

Approved March 31, 1986
Date

MINUTES OF THE HOUSE COMMITTEE ON COMMUNICATION, COMPUTERS AND TECHNOLOGY

The meeting was called to order by Representative Jayne Aylward at
Chairperson

3:30 ~~xxx~~/p.m. on March 3, 1986 in room 522-S of the Capitol.

All members were present except:
Representative Helgerson (excused)

Committee staff present:
Lynne Holt, Legislative Research Department
James A. Wilson, Revisor of Statutes

Conferees appearing before the committee:
Dr. Ted Kuwana, Director of Center for Bioanalytical Research, University of Kansas
Dr. Victor Sullivan, Acting Dean, School of Technology and Applied Sciences, Pittsburg
State University
Mr. Fred Sudermann, Executive Assistant to the President and Director of Governmental
Relations, Wichita State University
Dr. Garth Thompson, Director, Center of Excellence, Kansas State University

Chairman Jayne Aylward opened the meeting for hearings on HB 3034 and HB 3035.

Dr. Ted Kuwana spoke on HB 3035 (Attachment 1) and said the exemption would expedite the processing and acquiring of goods while maximizing performance/cost of such goods for the Center. He said they need flexibility while maintaining effectiveness in their purchasing practices.

Representative Dean asked if they were able to work at all with the purchasing department in their orders. Dr. Kuwana said he doesn't think the cooperation of the purchasing department is involved. The purchasing department is bound by certain codes.

Representative Friedeman asked if they ever order equipment modified for them and was told that very few vendors will modify equipment now.

Representative Goossen asked how many times last year they went through the competitive bidding process and was told about two or three times a month.

Representative Erne asked in addressing the use of making in-house purchases, if he would do this himself, and, if so, if he planned to contact many people to see where the best price was or if he was going to get it from an old buddy. Dr. Kuwana said what they try to do is to go to the large trade shows, visit the instrument manufacturers, and try to make at least an initial evaluation on performance, etc. Many companies have been in business many years and have an excellent reputation, and these are the ones they prefer to go with. There are not many instrument manufacturers that sell equipment in Kansas, he said.

Representative Sifers said he thinks the Committee feels that all of those involved with the centers are doing a splendid job with the technology transfer happening as fast as it is and he thinks the Committee feels that those involved should be congratulated and commended and he wanted to go on record as saying that.

Representative Green asked if on the liquid seismograph, they use it for class or research. Dr. Kuwana said this was research equipment.

Representative Friedeman asked if they made the effective date "Kansas Register" instead of "July 1" if it would help them and was told it would.

Dr. Victor Sullivan said he was primarily speaking to HB 3034 which gives permanency to the Centers which they haven't had. (Attachment 2) He said the Center is dedicated to provide assistance to Kansas Industries through the development, introduction and transfer of new technology for woods industry with a focus on design, testing and development of products and processing methods. He said he also seconded the remarks of Dr. Kuwana on HB 3035. They have run into the same type of problems.

Unless specifically noted, the individual remarks recorded herein have not been transcribed verbatim. Individual remarks as reported herein have not been submitted to the individuals appearing before the committee for editing or corrections.

CONTINUATION SHEET

MINUTES OF THE HOUSE COMMITTEE ON COMMUNICATION, COMPUTERS AND TECHNOLOGY,
room 522-S, Statehouse, at 3:30 ~~a.m.~~ p.m. on March 3, 1986

Representative Friedeman asked concerning the mention on page 6 of Initiation of the School of Technology Excellence Endowment to include the matching in a total drive for \$1,000,000. Bill Hollenbeck said that was a major capital plan for the entire University.

Fred Sudermann said Dr. William Wilhelm was there with him and they would also like to go on record as supporting HB 3034 for reasons mentioned today and go on record as supporting HB 3035. They hope that at some point the state can expand this to include all sponsored programs, but the Centers are a good start. He said they all have had programs delayed because of problems with purchasing.

Representative Dean asked if the physical and red tape distance between research and purchasing contribute to the complexities of purchasing. Mr. Sudermann said creative faculty is very frustrated over any kind of red tape. He doesn't think it is a problem of the purchasing agent on campus as much as it is everybody handling the order. Representative Dean asked if purchasing now was done in Topeka and under this bill would be done on campus. Mr. Sudermann said he didn't know exactly how it would work but he assumes the purchasing would be done on campus. Representative Dean asked if they got a chance to review the proposals and was told they did but they had to take the low bid. Mr. Sudermann said the difficulty starts with the time which is the frustrating thing.

Dr. Garth Thompson gave a progress report on the activities of their Center of Excellence, Computer Controlled Automation at Kansas State University. (Attachment 3) He said that in reference to the purchasing bill, they have many things in common with the other speakers. He said when he prepares to buy something, he has already researched the cost and performance and knows exactly what he wants and writes specifications in such a way that there is going to be one bid that meets the specifications, the piece of equipment that he knows he wants. But he has to wait for this process to occur which takes from three to six weeks minimum. He personally reviews all bids. He passed out some literature. (Attachment 4 and 5)

Representative Dean said Dr. Thompson was talking about the Center of Excellence and the researcher, however it would still be somebody on campus who would act as the buyer and asked why that was better than a buyer located in the State Office Building. Dr. Thompson said it didn't matter where the buyer was but it was circumventing the long bid process that was important. The main point is the exemption from the bidding process.

Representative Friedeman asked if there are any "multi-price" in this process. Dr. Thompson said there is an educational discount on many of the things. Representative Friedeman asked if it was possible that the bidding process actually increases the cost. Dr. Thompson said that if they take the entire cost including the red tape, he thinks there is no question but that it significantly raises the cost.

The hearings on HB 3034 and HB 3035 were completed.

The meeting adjourned at 4:30 p.m.

The next meeting of the Committee will be at 3:30 p.m. on Tuesday, March 4, 1986.



TO: Kansas Legislators
From: T. Kuwana, Director of Center for Bioanalytical Research [CBAR]
University of Kansas
Re: House Bill 3035

It is the desire of CBAR, the Center of Excellence at the University of Kansas, in its mission of conducting research for the development of innovative new technology for commercial purposes, to perform efficiently in a most cost-effective manner. House Bill 3035 authorizes the Chief Executive Officer, or such officer designee, of our Institution to enter into contract for the acquisition of goods or services in accordance with procedures adapted and administered by the Chief Executive with exemption from the competitive bid requirements of KSA 75-3739 and amendments thereto. This exemption will expedite the process of acquiring goods, namely chemical instrumentation and electronic test equipment, while maximizing performance/cost of such goods for the Center.

I believe that the above stated exemption will allow us to become even more cost effective than currently possible while providing time-efficiency in our pursuit of research results and innovations. It is important to recognize that we are operating at the "cutting-edge" of research and that we are engaged in a competitive battle with technology innovations being conducted on a nationwide, even international basis. Our dollars in Kansas are limited. Thus, it is desirable to obtain the "state-of-the-art" instrumentation or equipment when needed without delays. The field of chemical instrumentation is changing rapidly, and new devices, components or even complete instrumentation systems, are announced or appear on the market during the 30-60 days required for evaluation and bidding of these goods, as practiced under the current bid requirements. What we need is flexibility while maintaining cost effectiveness in our purchasing practices. What we need is purchase and delivery of goods as demanded by the research, without delays imposed by the current bid requirements. We would like House Bill 3035 to apply to all funds administered by the Center. This would include the state appropriated funds and all federal funds administered by CBAR.

I would like to illustrate the above statements with specific examples and comments about the importance of flexibility in our purchasing practices.

Example 1. Flexibility Nearly 3 months ago, we requested purchase for 2-liquid chromatographic pumps. Only one company, to our knowledge, manufactured the pumps that would meet our requirements and thus specifications. Once the bids were received, we placed an order to the above company since they met the bid specifications. About a week after the pumps were received, we learned that the company had a new version which, although cost about \$500 more each, would outperform the one we purchased. Of course,

2099 Constant Ave.--West Campus
Lawrence, Kansas 66046-2535
(913) 864-5140
Telex 420456
FAX (913) 749-7393

(Attachment 1)
3/3/86 Hs. CCT

the company had responded to what we had specified. We phoned the company right away and they agreed that we could exchange the pumps for the newer version. It was only necessary to have a new invoice. OF COURSE WE COULD NOT. Under the current bid requirements, it was necessary to reopen the bids with the new specifications, even though only one company made a large syringe pump without pressure pulses. We could not afford the time delays imposed by going through the bid/purchase requirement again.

Example 2. Time and cost-Effectiveness Several companies responded to a purchase request for a liquid chromatography. Only two of the bids met our specifications and the cost differed by about \$500. Company A was a well known manufacturer who had demonstrated the equipment prior to the purchase request. Company B, unfortunately, was delayed in their demonstration due to the ice/snow storm in late November. In our subsequent demo and discussions with Company B, after receipt of the bids, not only did Company B provide a 12 months warranty compared to 90 days for Company A, but B's instrument had multiple pumps and several internal features which allowed for future expansion of capabilities. We were, however, unable to purchase the chromatographic instrument from Company B, even tho it had superior features of performance flexibility, since it cost some \$500 more and Company A met the bid specifications. We could have decided not to purchase and begin the bid process again. However, we could not afford the time delays. I should also point out that it is nearly impossible to evaluate all of the features and performances of a complex instrument from the descriptive brochures sent by manufacturers.

We wish to purchase the maximum performance capabilities in goods, not only for the moment, but also with the future in mind. In both of the above examples, the expenditure of a few hundred dollars out of \$3700 in the first case and \$14,000 for the 2nd, would have served us much better than what we purchased. For the sake of brevity, other examples are not cited. We pledge to work with the Chief Executive Officer or officer designee regarding purchasing procedures to safeguard against any abuses while streamlining the procedure for time and cost-effectiveness of purchased goods. We thank the legislature for recognizing and appreciating our problems and for responding in a positive manner to maximize the use of funds that are being administered by the Center. Thank you.

Vic Sullu

CENTER FOR INDUSTRIAL INNOVATION AND
TECHNOLOGY TRANSFER
AT PITTSBURG STATE UNIVERSITY

ABSTRACT

- 1) **Mission, Goals, Scope of Activities:** The Center is dedicated to provide assistance to Kansas industries through the development, introduction and transfer of new technology for woods industry with a focus on design, testing and development of products and processing methods. The initial emphasis will be in the woods industry. The woods industry in the United States can be subdivided into four major divisions: the furniture manufacturing industry, the cabinets and fixtures industry, the millwork and casework industry, and the store fixtures and display furniture industry. Of these four, the largest in the State of Kansas is the kitchen cabinet industry. This industry tends to be rather small individual companies widely spread throughout the state. The primary focus of the Center would be to assist these industries in improving their productivity and thus, their economic impact on the state. A secondary focus would be to entice new industry, or expand existing industry within the state in conjunction with the Kansas Department of Economic Development and municipal and regional development agencies such as Mid-America, and the City of Pittsburg's incubator facility.

- 2) **Primary Departments Involved:** Industrial Arts and Technology which houses the Wood Technology technical area, the Department of Engineering Technology which houses the Electronics, Plastics, Mechanical Design, and Manufacturing technical areas, the Department of Chemistry, and the Kelce School of Business which houses the Center for Entrepreneurship and the Small Business Development Center. The initial focus would clearly be on the Wood Technology Division of the Department of Industrial Arts and Technology.

