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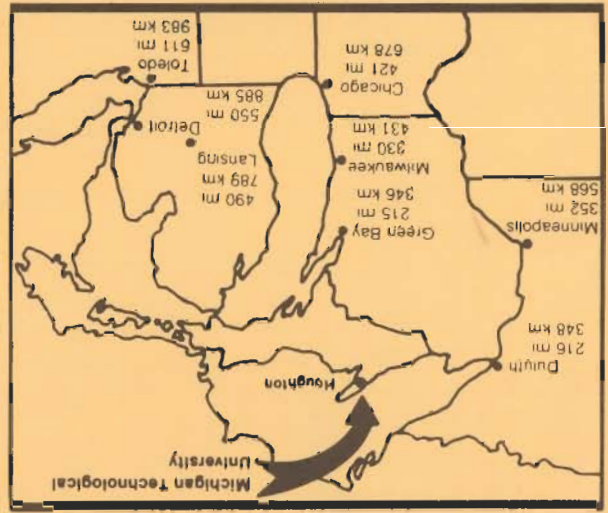


Michigan
Technological University
Houghton, Michigan, USA

North American Manufacturing Research
Institution of SME announces...

**TWELFTH
NORTH AMERICAN
MANUFACTURING
RESEARCH
CONFERENCE AND
ANNUAL MEETING
May 30-31, June 1, 1984**

North American Manufacturing Research Institution of SME
One SME Drive, P.O. Box 930
Dearborn, MI 48121 USA



NAMRC-XII • May 30-31, June 1, 1984
College of Engineering Michigan Technological University
Houghton, Michigan USA

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GENERAL AND REGISTRATION INFORMATION

REGISTRATION

Advance registration is important to the organization of the conference, as adequate facilities and meeting space may be arranged only when the size of the group is known in advance. Please complete the attached advance registration form and return it to us by May 9th, 1984. All registrations will be acknowledged and further information will be sent, including campus maps, travel information, etc.

Final registration will be held Tuesday, May 29th, 7-10 P.M. at the Main Street Inn, 820 Shelden Avenue, Houghton, and Wednesday, May 30th, 8-10:30 A.M. in Fisher Hall on the Michigan Technological University campus.

FEE

The registration fee of \$200.00 U.S. per person includes two lunches, a brunch, the Wednesday banquet, refreshment breaks and a bound copy of the NAMRC-XII Proceedings. There will be no one-day registration fees.

The registration fee must be paid by cash or check. The check should be payable to Michigan Technological University. A refund will be made if notification of cancellation is received two weeks prior to the start of the conference. Substitutions will be accepted anytime.

LOCATION

The program sessions will be held in Fisher Hall on the Michigan Technological University campus, Houghton, Michigan, USA.

MAP (See Outside Cover)

THIS IS MICHIGAN TECH

Michigan Technological University has an international reputation in engineering and science. It features one of the largest colleges of engineering in the United States, although the University's total enrollment is about 7,500. The Michigan Tech campus is located at Houghton in the historic "Copper Country" of Michigan's Upper Peninsula. Its location offers an unusual variety of outdoor recreational opportunities amid some of the most beautiful scenery in America.

TRANSPORTATION

Houghton-Hancock can be reached by air using Republic Airlines through Minneapolis or Detroit. (The airport code is CMX.) Advance reservations to the Houghton-Hancock airport should be made to ensure space availability.

VISIT TO LABORATORIES

The manufacturing laboratories of the College of Engineering will be open for visits as indicated in the program.

LODGING

Blocks of rooms for the conference have been reserved at the following:

1. Main Street Inn
820 Shelden Avenue
Houghton, MI 49931
(906) 487-1700
Distance from University
is ¼ mile.

Special Rates are \$30 +
tax for single rooms or
\$35 + tax for double
rooms.

2. Best Western King's Inn
215 Shelden Avenue
Houghton, MI 49931
(906) 482-5000
Distance from University
is ½ mile.

Special rates are \$27 plus
tax, single, \$33 + tax,
double for standard rooms
and \$37 + tax, single or
double occupancy for de-
luxe rooms. These rooms
will be held until May 15.

3. Copper Crown Motel
235 Hancock Street
Hancock, MI 49930
(906) 482-6111
Distance from University
is 1 mile.

Special rates are \$24 for
single rooms, \$29 for
double.

