ENGINEERING DESIGN GRAPHICS JOURNAL

FALL 1971 VOLUME 35 NUMBER 3 SERIES 105

MATTHEW McNEARY
Distinguished Service Award - 1971

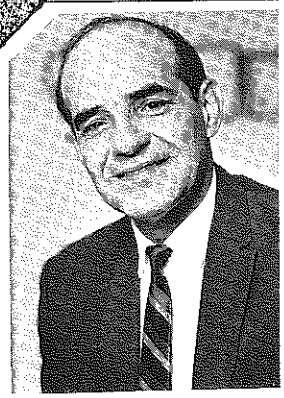
Published by the Engineering Design Graphics Division, American Society for Engineering Education

ENGINEERING DESIGN GRAPHICS JOURNAL

Fall 1971 Volume 35 Number 3 Series 105

Published for teachers and others interested in Engineering Graphics and Design. It is published three times per year -- Fall, Winter and Spring. The subscription rates are: $2.00 per year in the United States (single copies 75¢). Foreign rates upon request.

CONTENTS



Teaching Really Matters

AL ROMEO
Associate Editor

The theme of the 1971 Annual Meeting of the American Society for Engineering Education was "Teaching Really Matters". The topic of a particular session (which was repeated several times) was "Learning Really Happens When Teaching Really Matters".

Many of you may not have had the opportunity to attend this or others of the many excellent sessions which were concerned with effective teaching. Therefore, you should be made aware of the many possibilities available to upgrade the quality of instruction. This is not to suggest that the members of the Engineering Design Graphics Division of ASEE are deficient in their teaching capability. On the contrary, the history of the Division is replete with high caliber teachers and instruction. Our traditions require that we maintain, if not surpass, our forebears in instructional techniques. Could I challenge you to a self-examination and a self-evaluation of your classroom performance ? Furthermore, could you be encouraged to take one further step and, at least, try one new teaching technique or method, or approach to a subject?

Finally, could I prevail upon you to write a paper about your experience for publication in the Journal? It need not be long or formal, even a letter to the Editor would be encouraged if you shy away from the more formal types of papers. Your experiences, shared with your colleagues, at your own or other institutions, could encourage others to experiment and, subsequently, could lead to a revitalization of our profession, in addition to a wider acceptance of the objectives of our Division.

If you are willing to accept these challenges, the following questions might be helpful to you in the process.

Have you ever confronted yourself with the question of whether teaching really matters to you? Have you thought seriously about the teaching process ? Are you teaching your courses using the same techniques and methods which were used when you were a student? Have you tried any innovative techniques or conducted any educational experiments? Did you know that teachers are being criticized because the new educational methods, techniques and technology are not being generally used? Furthermore, did you know that the efficiency of the educational process in the last century has decreased rather than increased, despite the vast research in education and the substantial developments in educational tools and technology? What goals will you set for yourself and your students to assure that teaching really does matter to you?

(Editor's note: Comments on the above editorial are invited and should be addressed to Al Romeo at Ohio State University)

IN THE DIVISION

DISTINGUISHED SERVICE AWARD

The Distinguished Service Award is the highest award that can be given a member of our Division. It is reserved for a person of excellent professional stature. The award will not be given except on those occasions when nominees meet these high standards.

The person receiving this award must be outstanding as a teacher, one who has been inspirational to his students. He must have been instrumental in developing curricula and other educational activities beneficial to the teaching of graphics. He must have made scholarly contributions to literature, and have been of service to the Engineering Design Graphics Division.

Such a man has been nominated for the 1971 Distinguished Service Award.

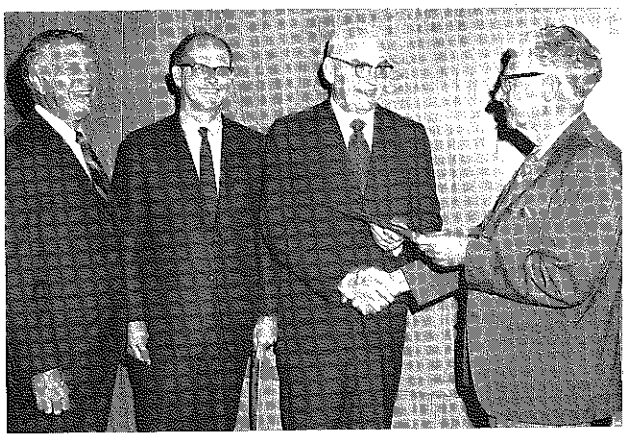
He was born in Philadelphia where he received his early education. A year after graduation from high school he entered Penn State University where he received his degree ir Civil Engineering. After three years of work in industry, he returned to Penn State as an instructor for three years before beginning a career that spans 35 years with the University of Maine. He earned his Master's Degree and worked for four years as an engineer with the Eastern Corporation during this time.

He has risen through the ranks from instructor to Professor and head of the Department of General Engineering.

The recipient was the chairman of the Engineering Graphics Division in 1962. .He is a recognized author in the field of graphics. He has made numerous contributions to our Division over a period of many years.

He is married and the father of four children.

The recipient of the 1971 Distinguished Service Award is Matthew McNeary.



Earl Black (right) presents the Distinguished Service Award to Matthew McNeary as Vice-Chairman Percy Hill (left) and Chairman Jim Earl look on.

CITATION

For the year 1971, the Engineering Design Graphics Division of ASEE has the privilege to honor Professor Matthew McNeary of the University of Maine as its Distinguished Service Award recipient.

Matthew McNeary has most competently served both our division and the parent society. For the Engineering Design Graphics Division, he has participated on many key committees and has held several elected positions including the chairmanship of the division. For the parent ASEE society, he served as General Chairman of the annual June meeting at the University of Maine and has since shared this valuable experience as a member of the annual meeting planning committee.

In further fulfillment of the requirements of the award, Matthew McNeary has effectively devoted his many talents to the enhancement of engineering education. As chairman of the General Engineering Department at Orono, Maine, Matthew was one of the select few who pioneered our efforts to promote the engineering education experience that would provide a more creative engineering graduate. To further this goal, he has authored several workbooks and journal articles on Creative Design Projects and has co-authored with Warner an outstanding text on Descriptive Geometry.

Above all, however, we honor Matthew McNeary this June 1971 for the friendship and brotherhood which he has nurtured within the Engineering Design Graphics Division.

Distinguished Service Award Committee

Eugene Pare
Earl Black
Steve Slaby

Division Officers

James Earle, chairman
Percy Hill, vice-chairman
Gordon Sanders, secretary

REPLY

It is a distinct honor to receive the Distinguished Service Award, and I am most grateful to the members of the Engineering Design Graphics Division for their kindness.

As one contemplates a lifetime of activity in the affairs of this Division he thinks first of the friendships he has made with colleagues from all corners of the nation. This is prized above all. Then, too, the annual June pilgrimages to educational centers to diverse parts of the country has been eventful and instructive for one who is tucked away in the far northeast. All these things will be remembered.

It is difficult to resist the temptation to make some suggestions that have proved to be good for me and our department at Maine. Some of these things I have said publicly, and I ask your forbearance if you have heard them before. We operate as a non-degree granting Department of General Engineering in the College of Technology at Maine with the authority to offer freshman engineering courses and other courses (e. g. computer programming, engineering economics, etc.) common to engineering curricula and not the distinct province of a degree-granting department. Engineering graphics or, as we call it, "Introduction to Engineering Design" is still our largest business, but only one of our enterprises. This has given us greater scope and security as a department. If you are offered the opportunity to teach computer programming in your department, take it. We have been teaching such a course to all sophomore engineers for five years now, and we have fully enjoyed it. We do not attempt to relate it directly ot graphics, but use a wide range of numerical methods and solve real engineering problems. In retrospect I would have regretted passing up the chance to get into this new field because it was inconvenient, a natural inclination.

I feel a little like the World War II soldier who wrote "Kilroy was here" on walls and board fences all over Europe. We all like to be remembered. The inclusion of my name among the Distinguished Service Award winners indicates that I was, indeed, here among good friends and dedicated teachers.

NOMINATIONS

1972-1973

The Nominating Committee for the Engineering Design Graphics Committee (ASEE) submits the following nominations for the Division for the year 1972-1973:

VICE-CHAIRMAN

KENNETH E. BOTKIN
Purdue University

Received his BSME at Purdue University in 1948; MS in Industrial Engineering in 1954. Joined the Purdue faculty as an instructor in 1948 and is currently the chairman of Engineering Graphics. Professor Botkin has been a member of ASEE and the Engineering Design Graphics Division for more than twenty years.

He served as the Advertising Manager of the Engineering Design Graphics Journal during 1966-1969 and is presently the Division Editor for the ASEE Journal, Engineering Education.

He is active in the affairs of the faculty of Purdue, as well as his community and his church. He is also a member of ASME, AAUP, PSND, Elks and Rotary.

KLAUS E. KRONER
University of Massachusetts

Began his teaching career in January of 1950 at New York University as an instructor of Engineering Drawing and Descriptive Geometry. Held a similar position at the University of Maine between 1955 and 1957. At present he is an Associate Professor in the Civil Engineering Department.

Professor Kroner has been a member of ASEE since 1953 and has held several positions in the Engineering Design Graphics Division, such as membership on Committee on Aims, Scope and Status (1960-63), Teaching Techniques Committee (1960-1970), Educational Relations Committee (1962-1969; chairman 1966-1969), Journal Advertising Manager (1969-1972); Host and Program Coordinator for the Mid-Year meeting of 1970.

Other activities include membership on an NSF sponsored Engineering Graphics Course Content Study in 1962; participation in three summer graphics conferences; made educational innovations such as overhead projector transparencies for teaching Descriptive Geometry and computer-aided supplementary teaching aids; publication of articles in the Division's Journal other periodicals; chairman of the New England Engineering Graphics Association (1965-1966).

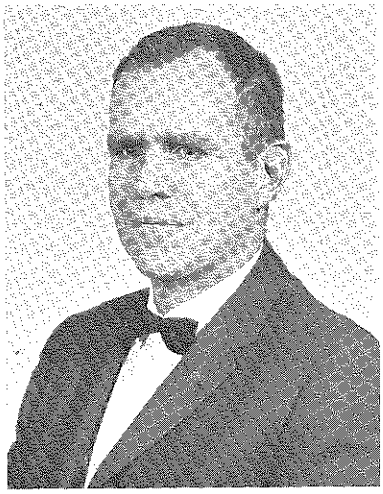
SECRETARY

R. WALLACE REYNOLDS
California State Polytechnic Institute

Received his BS degree from California State College (California, Oennsylvania) in 1940 and MS degree from Purdue University in 1946. He worked as a draftsman, technical writer and engineer between 1841 and 1946. He was an instructor of drafting at Purdue in 1946; Assistant Professor and chairman of Engineering Drawing at Washington & Jefferson College from 1946 to 1947; University of Santa Clara, 1947-1948; West Coast University, 1949-1952; Cal Poly at San

Professor Reynolds has been a member of ASEE since 1947 and has been a member of several committees in the Division and chairman of the Industrial Relations Committee since 1967. He has been the secretary of the Pacific Southwest Section of ASEE since 1969. Other professional credits are listed in Who's Who in the West and Dictionary of International Biography.

ROBERT D. LaRUE
Ohio State University



Received his BS and MS degrees in Mechanical Engineering at the University of Idaho and is a Registered Professional Engineer.

Professor LaRue has been an active member of the Engineering Design Graphics Division of ASEE since 1956. He was the Circulation Manager and Treasurer of the Journal of Engineering Graphics and has served on many of the Division's committees. He is currently the Co-chairman of the Design Display as well as Co-chairman of the Self-Study Committee. Bob has also been an active member of the Computer Graphics Committee for several years.

His present position is that of Professor of Engineering Graphics at Ohio State University.

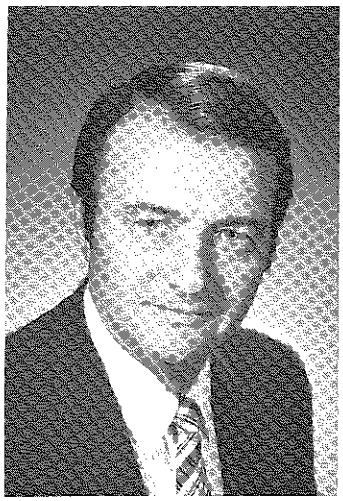
DIRECTOR (5 years)

JOHN R. BARYLSKI
Southeastern Massachusetts University

John is an associate professor at the Southeastern Massachusetts University. He has been an active member of the Engineering Design Graphics Division for many years. After spending eleven years in many areas of industry, he became the senior instructor in charge of the training shop for the United States Navy Department. After World War II he returned to industry for two years before joining the staff at SMU.

He has served on many committees in the Division, including the Educational Relations Committee, Awards Committee and the Design Display Committee (chairman in 1968). During the past four years he has been responsible for the publicity for the Annual Creative Design Display. He is also a member of the Self-Study Committee. John has also been a member of the New England Graphics Association and the Massachusetts Technical Drawing Teachers Association.