- 3) **Economic Impact:** The primary impact of the Center in its initial development, will be improving the competitiveness of the existing woods industry and in the start up of new industry in the State of Kansas. An additional emphasis will be on technical training for all levels of individuals in the woods industry from management, through engineering, and production workers. Southeast Kansas is an area of considerable timber resources with a small but growing sawmill industry. Kansas is known for the quality of its walnut, pecan, cherry and oak along with a developing resource in hackberry which is considered to be one of the industry's major future resources

(Attachment 2)
2-3-86 HS.CCT

for furniture. Battelle, in a recent economic study, stated the future of Kansas industry will be relatively small firms (20-100 employees). This will be especially true of Western Kansas and Southeast Kansas. The enhancement of companies and the start up of new companies in Kansas' small to medium sized cities will be central to the health of such cities as Coffeyville, Great Bend, Iola, and Parsons. The focus of our center will be on industries that typically locate in such communities. Battelle identifies Southeast Kansas as an ideal target for the development of wood related plastics and electronics industries. They also state at least 20% of new economic growth will be in start up of small companies of 20 employees or less.

CENTER STAFFING:

Director of the Center: (To be appointed)

Duane Griffiths, Associate Professor, Wood Technology, Department of Industrial Arts and Technology

Edwin Koehler, Associate Professor, Wood Technology, Department of Industrial Arts and Technology.

Bruce Jackson, Assistant Professor, Wood Technology, Department of Industrial Arts and Technology

James Farley, Professor, Technical Education Center Woods, Department of Industrial Arts and Technology.

(Additional faculty from other departments in a support relationship to Wood Technology are listed in the appendix.)

CENTER FOCUS:

The uniqueness of our nationally recognized Wood Technology program and the success of the graduates of Pittsburg State University in the woods industry already attest to the quality of the faculty and the curriculum in Wood Technology. This curriculum has been developed over a long history, but began to reach national prominence in 1976. With the establishment of the national wood advisory board, the Wood Technology program has become increasingly recognized throughout the country. The first major recognition was by the Architectural Woodwork Institute, the largest professional association in the woods industry when this organization appointed Pittsburg State University as the National Technical Education Center for AWI in December 1984. Pittsburg State was chosen after a national search of universities offering Wood Technology and Forest Products curricula.

LA-Z-BOY Corporation, Neosho, Missouri, Division, redesign of their total finishing system which became a model for the redesign of the finishing divisions of seventeen LA-Z-BOY plants throughout the United States.

Design of three new desks for the computer market for Riverside Furniture of Fort Smith, Arkansas. One of the designs became the outstanding furniture design award for 1984. See Appendix .

Research and evaluation of the warping and checking problem in unfinished furniture for Corporation of Carthage, Missouri.

Research and evaluation of a bandsaw problem for Woodmark, Inc., of Chanute, Kansas, with a resulting redesign and development of new bandsaw wheels leading to increased production and decreased use of materials. The research included tool design, metallurgy, and material-handling evaluation and machine redesign. This research involves faculty from Wood Technology, Manufacturing Engineering Technology and Technical Education as a team.

UNICOR: Division of Federal Prisons. Same finishing system improvements as La-Z-Boy and development of a pre-industrial training program. Leavenworth, KS.

Wells Cabinet: Machinery processing. Fredonia, KS.

Sherwood Cabinets: Finish problems. Parsons, KS.

Garnet Church Furniture: Material selection, Garnet, KS.

John's: Machinery design, Topeka, KS.

Precision Pattern: Aircraft interior design. Wichita, KS.

Prestige Products: Production problem and cabinet machining. Neodesha, KS.

Fosters Cabinets: Finish problems. Lansing, KS.

Architectural Accents: Finish problems. Olathe KS.

United Telecommunications: Finish problems. Shawnee Mission, KS.

O'Sullivan Industries: Finish application equipment guidance, and product design. Lamar MO.

Architectural Millwork, Inc.: Production problems. Hutchinson, Ks.

Emerson Electric Corp. Expert witness. St. Louis, MO.

International Woodwork Machinery Fair: Judges. This is the third largest industrial show in United States

Although not the primary role, a strong goal of the Center will be for basic research which could lead to patents and proprietary rights with income back to the Center through the Pittsburg State University Foundation. Because there is very little opportunity for basic invention of new materials in wood technology, the possibility of patents in wood technology appear to be in industrial process development or in unique applications of technology from other materials areas -- notably electronics, plastics and computer applications, relating to design, manufacturing, and to finishing.

The woods program is clearly not a forestry program as found in an agricultural university. In the wood sciences and forest products courses at Pittsburg State University, students look at wood as an industrial material. The questions answered are how to most efficiently and effectively machine it, finish it, and to choose the most cost-effective equipment and processes for any given product application -- millwork, furniture, cabinets, or construction. However, the faculty work very closely with Mr. Leonard Gould of the State and Extension Forestry housed at Kansas State University.

Because the heritage of PSU grew through industrial education, we understand what is required to provide pertinent seminars for in-plant training and other manpower services. Architectural Woodwork Institute identified PSU as their national Technical Education Center. The good working relationship developed with AWI and the commitment of the university to industrial development led to establishing a separate facility for AWI seminars. The AWI center is drawing hundreds of industrialists to the campus for intensive hands-on workshops. It is anticipated that other trade associations will also make use of these facilities and identify us as their educational center in the near future.

In recent months the wood technology area has expanded its reputation from national to international because of the AWI seminars which are being offered at an increasing rate. Wood machinery manufacturers from West Germany, Sweden, and Italy have recently donated or loaned equipment to Pittsburg State University. Although the equipment is primarily for use in AWI seminars, it is available for students and faculty in regularly scheduled classes, and for senior and graduate research projects.

FUNDING OF CENTER FOR INDUSTRIAL INNOVATION & TECHNOLOGY TRANSFER

The legislature established a decreasing matching fund process for centers of excellence whereby industry will match state funding over a four-year period.

	<u>Industry</u>	<u>State</u>	<u>Total</u>
Year 1	195,000.	130,000.	325,000.
Year 2	80,000.	160,000.	340,000.
Year 3	84,000.	168,000.	315,000.

Originally, the Center of Excellence funding was requested in the Kansas Department of Economic Development budget. The Center of Excellence funding requests are now included in each university's budget on an annual basis.

The Governor's 1987 budget proposal announced his recommendation for the initial year funding of \$130,000. The university has already initiated steps to raise the required matching funds through the following steps:

1. Establishment of a Center Advisory Board -- now in process of selection.
2. Identification of possible major funding sources -- now in progress with the first major presentation in late February 1986.
3. Initiation of the School of Technology Excellence Endowment to include the matching in a total drive for \$1,000,000.00.

Although a detailed budget cannot be established without thorough study and review by the Advisory Board, the following is a draft of major components needed to meet the mission of the center. These items take into account equipment already on hand and expertise of the current faculty.

PERSONNEL

\$46,800 (12 months) Director: An individual with a thorough understanding of industry with special emphasis in computer applications, industrial management experience (especially high tech), and the ability to relate the advanced manufacturing techniques of industry to new fields. Experience in development of new technology and with small manufacturing firms is desired. Knowledge of physics, math, and chemistry would be desirable to allow for applications of advanced technology to the woods industry.

\$30,000 (9 months) Wood Technology Asst. Professor-Asso. Professor: This position would be chosen with ability to teach courses now taught by the present faculty so that they may be released from one or more courses each semester to expand their current economic development and problem solving research. The current faculty are recognized as the leading experts, thus we need to release them rather than replace them with Center staff.

\$14,000 Civil Service Secretary I. Support for Director and faculty.

EQUIPMENT

\$80,000 Molder with profile grinder. This is the one major piece of industrial equipment not now available at PSU.

\$50,000 to CAD system dedicated to the Woods Technology Technical area.

\$100,000 Current systems at PSU are already dedicated to specific technical areas in plastics, mechanical manufacturing, and construction engineering technologies.

\$60,000 Panel Saw, second major industrial equipment not currently available at PSU.

\$125,000 NC router. This equipment would be directly related to production problems of advanced technology in the woods industry. It would complement the NC and CNC equipment already available in manufacturing engineering technology.

\$20,000 Microcomputer equipment for development of production and management software specifically designed for small and developing wood industry firms.

\$50,000 Modification and remodeling of Technical Education Building to house the Center in the same facility as the Wood Technology Laboratories and the AWI National Technical Education Center.

CONCLUSION

In the summer of 1985, Professor Jackson, on leave without pay from the university, worked for Unicor, the manufacturing arm of the U.S. Federal Prisons Systems. In his capacity as technical consultant, Professor Jackson researched and designed a totally new finishing division for Unicor's woodworking plant in Leavenworth. The implantation of this design has led to the expenditure in Kansas of over 3,000,000 Federal dollars, much of it spent with Kansas firms and contractors. Currently the UNICOR facility is being studied with the possible development of a similar area in the Kansas State Penitentiary at Lansing, Kansas.

This is but one example of the application of advanced technology to the woods industry and its resulting economic impact on Kansas. Although it is admittedly a unique application, it none the less illustrates how the application of sophisticated knowledge can affect one Kansas community. Professors Griffiths and Koehler have also been involved in significant technology transfer and industrial problem solving. With the Center for Industrial Innovation and Technology Transfer, PSU will be able to provide the personnel and fiscal support to allow this proven team time to apply their expertise to industrial and economic development in Kansas.

VITA

FACULTY OF CENTER FOR INDUSTRIAL INNOVATION AND TECHNOLOGY TRANSFER AT PITTSBURG STATE UNIVERSITY

DUANE GRIFFITHS - Assistant Professor

BS
MS
Advanced Graduate
Study

Pittsburg State University
Pittsburg State University
University of Arkansas

Industrial Education
Industrial Technology

Teaching Experience

Associate Professor
Graduate Faculty
Assistant Professor
Instructor
Instructor
Graduate Assistant

Pittsburg State University
Pittsburg State University
Pittsburg State University
California State University
University of Arkansas
Pittsburg State University

1986
1984
Wood Technology
Woods and Plastics

Licenses and Certifications

Certified SME, SPE
Certified Legal Witness in Wood Machinery

Publications and Scholarly Activities

Two Wood Technology Textbooks (1 in progress)
Editor, Technology Woods Journal
Numerous articles and research grants
Presentations before AWI, NKCA, SPE, SPI, ITEA, Four State Industrial Education

Duties

Professor in Charge - Wood Technology

EDWIN KOEHLER - Associate Professor in Wood Technology

BA
MA
Advanced Graduate
Study

Wayne State University
No. Colorado State University
Michigan State University

Industrial Education
Industrial Education
Safety Education

Teaching Experience

Associate Professor
Instructor

Pittsburg State University
Seward High School, Seward, Nebraska

Industrial Experience

Carpentry experience
General Contractor experience

Other Activities

President
Vice Pres & President
Vice Pres & President

Pittsburg Safety Council
Kansas Driver and Traffic Safety Education Assoc.
South Central Region of the American Driver and
Traffic Safety Education Association.

Secretary
Presenter of:

Four State Industrial Education Conference
Numerous talks on traffic safety and wood safety.

Wood Industrial Consulting

Woodmark, Inc., Chanute, KS
Morton Cabinets, Webb City, MO
Numerous wood industries in Southeast Kansas.