4. College Motel
1308 College Avenue
Houghton, MI 49931
Adjacent to University

Special rates are \$25 plus
tax for single, \$29 plus tax
double.

5. Vacationland Motel
U.S. 41
Houghton, MI 49931
(906) 482-5351
Distance from University
is 2 miles.

Special rates are \$25.50
plus tax per person,
\$27.20 plus tax for two
people, and extra person
is \$2.75 plus tax.

**BE SURE TO STATE THAT YOU ARE ATTENDING THE
NAMRC-XII CONFERENCE AT MICHIGAN TECHNOLOGICAL
UNIVERSITY WHEN MAKING YOUR RESERVATIONS.**

Please make your own reservations

SHUTTLE BUS SERVICE

Transportation will be arranged to transport participants between motels and the University. Schedules will be provided at Registration.

Transportation will be arranged from the airport on Tuesday afternoon. Times will be arranged by flight schedule. Please note on your registration form your arrival time and interest in this service.

SPOUSES PROGRAM

Tours of the Keewenaw Peninsula with stops at local specialty shops and local museums will be arranged. The program will be planned so that the spouses can join conference participants for cocktails and dinner on Wednesday evening. Please indicate your interest on the registration form. The charge will be determined when we know the number of spouses interested.

PARKING

For those who drive to campus, free parking is available in Lot 14 adjacent to Fisher Hall, and the Commuter Student Parking Lot on the campus. A map will be mailed upon receipt of the advance registration form.

CLOTHING

Early summers in the Keewenaw Peninsula are unpredictable and participants should plan to bring a jacket for cool evenings and some appropriate clothing for rain.

Bring swim suits, running shoes, racquets, etc., as you will

have an opportunity to unwind in MTU's new Student Development Complex following the banquet on Wednesday night and Thursday evening. Lockers and towels are available for a minimal fee.

PROCEEDINGS

All participants in the conference paying the registration fee will receive one bound copy of the NAMRC-XII Proceedings. Those who wish additional copies may order them in advance or at the Conference. After June 1, 1984, copies will be available by mail order through the Society of Manufacturing Engineers, One SME Drive, P.O. Box 930, Dearborn, Michigan 48121, U.S.A. at \$55.00 for NAMRI/SME and SME members and \$65.00 for nonmembers.

CONFERENCE ORGANIZATION

The North American Manufacturing Research Conferences were created by a group of researchers dedicated to further knowledge, and its dissemination and application in the field of materials processing. Presently the Conference is part of the activities of the North American Manufacturing Research Institution of SME.

The papers presented at this Conference have been selected by the Scientific Committee of NAMRI/SME from a large number of submitted abstracts. Conference arrangements are the responsibility of the NAMRC-XII Organizing Committee, Michigan Technological University.

CONFERENCE PROSPECTUS

The Twelfth North American Manufacturing Research Conference (NAMRC-XII) is designed to provide a forum for the presentation and informed critical discussion of results of basic and applied research in metalworking and related manufacturing. The format of the Conference is similar to that of NAMRC-I (McMaster University, 1973), NAMRC-II (University of Wisconsin-Madison, 1974), NAMRC-III (Carnegie-Mellon University, 1975), NAMRC-IV (Battelle Columbus Laboratories and Ohio State University, 1976), NAMRC-V (University of Massachusetts, 1977), NAMRC-VI (University of Florida, 1978), NAMRC-VII (University of Michigan, 1979), NAMRC-VIII (University of Missouri, 1980), NAMRC-IX (The Pennsylvania State University, 1981), NAMRC-X (McMaster University, 1982), and NAMRC-XI (University of Wisconsin-Madison, 1983).

The papers presented at this conference will describe work in the field of metal forming, metal cutting, machine tools, and manufacturing systems and controls. All papers presented at the conference are contained in the bound Conference Proceedings and represent work conducted in many of the renowned metalworking research centers throughout the world.

FOR ADDITIONAL INFORMATION

Contact Susan Leddy, Coordinator
Division of Education & Public Services
Michigan Technological University
Houghton, Michigan 49931
(906) 487-2262

NAMRI

TWELFTH NORTH AMERICAN MANUFACTURING RESEARCH CONFERENCE AND ANNUAL MEETING May 30-31, June 1, 1984

TECHNICAL SESSIONS AND PROGRAM



TUESDAY, MAY 29

7:00-10:00 P.M.