C. GORDON SANDERS
Iowa State University

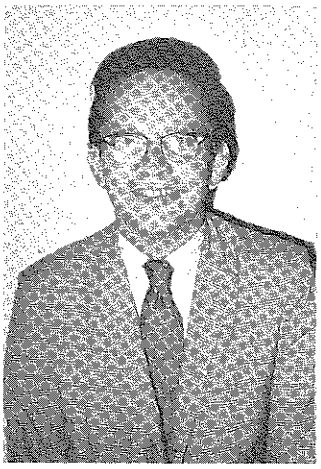


Professor Sanders received his bachelor's degree at the University of Northern Iowa in 1947 and his master's degree at the University of Northern Colorado in 1949. After teaching in high school, he taught at the University of Northern Colorado before joining the staff at Iowa State where he is, presently, the chairman of the Despartment of Engineering Graphics. He has spent several years as a draftsman, designer and methods engineer in industry. He is the co-author of two graphics problem books.

Gordon has been an active member of the Engineering Design Graphics Division, ASEE, serving as a member of the Teaching Techniques Committee, Division Editor for the ASEE Journal and Secretary of the Division. He is a member of Delta Phi Delta, Phi Delta Kappa and was Engineering Professor of the year at I. S. U. for 1967-1968.

ADVERTISING MANAGER, EDGJ

RALPH S. BLANCHARD Jr.
Northeastern University



An Associate Professor of Mechanical Engineering and Executive Officer of the Mechanical Engineering Department at Northeastern University. Ralph graduated from the University of New Hampshire with the BSME and earned the MSME at Northeastern University. He has been a member of ASEE for twenty years and is, at present, the chairman of the Judging Division of the Creative Engineering Design Display Committee. He is the past Arrangements Chairman for the National Vibrations Conference sponsored by the ASME. He is a former member of the Executive Committee, Boston Section and past chairman of Region One College Relations Committee, ASME. He is presently teaching courses in the areas of Design, Vibrations and Computer to juniors, seniors and graduate students. He is a consultant to the Liberty Mutual Insurance Company and Poloroid.

CLARENCE E. HALL
Louisiana State University

Received a BS in Agriculture, a BS in Physics and a Ph. D. from East Texas State University and an MS in Education and Engineering Graphics from the University of Tennessee. He has been a member of the Engineering Graphics Department of LSU since 1966 where he is an Associate Professor and Department Chairman. Dr. Hall has extensive industrial experience and has taught in the Texas Public Schools, University of Nebraska, University of Tennessee and Texarkana College. He holds membership in Phi Delta Kappa, Iota Lambda Sigma and ASEE. He is the author of technical articles and Engineering Graphics Design and Analysis Problems.

SUMMER SCHOOL
1972

Through this summer school, we hope to help members of our Division, and other Divisions, become involved in this subject area. It is obvious that in 2 or 3 days one cannot become sophisticated experts, but we believe that those who attend will go home with a better appreciation and more interest in this important topic. Also, card-deck copies of the programs used in the course will be available for the attendees to take home.

The Engineering Design Graphics Division is preparing to hold a summer school on Computer Graphics, next spring. The program will provide a course for those with no prior experience in computer programming or computer graphics. An alternate course will be provided for those with at least some experience with Fortran programming. The program will be held during the 2 or 3 days following the Annual ASEE Meeting at Texas Tech University in June of 1972.

Questionnaires have been prepared and sent to the membership of the Division. Hopefully, most of these have been returned so that the Summer School Committee may be in a position to plan the sessions for the benefit of all members. Those who have not received one of these questionnaires, due to the lack of mailing information, or those who have questions about the summer school, may write to

Professor Edward V. Mochel
School of Engineering & Applied Science
University of Virginia
Charlottesville, Virginia
22901

EDWARD V. MOCHEL, chairman
Summer School Committee

OFFICERS and COMMITTEES
of the
ENGINEERING DESIGN GRAPHICS DIVISION, ASEE

Division officers and committees for the 1971-72 academic year are listed below. These are the people who set programs, establish policy, and generally provide Division leadership within ASEE. Wherever possible the scope and purpose of the committee has been included to acquaint the membership with their objectives for the year.

Anyone who may be interested in communicating with a committee concerning ideas, issues, or to serve as a member, please write to the chairman of that committee, as listed. Almost all committees of the Division can use new people with ideas and who wish to become actively involved.

EXECUTIVE COMMITTEE

PERCY H. HILL (Chairman) (1 yr.)
Tufts University
Medford, Massachusetts
617-628-5000, ext. 438

WILLIAM B. ROGERS (Vice-Chairman) (1 yr.)
Virginia Polytechnic Institute
Blacksburg, Virginia

CLAUDE Z. WESTFALL (Secretary) (1 yr.)
University of Maine
Orono, Maine

A. P. McDONALD (Treasurer) (1 yr.)
Rice University
Houston, Texas

WILLIAM S. CHALK (Director) (5 yrs.)
University of Washington
Seattle, Washington

EDWARD V. MOCHEL (Director) (5 yrs.)
University of Virginia
Charlottesville, Virginia

ROLAND O. BYERS (Director) (5 yrs.)
University of Idaho
Moscow, Idaho

FRANK OPPENHEIMER (Director) (5 yrs.)
Gramercy Guild Group, Inc.
Denver, Colorado

JAMES H. EARLE (1 yr.)
(Senior Council Member)
Texas A&M University
College Station, Texas

KENNETH E. BOTKIN (Division Editor) (3 yrs.)
Purdue University
West Lafayette, Indiana

BORAH L. KREIMER (Editor, EDGJ) (3 yrs.)
Northeastern University
Boston, Massachusetts

KLAUS E. KRONER (Adv. Mgr., EDGJ) (3 yrs.)
University of Massachusetts
Amherst, Massachusetts

ROBERT J. CHRISTENSON (3 yrs.)
(Treasurer & Circulation Mgr., EDGJ)
General Motors Institute
Flint, Michigan

RESOLUTIONS COMMITTEE

(The purpose of the Resolutions Committee is to prepare formal resolutions as may be deemed desirable by the Chairman for approval by the membership of the Division. The scope of the Resolutions Committee is limited to non-technical matters such as acknowledgement of hospitalities extended and/or services rendered to the Division and its members. These resolutions are normally presented at a dinner meeting of the Division.)

IVAN L. HILL (Chairman)
Illinois Institute of Technology
Chicago, Illinois

B. LEIGHTON WELLMAN
Worcester Polytechnic Institute

FRANK OPPENHEIMER
Gramercy Guild Group, Inc.

CHAPLAIN

WILLIAM E. STREET
Louisiana State University
Baton Rouge, Louisiana

AWARDS COMMITTEE

ROLAND O. BYERS (Co-Chairman)
University of Idaho
Moscow, Idaho

PHILIP H. BRACH (Co-Chairman)
Washington Technical Institute
Washington, D. C.

JOHN R. BARYLSKI
Southeastern Massachusetts University

GEORGE COWELL
University of South Florida

EDWARD M. GRISWOLD
Cooper Union

KERMIT R. GULDEN
Rensselaer Polytechnic Institute

ROBERT O. LOVING
Illinois Institute of Technology

RICHARD A. PROUTY
Shoreline Community College

JAMES S. RISING
Iowa State University

LAWRENCE E. STARK
Texas A & M University

PUBLIC RELATIONS

ROBERT J. CHRISTENSON
General Motors Institute
Flint, Michigan
313-766-9070

NOMINATIONS

EARL D. BLACK (Chairman)
General Motors Institute
Flint, Michigan

STEVE M. SLABY
Princeton University

JAMES H. EARLE
Texas A & M University

JOHN R. BARYLSKI
Southeastern Massachusetts University

ELECTIONS COMMITTEE

WILLIAM B. ROGERS (Chairman)
Virginia Polytechnic Institute

W. GEORGE DEVENS
Virginia Polytechnic Institute

JOSEPH B. DENT
Virginia Polytechnic Institute

FRANK F. MARVIN
Virginia Polytechnic Institute

POLICY COMMITTEE

EDWARD W. JACUNSKI (Chairman)
University of Florida
Gainesville, Florida
904-392-0946

STEVE M. SLABY
Princeton University

EARL D. BLACK
General Motors Institute

R. WALLACE REYNOLDS
California State Polytechnic Institute
San Luis Obispo

DISTINGUISHED SERVIC AWARD COMMITTEE

EARL D. BLACK (Chairman)
General Motors Institute
Flint, Michigan

STEVE M. SLABY
Princeton University

JAMES H. EARLE
Texas A & M University

PUBLICATIONS COMMITTEE and ENGINEERING DESIGN GRAPHICS JOURNAL

(The purpose of the Publications Committee is to edit and publish the Division's publications. It is responsible for its own financing through subscriptions and advertising.

The editorial board has the responsibilty for acquiring material, for publication, that is beneficial and of interest to the membership of the Engineering Design Graphics Division.)

BORAH L. KREIMER (Chairman & editor)
Northeastern University
Boston, Massachusetts
617-437-2396

ROBERT J. CHRISTENSON (Circ. Mgr. & Treas.)
General Motors Institute
Flint, Michigan

KLAUS E. KRONER (Adv. Mgr.)
University of Massachusetts
Amherst, Massachusetts

AL ROMEO (Associate Editor)
Ohio State University
Columbus, Ohio

JOHN G. KREIFELDT (Assistant Editor)
Tufts University
Medford, Massachusetts

ALLAN CLEMOW (Book Editor)
Tufts University
Medford, Massachusetts

COMPUTER GRAPHICS COMMITTEE

(To provide a means of exchange and disseminating information on computer graphics and its relationships to all branches of engineering, especially engineering design graphics.)

EDWARD V. MOCHEL (Co-Chairman)
University of Virginia
Charlottesville, Virginia
703-924-3404

CLARENCE E. HALL (Co-Chairman)
Louisiana State University
Baton Rouge, Louisiana
504-388-2022

ELTON W. ARCHER
Letourneau College

WILLIAM M. BAGGS
Georgia Institute of Technology

CARL W. BECHTOLD
University of Colorado

FRANKLY BROWN
Northeastern University

JAMES BURNETT
Michigan State University

SUMNER B. IRISH
Graphical Technology Corporation

ROBERT D. LaRUE
Ohio State University

STEVE M. SLABY
Princeton Unuversity

ROBERT THORNHILL
Wayne State University

EARL C. ZULAUF
Applied Dynamics Corporation

BURAK HOUCK
North Carolina State University

LARRY GOSS
Oklahoma State University

DARRYL JANOWITZ
Illinois Institute of Technology

CURTIS HERTEL
University of Missouri - Rolla

EDUCATIONAL RELATIONS COMMITTEE

(It is the purpose of the Educational Relations Committee to concentrate its efforts towasrd inproving the teaching of drawing in the high schools. The product of an upgraded high school course enters the college program at a higher level and is able to go on to advanced work that cannot be accomplished under existing conditions.)

RALPH M. COLEMAN (Co-Chairman)
University of Texas - El Paso
El Paso, Texas

GROVER C. GRUBB (Co-Chairman)
University of Texas - Arlington
Arlington, Texas

JOHN R. BARYLSKI
Southeastern Massachusetts University

LLOYD C. CHRISTIANSON
University of Missouri

J. TIMOTHY COPPINGER
Texas A&M University

CHARLES R. COZZENS
Memphis State University

WENDELL DEEN
Tarrant County Junior College

PAUL S. DeJONG
Iowa State University

CHARLES W. KEITH
Kent State University

ROBERT S. LANG
Northeastern University

CECIL P. MARION, Jr.
University of Miami

WILLIAM B. ROGERS
Virginia Polytechnic Institute

ROBERT J. STRANCE
Illinois Institute of Technology

ERNEST R. WIEDHAAS
Pennsylvania State University

TEACHING TECHNIQUES COMMITTEE

(The Teaching Techniques Committee has two purposes. They are as follows;

1. To collect, from whatever sources are available, and to disseminate to the members of the Division information regarding new methods and techniques which will be useful in the teaching of graphics.
2. To frequently review older techniques of instruction, such as the chalkboard, film strips, overhead projector, and models.)

ERNEST C. SCHAMEHORN (Chairman)
Essex Community College
Baltimore County, Maryland
301-682-6000

R. M. BARNETT
University of Arizona

SAMUEL M. CLELAND
Texas A&M University

ARV EIDE
Iowa State University

LARRY D. GOSS
Oklahoma State University

EDWARD D. KNOBLOCK
University of Wisconsin - Milwaukee

ROBERT D. LaRUE
Ohio State University

CARL BECHTOLD
University of Colorado

LAWRENCE E. STARK
Texas A&M University

MERWIN L. WEED
Pennsylvania State University

ENGINEERING DESIGN EDUCATION COMMITTEE

(The aim of the Engineering Design Education Committee is to gather, develop and exchange information on methods and techniques of teaching engineering graphics and creative design.

Successful problems and methods are to be compiled, reviewed, and published for use by teachers of Engineering Design in improving their course offerings.

The committee shall be available for consultation to those who desire assistance in the creative approach to solving Engineering Design problems.)