BRUCE JACKSON- Instructor in Wood Technology

BS
MS

Northern Illinois State University Industrial Education
Northern Illinois State University Industrial Education

Experience

Instructor Pittsburg State University
Instructor Northern Illinois State University
Instructor DeKalb High School, DeKalb, Illinois
Visiting lecturer for USAID. India and Indonesia in Wood Technology

Industrial Experience

Woodmark, Inc.,
Riverside Furniture
La-Z-Boy Industries
UNICOR - Federal Prison Systems
Finishing Expeditor, Addressograph-Multigraph, Mt. Prospect, Illinois
Foreman - General American Research, Division of American Transportation
Corporation
Draftsman - Illinois Lock Company, Wheeling, Illinois.

(Bruce Jackson, continued)

Consulting

Numerous cabinet, millwork, and furniture firms in Midwest.

Publications:

12 publications in wood with emphasis on finishing and production problems.

2 Audio visual training films on finishing and wood production.

JAMES FARLEY - Professor

BS
MS

Pittsburg State University
Pittsburg State University

Industrial Arts
Industrial Arts

Teaching Experience

34 years at Pittsburg State University

Administrative Experience

Interim Director Physical Plant - PSU 1967-1968

Interim Director Vocational Technical Div.- PSU 1968

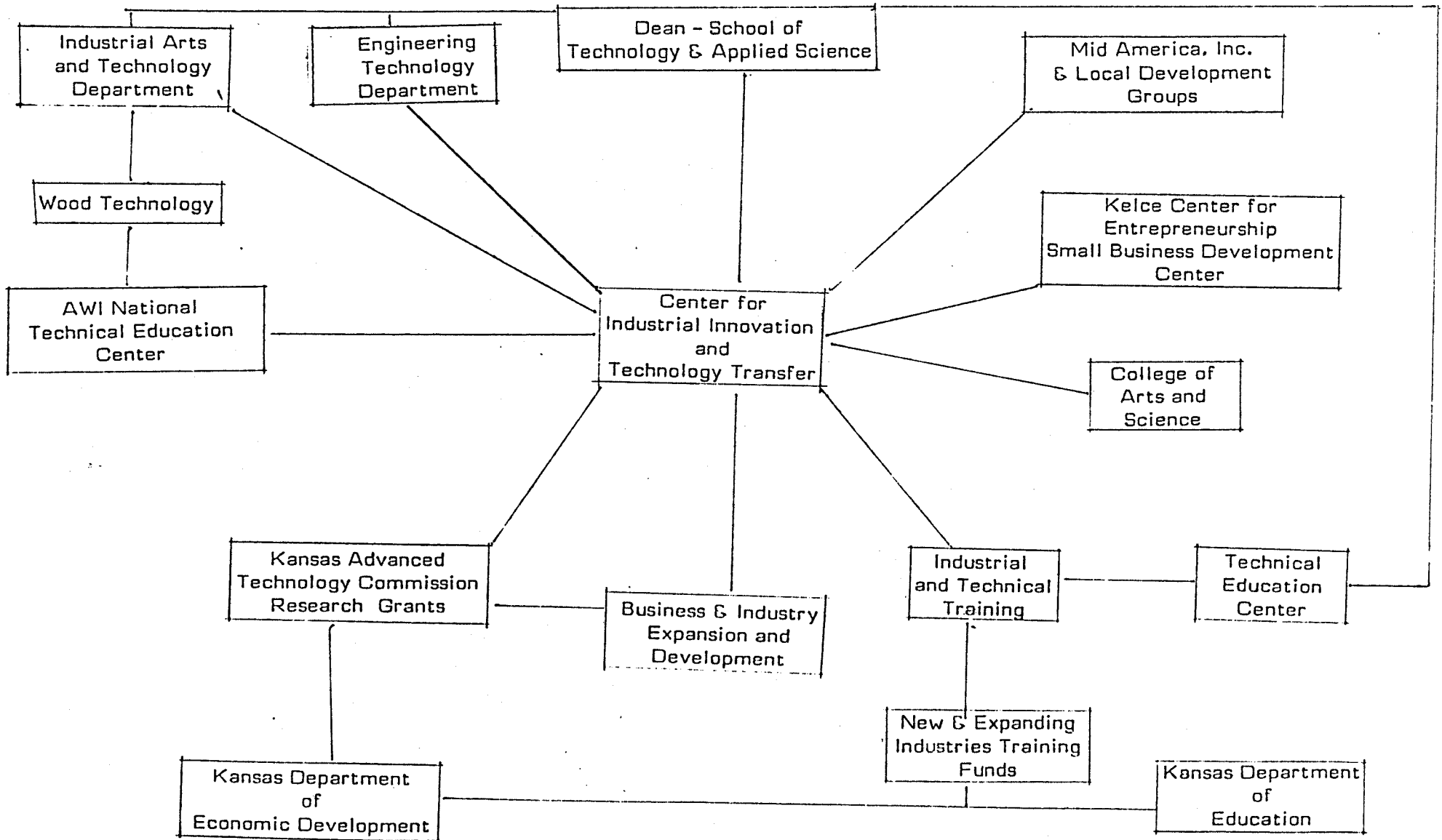
Duties

Professor in charge. Technical Education Center program in cabinet and furniture making.

Consulting

Woods industries in Kansas and Southwest Missouri

Center for Industrial Innovation & Technology Transfer
Operational & Economic Development Model



APPENDIX

FACULTY IN SUPPORT AREAS FOR
INDUSTRIAL INNOVATION & TECHNOLOGY TRANSFER
IN WOOD TECHNOLOGY

Manufacturing Engineering Technology

Associate Professor Dr. Larry Williamson. Lead Professor. Specialty: NC, CNC, Materials Handling, Machine Shop.

BSE Industrial Arts, Pittsburg State University
MS Industrial Arts, Pittsburg State University
EdD Vocational Education, University of Arkansas

Assistant Professor William Barrow, Specialty: General Metals, Robotics, Automated Systems, Metalurgy.

B.S. Industrial Education, University of Missouri
MSEd Practical Arts-Vocational Ed, University Missouri.
Senior Member, Society of Manufacturing Engineers

Professor Vernell Goold, Chairman Engineering Technology Specialty: Tool Design, Manufacturing Engineering.

B.S. Industrial Education, Wichita State Univer.
MS Industrial Education, University of Wisconsin
SME Certified Manufacturing Engineer

FEF Professor, Robert Bradley, Interim Chairman, Industrial Arts/Technology. Specialty: Cast Metals, Dimensional Metrology

BA-BS Vocational Education, Industrial Arts Education
West Michigan University
MA Vocational Education, West Michigan University
Advanced graduate work University of Michigan, and
Pittsburg State University

Electronics Engineering Technology

Associate Professor Steve Hefley, Lead Professor. Specialty: Linear Systems Communications

BSIT Technology, Pittsburg State University
MS Technology, Pittsburg State University

James Lookadoo, Assistant Professor, Specialty: Computer Application, Digital Equipment

BS Physics-Math, Henderson State University
MS Physics, Texas A & M University
Ph.D (in progress) Electrical Engineering, Univ. Arkansas

Dr. William Studyvin, Associate Professor, Specialty: Gen. Electronics, Controls, Microprocessors

BS Electrical Engineering, University of Missouri at Rolla
MS Electrical Engineering University of Missouri - Columbia
PhD Electrical Engineering, University of Arkansas

Plastics Engineering Technology

Hamid Emadipour, Assistant Professor, Specialty: Composites, Polymer Science

API Polymer Science, Borough Polytechnic Institute, London
MS Polymer Science & Engineering, Case Western Reserve University
PhD (in progress) Case Western Reserve University

Dr. George Graham, Professor, Lead Professor, Specialty: Processing and Part and Mold Design

BS Mechanical Engineering Purdue University
MS Industry & Technology, Northern Illinois University
PhD Technical & Industrial Ed., Kansas State University

Mechanical engineering Technology

A. Gene Chambers, Associate Professor, Specialty: Structural and Mechanical Design

BSE Mathematics, University of Central Arkansas
BSAE Aeronautical Engineering, Wichita State University
MS Mathematics-Education, University of Arkansas
Registered Professional Engineer

Kenneth Fladie, Assistant Professor, Lead Professor, Specialty: Field and Project Engineering.

AAS Construction Technology, Erie Co. Community College
BS Civil Engineering, Kansas State University
MS Civil Engineering, University of Pittsburgh
MPWA Public Works Administration, University of Pittsburgh
Registered Professional Engineer

Dr. Joe Porter, Assistant Professor, Specialty: Computer Aided Drafting

BSIT Design and Drafting, Pittsburg State University
MS Technical Teacher Education, Pittsburg State University
PhD University of Missouri - Columbia



RIVERSIDE FURNITURE CORPORATION

February 28, 1983

Mr. Duane Griffiths
Department of Technology
Pittsburg State University
Pittsburg, KS 66762

Dear Duane,

Having come back from a college recruiting trip from two mideastern states has prompted me to write this letter.

Too often we take for granted our schools that excel with their students. I, for one, wish to say to you, the staff, and Pittsburg State University Wood Technology School, "Thanks, you have spoiled us!"

During my interviews with the other schools I found myself making a comparison of students and faculty and needless to say we returned home without making a single job offer.

We feel the graduating seniors of the Wood Tech School of PSU are better prepared to enter furniture manufacturing than the other wood technology schools. This credit should go to you and your staff, so please don't let up, continue to spoil us.

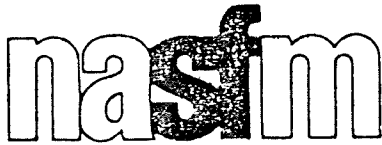
Again, thank you for your devotion and dedication to employers and students.

Sincerely,

RIVERSIDE FURNITURE CORPORATION

Bill Corrotto
Director of Personnel

BC/ds



NATIONAL ASSOCIATION OF STORE FIXTURE MANUFACTURERS

OFFICERS

President

WILLIAM J. HUNT
Myers Industries, Inc.
Lincoln, Illinois

Vice President

A. JAMES GIELISSEN
Hughes and Company
Denver, Colorado

Treasurer

JOHN H. SCHLEGEL
Hamilton Fixture
Hamilton, Ohio

Executive Director

ROBERT L. STRAUSS
Sunrise, Florida

DIRECTORS

DALE E. BERGLUND
Customcraft Fixtures, Inc.
Albuquerque, New Mexico

PIUS BERNHARD
Bernhard Woodwork, Ltd.
Northbrook, Illinois

CHESTER C. GERBER
M. Gerber Construction Company, Inc.
Maspeth, New York

CLARENCE JONES
Oklahoma Fixture Company
Tulsa, Oklahoma

ROBERT F. KAY
Woodwork Corporation of America
Chicago, Illinois

GERALD L. PELLETIER
Modern Woodcrafts, Inc.
Farmington, Connecticut

JOHN RILKO
Woodworkers of Denver, Inc.
Denver, Colorado

LAWRENCE SCHAN
HBSA Industries, Inc.
Brooklyn, New York

DAVID S. VARON
Crown Metal Mfg. Company
Chicago, Illinois

MARK N. ZALK
Self-Serv Fixture Co., Inc.
Dallas, Texas

April 7, 1983

Mr. L. Duane Griffiths
Pittsburg State University
Department of Industrial Arts
Education
Pittsburg, Kansas 66762

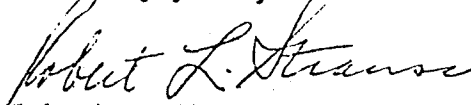
Dear Duane:

You will be happy to know that our association has decided to award a scholarship in the amount of \$500.00 each year to a student in your department who is entering the university.