REGISTRATION AND RECEPTION

Main Street Inn, Houghton

WEDNESDAY, MAY 30

8:00-10:30 A.M.

REGISTRATION

Fisher Hall

9:00-10:00 A.M.

WELCOMING ADDRESS: **Dr. D.F. Stein, President**, Michigan Technological University, Houghton, Michigan

INTRODUCTORY REMARKS: **W.B. Rice, President, NAMRI**, Mechanical Engineering Department, Queen's University, Kingston, Ontario, Canada

OPENING ADDRESS: **Dr. S.A. Tobias, Head, Department of Mechanical Engineering, University of Birmingham, Birmingham, England**

"Academic Conferences as a Means for Technology Transfer"

10:00-10:30 A.M.

REFRESHMENT BREAK

10:30-Noon

SESSION 1

A. Co-chairmen: **S. Kalpakjian, Illinois Institute of Technology** and **G.D. Lahoti, The Timken Company**

1. "Determination of Stress-Strain Curves for High Strain Rates Using a Torsional Split Hopkinson Bar", **W.B. Rice, Queen's University, Kingston, Ontario, Canada** and **K.H.W. Seah, National University of Singapore, Singapore**
2. "On the Workhardening of Sintered Porous Materials", **S.D. El Wakil, Bradley University**
3. "Drawing of Electroplated Steel Wire", **R.A. Kohser, and Thomas J. O'Keefe, C.Y. Tsao, University of Missouri, Rolla, and E.R. Cole, U.S. Bureau of Mines**
4. "Comparison of Experiment With Theory for Single and Multi-Pass Drawing of Tough Pitch Copper and 2024 Aluminum", **E.G. Thomsen and S. Kobayashi, University of California, Berkeley**

B. Co-chairmen: **C.H. Kahng, University of Colorado** and **J.F. Kahles, Metcut Research Associates**

1. "Some Aids Towards Improved Performance in U.S.M.", **S.R. Ghabrial, S.M. Saleh, Ain Shams University, Cairo, Egypt, A. Moisan, and D. Kremer, Ecole Nationale Supérieure d'Arts et Métiers, Paris**
2. "Electrochemical Machining Development for Turbine Generator Rotor Slots", **R.E. Fromson and J.F. Mancuso, Westinghouse Electric Corp., Pittsburgh, Pennsylvania**
3. "Experimental and Theoretical Investigation of EDM Debris", **K.P. Rajurkar, University of Nebraska, Lincoln, S.M. Pandit and B.R. Venkatapathy, Michigan Technological University**
4. "A Review of Ion Implantation Technology, 1981-1983", **R.E. Fromson and R. Kossowsky, Westinghouse Electric Corp., Pittsburgh, Pennsylvania**

1:30-3:00 P.M.

SESSION 2

A. Co-chairmen: **R.W. Kauppila, Michigan Technological University** and **S. Kobayashi, University of California, Berkeley**

1. "Automation of the Condie Process", **N. Ritter and B. Avitzur, Lehigh University**
2. "Determination of Residual Stresses in Industrial Extrusion", **A.E. Tekkaya and K. Lange, University of Stuttgart, Stuttgart, West Germany**
3. "Overall Analysis of Non-Axisymmetric Extrusion and Drawing", **M. Kiuchi, University of Tokyo, Tokyo, Japan**
4. "Deformation in Low-Reduction Plane-Strain Containerless Extrusion", **S.K. Chanda, P. Hartley, C.E.N. Sturgess, G.W. Rowe, University of Birmingham, Birmingham, and J. Simkin, Rutherford Appleton Laboratory, England**

B. Co-chairmen: **J.E. Mayer, Jr., Kennametal, Inc.** and **S. Ramalingam, University of Minnesota**

1. "A New Radiometric Method of Measuring Drill Wear", **S.K. Jetley, State University of New York, College of Technology, Utica**
2. "State Model for Flank Wear in Metal Cutting", **Y. Koren and A.G. Ulsoy, University of Michigan, Ann Arbor**
3. "Behaviour of Sialon Ceramic Tool When Machining Cast Iron", **S.K. Bhattacharyya, A. Jawaid and M.H. Lewis, University of Warwick, Coventry, England**
4. "Wear Mechanism of P/M High Speed Steel Tools", **R. Kitagawa, Yamaguchi University, Ube, Japan, and C.H. Kahng, University of Colorado**