WILLIAM A. EARL (Chairman)
S. U. N. Y. College of Ceramics
Alfred University
Alfred, New York
607-587-8111, ext. 62

PERCY H. HILL
Tufts University

WILLIAM S. CHALK
University of Washington

JERRY DOBROVOLNY
University of Illinois

JAMES H. EARLE
Texas A&M University

WAYNE FELBARTH
University of Detroit

JOE V. CRAWFORD
Iowa State University

ROLAND R. RUHL
University of Illinois

GRAPHICS TECHNOLOGY COMMITTEE

(The Graphics Technology Committee has identified three purposes which it should serve. First, the committee intends to establish liaison with those post-high school programs that offer an academic major or specialty in graphics and to encourage those faculties to join in the promotion of Graphics Technology. Second, the committee intends to establish this liaison through a biannual survey aimed at determining the typical graphics curriculum. The third purpose for the committee is to compile a listing of recommendations and procedures for astablishing two-year and four-year post high school graphics technology curricula.)

CHARLES H. McNEESE (Chairman)
Tarrant County Junior College
Hurst, Texas
817-281-7860, ext. 340

PAUL S. DeJONG
Iowa State University

PHILIP L. BRACH
Washington Technical Institute

WILLIAM A. EARL
Alfred University

DON T. CONNERELY
Pensacola Junior College

CLAUDE PARKS
Hutchinson Community Junior College

INDUSTRIAL RELATIONS COMMITTEE

(To reach a mutual understanding of industry's needs in the technical background of its men and education's ability to develop such a desired background.

To encourage the proposal and development of new graphic tools of value to industry and to investigate and advance methods of implementing the dissemination of such new ideas.

To solicit real design situations from industry of various levels of sophistication but with special emphasis on relatively simple and straightforward solutions.)

R. WALLACE REYNOLDS
California State Polytechnic College
San Luis Obispo, California
805-546-2485

ROBERT O. BUTLER
Iowa State University

J. TIM COPPINGER
Texas A&M University

HERBERT GERNANDT
Jet Propulsion Laboratory

A. F. HARTFORD
E. I. DuPont de Nemours & Company

JAMES D. MURPHY
Arnold Research Organization

GEORGE PANKRATZ
University of Toledo

E. W. STEELE
3 M Company

EDWARD ZAVITZ
The Detroit Edison Company

WEBSTER CHRISTMAN, Jr.
University of Wisconsin - Milwaukee

CREATIVE DESIGN DISPLAYS COMMITTEES

DISPLAY DIVISION

(To DISSEMINATE information regarding the Display to as many prospective participants (engineering educators) as possible. To RECEIVE declarations of intent to display and requests for display space from (at least partially) committed participants. To COORDINATE this information and the activities of the HOST Institution Display Chairman so as to PROVIDE SPACE and AID required by the participants in setting up their projects at the Display.)

ROBERT D. LaRUE (Chairman)
Ohio State University
Columbus, Ohio
614-293-2671

ROLAND C. PARÉ
California State Polytechnic College

L. M. GRAHAM, Jr.
Texas Tech University

PAUL S. DeJONG
Iowa State University

JUDGING DIVISION

(The Creative Design Display Committee, in running a design display at the Annual Meeting, hopes to motivate both engineering students and educators in the area of creative engineering design. By displaying the designs, it gives educators an opportunity to see the type and quality of work being done across the country. Running seperate contests at the four undergraduate and graduate levels provides for the recognition of the different levels of student design projects based on their engineering training.)

RALPH S. BLANCHARD, Jr. (Chairman)
Northeastern University
Boston, Massachusetts
617-437-2966

BORAH L. KREIMER
Northeastern University

RALPH SEXTON
Northeastern University

R. WALLACE REYNOLDS
California State Polytechnic College

THEORETICAL GRAPHICS COMMITTEE

MARC SAUVAGEAU (Co-Chairman)
Ecole Polytechnique de Montreal
Monteal, Quebec, Canada

JOHN BREWER (Co-Chairman)
Louisiana State University
Baton Rouge, Louisiana

PATRICK BORECKY
University of Toronto

DOUGLAS AMADEO
University of California - Irvine

MARY BLADE
Cooper Union

LUISA BONFIGLIOLI
Technion - Israel Institute of Technology

WILLIAM BUNGE
Wayne State University

LANE CALENDAR
Rutgers University

ARCY T. D'ALBUQUERQUE
Universidad de Estado daGuanabara,
Brazil

HAROLD L. DELLENDER
East Tennessee State University

HOWARD EVES
University of Maine

MICHAEL P. GUERARD
Texas A&M University

SANDOR T. HALASZ
City College of the City Univer sity
of New York

EDWARDO E. LOZARD
Princeton University

WALTER MESSCHER
Transportation Systems Center

ROBERT RIGHTS
Newark College of Engineering

WILLIAM WARNTZ
Harvard University

FORREST WOODWORTH
University of Detroit

HUMAN FACTORS IN DESIGN COMMITTEE

The committee on HUMAN FACTORS IN DESIGN has been formed to define the extent and place of Human Factors design considerations in the undergraduate engineering curriculum. The concern of Human Factors is directed specifically toward the "human element" in systems and design problems and it is the human element which after all engineering is to serve. It has become increasingly apparent that the human is a component in many engineering systems and that the complete design requires knowledge of this human element. Basic data, theoretical/practical studies, research techniques have been growing rapidly in Human Factors. Much of this knowledge should be integrated into Engineering Design to satisfy the recognized need for human relevance in undergraduate education and to produce an engineer better prepared to deal with society's technological needs and problems.

JOHN G. KREIFELDT (Chairman)
Tufts University
Medford, Massachusetts
617-628-5000, ext. 242

RENWICK CURRY
Massachusetts Institute of Technology

JAMES H. EARLE
Texas A&M University

JOHN LYMAN
University of California at Los Angeles

WILLIAM J. CROCHETIERE
Tufts University

GORDON ROBINSON
University of Wisconsin

RICHARD PEW
University of Michigan

LARRY D. GOSS
Oklahoma State University

MID-WINTER MEETING COMMERCIAL EXHIBITS

LEON M. BILLOW (Chairman)
United States Naval Academy
Annapolis, Maryland

FRANK OPPENHEIMER
Gramercy Guild Group, Inc.

MORGAN THOMAS
Kueffel & Esser Inc.

BURT FRASER
University of Houston

ASEE PUBLICITY

JOHN R. BARYLSKI
Southeastern Massachusetts University
North Dartmouth, Massachusetts

SELF-STUDY COMMITTEE

COMMITTEE EAST

WILLIAM B. ROGERS (Chairman)
Virginia Polytechnic Institute
Blacksburg, Virginia

MARY BLADE
Cooper Union

ALLAN H. CLEMOW
Tufts University

JOHN R. BARYLSKI
Southeastern Massachusetts University

EDWARD GRISWOLD
Cooper Union

STEVE M. SLABY
Princeton University

BORAH L. KREIMER
Northeastern University

COMMITTEE WEST

ROBERT D. LaRUE (Chairman)
Ohio State University
Columbus, Ohio

JOHN BREWER
Louisiana State University

ROBERT CHRISTENSON
General Motors Institute

ROLAND O. BYERS
University of Idaho

JAMES H. EARLE
Texas A&M University

R. WALLACE REYNOLDS
California State Polytechnic College

IVAN L. HILL
Illinois Institute of Technology

WILLIAM PUNKAY
Harper College

ROLAND L. BUHL
University of Illinois

COORDINATOR

BORAH L. KREIMER (Co-Chairman and Chairman of Implementation Committee)
Northeastern University
Boston, Massachusetts
617-437-2396

PHILIP H. BRACH (Co-Chairman)
Washington Technical Institute
Washington, D. C.
202-966-6416

SELF - STUDY REPORT

During the past year a self-study committee was organized to study the organization of the Engineering Design Graphics Division, evaluate it and make any necessary recommendations. The committee was made up of two parts; committee east and committee west. The following is a report agreed upon by the entire committee and written by Professor William B. Rogers, formerly of the United States Military Academy and presently a member of the faculty of Virginia Polytechnic Institute.

SELF-STUDY REPORT

BASIC ISSUES

At the outset of its deliberations, the Committee addressed three major issues, viz; 1) the relationship of the Division to the Society; 2) the purpose of the Division; 3) the organization needed to implement the stated purpose.

1. Relationship to the Society

It must be recognized that the American Society for Engineering Education (ASEE) is not a loose federation of independent societies, but a single society divided into professional interest groups (committees and divisions) and geographical areas (sections) to facilitate administration and operations, and, hopefully, best serve the needs of its individual members. Regardless of his special interests or how recruited, each member joins and pays his dues to ASEE. Committee or Division affiliation is indicated by three choices in order of preference by each applicant and is subject to annual revision. Assignment to a section results from residence within a definite geographical area.

In an organization as large and complex as the ASEE, autocratic tendencies on the part of executive personnel are inevitable and perhaps necessary to expedite the business of the Society and prevent anarchy. On the other hand, the burdensome bureaucracy apparently existing and and growing within the ASEE administrative structure tends to inhibit initiative in subordinate units and discourages individual members who feel, with growing indignation and frustration, that they have no real voice in the operation of their Society.

The life of the ASEE is dependent on the viability of its committees and divisions, the smaller professional interest groups in which each ASEE member can enjoy active and productive participation. Viable committees and divisions, with meaningful programs and active mamber participation, are possible only if the ASEE administration provides substantial support in the form of recognition, guidance, encouragement, appropriate delegation of authority, and adaquate funds. Funding of committee/division activities can be considered adaquate (within the limits imposed by the total funds available) when a significant percentage of each member's annual dues is prorated to the committee/division of his choice with unused year-end funds cumulating to the credit of that subordinate unit. With "money in the bank", each committee/division would be in a better position to plan and implement long-range programs. Each member would have a greater opportunity to exercise some real control over, at least, a part of his substantial ASEE dues and to participate directly through his committee/division in the programs funded from these dues.

The Self-Study Committee recommends that the elected officers of the Engineering Design Graphics Division:

a. Recognize that the Engineering De-Graphics Division must function as a subordinate unit within the administrative structure of the ASEE, and not consider the Division an independent and autonomous professional society.

b. Learn as much as possible about the organization and functioning of ASEE administrative structure, and utilize and take advantage of this structure and the Executive Secretariat to the maximum extent in implementing the Division plans and programs.

c. Press the ASEE administration by every legitimate means for a significant pro-rata return of individual members annual ASEE dues to committee/division control.

2. Purpose of the Engineering Design Graphics Division

The committee agreed that Article I, Section 2 of the Division By-Laws inadequately defined the purpose of the Division, and recommends the following.

The purpose of the Division shall be to:

1) provide leadership and guidance for those engaged in the teaching and practice of conceptual design and graphical analysis;

2) investigate matters relating to engineering graphics and to inform the membership of current developments;

3) encourage the early participation of engineering students in the areas of graphics and design;

4) promote, stimulate, and provide opportunities for the professional interchange of ideas among the membership;

5) maintain a liaison with industry and government,

3. Division Organization

The committee noted the proliferation of appointed committees with large memberships, recognizes the desirability of involving as many members as possible in the operation of the Division, and does not suggest limiting the Chairman's prerogative of appointing any committees deemed necessary for the conduct of his plans and programs. The committee has no argument with the few active committees having specific assignments who perform their duties with dispatch. However, many committees have no clearly defined function, do nothing, and quietly "die on the vine". Other, equally dead, committees are revived momentarily by a too-late, conscience-stricken chairman whose total activity consists of a hastily written "annual report" explaining why the committee was unable to accomplish anything. These "reports" are largely unread, contribute little or nothing to Division progress, and consume valuable time at a business meeting.

Under the present organization, the five directors, with the exception of the treasurer, have no specifically defined duties. The five-year term of office effectively relegates five capable leaders to limbo during a potentailly productive period of service. The committee chairmen report directly to the Division chairman, a system which has certain merit, but which, when many committees are involved, can be clumsy and inefficient. The present Division organization does not take advantage of the geographic sectional structure of the ASEE. The committee feels that the Division has not sufficiently utilized the existing ASEE Section organization in accomplishing its purpose.

The committee recommends a functional grouping of the appointed committees directed and coordinated by the vice-chairman and elected directors as described below and outlined on the Organizational Chart.