The total scholarship would be in the amount of \$2,000.00 payable at the rate of \$500.00 each year over a period of four years. We would make our initial award to a new student designated by you this year and then make the same award next year to another student and follow the process in subsequent years.

We shall await further word from you as to the procedure to follow and when you desire payment.

Sincerely yours,


Robert L. Strauss
Executive Director

RLS/bac



NATIONAL KITCHEN CABINET ASSOCIATION

November 21, 1983

Mr. L. Duane Griffiths
Professor in Charge
Wood Technology
Pittsburg State University
Pittsburg, Kansas 66762

Dear Professor Griffiths:

As the Executive Director of the National Kitchen Cabinet Association, I am pleased on behalf of our members, several of whom are located in Kansas, to correspond with you concerning the wood technology program of Pittsburg State University.

The National Kitchen Cabinet Association (NKCA) is a national trade association composed of 158 companies who manufacture factory-finished kitchen cabinets and bath vanities, and 138 suppliers of goods and services to the cabinet manufacturers.

NKCA provides a wide range of services to its members including administration of a testing/certification program; statistical/marketing reports; a public relations program; product trend information; government relations; and education programs. The association sponsors an annual convention and other meetings.

I have received very favorable comments on your program from NKCA members in Kansas who have employed your graduates and otherwise participated in your program. Thus, association members recognize your wood technology program as being outstanding and providing a valuable service to the wood products industry. We would be pleased to cooperate with you in making known the background and availability of your graduates.

I wish you and the University continued success in the wood technology program.

Yours truly,

C. Richard Titus
C. Richard Titus
Executive Director

CRT:jct

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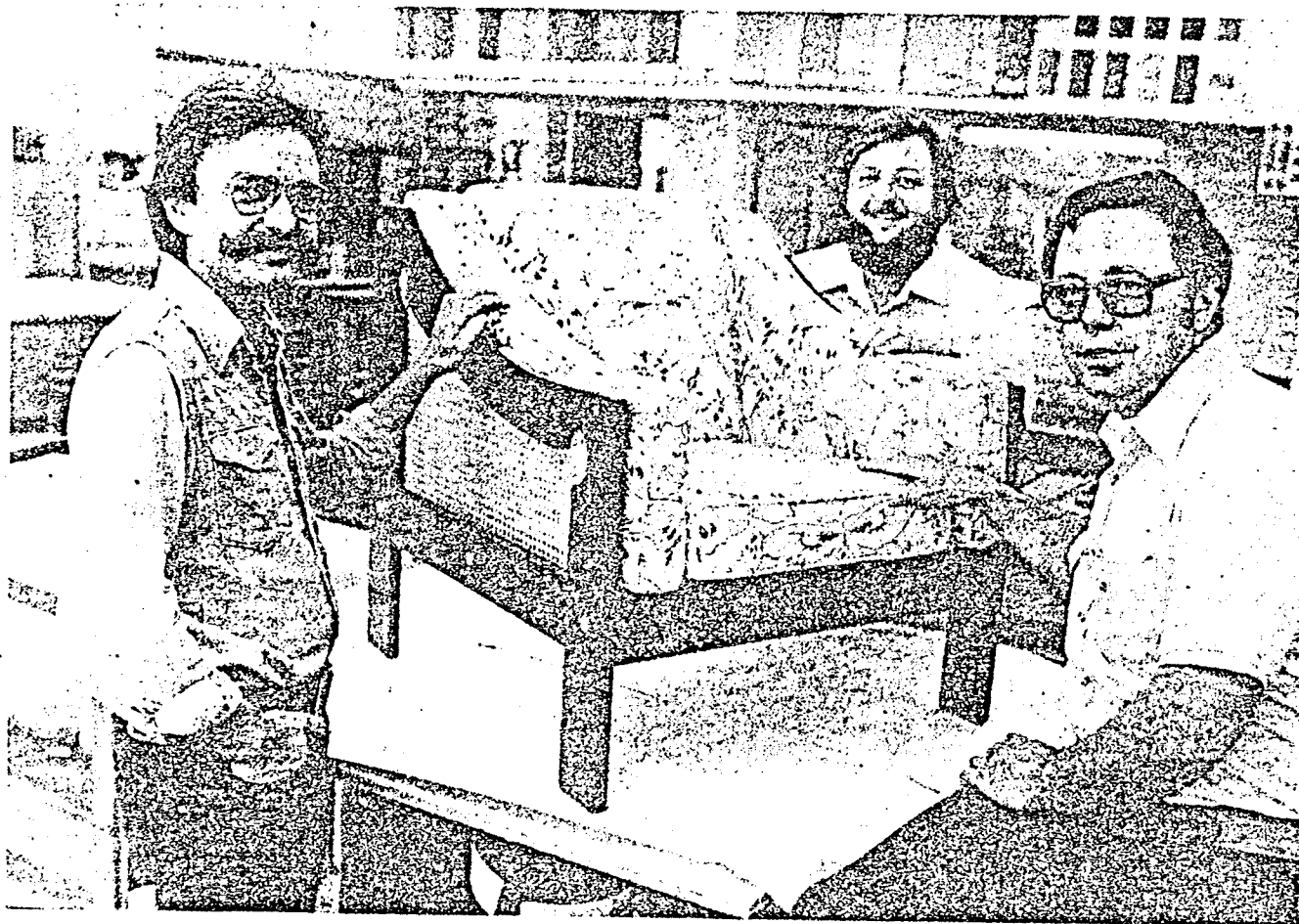
HOUSTON H. SWARD
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New chair

Three Pittsburg State University wood technology faculty members, including Paul Briggs, left, British exchange professor for 1979-80, Bruce Jackson, center, and Larry Williamson, display the work of Galena freshman Steven Brad-

shaw. The chair, personally designed and constructed by Bradshaw, will be judged in September at the International Machinery and Furniture Supply Fair, USA. The chair will be graded on its design, workmanship, manufacturing adaptability and marketability.

Original chair shipped to fair

A chair designed and hand-manufactured by a Pittsburg State University wood technology student is enroute to the International Woodworking Machinery and Furniture Supply Fair, USA, the fifth largest industrial show in the United States.

The chair, created and crafted by Steven Bradshaw, PSU freshman from Galena, will be judged in the student furniture design competition.

The piece will be judged in four categories, upholstered furniture, quick assembly features, craftsmanship and design creativity.

If judged best in any of the first three categories, as well as Best in Show, Bradshaw could receive \$1,000

in cash prizes.

Bruce Jackson, PSU wood technology instructor and one of Bradshaw's advisors, said that the chair is an excellent piece of work.

"Even though Steve is just a freshman, we are very proud of his product," Jackson says. "He got a tremendous amount of experience from applying theory into the actual design and production. Quite frankly, we're hoping one or more of the manufacturers at the fair will show an interest in commercially marketing Steve's chair."

Judges in the fair competition, being held Sept. 13-17 in Louisville, Ky., will be professionals from the fur-

niture industry, including manufacturers, retailers and designers.

Bradshaw's design will be graded on its originality, engineering and creative use of materials. The piece will also be judged for its marketability, manufacturing adaptability and workmanship in construction and finishing.

The approximately 30 by 30 by 30 inch easy chair is constructed of beech wood which was treated with a deep royal purple stain. Natural colored caning covers the sides of the chair, which is designed with four cushions upholstered in a beige and purple printed fabric.



RIVERSIDE FURNITURE CORPORATION

RICHARD J. UDOUJ, President

May 5, 1983

Mr. Bruce Jackson,
Asst. Professor of Technology
Pittsburg State University
Pittsburg, Kansas 66762

Dear Bruce:

Our computer desks were a big success at High Point - just as we expected.

We have been getting much favorable publicity, both in the trade press as well as local newspapers throughout the country. I am enclosing copies of two articles which appeared in the Newport News "Daily Press" and the "Houston Chronicle".

I am also enclosing an excerpt from the Sunday, May 1, "Kansas City Star" which points out how important your input was to this project in enabling us to offer a truly functional as well as attractive line of computer desks.

Thank you again for your help.

Sincerely,

Richard J. Udouj



For more information on the AWI Seminars, contact:

Judith C. Beattie
Architectural Woodwork Institute
2310 South Walter Reed Drive
Arlington, Virginia 22206
(703) 671-9100



For more information on the Pittsburgh State University Workshops please contact:

L. Duane Griffiths
(or Deanna Loughmiller)
Pittsburg State University
Wood Technology
Pittsburg, Kansas 66762
(316) 231-7000

1986 CALENDAR

JANUARY 1986

17-18
Detailing and Billing Seminar
Houston, Texas*

26-29
Communications and Employee Motivation
Pittsburg State University
Pittsburg, Kansas

FEBRUARY 1986

14-15
Estimator Seminar
Tampa, Florida*

19-22
Top Executive Seminar
Tarpon Springs, Florida

23-29
32mm Cabinet Construction
Pittsburg State University
Pittsburg, Kansas

MARCH 1986

16-19
Computers In Small Business
Pittsburg State University
Pittsburg, Kansas

APRIL 1986

18-19
Project Management Seminar
Chicago, Illinois*

20-25
Lumber Grading
Pittsburg State University
Pittsburg, Kansas

JUNE 1986

20-21
Detailing and Billing Seminar
Pittsburgh, Pennsylvania*

SEPTEMBER 1986

4-6
Plant Superintendents Tour and Seminar
Atlanta, Georgia

18-20
Estimator and Project Management Seminar
New York, New York*

NOVEMBER 1986

14-15
Junior Executive Seminar
Nashville, Tennessee

16-21
Radius Work On The Shaper
Pittsburg State University
Pittsburg, Kansas

DECEMBER 1986

8-12
Finishing Workshop
Pittsburg State University
Pittsburg, Kansas

* AWI non-members are welcome to attend these seminars.

PITTSBURG STATE UNIVERSITY WORKSHOPS

AWI's National Technical Education Center is located on the campus of Pittsburg State University, Pittsburg, Kansas. The AWI and Pittsburg State are partners in this unique program which offers very intensive seminars on woodworking. Practical and to the point, these seminars are designed for line workers, first line supervisors, as well as mid- and upper-level management.

L. Duane Griffiths, Professor in Charge of Wood Technology, conducts the seminars at the University. Seminar speakers are carefully chosen from among AWI associate members and other experts in the particular seminar field.

Most sessions are held in the Pittsburg State University woodwork technology laboratories. Seminar participants are housed in comfortable university dormitory rooms, furnished with towels, linens and televisions. Rooms are single occupancy and meals are furnished through the university dining halls.

All workshop dates are tentative. Registration materials are sent to all Active members about 45 days prior to the workshop dates. These workshops are available only to Active AWI members.



