", J. J. Shah and M. T. Rogers, Arizona State University
2. "A Computational Geometry Approach to Geometric Tolerancing", K. Lai, Qinghai Engineering and Agricultural Institute, Xining, China and J. Wang, Northwestern University, Illinois

10:00-10:30 a.m.

REFRESHMENT BREAK

10:30-12:00 Noon

SESSION 5

A. Co-Chairmen: G. D. Lahoti, The Timken Company, Canton, Ohio and K. K. Wang, Cornell University, New York

1. "Finite Element Simulation of Superplastic Forming", N. Rebelo and T. B. Wertheimer, MARC Analysis Research Corporation, Palo Alto, California
2. "Three-Dimensional Finite Element Analysis of Metal Forming Processes with Special Reference to Boundary Conditions", Guo-Ji Li, Y-J. Huang, and W-Q. Chen, Fuzhou University, China
3. "A Simplified Three-Dimensional Finite Element Method For the Analysis of Sheet Metal Forming", C. H. Toh, General Electric Company, Corporate R&D,

3. "An Analytical and Experimental Study of the Inflation Stage in the Blow Molding of Polymers", H. K. Jorgensen, J. C. Gerdeen, K. J. Weinmann, and M. G. Hansen, Michigan Technological University

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3. "Data Dependent Systems Analysis of Machine Vision Data", S. M. Pandit and C. R. Weber, Michigan Technological University

3:00-3:30 p.m.

REFRESHMENT BREAK

3:45-5:00 p.m.

TOURS OF MECHANICAL AND INDUSTRIAL ENGINEERING LABORATORIES

5:00 p.m.

WINE AND CHEESE RECEPTION

Levis Faculty Center, Third Floor

6:00 p.m.

NAMRI/SME MEMBERSHIP MEETING

Levis Faculty Center, Room 407

8:00 p.m.

ASME PED EXECUTIVE COMMITTEE MEETING

Levis Faculty Center, Room 407

DINNER ON YOUR OWN

Friday, May 27

8:30-10:00 a.m.

SESSION 7

A. Co-Chairmen: M. Devenpeck, Clarkson University and K. A. Stelson, University of Minnesota

1. "Formability Study of 2090 Al-Li Alloy" A. E. Bayoumi and H. Frank, Washington State University
 2. "Experimental and Numerical Comparisons of Sheet Stretching", B. B. Yoon, R. S. Rao and N. Kikuchi, University of Michigan
 3. "Some Unusual Properties in Cold-Forming of Metals", E. G. Thomsen, University of California at Berkeley
- B. Chairman: R. Komanduri, National Science Foundation, Washington, D.C.

1:30-3:00 p.m.

SESSION 2 Illini Union

A. Co-Chairmen: *K. Komvopoulos*, University of Illinois at Urbana-Champaign, and *K. F. Kennedy*, Alcoa Laboratories, Alcoa Center, Pennsylvania

1. "A Novel Approach to Metal Flow Prediction and Analysis for Drawing of Complex Shapes", *M. Karima*, Ontario Center for Advanced Manufacturing, Canada
2. "Computer Aided Simulation of Shape Rolling Processes", *M. Kiuchi* and *J. Yanagimoto*, University of Tokyo, Japan
3. "Analysis of the Ring Compression Test Using a General Friction Model and the Upper Bound Elemental Technique", *P.H. Hansen*, *N. Bay*, and *P. Christensen*, Technical University of Denmark, Denmark
4. "Strategy for Friction Modeling in Computer Simulations of Metal Forming", *W. R. D. Wilson*, Northwestern University, Illinois

B. Co-Chairmen: *B. Klamecki*, University of Minnesota and *P. Bandopadhyay*, General Motors Research Laboratories, Warren, Michigan

1. "The Effect of Shear Plane Length Models on Stability Analysis in Machining Simulation", *C.-J. Li*, Simonds Cutting Tools, Fitchburg, Massachusetts and *W. R. DeVries*, Rensselaer Polytechnic Institute, New York
2. "The Geometry of Floor Cut Surfaces Generated by the Bottom of an End Mill", *J. W. Sutherland*, University of Illinois at Urbana-Champaign and *T. S. Babin*, Motorola Inc., Schaumburg, Illinois
3. "Mechanical and Material Influences on Machined Surface in Precision Turning of Steel with Ceramics", *G. Warnecke* and *P. Bach*, Universitat Kaiserslautern, West Germany

C. Co-Chairmen: *M. Cutkosky*, Stanford University, California and *M. Philpott*, Cranfield Institute of Technology, United Kingdom

1. "Manipulator Collision Avoidance by Dynamic Programming", *J. Cesarone*, University of Illinois at Chicago and *K. F. Eman*, Northwestern University, Illinois
2. "Hydraulic Servo System Design for Noncircular Machining", *T.-C. Tsao* and *M. Tomizuka*, University of California at Berkeley
3. "Improving Robot Positioning Accuracy by Local Interpolation", *O. Masory*, Texas A&M University

3:00-3:30 p.m.

REFRESHMENT BREAK

3:30-5:00 p.m.

SESSION 3 Illini Union

A. Co-Chairmen: *D. R. Durham*, Oklahoma State University and *Y. K. Lee*, General Motors Research Laboratories, Warren, Michigan

1. "AFD: An Automated Forging Design System", *J.-P. Tang* and *S.-I. Oh*, Battelle Columbus Division, Columbus, Ohio
2. "Application-Oriented CAD System for Multi-Stage Tooling Design for Cold Forging", *W. Makosch* and *K. Lange*, Universitat Stuttgart, West Germany

- Research Corporation, Palo Alto, California
2. "Three-Dimensional Finite Element Analysis of Metal Forming Processes with Special Reference to Boundary Conditions", *Guo-Ji Li*, *Y.-J. Huang*, and *W.-Q. Chen*, Fuzhou University, China
3. "A Simplified Three-Dimensional Finite Element Method For the Analysis of Sheet Metal Forming", *C. H. Toh*, General Electric Company, Corporate R&D, Schenectady, New York
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