VICE CHAIRMAN
- By-Law Committees
  - Nominating Committee
  - Committee on Elections
  - Distinguished Service Award Committee
- Resolutions Committee
- Awards Committee
- Ad Hoc Committees

DIRECTOR (Liaison Committees)
- Disadvantaged Minorities Program Committee
- Educational Relations Committee
- Student Relations Committee
- Public Relations

DIRECTOR (Technical and Professional Committees)
- Teaching Techniques Committee
- Computer Graphics Committee
- Graphics Technology Committee
- Theoretical Graphics Committee
- Engineering Design Education Committee
- Human Factors Committee

DIRECTOR (Programs Committees)
- Meetings Committee
- Displays Committee
- Summer School Committee

DIRECTOR OF PUBLICATIONS (The Director of Publications shall be the Editor of the Engineering Design Graphics Journal and Division Editor for Engineering Education.)
- Engineering Design Graphics Journal
- Division Newsletter
- Membership

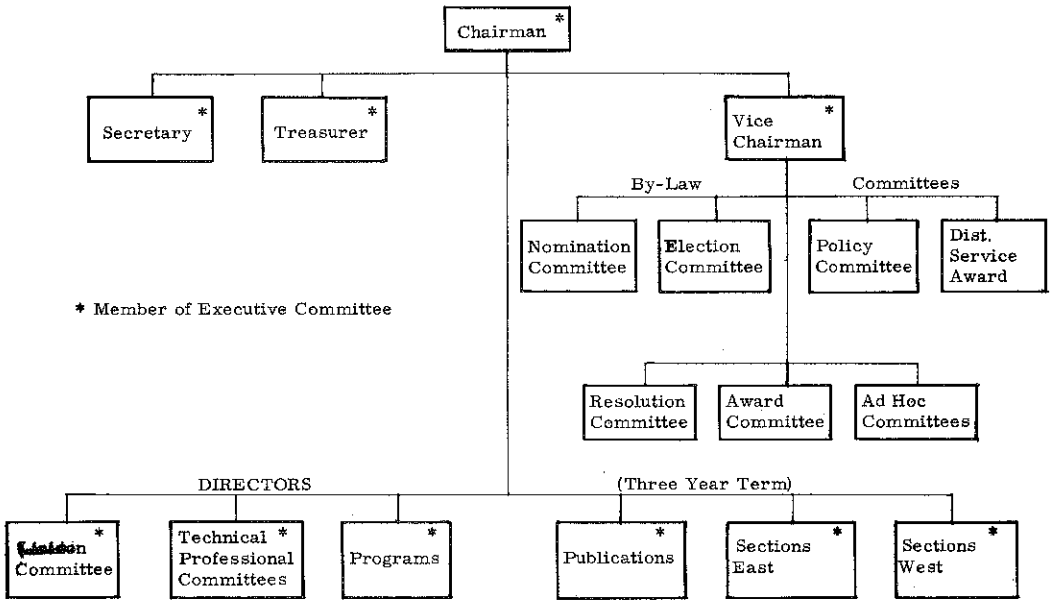
DIRECTOR (Sections East)
- Committee chairman for each Section, East

DIRECTOR (Sections West)
- Committee chairman for each Section, West

(Listing of committees does not constitute a recommendation to continue these committees nor to abolish any that are not listed, but illustrates suggested groupings.)

Respecting committee reports, each com-

PROPOSED ORGANIZATION
ENGINEERING DESIGN GRAPHICS DIVISION
ASEE



mittee chairman would be expected to submit a report to his director well in advance of the Executive Committee Meeting. The director would consolidate the reports of his committee chairmen into a single report submitted to the Division Chairman. These reports, from the directors, should be available for study prior to the meeting of the Executive Committee so that controversial or other critical issues could be intelligently discussed and action taken at the Executive Committee session.

FINANCIAL MANAGEMENT

Available funds are from three possible sources: 1) from ASEE based on an approved budget; 2) from the Engineering Design Graphics Journal; and 3) from miscellaneous sources. Miscellaneous sources include registration fees in excess of expenditures for Mid-Year Meetings, rental of display space at Mid-Year Meetings, etc. The total of these sources falls far short of the fiscal requirements for a minimal program. Successful Division operation in the past has depended on, and continues to depend on substantial institutional support, both direct and indirect, from the employers of individual members, in particular the elected and appointed officers, and the willingness and ability of individual members to pay in whole, or part, their own expenses for travel, telephone calls, postage, office supplies, etc. The Committee recognizes that some institutional support is essential, and that all "out-of-pocket" expenses of members on behalf of the Society cannot be eliminated. However, the financial condition of many educational institutions is causing comptrollers to cost account much more carefully institutional activities, the result being a drastic reduction in the support previously given freely to professional socities.

The most obvious source of income is from annual dues of individual members, and the most obvious complaint from individual members is, "What do I get for my money?"

Another mamber complaint, and certainly a valid one, is "I have nothing to say about how my dues money is spent." The Committee was unanimous in agreeing that the Division budget should be based on the size of the Division membership as reflected by the annual preference statement submitted annually with the ASEE dues payment, assuming a pro-rata return of a fixed percentage of member dues to Division control. With Division officers in control of a substantial portion of the money paid in dues, and member opinion would be effective at this level in directing expenditures. Division officers can be approached by individual members for a person-to-person interchange of opinions, and are in close touch with the thinking in their division membership. The ASEE bureucracy in Washington is unapproachable, autocratic, out-of-touch with and seemingly caring little for the opinion of the individual member who does not bear high administrative credentials.

With respect to Journal funds, the Committee agreed that the only way to improve the Journal beyond its present level of quality is to spend more and more money. It was also agreed that the Journal should be financially in-

dependent, neither dependent on nor contributing to the Division treasury, under normal conditions of operation. The Committee expresses concern that a large balance in the Division treasury, from Journal funds or other sources, might be subject to levy by the ASEE. It does not appear that Journal funds would be in such jeopardy.

The Committee recommends that:

1. the Division budget submitted to ASEE be based on a pro-rata allocation of annual member dues of not less than 10% for members indicating EDGD as first choice and 5% for members indicating EDGD second or third choice. It is further recommended here, and elsewhere in this report, that Division officers take the lead in working with officers of other Divisions and committees to establish a pro-rata fund allocation as ASEE policy.
2. Division budgets be prepared to more accurately reflect money that is actually spent on Division administration and operations, considering reduced institutional financed support and the desirability of encouraging active participation by younger, junior, and less affluent members of the Division who cannot be expected to underwrite Society expenses from personal funds.
3. the Journal be financially autonomous and that all money accruing to the Journal in excess of normal operating expenses be applied to improving the Journal. Implementation of this recommendation should not preclude the Journal financial support of programs appropriate for Journal sponsorship.

MEETINGS: ANNUAL, MID-YEAR, SECTIONAL

Discussions of meetings past and suggestions for meetings future were general and included the common complaints; that we are talking to ourselves; the need for less talk from the platform and more audience participation; the need to attract younger members; relationship with the host institution; accommodations; expenses; displays; the merits of meeting on a college campus versus a commercial center; etc.

The Committee recommends that:

1. Mid-Year Meeting planners arrange for a meeting place in an environment appropriate to an academic society and compatible to the stated purpose of the Division, and that every effort be made to minimize the costs to encourage attendance by younger members who may be paying most, or all of their own expenses.
2. Students be invited to present papers, and that a student presentation be planned for each Annual and Mid-Year Meeting.
3. Division officers encourage and assist Section Committee chairmen to arrange for Engineering Design Graphics Division sessions at the Sectional Meetings.
4. Appropriate representatives of publishing houses and manufacturers be invited to display at Mid-Year Meetings.

CREATIVE DESIGN DISPLAY

The Committee was unanimous in its praise of the Creative Design Display. The possibility of preliminary competitions in each Section with the winners competing Nationally at the Annual Meeting was discussed. It was agreed that the National winners should be invited to make a platform presentation of their project at one of the Division technical sessions. The Committee recognized the difficulties of timing, coordination with various Sections, etc., involved in this proposal.

The Committee recommends that:

1. The Creative Design Display should be continued and maintained at its present level of excellence.
2. A committee be appointed to investigate the possibilities of preliminary competitions with Sectional winners competing for National honors at the Annual Meeting.
3. National winners, however determined, be invited to make presentations at a Division technical session.

DISTINGUISHED SERVICE AWARD

The Committee discussed, in some detail, the procedure for selecting the Distinguished Service Award recipient, and concluded that the selection procedure now followed, was satisfactory. It was pointed out that members making nominations frequently omitted any supporting information needed to qualify their nominee as a candidate.

The Committee recommends that a nomination form be prepared by the Distinguished Service Award Committee which outlines the qualifications and provides space for a brief

outline of the nominee's performance in each category and this form accompany the annual request for nominations.

JOURNAL OF ENGINEERING DESIGN GRAPHICS

Considering the membership of most of the Committee, it might have been expected that the Journal was mentioned often throughout the deliberations. The Committee conceded that it is practically impossible to publish a first class journal on the limited resources at the editor's disposal. With little money, a new amateur editor every three years, and a geographically seperated staff, it seems incredible that the Journal has attained and continued at its present standard of quality. Those member-subscribers who complain the loudest are invited to join the publishing board, and contribute their talents to improving the Journal.

The Committee finally concluded that the Journal problems were of such magnitude that a seperate study is indicated, and so recommends. The Committee did consider the Journal's administration, operational procedures, and the needs of the Division sufficiently to make the following recommendations relative to the Journal.

1. The Division Editor (representing the Division on the staff of Engineering Education) should be the Editor of the Journal and not a seperate position.
2. A Division Newsletter should be published periodically and contain news of the Division leaving the Journal to publish primarily a technical-professional publication.
3. An Associate Editor should be elected (or appointed) to work closely with the Editor and be responsible for the publication of a Division Newsletter.
4. The position of Circulation Manager-Treasurer, of the Journal, should be seperated into two positions ------ a Business Manager (to also serve as treasurer) and a Circulation Manager.
5. The Circulation Manager should also serve as Chairman of the Membership Committee.
6. The Editor should be provided, from Journal funds, an expense allowance, for which he need not account, of $150 for each issue of the Journal published to cover "out - of - pocket" expenses and partly compensate for his time.
7. The Editor should strive to continue publishing three issues of the Journal per year.

PLANS AND PROGRAMS

It often appears that the Division drifts along somewhat aimlessly from one year to the next, exerting itself from time to time with an outstanding program such as a summer school or the creative design competition, but with no explicit plan to guide each new Administration.

The Committee recommends that:

1. The Directors formulate, annually, a five-year projection, recommending plans and programs for the Division during that time frame.
2. The Executive Committee prepare, annually, a three year implementation program based on the five-year projection, revised and updated with recommended priorities to guide future Administrations.
3. Each incoming Administration prepare a workable operational program to effect the accomplishment of the plans and programs falling within its tenure.

BY-LAWS

While the Committee did not make a specific and critical study of the By-Laws, it was generally agreed that this document is adaquate for the present organization and operational procedure. The implementation of some of the Committee's recommendations will require a revision of By-Laws to conform to changes.

One change in the By-Laws has already been recommended, namely, a more detailed statement of the Division's purpose. One addition is recommended. The By-Laws do not provide for the removal of an appointed or elected official who is not satisfactorily performing the duties of his office. The Committee recommends that a paragraph be added to Article III of the By-Laws as follows;

Section 2a. (8)

He shall assure the effective operation of the Division by revoking the appointment of any appointee who is not, in his judgement, satisfactorily performing the duties of the office to which he was appointed and shall appoint another member to serve the unexpired term. If, in his judgement, an elected officer is not fulfilling the obligations of his office, he will, with the advice and consent of the Executive Committee, request the resignation of the delinquent officer and ap-

point another member to serve in that office until the next annual election.

CONCLUSION

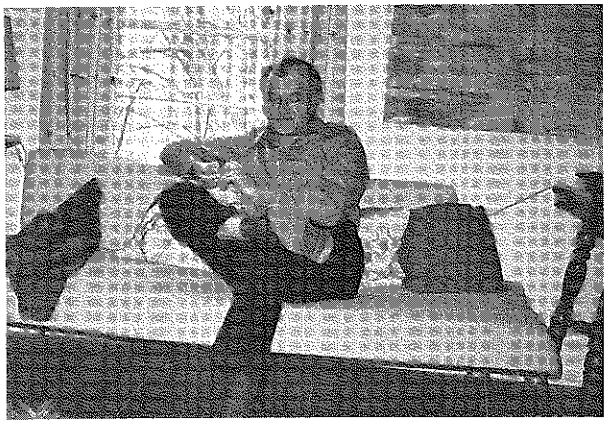
The Committee attempted to deal with the problems of the Division frankly and objectively. The recommendations imply no criticism of the dedicated work and positive accomplishments of past or present Administrations, and the Committee hopes that this report will be considered and evaluated as an objective introspection with the sole purpose to improve the Division.