Southern Furniture Manufacturers Association

P.O. Box 2436 • High Point, North Carolina 27261 • (919) 889-1905

October 21, 1983

Mr. L. Dwayne Griffiths
Pittsburgh State University
Department of Industrial Arts & Education
Pittsburgh, KS 66762

Dear Dwayne:

I would like to take this opportunity to commend Pittsburgh State University on its Wood Technology Program. Speaking for our members, we are very appreciative of your efforts to promote wood technology and especially furniture manufacturing as a career opportunity.

The Southern Furniture Manufacturers Association, founded in 1905, is a non-profit voluntary trade association for manufacturers of residential and institutional furniture. We are dedicated to aiding the continuing growth and development of the furniture industry. One way to accomplish this is to encourage schools, such as Pittsburgh State University, to develop the future leaders of our industry through their curriculums.

There is an old saying, "the proof of the pudding is in the eating," and the proof of your program is the quality of students you have graduated. One of our member companies has been very pleased with the graduates they have hired. I have been told they plan to continue to recruit at your school which, to me, says something of the caliber of your students.

SFMA encourages Pittsburgh State University to continue their Wood Technology Program and strive, as we all must, to enhance your on-going furniture manufacturing curriculum.

Cordially,

A handwritten signature in dark ink, appearing to read "Larry F. Runyan", written in a cursive style.

Larry F. Runyan
Director of Manufacturing Services

LFR/eh

PSU instrumental in attracting firm

By NEAL McCHRISTY

Morning Sun Staff Writer

Pittsburg State University and its wood technology program helped attract an industrial prospect for Pittsburg that will employ 130 people within the next 18 months.

The work of the university representatives in helping to bring the prospect, Merchandising Fixtures, Inc. (MFI), Coon Rapids, Minn., to view Pittsburg was lauded by City Manager Mike Conduff during the city commission meeting Tuesday.

PSU representatives were contacted after the Kansas Department of Economic Development (KDED) indicated a firm was interested in locating in the Southeast Kansas. Conduff said that the PSU people were an "important force" in bringing the prospect to the community.

The firm's selection of Pittsburg is to be helped by securing funding through KDED and the city. Tuesday the city indicated that it would pursue a letter of intent to issue \$2.5 million in industrial revenue bonds, and OK a resolution to pursue the \$500,000 grant from KDED through the Crawford County Commission.

The hearing for the grant from KDED is scheduled for Monday. The city pursued the grant through the county commission as it had already applied for one KDED grant, and was allowed one per quarter.

MFI is a company that

makes wood products including desks and shelving, Conduff said. The grant hearing notice states the proposed location is in the Regional Industrial Park.

In another grant request, Mark Turnbull, administrator of community development and housing, presented a request for expansion by Dyco, Inc. that would allow a low-interest deferred loan for \$400,000 from KDED.

The loan will be coupled with \$3.85 million from the company for renovation of the facility and to purchase equipment for manufacturing T-shirts. The company currently places letters and designs on clothing.

The application was approved. Turnbull said the expansion would create 110 new jobs at Dyco, Inc., which is located at 701 E. Washington.

In another grant application, the city approved an application for a one year grant from KDED for street paving and rehabilitation of owner-occupied housing. The application had been revised, and the amount requested was \$424,624.

In other action, the city commission:

— Set the amount for the 29th Street project at 90 percent of the money for the participation by the city and 10 percent by the property owners along the street. The assessment will be by a combination of square footage.

(See CITY Page 8)

Sun
Pittsburg, Kansas, Wednesday, October 10, 1984—36 Pages, 6 Sections.
MORNING SUN

FACULTY NEWS

Issued twice monthly by the Office of Public Affairs and Information

October 17, 1984

Wood Group Selects PSU

The University announced Tuesday that the Architectural Woodworking Institute, a major national trade organization representing more than 750 manufacturers in millwork and related industries, has selected PSU as the location for its National Technical Education Center.

University officials are hailing the selection as a major action which will bring additional national recognition to the program, School of Technology and Applied Science and the University. In addition, the center will directly benefit regular University students.

The education center concept is a first for AWI. Through the wood technology faculty is developing specialized technical programs for AWI member employees, with the first two week-long programs scheduled for December and January on campus.

The University has been working with AWI for the last 12 months on the center concept. The selection this fall after AWI officials made two visits to the campus, and formal written proposals were finalized.

AWI member companies are primarily involved in the production of interior woodworking -- moldings, doors, windows and cabinets -- for buildings. The companies are high-quality oriented, and their manufacturing processes involve some of the highest levels of wood technology and sophisticated production facilities.

The two upcoming seminars will deal with finishing application techniques and shaper operations. These programs are being designed for production personnel who work directly in the manufacturing process.

Enrollments in each seminar will range from 15-30 depending on the subject and level. Classes and labs will include day and evening sessions and participants will be individually housed in specially prepared University residence hall rooms.

FACULTY AND STAFF MEMBERS RECEIVE 1985 ANNUAL FUND INFORMATION

Earlier this week members of the faculty and staff received a letter and additional information about the "Campaign for Pittsburg State" 1985 Annual Fund. The letters were signed by Faculty and Staff Committee Chairman Bob Noble and a committee member representing one of the various areas of the University.

Faculty and staff are encouraged to participate in this year's Annual Fund by making unrestricted contributions.

Continued next page

ECONOMIC IMPACT SIGNIFICANT

Last week the University released study information about its overall economic impact which last year totaled nearly \$84 million in the Pittsburg area alone.

The economic influences of PSU students, faculty and staff are the focus of a new study by the Kelce School of Business and Economics. University officials have and will continue to use the information to underscore the importance of future cooperative relationships between the University and the area.

Continued pp. 3-4

ANNUAL FUND INFO. Continued

Special purpose donations also are welcome. These may be made to any of the five major 1985 Annual Fund priorities or to other purposes of interest. The five priority items include faculty/staff development, library acquisitions, microcomputers, scholarships and the University's proposed FM Radio station.

This is the first time a University-wide effort has been made to include faculty and staff in the Annual Fund. Committee members are emphasizing the positive affects broader internal participation will have on the level of external support the University receives. To quote the informational flyer which accompanied the letter, "Participation is the key, not the level of your contribution."

Faculty and staff members are asked to make their contributions or pledges by Nov. 2. The Nov. 7 issue of FACULTY NEWS will include information about the progress of the campaign. Anyone who has questions about the program of the Annual Fund are encouraged to contact Bob Noble, any committee member or the Development and Public Relations Office.

FOURTH ANNUAL PRINCIPALS DAY

"Beyond the Falling Sky: Leadership for an Effective School Climate" is the theme for the Fourth Annual Principals Day scheduled for Nov. 15. The School of Education and Curriculum and Administration will host the event. The conference will be held from 8:30 a.m. to 1:15 p.m. in the Sunflower Ballroom of the Student Center. For more information concerning Principals Day contact Paul Parker, Ext. 297.

KANSAS TALENT NEEDED FOR CHAUTAUQUA '85

An old fashioned traveling chautauqua tent show will tour Kansas for the third year in a row. Competition is now open for humanities scholars interested in working on next year's four state tent program. The Chautauqua '85 theme will be "Writers of the Great Plains." Interested applicants should contact the KCH office in Topeka (913) 357-0359. Preliminary applications are due by Oct. 26.

AWI CENTER IS CATALYST FOR ADDITIONAL PROGRAMS

While the University has taken another step toward national prominence with its selection for AWI's National Technical Education Center, the AWI action has already spun off additional benefits which have far-ranging potential.

According to Technology Dean David McFarland, the University has been contacted by some of the nation's largest equipment manufacturers and other trade organizations as a result of the AWI selection.

Several national and international machinery manufacturers are interested in equipping the AWI laboratories at company expense. Other trade organization interest ranges from developing additional seminar concepts and subjects to the potential of initiating new degree programs for woods industry personnel.

Future issues of FACULTY NEWS will update developments relating to the AWI program and related activities.

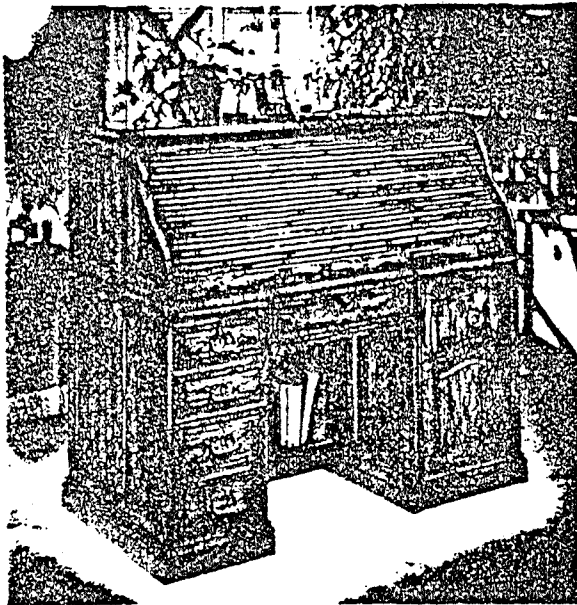
PRESIDENT WILSON HONORED AS OUTSTANDING MICHIGAN STATE ALUM

President Wilson was honored Saturday as a 1984 Outstanding Alumni of the Michigan State University College of Communication Arts and Sciences. Wilson earned his Ph.D in speech at Michigan State in 1966.

Michigan State has selected only 50 College of Communication Arts and Sciences Outstanding Alumni since the award program was initiated in 1972.

Past recipients include: Lee Frischknecht, president of National Public Radio Network; John Meyers, publisher of Sports Illustrated; George Johnston, president of J. Walter Thompson Advertising; and Myra MacPherson, free lance writer and author of the best-seller on Washington political leaders entitled The Power Lovers.

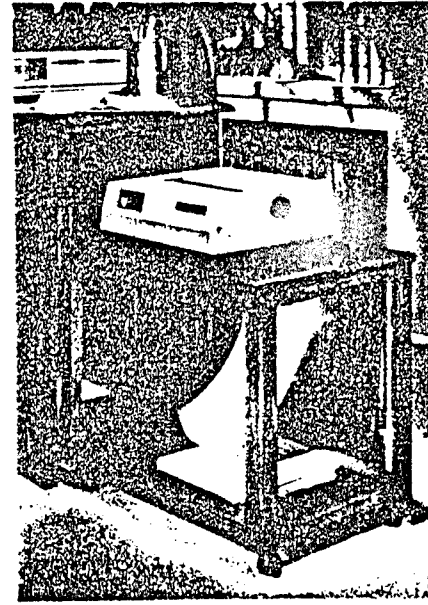




775 Roll Top Computer Desk

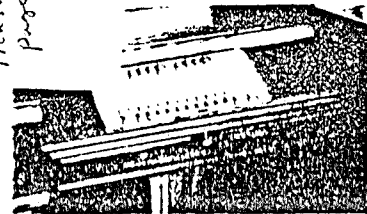


775 Roll Top Computer Desk
Lockable left-facing pedestal complete with pull-out writing surface, three drawers, including one file. File drawer with Pendaflex rods that adjust to either letter or legal and features full extension drawer guides.

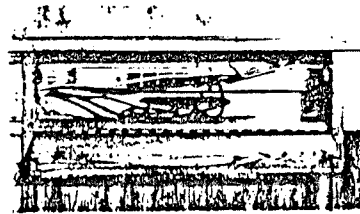


Slide-Out Printer Tray
Slide-out printer tray behind right-facing swing out lockable doors. Printer tray features two shelves on heavy-duty casters for ease of in and out movement. Printer sits conveniently on top shelf when tray slides compactly behind door. The tray will accommodate most of top-selling computer systems, specifically The Apple II, Radio Shack's TR80, and the IBM Personal Computer.