C. Co-chairmen: **M.P. Deisenroth, Michigan Technological University** and **R.L. Kegg, Cincinnati, Milacron**

1. "An on-line Controller for Improving Spot-Weld Quality", **J.W. Kim, H.S. Cho, and C.W. Lee, Korea Advanced Institute of Science and Technology, Seoul, Korea**
2. "The Use of Computer Vision for Inspection in a Flexible Manufacturing Cell", **P.K. Wright, M.G. Goldstein, and D.A. Bourne, Carnegie-Mellon University, Pittsburgh, Pennsylvania**
3. "Artificial Intelligence Based Generative Process Planning", **R.H. Phillips, Z.S. Zhang and R.C. Patel, University of Illinois, Chicago**

3:00-3:30 P.M.

REFRESHMENT BREAK

3:30-5:00 P.M.

SESSION 3

A. Co-chairmen: **T. Altan, Battelle Columbus Laboratories** and **A.T. Male, Westinghouse Electric Corp.**

1. "Effects of Cold Bar Drawing on Workability in Subsequent Upsetting", **C.L. Girolami, G.M. Canada, Oshawa, Ontario; C. Ensari, Trakya Dokum, Luleburgaz-Kirklareli, Turkey; and J.A. Schey, University of Waterloo, Waterloo, Ontario, Canada**
2. "A Modified Slab Method for Axisymmetric Upset Forging", **O.M. Ettouney and K.A. Stelson, University of Minnesota, Minneapolis**
3. "Single Step vs. Multistep Pressing in Metal Forming—An Experimental Study Using Moire Fringes", **F.P. Chiang and T. Hareesh, State University of New York, Stony Brook**

B. Co-chairmen: **D.G. Lee, Ford Motor Company** and **K.P. Rajurkar, University of Nebraska, Lincoln**

1. "Face Milling with Cubic Boron Nitride", **H.K. Toenshoff and W.E. Borys, University of Hannover, Hannover, West Germany**

10:00-10:30 A.M.

REFRESHMENT BREAK

10:30-Noon

SESSION 5

A. Co-chairmen: **C.E.N. Sturgess, University of Birmingham, U.K.** and **J.A. Schey, University of Waterloo, Canada**

1. "Computer Aided Design (CAD) of Forging and Extrusion Dies for the Production of Gears by Forming", **D.J. Kuhlmann, P.S. Raghupathi, T. Altan, Battelle Columbus Laboratories, and D. Ostberg, U.S. Army Tank Command, Warren, Michigan**
2. "The Use of Accelerometer Signals for the Determination of Workpiece Deformation and Load Histories During Upsetting by Hammer", **C.R. Yeh, H.A. Evensen, A.A. Hendrickson, and K.J. Weinmann, Michigan Technological University**
3. "The Influence of the Shape of Load Bearing Members of Metal Deformation Machines on Metal Deformation", **C. Frame, Chambersburg Engineering Co., Chambersburg, Pennsylvania**

B. Co-chairmen: **M.C. Shaw, Arizona State University** and **R.P. Lindsay, Norton Company**

1. "An Experimental Investigation of the Transient Behavior of the Grinding Process", **P.A. Leitch, Bendix Automation, Solon, Ohio**
2. "Accuracy Concerns in Crush Dressed Form Grinding", **M.W. Burnham, Rockwell International, Golden, CO**
3. "Methods for Testing Grinding Wheel Quality", **G. Spur and C. Stark, Technical University of Berlin, Berlin, West Germany**

C. Co-chairmen: **B.N. Colding, Sandvik, Inc., and L.A. Kendall, Washington State University**

1. "Stability Analysis of the Boring Process System", **S.G. Kapoor, G.M. Zhang, and L. Bahney, University of Illinois, Urbana**
2. "Adaptive Enhancement of Machinability Data Base Systems in Automated Manufacturing", **P. Balakrishnan and M.F. DeVries, University of Wisconsin, Madison**

12:00-1:30 P.M.