Respectfully submitted
Self-Study Committee

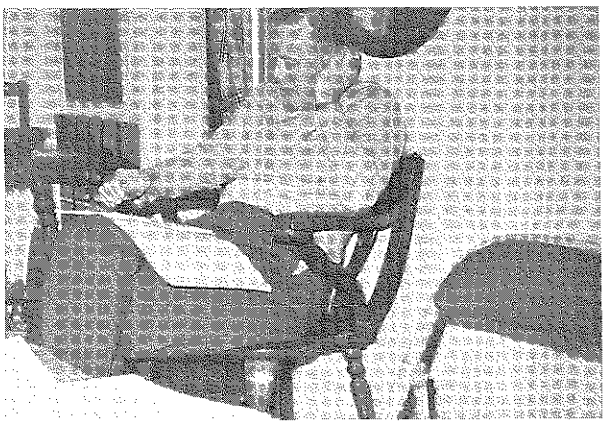
Any comments, recommendations, etc., should be sent to

Borah L. Kreimer
32 KN
Northeastern University
360 Huntington Avenue
Boston, Massachusetts 02115

Self-Study Committee, East. Front row Borah Kreimer and Steve Slaby. Back row Mary Blade, Bill Rogers and Ed Griswold



Steve Slaby preparing his suggestions



Bill Rogers recording committee decisions

Fourth Annual
Creative Engineering Design Display

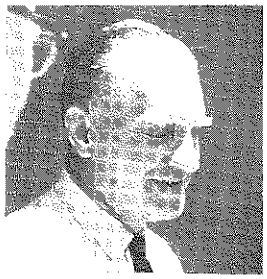
At The

United States Naval Academy

Annapolis, Maryland

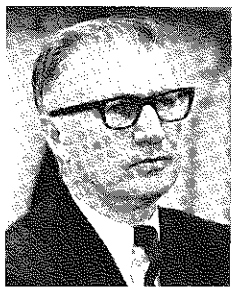
June 1971

It all began during the school year 1965-1966 when the (then) vice-chairman of the Engineering Graphics Division of ASEE had an idea for a summer school to be held before the 1967 annual convention of the Society. His idea was to organize sessions during which colleagues might develop methods that may be used to teach Creative Engineering Design. He, E. W. (Jack) Jacunski, then began to develop this idea by seeking out the person who could best organize and lead this enterprise.



Jack Jacunski

During the 1966 mid-year meeting of the Division, Jack "twisted the arm" of Percy Hill to become the director, organizer and coordinator of this project. The result was a summer school that is considered to be the best to have been held by the Division.



Percy Hill

The summer school was so successful that its proceedings were published as an adjunct to the regular issues of the JOURNAL OF ENGINEERING GRAPHICS. This special issue was put together by Herbert Yankee (special issue editor) in such a manner that it is being used as a reference by instructors as well as students of Creative Engineering Design. Herb deserves special recognition for this outstanding work since he was pressed into service after others withdrew from their promises.

With the interest for teaching Creative Engineering Design being shown by many, the 1967-1968 Division chairman, Eugene Pare, felt that it should be encouraged. What better way than to show-off one's work? Hence the idea for an Annual Creative Design Display. Gene then found the ideal individual to organize and supervise the first display in John Barylski. With no past experience on the part of anyone to whom John could turn, he started a show for freshman and sophomore student projects. Although there were many Society members who disapproved of this type of work, the Division was asked to include designs from upperclass and graduate students. This was done for the first time in 1970. The Display has now become an activity that many engineering instructors look forward to, each year.

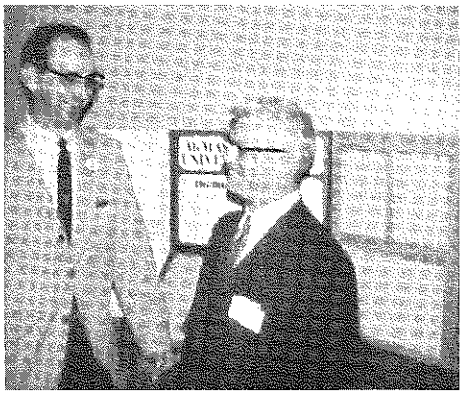
Gene Pare

Under the guidance of such capable people

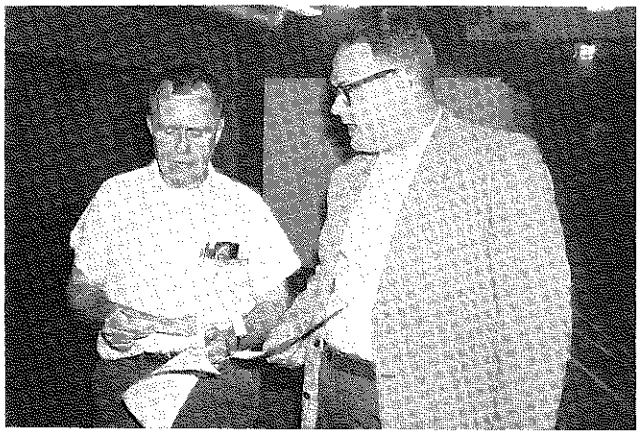
as Robert LaRue (physical displays) and Ralph Blanchard (judging and awards) we expect to continue our progress in helping to develop the teaching of Creative Engineering Design.

The 1971 Display saw 38 schools entering 77 student design projects in the five categories as follows;

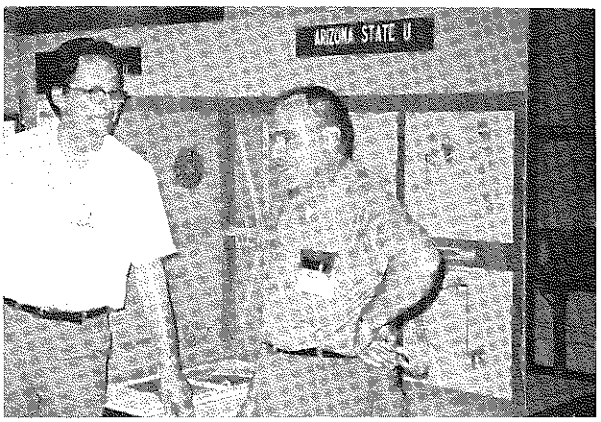
Freshman design projects	47
Sophomore design projects	9
Junior design projects	5
Senior design projects	13
Graduate design projects	3



AL HOAG and JOHN BARYLSKI
Co-Chairman, 1968

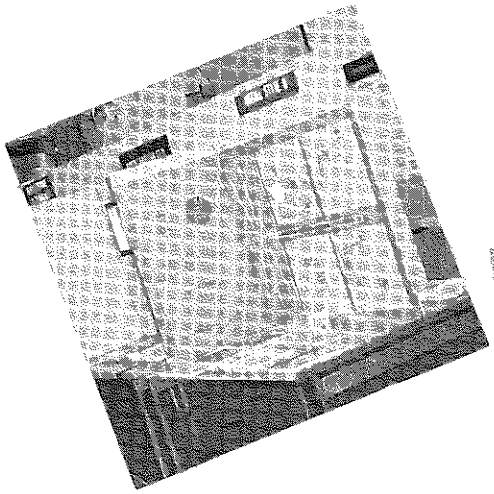


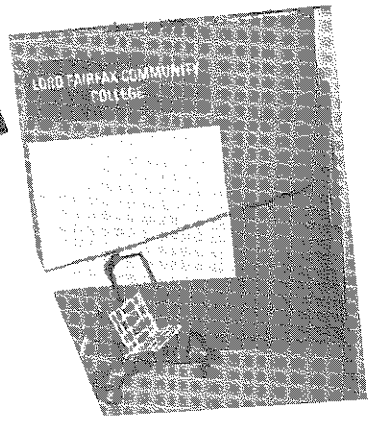
BOB LaRUE and PHIL BRACH
Co-Chairmen, 1970

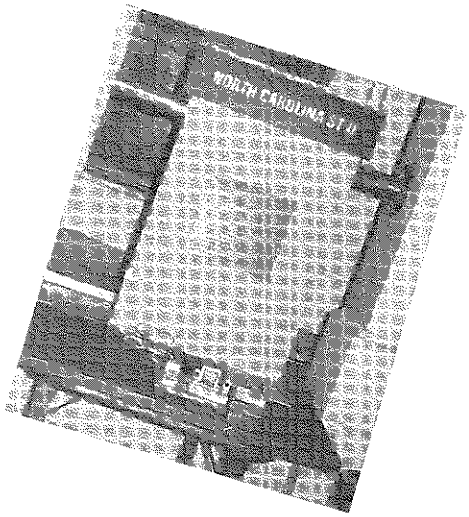


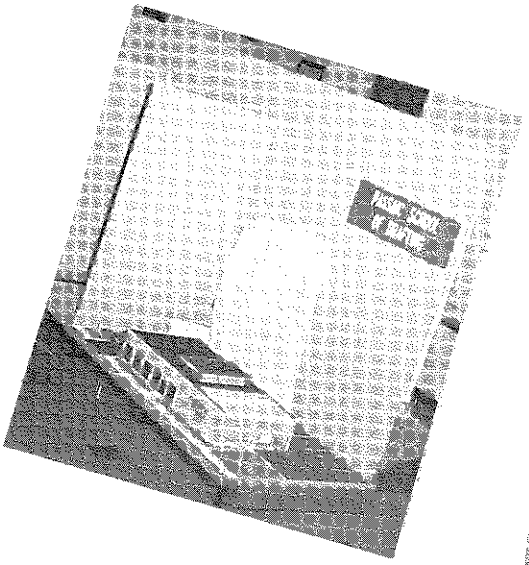
RALPH BLANCHARD and BOB LaRUE
Co-Chairmen, 1971 and 1972

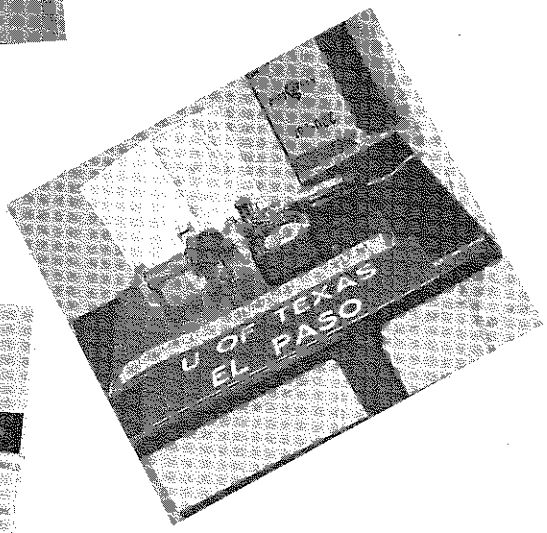
JACK JACUNSKI thanking the Judges and the Committee for their work on the 1971 Display

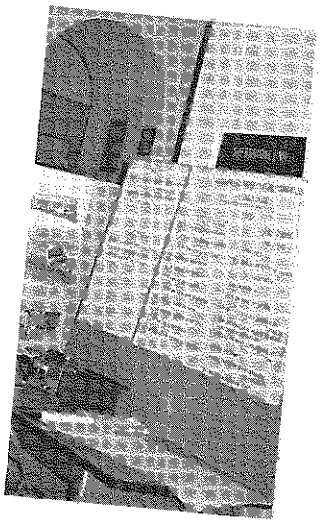


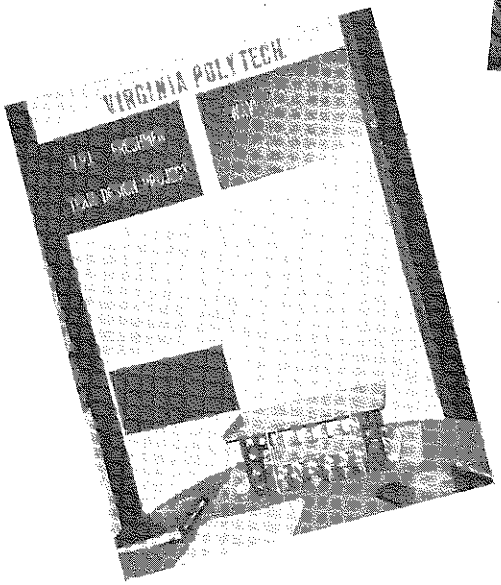

LORD FAIRFAX COMMUNITY
COLLEGE

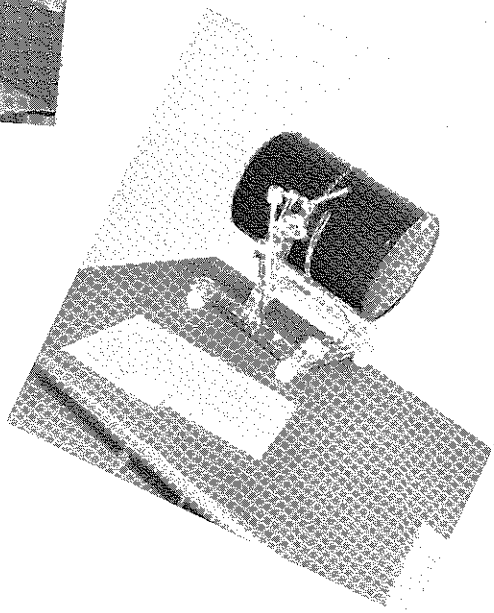





U OF TEXAS
EL PASO




VIRGINIA POLYTECH



Design Display Awards

The award winneres were;

FIRST PLACE AWARDS

Freshman (tie)

VARIABLE TORQUE TRANSFER ASSEMBLY
Designers: J. Edwards
B. Knight
B. Whitestone
Instructor: Professor Don Hansen
School: Louisiana State University

MANUALLY OPERATED BILGE PUMP
Designers: Novacek
Patec
Pecor
Persoh
Pinyuzy
Popelka
Richard
Instructor: Professor James Earle
School: Texas A & M University

Sophomore (tie)

ELECTRONIC EDITOR FOR ONE-INCH HELICAL SCAN VIDEO TAPE
Designer: P. Ford
Instructor: J. T. Dygdon
School: Illinois Institute of Technology