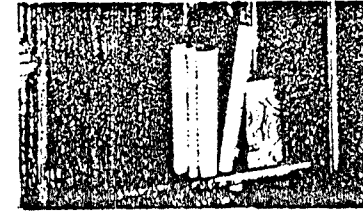
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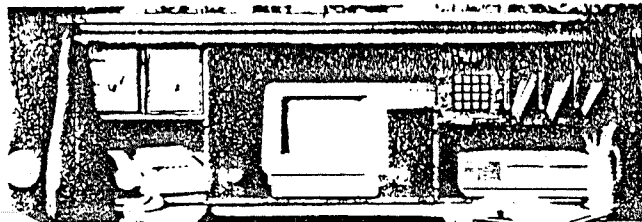
Sliding Panel
Working surface has sliding panel that conceals drop lid keyboard compartment.



Multiple Outlet Strip
Located in concealed electrical compartment on approach side of desk. Outlet strip with ten foot cord, built-in circuit breaker and surge protector.



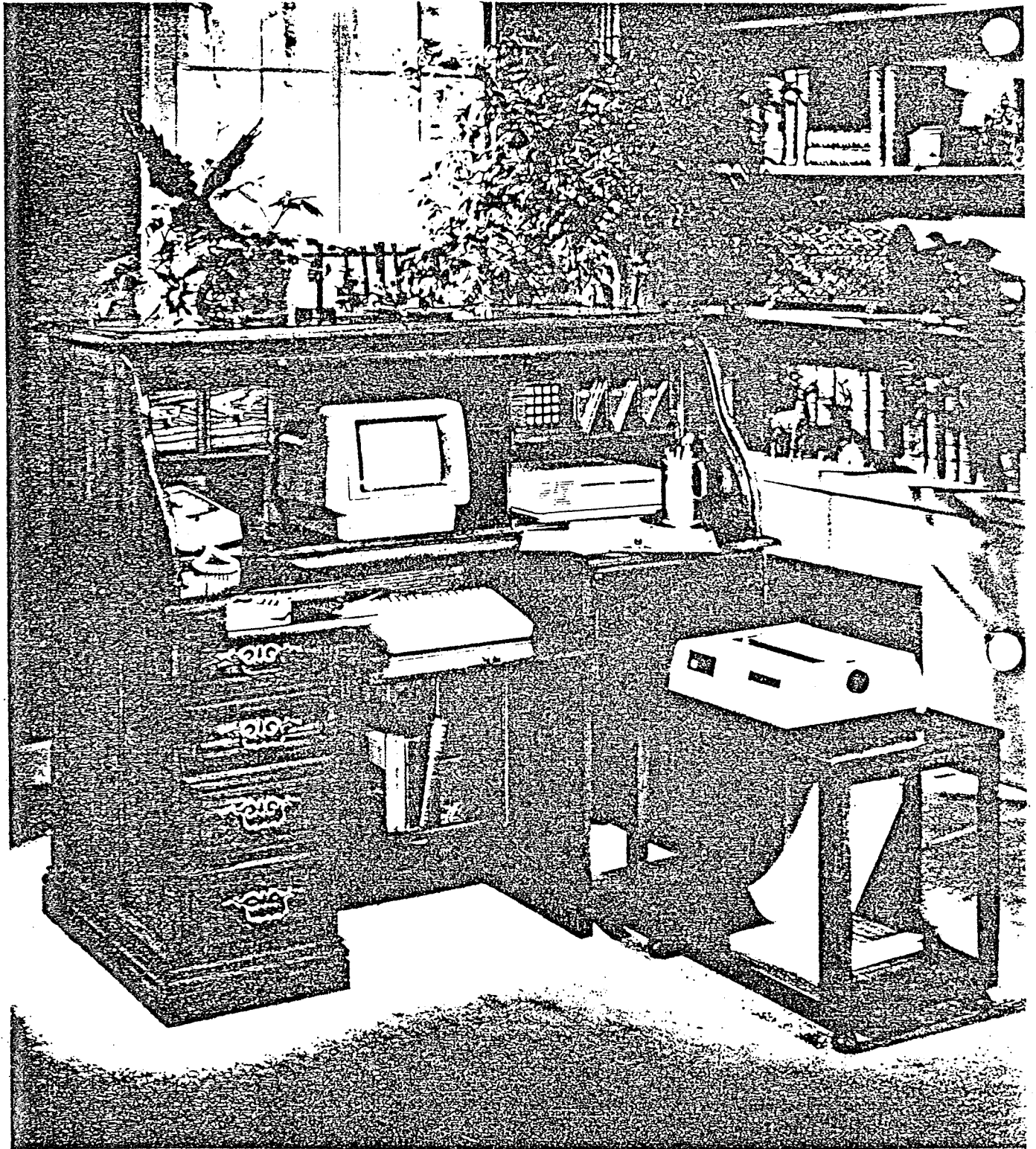
Bookshelf
Attached to modesty panel and provides extra storage space.



775 Roll Top Computer Desk
Pigeon Hole Assembly
From left to right lockable roll top compartment features: telephone compartment with telephone jack, two convenience drawers, space for video display monitor, digital clock, a touch-tone panel with secret code that controls power supply, 6" storage racks for floppies and cassettes, and a built-in disc drive compartment.



BEGINS WITH RIVERSIDE



775 Roll Top Computer Desk
56 x 30 x 50H
Constructed of oak solids and select pecan
veneers in a traditional pecan finish.



COLLEGE OF ENGINEERING
KANSAS STATE UNIVERSITY
CREATING THE CENTERS OF EXCELLENCE BY STATUTE
TESTIMONY
BEFORE THE
COMMUNICATIONS, COMPUTERS AND TECHNOLOGY COMMITTEE
March 3, 1986

We are pleased to submit this progress report on the development of our Center of Excellence, Computer Controlled Automation. The Center will give the State of Kansas additional expertise in this very dynamic area and will assist Kansas industry--present and future--to be more competitive in the international marketplace. It should also be an attraction for industries who are contemplating relocation.

The focus of the Center is the study and use of computers, robots, artificial intelligence, computer controlled machines, flexible manufacturing systems and instrumentation in sensing, controlling, communicating and decision-making processes in engineering design and manufacturing.

The Center's activities are truly interdisciplinary. They involve most of the engineering departments and ultimately may involve computer science, mathematics, physics, chemistry, statistics and agriculture.

Most of the Center's projects are cooperative with industry and some are assisted with funds from the Kansas Department of Economic Development. Some of the major industrial sponsors are the Boeing Military Airplane Company, International Robomation/Intelligence, Caterpillar, Funk Manufacturing, Rockwell International, Motorola and Armco. Some of the current Center research projects are:

Development of robots or articulated mechanisms

Stereoscopic vision for improved control
Application of advanced control concepts
Simplifying dynamic characterization
Optimizing robot-component paths
Development of robot-action simulators
Robots for enhancing the quality of life for the elderly
Generation of 3-D geometric models from 2-D graphic views

(Attachment 3)
3-3-86 Hs. CCT

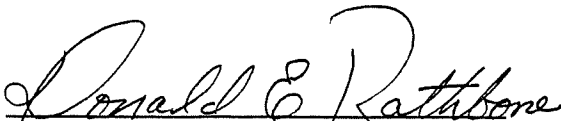
New mathematical methods for chemical process design and synthesis
Computer control of tractor (farm and over-the-road) engines and new, special transmissions
Automatic data handling for avionics to replace human decisions

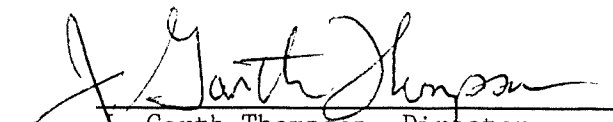
The development of the Center made possible a \$1 million expansion of the College of Engineering computing center by acquiring two high capacity mini-computers. These computers will increase research capabilities in engineering analysis, graphics, design and manufacturing processes. Also, equipment valued at \$0.5 million has been secured for research in flexible manufacturing systems using robots and programable controllers.

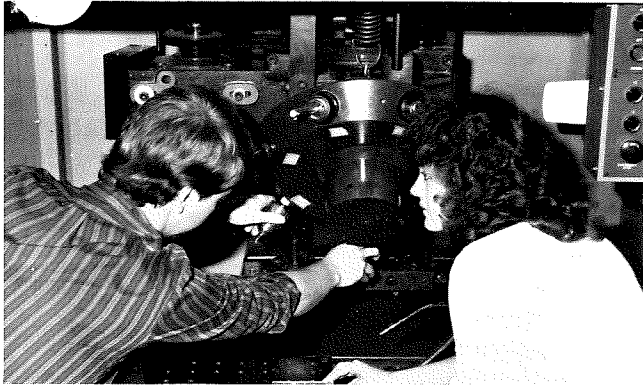
The Centers of Excellence are built around and use the potential of Kansas universities to foster high-technology economic development. This is occurring at the KSU Center. Significant interaction with cooperative industries has already occurred and will continue to develop. The Center is (1) enhancing the ability of in-state industries to be competitive, (2) bringing considerable funding into the State from federal and out-of-state industrial sources, (3) attracting highly qualified faculty and graduate students, and (4) providing a very positive technological environment for industrial development in Kansas. These synergistic qualities are effectively illustrated in a diagram in the attached report. That shows that the Center is having an effect on the University which is far greater and longer lasting than the results attached to the specific projects now in progress.

Questions have been raised about the possible duplication between the WSU and KSU Centers. There is little duplication in the work actually being done. While it is true that the scope denoted by the KSU Center is being emphasized by other engineering colleges of the nation, it represents activity at the forefront of industrial development and research in manufacturing technology and related engineering design. Effective evaluation must consider the actual work being done.

The goal of the WSU Center is to help industry increase productivity through technology transfer and training. It will help industry by providing workshops, short courses, consulting and other forms of training. The KSU Center will assist industry by developing new knowledge, technology and engineering techniques to feed engineering design and manufacturing. The two centers are complementary.


Donald E. Rathbone, Dean
College of Engineering


J. Garth Thompson, Director
Center For Research in
Computer Controlled Automation



Through the Center of Excellence in Computer-Controlled Automation, the world of robotics, industrial automation, computer-aided design and manufacturing, computer systems, and artificial intelligence is coming together in research projects conducted by faculty members within and outside the College of Engineering.