NAMRI/SME LUNCHEON

Union Ball Room

1:30-3:00 P.M.

SESSION 6

A. Co-chairmen: **D.A. Koss, Michigan Technological University** and **R. Sowerby, McMaster University, Canada**

1. "Geometrical Aspects of Stretch-Bend Testing and a Correlation with Forming Performance", **J.M. Story, Aluminum Company of America, Alcoa Center, PA**
2. "Influence of Process Parameters on Surface Condition in Sheet Metal Forming in Aluminum Alloys", **E. Moesle, Porsche, A.G. and K. Lange, University of Stuttgart, Stuttgart, West Germany**
3. "Development of a Computer Program 'AXIFORM' for the Analysis of Forming of Axisymmetrical Sheet Metal Parts", **J.C. Gerdeen, Michigan Technological University**

B. Co-chairmen: **J. Tlustý, University of Florida** and **D. Dornfeld, University of California, Berkeley**

1. "An Improved Method of Stability Analysis for Machining Under Regenerative Vibration Conditions", **X.G. Yang, Huazhong University of Science and Technology, China, J.W. Chen, Beijing Institute Agricultural Mechanization, Beijing, China, and S.M. Wu, University of Wisconsin, Madison**
2. "Influence of Mechanical Vibrations on Workpiece Shape in External Plunge Grinding", **H.K. Toenshoff and B.**

W.R. Shapton, Michigan Technological University

- "Identification of Complex Mode Shapes of Machine Tool Structures by the Dynamic Data System Method", **Y.C. Shin, K.F. Eman and S.M. Wu, University of Wisconsin, Madison**
- "Guideway's Geometrical Error Measurement and Forecasting Control", **Z.X. Chen, Z.N. Zhu, and S.M. Wu, University of Wisconsin, Madison**
- "Interactive Design Optimization of Machine Structural Systems", **M. Yoshimura, Kyoto University, Kyoto, Japan**

12:00-1:30 P.M.
LUNCHEON
Union Ball Room

ADVANCED REGISTRATION FORM
NAMRC-XII MAY 30, 31 AND JUNE 1, 1984



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Enclosed is a check made payable to Michigan Technological University @ \$200 per person

Additional Copies of the NAMRC XII Proceedings @ \$55 per copy (member price)

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Additional banquet tickets @ \$15.00 _____

I AM INTERESTED IN TRANSPORTATION _____

FROM THE AIRPORT. I EXPECT TO ARRIVE _____

ON THE FLIGHT FROM _____

ON TUESDAY.

MAIL TO: PROFESSOR K. J. WEINMANN

CHAIRMAN, NAMRC ORGANIZING COMMITTEE

ME-EM DEPARTMENT

MICHIGAN TECHNOLOGICAL UNIVERSITY

HOUGHTON, MICHIGAN 49931 USA

6:00 P.M.

COCKTAILS

Student Development Complex

7:00 P.M.

CONFERENCE BANQUET

Student Development Complex

8:30-11:30 P.M.

RECREATION

Student Development Complex

THURSDAY, MAY 31

8:30-10:00 A.M.

SESSION 4

- A. Co-chairmen: **E.G. Thomsen, University of California, Berkeley** and **R.P. McDermott, M.S.P. Industries Corp.**
- "A Process Modeling Study of the Influence of Friction During Rib Forging", **N. Rebelo and C.R. Boer, Brown, Boveri & Co., Baden, Switzerland**
 - "Forming Sequences in Axisymmetric Cold Forging", **A. Al-Sened, P. Hartley, C.E.N. Sturgess, and G.W. Rowe, University of Birmingham, Birmingham, England**
 - "Investigation of Defect Formation in Rib-Web Type Forging by ALPID", **W.T. Wu, S.I. Oh, and T. Altan, Battelle Columbus Laboratories**
 - "Simulation of Closed Die Forging of Isothermal Titanium Disk Forging Using ALPID", **J.A. Ficke, S.I. Oh, Battelle Columbus Laboratories, and J. Malas, Wright-Patterson AFB**
- B. Co-chairmen: **R.S. Hahn, Hahn Associates** and **R. Komanduri, General Electric**
- "Temperature Distribution During Abrasive Cut Off", **S.S. Alvi and P.C. Pandey, University of Roorkee, Roorkee, India**
 - "Grinding Temperature", **M.C. Shaw, Arizona State University**
 - "Crystal Effects in CBN Grinding", **K.K. Hon, University of Birmingham, Birmingham, England**
 - "Decomposition of Forces and Specific Energy in Grinding", **S.M. Pandit and G. Sathyanarayanan, Michigan Technological University**
- C. Co-chairmen: **J.I. ElGomayel, Purdue University** and **J.G. Bollinger, University of Wisconsin, Madison**
- "A Constant Sharpness Adaptive Control for Grinding", **R.C. Chang and P.A. Leitch, Bendix Automation Research Division, Solon, OH**
 - "Multi-Microprocessor Control of Plunge Grinding", **H. Kalisz, University of Birmingham, Birmingham, England**
 - "Digital Control Algorithms for Electromechanical Machine Tool Feed Drives", **W.C. Johnson, Moog Inc., Aurora, NY, K. Srinivasan, and P. Kulkarni, Ohio State University**