CARGO LOADING AND CARRYING DEVICE
Designers: L. Salerni
R. Clark
S. Smith
Instructor: Professor Leon Billow
School: United States Naval Academy

Junior

COMPUTER GRAPHICS SYSTEM FOR THE GENERATION, DISPLAY AND MANIPULATION OF COMPLEX FIGURES WITH MINIMAL CORE USAGE
Designer: D. Vicknair
Instructor: Professor J. A. Brewer III
School: Louisiana State University

Senior

RECLAMATION OF A TOWN OF 20,000
Designers: H. Gershman
W. Matusz
L. Hubbard
R. Scenna
Instructor: Professor Ralph Blanchard
School: Northeastern University

Graduate

TUFTS INTERACTIVE COMMUNICATOR
Designers: Mead
Foulds
Altshuler
Preissler
Yao
Instructor: Professor W. Crochetierre
School: Tufts University

SECOND PLACE AWARDS

Freshman

SONIC FRUIT WASHER
Designers: H. Powell
D. Floyd
Instructor: Professor U. F. Earp
School: Virginia Polytechnic Institute

Senior

DISPOSAL SYSTEM FOR SUBMARINE SANITARY TANKS
Designers: R. Capra
K. O'Bryant
R. Cooper
K. Athow
Instructors: Professor Hirsch
Professor Rankin

THIRD PLACE AWARDS

Freshman

AUTOMATIC CATTLE SPRAYER FOR CONTROL OF COMMON INSECTS
Designers: Clement
Farr
Golden
Hargrove
Hutcheson
Jan
McFarlin
Instructor: Professor R. Vogel
School: Texas A & M University
Branch Campus

Senior

TRACKED AIR CUSHION VEHICLE
Designers: J. Bowen
J. Johnson
J. Eichenbaum
Instructor: R. Simms
School: San Fernando Valley State College

HONORABLE MENTION

Freshman

SESOR, Inc.
Designer: Dan Withers
Instructor: Dr. E. Chilton
School: Arizona State University

APARTMENT COMPLEX
Designers: L. Hurwitz
D. Templeton
R. Macel
T. Wotkowski
Instructor: Professor Kurt Rolle
School: University of Dayton

ELLIPSOTRACE
Designers: S. Daravong
G. Daigle
M. Pominville
Instructor: Professor M. Sauvageau
School: École Polytechnique

SAILBOAT SPEEDOMETER
Designers: B. Becker
M. Pantelo
Instructor: Professor Tom Short
School: General Motors Institute

SAFE ELCTRIC OUTLET
Designers: Carpenter
Mainville
Dubicki
Emery
Brennan
Juneau
Instructor: Professor Ralph Dalphin
School: University of Hartford

A CHILD'S EDUCATIONAL TOY
Designers: R. Metz
C. Guroky
J. Amoroso
Instructor: R. Strance
School: Illinois Institute of Technology

A CORDLESS ELECTRIC ERASER
Designers: L. Martinalli
T. Anderson
D. Fergus
J. Macnett
Instructor: Professor F. M. Hrachovsky
School: Illinois Institute of Technology

THE APPLICATION OF AUTOMATION TECHNIQUES TO THE MAINTAINANCE OF LANDSCAPES
Designers: H. Jacob
A. Amoroso
K. Cebelinski
M. Kennedy
G. Klimczak
Instructor: Professor E. J Caldario
School: University of Illinois
Chicago Circle

INEXPENSIVE UNDERGRAOUND SPRINKLING SYSTEM
Designers: D. Jadin
M. Cook
D. Hansen
J. O'Keefe
G. Pacron
D. Joyce
N. Patez
Instructor: Professor E. J. Caldario
School: University of Illinois
Chicago Circle

LIGHT AIRCRAFT CABIN SAFETY
Designers: D. Larson
C. Richards
L. Bremer
Instructor: Professor P. S. DeJong
School: Iowa State University

AUTO SAFETY HARNESS RESEARCH
Designers: D. Delzell
J. Haag
R. Less
M. Pinnekamp
D. Rowland
Instructor: Professor K. G. Geringer
School: Iowa State University

TWO-SEATED GYROCOPTER
Designer: D. E. Ames
Instructor: Albert Dryer
School: Lord Fairfax Community College

SELF-ILLUMINATED STREET SIGN
Designer: D. Franco
Instructor: Professor H. J. Apfelbaum
School: Lowell Tech

CATALYTIC MUFFLER
Designers: (four not listed)
Instructor: Professor W. H. Eubanks
School: Mississippi State University

PORTO-STEP
Designers: (four not listed)
Instructor: Professor W. H. Eubanks
School: Mississippi State University

UNION STATION --- WILL IT SURVIVE OR DIE?
Designers: DeBusman
Lee
King
Instructor: Professor R. Duncan
School: University of Missouri
Kansas City

CARDBOARD CHAIR DESIGN
Designers: Pool
Ptacek
Roberts
Instructor: Professor R. Duncan
School: University of Missouri
Kansas City

DIE DESIGN FOR SMALL RECEPTACLE
Designer: Bachamn
Instructor: Professor R. Britton
School: University of Missouri
Rolla

ELECTRONIC SECURITY SYSTEM
Designers: A. Dittloff
J. Holland
F. Sweeney
R. Crawford
J. Culp
Instructor: Professor R. Hammond
School: North Carolina State University

HOME SEWAGE TREATMENT PLANT
Designers: S. Piantedosi
L. Welford
Instructor: Professor W. Rule
School: Northeastern University

BLIND INTERSECTION CONTROL
Designers: M. Teheranian
A. Bevilacqua
M. Corosa
D. Fuccillo
Instructor: Professor B. L. Kreimer
School: Northeastern University
Suburban Campus

BASIC RENEWAL DESIGN FOR BOSTON'S SOUTHWEST CORRIDOR
Designer: R. Flannery
Instructor: Professor B. L. Kreimer
School: Northeastern University
Suburban Campus

TOTAL COMBUSTION INCINERATOR
Designers: (not listed)
Instructor: (not listed)
School: Ohio University

CLOCK SYNCHRONIZATION FOR OHIO UNIVERSITY
Designers: (not listed)
Instructor: Professor M. DiLiberto
School: Ohio University

ELECTRICAL APPLIANCE SALES AND REPAIR BUILDING
Designers: J. Rivera
J. Musante
Instructor: Professor V. Murray
School: Passaic School of Drafting

ROAD FRICTION TESTER
Designers: S. Kosak
W. Perugino
Instructor: Professor Robert Foster
School: Pennsylvania State University

PENN STATE MONORAIL SYSTEM
Designers: P. Suhocki
D. Taylor
R. Maggi
Instructor: Professor Hugh Rogers
School: Pennsylvania State University

LIGHT-O-MATIC
Designer: G. Halle
Instructor Professor P. A. Deschenes
School: University de Sherbrooke

SUB-COMPACT AUTOMOBILE
Designer: D. Freeman
Instructor: Professor T. Ashley
School: Southern Methodist University

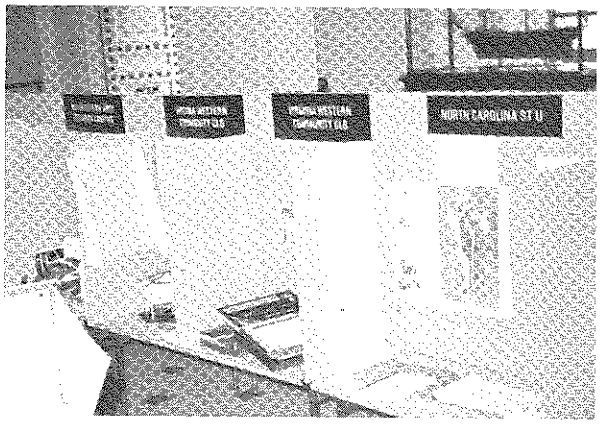
HAND WATER PUMP
Designer: S. Charusorn
Instructor: Professor J. Bosher
School: Southern Technical Institute

DOC-A-BOAT
Designers: B. Pumphrey
J. Sherin
D. Trammell
Instructor: T. Dennis
School: Tarrant County Junior College

AUTOMOTIVE COFFEE MAKER
Designers: Homfeld
Illian
Hennis
Hodge
Hoehn
Instructor: Professor L. Stark
School: Texas A & M University

VUAC EXERCISER
Designers: Olanoff
Poges
Sussman
Trop
Zona
Warshasky
Instructor: Professor Kreifeldt
School: Tufts University

OCTABODE
Designers: Bell
Finnegan
Lezberg
Griffis
Dunkak
Instructor: Professor Kreifeldt
School: Tufts University



BRIDGE & ROADWAY DESIGN
Designers: B. Ventreska
T. Urban
R. Visioli
Instructor: Dr. E. W. Clarke
School: Villanova University

DUSTLESS SELF-ERAING DEMONSTRATION BOARD
Designer: I. Kacenelenbogen
Instructor: Professor C. A. Rankowski
School: Villanova University

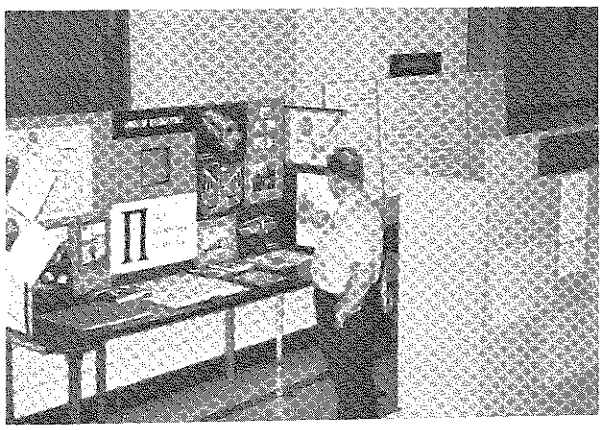
GROCERY STORE CHECKOUT
Designers: Large
Cuddy
Cumby
Daris
Instructor: Professor J. Brown
School: Virginia Polytechnic Institute

TEMPORARY PREFAB STRUCTURE
Designers: M. Dobie
C. Hanes
W. Wells
Instructor: Professor Martin Levine
School: Virginia Western Community College

DRAFTING KIT
Designers: G. Graighead
C. Deitrick
B. Lussen
M. Robbins
R. Sowers
Instructor: Professor Martin Levine
School: Virginia Western Community College

UNDERWATER SPEAR GUN - AIR ACTUATED
Designer: D. Ferrier
Instructor: Professor J. A. MacDonald
School: University of Western Ontario

OIL CHOKE
Designers: Parchim & team
Instructor: Professor Ratledge
School: University of Wisconsin Milwaukee



DRILL PRESS CLAMP
Designers: Crucius & team
Instructor: Professor Christman
School: University of Wisconsin Milwaukee

Sophomore

MOUSETRAP POWERED VEHICLE
Designer: D. McRae
Instructor: Professor Tom Short
School: General Motors Institute

RETRACTABLE LANDING GEAR CONVERSION
Designer: J. Fitch
Instructor: Professor R. Zachary
School: Louisiana State University

MANUFACTURING FACILITY
Designer: E. Ebner Jr.
Instructor: Professor H. J. Apfelbaum
School: Lowell Tech

AIR POWERED CAR JACK
Designer: Linsenbardt
Instructor: Professor R. Britton
School: University of Missouri Rolla

COUNTY CHURCH
Designers: R. Ramis
D. Vetrano
N. Dykstra
Instructor: Professor V. Murray
School: Passaic School of Drafting

AIR COMPRESSOR-EXPANDER
Designers: V. Ronemous
B. Norman
Instructor: Professor J. Bosher
School: Southern Technical Institute

SPRAYING AID
Designers: Weimer & team
Instructor: Professor Ratledge
School: University of Wisconsin Milwaukee

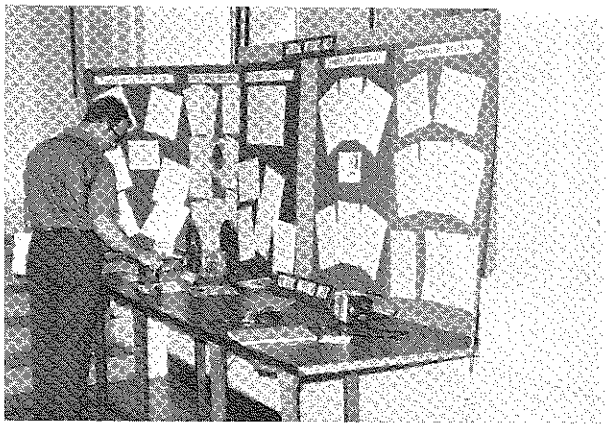
Junior

NEUTRON FLUX DENSITY MAPPING
Designer: T. Wells
Instructor: Professor Byard Houck
School: North Carolina State University

COMPUTER AIDED DESIGN — SMOKE TUNNEL SIMULATION
Designers: R. Freuler
T. Gueth
Instructor: Professor R. LaRue
School: Ohio State University

8 x 10 PROCESS CAMERA
Designer: M. Reicher
Instructor: Professor J. Lipari
School: Passaic School of Drafting