Dr. Donald E. Rathbone, Dean
College of Engineering
Kansas State University

For more information, contact:
Dr. J. Garth Thompson
Department of Mechanical Engineering
Durland Hall
Kansas State University
Manhattan, Kan. 66506
(913) 532-5610

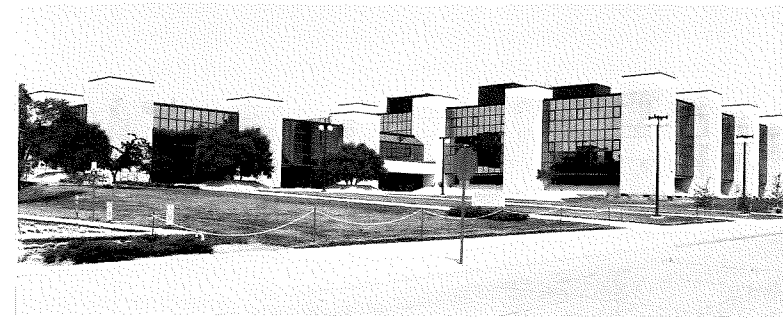
Notice of Nondiscrimination

Kansas State University is committed to a policy of nondiscrimination on the basis of race, sex, national origin, handicap, or other nonmerit reasons, in admissions, educational programs or activities, and employment, all as required by applicable laws and regulations. Responsibility for coordination of compliance efforts and receipt of inquiries, including those concerning Title IX of the Education Amendments of 1972 and Section 504 of the Rehabilitation Act of 1973, has been delegated to Jane D. Rowlett, Ph.D., Director, Affirmative Action Office, 214 Anderson Hall, Kansas State University, Manhattan, Kansas 66506, (913) 532-6220.

College of Engineering
Durland Hall
Manhattan, KS 66506



Center of Excellence
in
Computer-Controlled Automation



College of Engineering
Kansas State University
Manhattan, Kansas

(Attachment 4)
3-3-86 Hs. C.C.T.

High Technology: Industry/University as Research Partners

In 1983, the Governor and Legislature of the State of Kansas provided an initiative for the establishment of Centers of Excellence to promote cooperative research between the state's universities and private companies engaged in development and utilization of high technology.

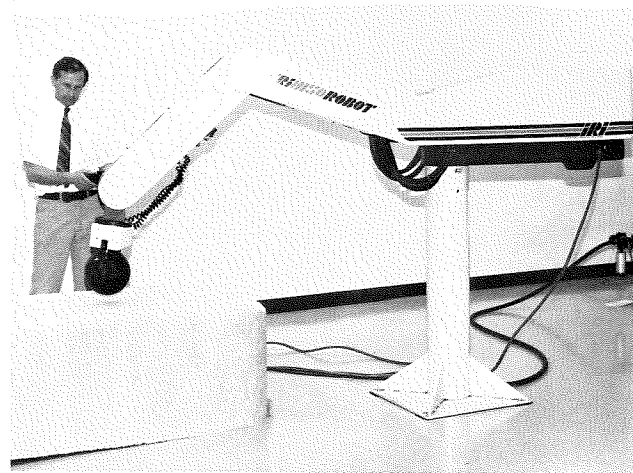
Acting on this initiative, Kansas State University formed a Center of Excellence in Computer-Controlled Automation. The goal of the Center is to provide high-technology research that will help industries expand their services, manufacture new products, and increase productivity.

The Center is located in the College of Engineering. However, other disciplines outside of engineering also will be involved in sponsored or cooperative research with industrial partners.

Industrial Automation to Artificial Intelligence

Forming the nucleus of the Center are faculty members from the Departments of Mechanical Engineering, Industrial Engineering, Electrical and Computer Engineering, Chemical Engineering, Nuclear Engineering, Agricultural Engineering, and Civil Engineering. As more projects are identified, faculty from other engineering departments as well as those from agriculture, computer science, mathematics, physics, chemistry, biology, and statistics will participate.

Faculty members currently attached to the Center have research expertise in areas such as instrumentation, automatic controls, digital systems, robotics, vision systems, computer-aided design and manufacturing, knowledge-based computer systems, and artificial intelligence.



Robotics: The Future is Now

More than 5,000 robots are in use today in U.S. manufacturing plants. By 1990, that figure is expected to climb to 20,000.

Recognizing the growing importance of robotics in the manufacturing process, the Center will be directing a considerable amount of attention to this area. The College of Engineering recently acquired an International Robomation/Intelligence M50 robot. This full-scale industrial robot is serving as a valuable research and teaching tool. Other planned acquisi-

tions will enhance the ability of the College to carry out robotics activities.

The M50 robot can be used in "hands-on" workshops and as an aid in explaining how companies can improve repetitive operations at lower costs, increase reliability and precision in their products, and make changes in product design with greater flexibility.

Some research projects in the Center are:

- Computer control of robotic devices
- Application of intelligent, sighted robots to non-repetitive tasks
- Application of artificial intelligence to industrial automation
- Development of sensors for automated operations
- Computer control of tractor engines
- Flexible manufacturing systems
- Knowledge-based control units

Some results of the recently established robotics program in the College of Engineering are:

- "Robotics in Manufacturing" conference
- Acquisition of a technical library
- Graduate degrees in the robotics area
- Undergraduate courses
- Research publications
- Workshops and seminars

Computers: The Key to High-Technology Research

The College of Engineering has two remote computing centers. The center in Durland Hall, our new engineering building, has been expanded to accommodate two Harris 800 minicomputers and a number of additional terminals. The Harris system will increase teaching capabilities in graphics, computer-aided design, and computer-aided manufacturing. A VAX-750 and three new graphic design stations also will be part of the Durland center.

The Harris computers, along with the VAX-750, will provide researchers with the computer capacity necessary for conducting research projects in the Center for Computer-Controlled Automation.

CENTER OF EXCELLENCE
FOR
RESEARCH
IN
COMPUTER-CONTROLLED AUTOMATION

COLLEGE OF ENGINEERING
KANSAS STATE UNIVERSITY

JANUARY 30, 1986

(Attachment 5)
3-3-86 Ms. CCT

CENTER OF EXCELLENCE
FOR
RESEARCH
IN
COMPUTER CONTROLLED AUTOMATION

COLLEGE OF ENGINEERING

KANSAS STATE UNIVERSITY

JANUARY 30, 1986

PURPOSE

A Center of Excellence has been established at Kansas State University to conduct research and to develop advanced development methods in computer-controlled automation which will give the State of Kansas additional expertise in this high technology area and which will help Kansas industry --- present and future --- be more competitive in the international marketplace. The Center should also be an attraction for new industries and for industries who are contemplating relocations.

The focus of the center is the use and study of computers, robotics, artificial intelligence, numerically controlled machines, flexible manufacturing systems and instrumentation in the sensing, controlling, communicating and decision making processes in engineering design and manufacturing. The Center brings together Kansas industries and researchers in mutually beneficial projects.

BACKGROUND

The Center was established from a 1983 initiative by Governor Carlin and the Kansas legislature which provided for the establishment of Centers of Excellence at Kansas State University, Wichita State University and the University of Kansas to promote the development and utilization of high technology. The Center's research projects are supported by matching funds from industry.

Faculty from mechanical engineering, industrial engineering, electrical and computer engineering, chemical engineering and agricultural engineering are currently involved in the center's research projects. As more projects are identified, faculty from other engineering departments and from computer science, mathematics, physics, chemistry, agriculture and statistics are expected to participate.

ACTIVITIES

Some of the research projects being conducted through the Center include:

- .stereoscopic vision for robot control
- .application of advanced control concepts to articulated mechanisms
- .single reference frame dynamics and minimum time optimal path planning for robotic manipulators
- .semi-automatic generation of 3-D geometric models from multiple 2-D views
- .automated generation of robot simulators
- .optimal structures in process design and synthesis
- .robotics for enhancing the personal autonomy of the elderly in non-medical long-term care facilities
- .optically coupled tactile sensor array for robotics
- .computer control of tractor engines and continuously variable transmissions
- .computer modeling of the heat transfer in a powershift transmission clutch under slippage
- .characteristics of real time knowledge based system structures
- .integration of time-varying data into knowledge-based systems for avionics applications.

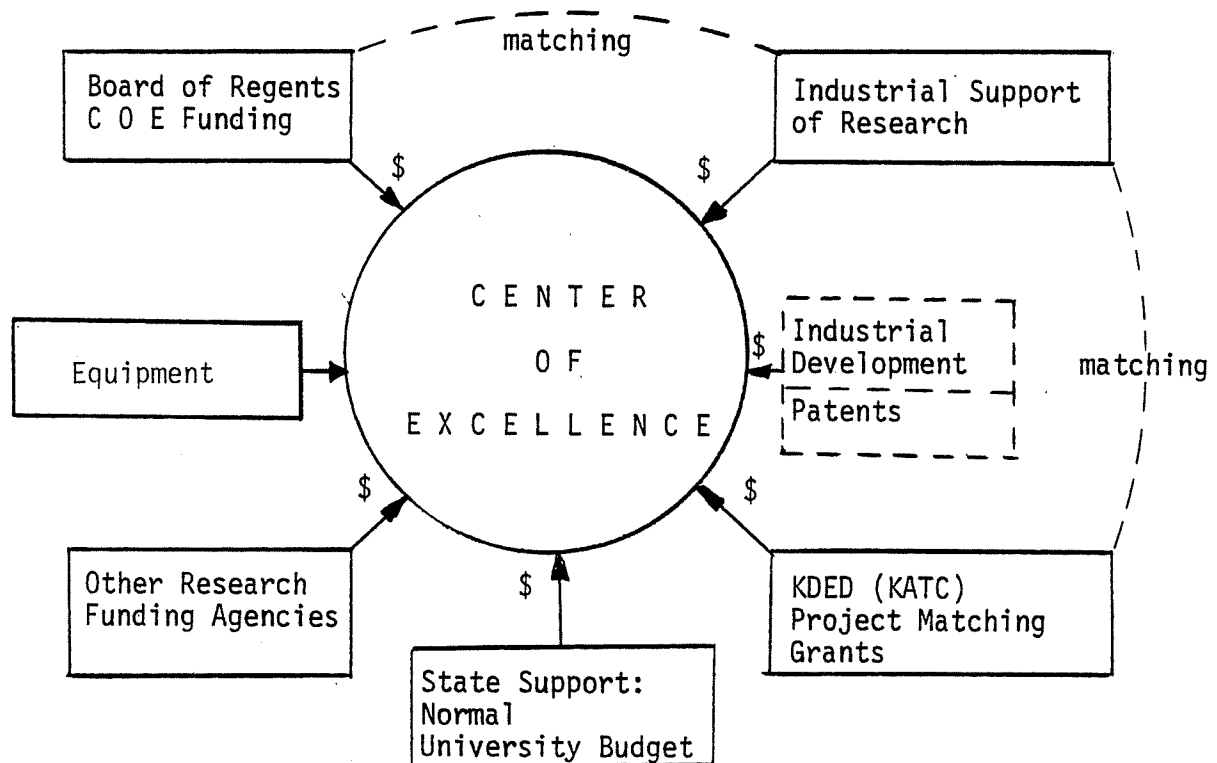
Computers are an integral part of high-technology research at KSU. A \$1 million expansion of the computing center in Durland Hall has been completed. Its Harris 800 mini-computers are being used to increase research capability in graphics, computer-aided design and computer-aided manufacturing. New graphic design work stations are also being added.

The Center is also hoping to add 0.5 million dollars in flexible manufacturing assembly systems and related robots and program controllers.

Detailed descriptions of some of the projects are given in Appendix A.

SYNERGISM

The intention of the Governor and the Legislature in establishing the Centers of Excellence was to utilize the potential of our Universities to foster high technology economic development in the State of Kansas. From the above descriptions of the cooperative industry and university research projects, it is clear that the intended economic development is beginning to occur. The Center is (1) enhancing the ability of instate industries to be competitive nationally and internationally, (2) bringing considerable funding into the State from federal agencies and out-of-state companies that is being used to attract additional faculty and graduate students and to provide support services and personnel, and (3) providing a very positive technological environment that should be very attractive to firms that are considering Kansas as a possible location. The figure below illustrates the relationship of the Center and the funding provided through the Board of Regents to other research funding agencies and sources.