Germany

- "On the Relationship Between Thermal EMF and Vibration in Turning", **Z.L. Zhang, Jilin University of Technology, Changchun, China, and K.F. Eman, University of Wisconsin, Madison**
- C. Co-chairmen: **C.W. La Maistre, Rensselaer Polytechnic Institute** and **I. Ham, Pennsylvania State University**
- "Computer Aids for Productivity Increasing in a Seamless Tube Factory", **A. Conti, M. Corbo, G. Manfrinato, Dalmine SpA, Milano and S. Rossetto Politecnico di Torino, Torino, Italy**
 - "Equipment Replacement Problem in a Production Line: A Simulation Approach", **U. La Commare, University of Palermo, Palermo, Italy**
 - "On the Design and Control of FMS for Rotational Parts", **N.G. Bilalis and A.G. Mamalis, National Technical University of Athens, Athens, Greece**

3:00-3:30 P.M.

REFRESHMENT BREAK

3:45-5:00 P.M.

TOURS OF MANUFACTURING LABS

DINNER ON YOUR OWN

8:00 P.M.

- NAMRI Membership meeting, Main Street Inn
- ASME PED Executive Committee meeting, Main Street Inn

FRIDAY, JUNE 1

8:30-10:00 A.M.

SESSION 7

- A. Co-chairmen: **J.C. Gerdeen, Michigan Technological University** and **J.M. Story, Alcoa**
- "Parametric Punch Descriptions in Modeling Sheet Metal Formability", **T.B. Stoughton, G.M. Research Lab, Warren, MI**
 - "Sculptured Die Cavities", **J.P. Duncan and C.Y.K. Lau, University of British Columbia, Vancouver, B.C. Canada**
- B. Co-chairmen: **B.F. von Turkovich, University of Vermont** and **W.B. Rice, Queen's University, Canada**
- "Information Flow Through the Workpiece in Metal Cutting", **B. Klamecki, University of New Mexico**
 - "Some Observations on Machining Steel Using Tools With Step Type Chip Breakers", **A.K.A. Radwan and R.M. Taher, Valparaiso University**
 - "Manufacturing of Blanking Tool and its Die-Set by Laminating Laser-Cut Steel Sheets", **H. Yokoi, T. Suzuki, K. Suzuki, and T. Nakagawa, University of Tokyo, Tokyo, Japan**
- C. Co-chairmen: **R.E. DeVor, University of Illinois, Urbana** and **W.R. DeVries, Rensselaer Polytechnic Institute**
- "The Use of Adhesive Technology in the Assembly of Machine Tools", **S.M. Robie, Bendix Automation Group, Solon, OH**
 - "Fabrication of Reinforced Aluminum Cylindrical Pressure Vessel", **W.L. Takahashi and H.A. Al-Qureshi, Instituto Tecnológico de Aeronautica, Sao Jose dos Campos, Brasil**
 - "The Application of Maximum Entropy Spectrum in Analysis of the Accuracy of Precision Gear Transmission", **Qu Liangshen, Ho Zhengjia, and Chen Yubao, Xian Jiaotong University, Xian, China**

10:00 A.M.

CONFERENCE ENDS

10:30-Noon

EARLY LUNCH