PRESSURIZED PAINT ROLLER
Designer: Cotic
Instructor: Professor Pavelic
School: University of Wisconsin
Milwaukee



Senior

A SYSTEM FOR THE ASSEMBLY OF A 20-PIECE CLUTCH
Designers: Team of 21 with report edited by T.ADA
Instructor: Professor R. Mott
School: University of Dayton

SOLAR ENERGY HOME HEATING
Designers: C. Cullen
S. Roman
S. Licharowicz
C. Shultz
R. Smith
Instructors: Professor R. A. Hirsch
Professor B. H. Rankin
School: Johns Hopkins University

COMPUTER INTERACTIVE USER-ORIENTED GRAPHICS LANGUAGE
Designer: C Mount
Instructor: Professor F. W. Warner
Professor J. A. Brewer, III
School: Louisiana State University

A STUDY OF NUCLEAR WEAPONS AND THEIR EFFECTS
Designers: Bailey
Garrett
Lauffer
Sutherland
Instructor: Professor R. Duncan
School: University of Missouri
Kansas City

WATER MACHINE
Designers: R. Stewart
Instructor: V. D'Angelo
Instructor: Professor J. Lipari
School: Passaic School of Drafting

COMPUTERIZED PARKING STUDY
Designer: R. Darby
Instructor: Professor Byard Houck
School: North Carolina State University

FLIGHT VEHICLE DESIGN
Designers: Capp
Diebold
Haase
Jahnke
Morris
Owen
Voight
Instructor: Professor G. A. Palmer
School: Purdue University

WATER AND SANITARY SEWER DISTRIBUTION SYSTEM STUDY
Designers: W. Holland
P. Combs
E. Hannesschlager
Instructor: Professor J. Bosher
School: Southern Methodist University

COMBINED LOOK, Etc.
Designers: Jankowski
Walz
Instructor: Professor Beimborn
School: University of Wisconsin
Milwaukee

Graduate

FAULT CURRENT CALCULATION PROGRAM WITH GRAPHICAL OUTPUT
Designer: P. Gill
Instructor: Professor H. A. Brewer, III
School: Louisiana State University

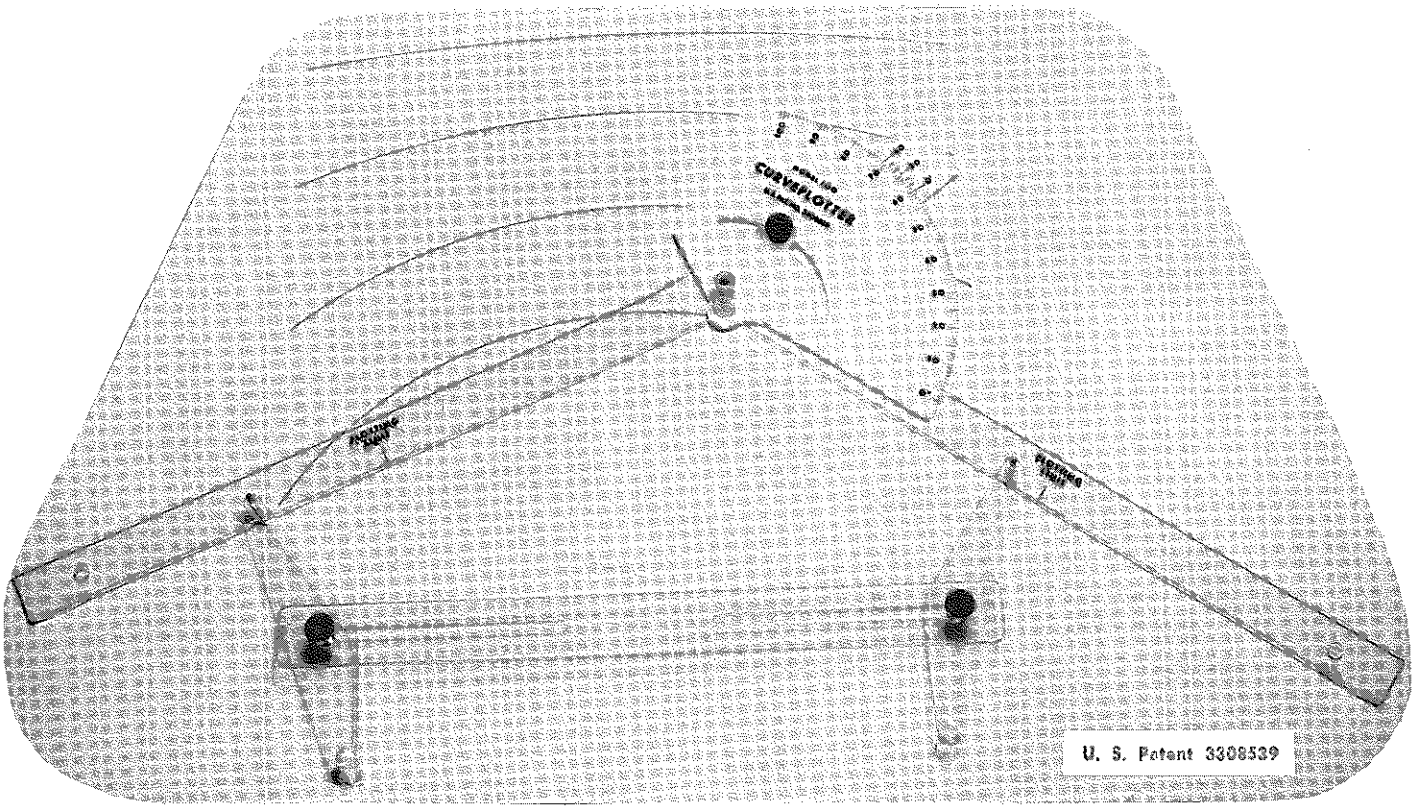
TRANSPORTATION LOCATION GAME
Designers: Ryan
Gonia
Instructor: Professor Beimborn
School: University of Wisconsin
Milwaukee

Senior-Graduate

DESIGN OF A MANUFACTURING ENTERPRISE
Designers: M. Dickman
M. Divecha
W. Fuggi
J. Gebhart
M. Gransky
C. Herskowitz
K. McCartney
A. Morandi
W. St. Aubin
C. Thomsen
J. Viamonte
R. Wimmer
E. Wolpin
Instructor: Professor P. Dilloway
School: University of Bridgeport

Introducing CURVEPLOTTER MODEL 100

"a unique drafting instrument for drawing curves, using chord-angle-radius relation"



FEATURES....

- *draws an accurate curve any radius one inch to infinity*
- *sets to any scale of linear measure*
- *sets arbitrarily or to mathematical formula*
- *sets to chord and chord deflection angle*
- *sets to long chord and mid-ordinate, or rise*
- *draws parallel offset curves*
- *projects curves from tangent or curve*
- *helps determine radius and degree of a pre-drawn curve*
- *use as protractor*
- *uses standard size drawing leads*
- *saves drafting time*
- *durable plastic construction*

CURVEPLOTTER INSTRUMENT, INSTRUCTION MANUAL AND EXTRA LEADS IN A MAPLE FINISH CASE

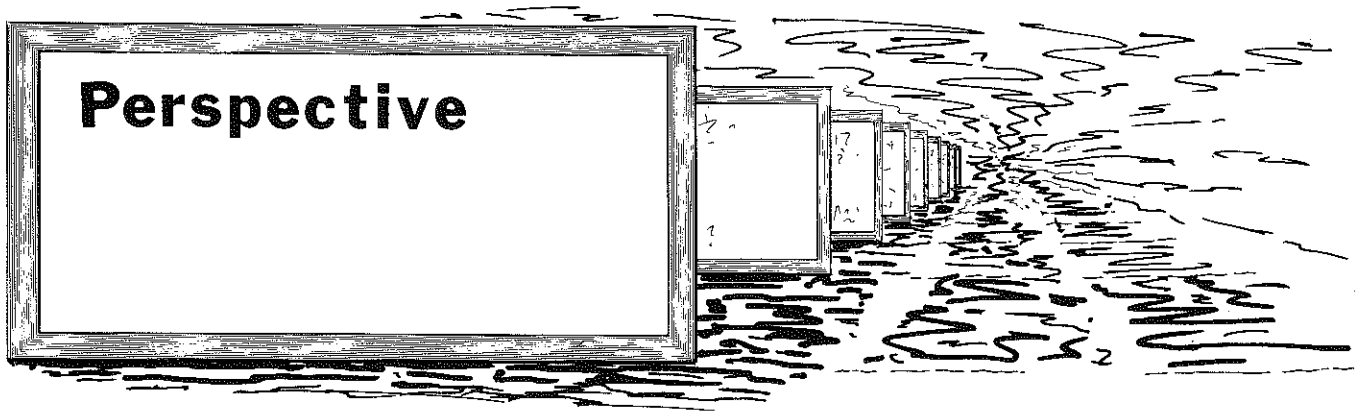
only

$48.

F.O.B. TALLAHASSEE, FLORIDA. INCLUDES STATE SALES TAX. SHIPPING AND INSURANCE CHARGES.

CURVEPLOTTER, INC.
P. O. BOX 1822
TALLAHASSEE, FLORIDA 32302

Perspective



O. A. OLSON

(The following was an editorial in the Ames Daily Tribune on March 18, 1971.)

"One of the many reasons the name 'Ames is known far and wide is a little device developed by O. A. Olson. Called by him the 'Ames Lettering Guide' the small instrument probably has been used by nearly every aspiring engineer or draftsman who was ever enrolled in a mechanical drawing class.

"Simple in its design, the device allowed the draftsman to put precisely-spaced lines on his drawing as a guide to the lettering required to identify various parts and the plate itself. For more than half a century, Mr. Olson's invention has been in widespread general use.

"For many years, the manufacture of the lettering guide was carried on in the basement of his home, and the work of assembling, packing and shipping furnished employment for several generations of college students and student wives.

"Mr. Olson took great pride in his little manufacturing operation, showing visitors around with detailed axplanation. He ducked under furnace pipes with comments about the 'low overhead' and explained that the assembly area was below 'the kitchen upstairs, where we make the dough.'

"The Ames lettering device was not his only invention. He also perfected a number of items intended for use in teaching geometry and for other mechanical drawing applications, including the Draft-pak used by school students here and elsewhere.

"He had a great imagination, enetrprise, practicality and with it all, a great love of life. Along with many other people here, we held a great affection for him."

O. A. Olson, 87, died at his daughter's home in Cedar Rapids on Monday, March 15, 1971.

Born on December 12, 1883 at Tonsburg, Norway, he came to the United States as a small child. He graduated from Iowa State University in 1908 with a B. S. degree and in 1914 earned the M. E. degree. He was appointed to the staff of mechanical engineering in 1913 and served with the department until 1935 when he became head of the engineering drawing department. He retired in 1948.

Professor Olson founded the O. A. Olson Manufacturing Company in 1919 to produce the Ames lettering guide which sold all over the world. He is also the inventor of a valve seating machine as well as developing a number of graphic design teaching aids.

Besides being a member of the Ascension Lutheran Church, he was a charter member of the Sioux City Rotary Club and held membership in the Ames Rotary Club. He aided many engineering students by offering them work in his plant, thus enabling them to graduate.

Professor Olson is named in "American Man of Science", "Who's Who, in Iowa", "Who's Who in America", Who's Who in Education of Norwegian origin" and "Who's Who in American Education".

He is survived by two daughters, Mrs. Wright of Cedar Rapids and Mrs. Huston of Ames, a sister, Anna G. Olson of Fergus Falls, Minnesota, a half-sister, Mrs. Nettie Mattison of Bingham Lakes, Minnesota, seven grandchildren and one great grandchild.

He was preceded in death by his wife, Goldie Payne O. Olson, and a brother.

Col. WILLIAM B. ROGERS

(United States Army,retired)

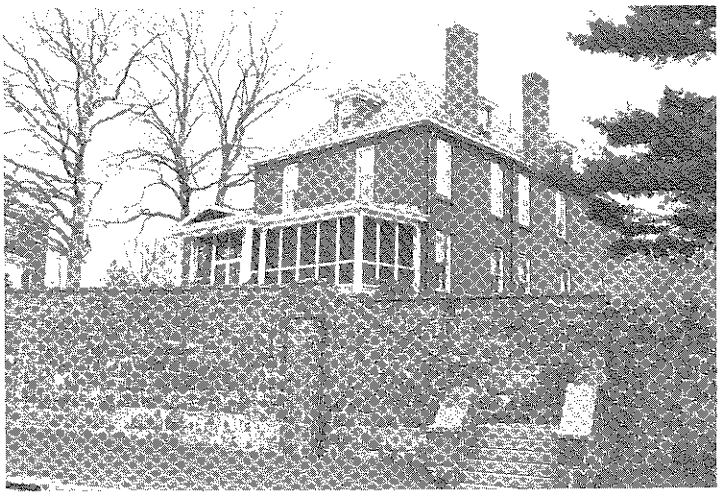
Colonel William B. Rogers, associate professor in the United States Military Academy's Department of Earth, Space and Graphic Sciences, retired recently after more than 23 years of active duty and was presented the Legion of Merit by Colonel Charles R. Broshous, head of the ES&GS Department.