The establishment of the Center at KSU is also having an effect at the University which will be far greater and longer lasting than the effects of the specific projects now in progress.

Research in computer-controlled automation has been going on at Kansas State University for many years. In fact, attempts had been made to expand this area before the establishment of the Center of Excellence. Progress

made in the Mechanical Engineering Department as a result of the establishment of the Center will illustrate the effect that is occurring in other departments as well.

Mechanical Engineering has been trying to hire additional faculty members in the computer control area for sometime. Positions have been offered to qualified individuals during that time, but none had accepted the offer. As a direct result of the establishment of the Center of Excellence, one new professor from Tulane University was added last fall. Another, from Cornell University, has accepted a position for next fall. Three more highly qualified candidates are being evaluated for another position to be filled within the year. A five year grant from the Exxon Foundation to provide salary enhancement for non-tenured faculty has been a key factor in attracting these new professors. The question remains if they can be retained once the grant runs out without substantial improvement in the salary and fringe benefit allocation from the State.

In the ten years prior to the establishment of the Center, the Mechanical Engineering Department brought in about \$120,000 for sponsored research in the computer control area. In the three years since the establishment of the Center, the department has brought in over \$660,000 in this area in addition to the support provided to it by the Center. Most of the funding since the establishment of the Center has been for cooperative projects with industry.

In the ten years prior to the establishment of the Center there were 9 M.S. and 2 Ph.D. students in this area in Mechanical Engineering. By the end of this academic year 9 M.S. students will complete their degrees in this area since the establishment of the Center. In addition there are 7 M.S. and 5 Ph.D. students in progress. Four of the five Ph.D. students came here specifically to work on projects in the Center. Three came from other U.S. universities.

With the addition of quality faculty members and graduate students, with increased recognition in the industrial community throughout the nation, and with the improvement in facilities acquired through the Center, the State of Kansas has greatly benefited from its investment in the Centers of Excellence and will continue to do so.

RELATIONSHIP TO WSU

Wichita State University has established a Center of Excellence in Productivity Enhancement. The goal of the WSU Center is to help industry increase productivity through technology transfer and training while the goal of the KSU Center is research. WSU will help industry by providing workshops, short courses, consulting and other forms of training to assist a company in the selection and application of state-of-the-art equipment and methods. The KSU Center will help industry by developing new techniques and technology which apply to engineering design and manufacturing. The two Centers do not overlap very much and are, in fact, quite complimentary.

APPENDIX A

In order to better portray the activities of the Center, a few of the projects will be discussed.

STEREOSCOPIC VISION FOR ROBOT CONTROL

Good progress has been made in the research on stereoscopic vision for robot guidance and control. A stereoscopic vision algorithm has been developed based on a simple model rather than rigorous mathematical relationships. The model is calibrated to the specific dual camera arrangement. A simple calibration device was devised. Using the simple model, the computer is able to determine the location of objects in three dimensions in 300 ms., including all processing of both camera images. This computation time is fast enough so that the cameras can be attached to a robot and can provide control signals so that the robot can acquire moving objects. The accuracy of the system is inversely related to the field of view so that the object location accuracy gets better as the system converges on the object. The system has been successfully demonstrated on a five axis robot.

APPLICATION OF ADVANCED CONTROL CONCEPTS TO ARTICULATED MECHANISMS

The control of articulated mechanisms is a complex task. Hierarchical control structures are proposed where higher levels in the hierarchy utilize sensory and command inputs to obtain overall motion objectives and the lower levels in the hierarchy utilize information from the higher levels and from sensors to control the actuators of the individual articulated parts.

The advanced control concepts include model referenced adaptive control, feed-forward compensation, and recursive rational B-spline representation of articulated link motion.

One objective of this advanced controls research is to develop a suitable model-referenced adaptive control (MRAC) strategy for articulated mechanisms, and to compare the response characteristics and the computational requirements of the MRAC strategy to a conventional control strategy. The first task is to develop dynamic models of manipulators. A three degree of freedom model representing the dynamic motion of the torso, shoulder, and elbow joints of a 5-axis robot has been developed for use in this study. Also, a complete dynamic model of a six legged walking mechanism has been developed. The second task is to develop a computer simulation of the dynamic models and to implement conventional control strategies. Simulations of both systems have been developed and implemented. These simulations provide the response characteristics and computational requirements for the conventional control as a basis of comparison for the proposed MRAC strategy. The third task is the development of model-referenced control strategies. Prior published work has not adequately examined the effect of the interaction of simultaneous motion of several axes on the stability of model-referenced adaptive

control strategies. Our preliminary evaluations show the MRAC strategies to be stable as each joint moves independently, but they become unstable when the axes move together. An important result of the work will be an evaluation of suitability of adaptive control strategies in multiple axis motion. Another important task is to develop simplified adaptive control strategies. Adaptive control strategies reported in the technical literature require too much computation to be implemented in real time in computers that are of reasonable size and speed for mechanism control purposes.

Articulated mechanisms include, among other things, robotic manipulators and the legs of walking machines. Another purpose of the advanced controls research project is to develop a mathematical modeling concept to describe smooth and graceful paths for these devices. In particular, the modeling concept should define the path with a prescribed degree of smoothness extending from the present position through future points which are changed and added to as the motion proceeds. Changing and adding future points on the path may be the result of machine vision or other sensory inputs or they may represent on-line commands from an operator. Rational B-spline mathematics is being used in this work. New techniques to recursively generate the spline functions have been developed. The rational B-spline is desirable for these applications since the degree of smoothness can be controlled by the order of the spline basis, spline functions have local support, spline functions are invariant through homogeneous transformations, and conic sections can be exactly represented in rational B-splines. The recursive spline is being evaluated as a tool for more intelligent control of robotic manipulator motion and for the definition of changing gates for walking machines.

The complete dynamic model of an articulated hexapod has been developed. The model has been represented in a computer simulation and various portions of the advanced control concepts have been implemented. Tests are being conducted with the simulation to evaluate and extend the control concepts. A more flexible articulated hexapod is being designed with an improved leg mechanism. Dynamic models and simulation algorithms are being developed to evaluate the performance of the more flexible structure.

SINGLE REFERENCE FRAME DYNAMICS AND MINIMUM TIME OPTIMAL PATH PLANNING FOR ROBOTIC MANIPULATORS

The description of robot dynamics is a difficult problem. Due to the use of multiple reference frames which translate and rotate, the inertia seen by any joint is an instantaneous function of the arm configuration. It has been determined that if the positions of all link ends are described with respect to one global or base coordinate system and the dynamic equations were written only in terms of cartesian coordinates with respect to the base coordinate system then a simple set of dynamic equations will be produced. There will be three times as many equations of motion, however these equations possess a constant mass matrix and easily allow the incorporation of arm compliance into the equations of motion. Also, by knowing the joint locations, the joint variables (rotation or displacement) can be easily recovered.

Due to constraints of construction, robot arms are not free to move in all directions. It is necessary to add constraints to the problem in order to obtain the true motion of the arm. These constraints are kinematic in nature, however the kinematic constraints must be expressed in terms of the global coordinate system as opposed to the local coordinate systems in which arm kinematics has been described in the past.

At the present time a kinematic formulation of the arm configuration has been developed. The next step will be to perform simulations of robot arms using the new dynamic formulation.

There is an added benefit of this work besides a convenient dynamic formulation. The standard method for writing the equations of motion for serial manipulators in terms of joint variables produces a description which consists of thousands of terms. Simplified approximate equations can be obtained by placing limits on the joint velocities for the purpose of determining control strategies. For high speed flexible links the same approximations do not hold. If the arm motion can be described by a set of equations which possess a tractable form then the full set of equations may be used for deriving control strategies and improved arm models.

The determination of the minimum-time paths of a robotic manipulator between two points is a difficult problem. The difficulty stems from the complicated non-linear dynamics of the arm itself and the minimum-time formulation adds another set of non-linear equations which must be solved. The motion of compliant links is described in terms of either minimum-time equations or at least some type of optimal trajectory. In the past the optimal control was found through a gradient search technique. This research concerns the development of a new technique for determining the minimum time path of a manipulator. The procedure under investigation involves modeling the time domain and the dynamic equations of motion with cubic spline finite elements. The element itself is able to stretch or shrink in order to satisfy the minimum time criterion. The advantage of this approach is that the minimum time motion results from a direct iterative solution as opposed to gradient optimization techniques used in the past. This minimum time modeling procedure and the new dynamic formulation are expected to produce a significant improvement in computational time as compared to past methods.

SEMI-AUTOMATIC GENERATION OF 3-D GEOMETRIC MODELS FROM MULTIPLE 2-D VIEWS

This report describes a project for the semi-automatic generation of 3-D geometric models from multiple 2-D views. When a mechanical part is designed the traditional procedure has been for a trained draftsman to prepare drawings of the part which include dimensions and notes by which a machinist is guided in making the part. In addition to the usual orthogonal views the drawings may include auxiliary views, cuts, sections, profiles and various projections. Historically, design drafting was done by hand on paper, vellum, mylar or other media. In recent years much of the design drafting has been done on 2D computer aided design drafting (CADD) systems. The use of 2D CADD systems did not fundamentally alter the

design-drafting-manufacturing process. The CADD system enabled the draftsman to more quickly and more accurately produce the drawings and added the capability to make modifications in one or more views and quickly produce another set of drawings which greatly increased the efficiency of the design drafting process. With the emerging development of 3D CADD capabilities it is anticipated that a fundamental change in the design drafting manufacturing process will occur. Future designers will create 3D geometric models of parts on a 3D CADD system. Once the 3D model is created it may be "viewed" as a 3D object in any orientation on the CADD system screen or any number of 2D views may be drawn on the CADD system plotter. The part can even be "viewed" in relation to other parts and structures to determine fit and function of assemblies and systems. The availability of the 3D geometric model also makes it very easy for the designer to perform a large variety of computer aided analysis evaluations. Ultimately, it is expected that parts will be manufactured by machines which are computer controlled using data derived directly from the 3D geometric models, thus eliminating the need for drawings altogether.

Since the design of most mechanical devices is evolutionary, ie. a new device is a modification of a prior design, and many parts must fit into existing assemblies and structures it is essential to the transition from the traditional design process to the future 3D CADD process that an efficient means be provided to convert existing designs based on 2D views into 3D geometric models. Scanning systems are commercially available which will convert drawings into 2D CADD data. The 2D CADD data produced by these scanners is quite coarse and requires significant editing to produce usable 2D CADD data sets. The specific need is for an efficient procedure by which 2D CADD data sets representing multiple 2D views of the same object can be converted into a single 3D geometric model of the object. If the 2D CADD data sets are produced by scanning drawings it would be desirable to be able to produce suitable 3D models without performing extensive pre-editing of the 2D data.

The primary problem of developing a mathematical basis for performing 2D to 3D conversion has been solved. The task of writing and evaluating computer algorithms to perform the required mathematical operations and solve the resulting equations is underway. The anticipated outcome is a set of computer algorithms which interactively and semi-automatically perform the 2D to 3D conversion to an appropriate geometric model form.