Colonel Rogers has been teaching West Point cadets in engineering classes since July 1951 and will continue his service as an educator in the College of Engineering of Virginia Polytechnic Institute in Blacksburg, Virginia.

A native of Knoxville, Tennessee, Colonel Rogers is a co-author of Engineering Graphics, a text in use at more than 50 colleges and universities. He has held numerous posts in the American Society for Engineering Education and is currently Vice-Chairman of the Engineering Design Graphics Division of the Society. During the school year of 1972-73, Colonel Rogers will serve as its Chairman.

Colonel Roger's wife, Martha, was active is West Point Community affairs with her husband, serving as president of the Alter and Hospital Guild, chairman of the Protestant Women of the Chapel, and chairman of the West Point-Highland Falls United Churchwomen. As a registered nurse, she frequently served as a child care instructor in the Military Academy Hospital, social worker and helper at the West Point Blood Bank.

Colonel Rogers received a bachelor's degree in Mechanical Engineering from the University of Tennessee in 1947 and an A. M. E. in Industrial Arts from the University of Florida in 1951. In 1958, Colonel Rogers completed the Engineer Officer Advanced Course, Ft. Belvoir, Virginia.



The ROGER'S old homestead at West Point

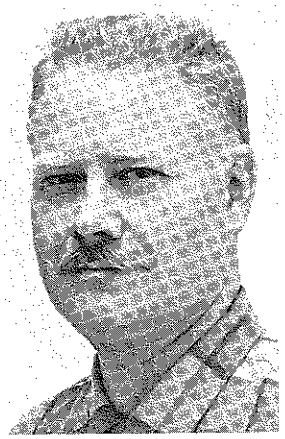
Colonel WILLIAM B. ROGERS (right) being presented the Legion of Merit by Colonel CHARLES R. BROSHOUS.

THE CASE FOR SWITCHING TO MARS-700 TECHNICAL PENS.

While MARS-700 pens are great all by themselves, it's our case that really makes it. ☐ Consider an average day. ☐ First thing in the morning, you take your MARS-700 pen set case from the drawer (it really fits in drawers), and open it up. The pen points, as they have been all night, are resting at a 15° angle. This is so the ink will flow back from the point into the cartridge which eliminates the possibility of the point clogging. ☐ Once opened, it becomes a working stand. You remove the pens you need from their slots and insert them in their own keyholes. The caps are now locked in the holes and to use the pen you simply unscrew it from the cap. To change line widths, one pen is put back into its cap and the next pen required is picked up, so instant change of line widths with only one hand becomes a reality ☐ Come five o'clock, replace the pens in the slots, and the whole case closes back up for easy storage. ☐ And that's our case. It now rests.

MARS-700 TECHNICAL PENS

For complete catalog write to Dept. 55, J.S. Staedtler, Inc. Montville, N.J. 07045. In Canada: J.S. Staedtler-Canada, Ltd., Toronto



Canned Case Studies for Design Courses

EARL T. RUTLEDGE
Systems-Design Department
University of Wisconsin - Milwaukee

Teachers of many engineering courses favor the use of case studies as a device to emphasize the "real world" aspects of their discipline. Case studies work especially well as design examples and as project histories. They can be used as complete or partial cases. They can be presented as open ended problems which can be completed by the student. Case studies can be used to introduce a step in the design process. For example, the use of a classroom ideation session on a problem, followed by the solution arrived at by an experienced designer. Carefully selected material can similarly serve as an example of a feasibility study or a design iteration, or it can demonstrate a well written report.

THE PROBLEM

The situation at UWM is like that in many other Engineering Colleges. The first design course is taught by the Systems-Design Department in the freshman year. Most of the students in this course are almost unaware of what engineering really is and have very little knowledge of the design process. Still, as part of the introductory course in design, each student does an individual feasibility study. He works as part of a team on a preliminary design and a detail design. Class questions have made it apparent that, while the design process can be taught, the students do not grasp its importance in business and industrial situations. Some have difficulty in determining how their projects should proceed. The course appeared to need presentations that could show the applications of various design phases and procedures. One way was to demonstrate by using examples of products from industries of which the students were aware. Case studies from textbooks and industrial reports, as well as examples and live presentations from local industry were applied.

While written studies are useful, students are most impressed by live presentations by engineers who come in with cases from industry and speak to the class. Such live presentations do raise the problems of repeated presentations in large courses, absent students and evening sections. Weather conditions, as well as the speaker being sent out of town, can interfere with the presentation of live case studies. Many speakers do not feel that they have the time to come in semester after semester to repeat a presentation.

A SOLUTION

One solution, the design staff found to these problems, is to convert the presentations by applying some audio - visual technique and thus make them available any time they are needed. Written case studies can be used but the addition of sound can greatly increase the quality of the material and make it more effective. One method that has proven to be very satisfactory, is the use of tapes of the presentations in equipment that will also change slides. 35 mm. slides allow the simple addition of color, presentation of tables and pictures of actual products with ease. Presentors are sometimes willing to work with the design instructor to edit and revise the presentation. Extraneous noises and interference can be removed by retaping from a script, typed up from the original presentation tapes.

If the speakers voice doesn't record well, the script can be revoiced by someone else. Most companies will provide copies of their slides or color copies can be made for about eighteen cents each. Thus, the entire cost of a canned case study with eighty slides and a cassette tape can be less than twenty five dollars. If the original presentation used the overhead projector, the transparencies can be copied onto slides, or if desired, additional overhead transparencies can be made for use with tapes containing audible change tones for manual use in the classroom. The use of 8 mm. sound film is very effective but at higher costs than slides.

AN EXAMPLE

One case study recently packaged by the Systems-Design Department came from a local, well known manufacturer of kitchen appliances and barber equipment. One of the company's engineers agreed to come to present a summary of a project involving the design of a battery operated, professional hair clipper. The first presentation was taped as the slides were called for by the speaker. The presentation gave a complete and clear summary of the project from feasibility study to revisions.

The department then reviewed the material. A few title slides were added. The company provided some detail slides of parts and products. The tape was then used in discussion sessions during the succeeding semesters. The quality of the recording voice was such, however, that the decision was made to retape the presentation. A script was typed from the original tape. Some points in the discussion were expanded while others were reduced. An experimental tape was recorded and then a final tape was prepared on cassette for use on the Wollensak 2550 AV. Change tones were added and the presentation of the case study was ready for use in any classroom.

The total time involved for the design staff was under twenty hours including student help and secretaries. Thus, even in the case of a presentation involving revision, revoicing and a few additional slides, the cost can be less than sixty-five dollars. This is a fairly reasonable cost for a package that can be used for many semesters, at any time of day or any point in the semester when it is required.

HOW ABOUT YOU?

Printed reports are the quickest way to get your case study collection started. Periodical articles and papers given at institutes can sometimes be used as they are presented. Some companies, such as GM, have made educationally oriented material available from time to time. However, the most effective, on call, studies are in some multi-media format. Early in Introduction to Design, UWM Engineering students view "problem films". These are silent 8 mm. films taken by the Systems-Design Department. The purpose for these inexpensive visual studies is the development of problem sensitivity. A home quality camera will do the job.

If the case study material comes to you as a written presentation to start with, it is fairly simple to convert it to a tape-slide presentation. One technique is to set up the study on cards like an animation story board. Prepare the slides, write the script and record the material. Then the tones which signal the change of visuals are inserted on the tape. Another way to prepare the material, if a member of your department is well acquainted with the product or problem, is to set up the slides on a light table or slide editor and ad lib the first recording.

The hardware to present tape-slide units will range from $200 to $400. If your school does not include an instructional media center where tapes can be recorded and photographs can be taken, you can develop a departmental facility that will do a satisfactory job using an instamatic type cartridge camera. A little ingenuity and a few scrap parts can build copy equipment capable of producing presentable slides. Even a complete ready to use copy package will be less than $130. Most slide activating tape equipment includes recording and pulsing built into the hardware.

One effective application of audio tape used at UMW, is the live recording of a Synectics session, which is outlined by the discussion instructor while it is being played. This procedure provides visual support for the voices being heard.

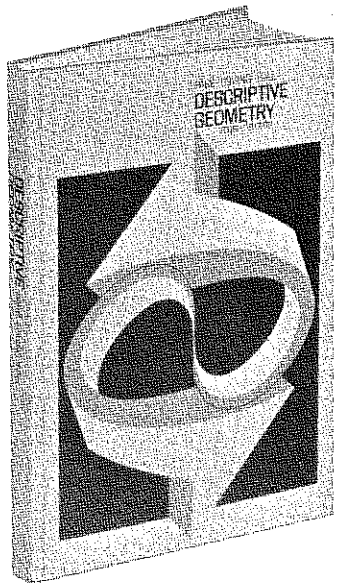
Local companies can usually be counted on to help with educational materials. Select, for your classes, projects suited to the level of your students. A simple example of the optimization of a machine part can be presented readily with color slides and sound. This type of presentation can be of great value to a student team that is refining a design or to a student getting acquainted with value analysis. Some commercially prepared training films, in 16 mm. sound, have been produced. You can obtain them through industry or film distributors if they are suited to your classes.

Once a selection of case studies is available, the design instructor can use them as appropriate to his teaching technique. Cases can be applied to lecture sessions and discussion sections. If facilities are available in a library or instructional media center these studies can be assigned as references out of class. Assignments can be related to an individual student's own project.

With increased emphasis on the individual design projects, even at the freshman level, the use of "canned" case studies is well worth the time and cost involved in their development.

NOW AVAILABLE—

A new edition of a leading MACMILLAN text--



DESCRIPTIVE GEOMETRY

Fourth Edition

By E. G. PARÉ, Washington State University; R. O. LOVING and I. L. HILL, both of the Illinois Institute of Technology

This new edition of a classic text is designed for the one-term drawing course that usually follows engineering graphics or technical drawing. The organization of the previous editions has been retained because it follows the course outline. The fundamentals of the science are presented in pedagogically sound units of work which should concur with class sessions. Division of the material into relatively short, homogeneous chapters increases its usefulness as a reference. *Descriptive Geometry Worksheets,* by the same authors, follow the text organization and introduce new principles in order of both need and difficulty.

Features of the Fourth Edition:

- The inclusion of problems in pictorial form—the form of graphic communication often used by the designing engineer. These pictorial projects will serve both to reinforce the related orthographic principles and, more importantly, to stimulate the development of the student's depth perception and visualization ability. This original material has been thoroughly student tested.
- New problem layouts have been added or substituted throughout and new self-testing problems have been added.
- The notation system has been simplified by elimination of most of the superscripts associated with the point and line identification.
- The decimal system of dimensioning is now used throughout all of the text material, practically all of the drawings, and on over 50% of the problem layouts.
- All shaded figures have been airbrushed.

1971 392 pages $7.95

CONTENTS

A series of worksheets coordinated with the text:

DESCRIPTIVE GEOMETRY WORKSHEETS

Series A, B, and C

By the above authors

Series A, Third Edition, 1968, 77 sheets, paper.....$4.95
Series B, Second Edition, 1966, 76 sheets, paper.....$4.95
Series C, Second Edition, 1967, 72 sheets, paper.....$4.95

Solutions Manuals are available, *gratis.*

ENGINEERING CLASSICS FROM MACMILLAN

ARCHITECTURAL GRAPHICS
Second Edition

By C. LESLIE MARTIN

While retaining the features that led to the First Edition's wide acceptance, this classic text has been thoroughly revised to reflect some of the many advances that have occurred in the architectural graphics field since its publication.

The Second Edition features:

- New introductory material and terminology in the section on paraline drawings.
- More attention to perspective drawing of interiors and simpler methods for some perspective constructions.
- A new chapter on variations of light and shadow that forms a transition between shadow construction and rendering while emphasizing simple considerations that are basic to good rendering.
- More illustrations which present a better variety of techniques in the chapter on renderings.
- An excellent chapter on architectural models that includes illustrations of the basic types and uses from a number of sources.
- Changes throughout in explanatory lettering, shading, drawings, and text. These improve the coordination between text and illustration and make both clearer.

Architectural Graphics is designed for the general course of the same name. It includes enough material for separate courses on Paraline Drawing, on Perspective, or on Shades and Shadows.

1970 239 pages $9.95

DESIGN GRAPHICS
Second Edition

By C. LESLIE MARTIN

This text is the most complete and comprehensive treatment of graphic representation available. The concepts and information necessary for understanding the drafting process of developing a design are presented in step-by-step fashion. The book begins with a discussion of drafting equipment and its correct use and proceeds to the treatment of lettering on drawings, the most useful methods of representing objects by drawings, and techniques of rendering.

1968 307 pages $9.95

TECHNICAL DRAWING
Fifth Edition

By the late FREDERICK E. GIESECKE; the late ALVA MITCHELL; HENRY CECIL SPENCER, Professor Emeritus, The Illinois Institute of Technology; and IVAN LEROY HILL, The Illinois Institute of Technology

The leading text in its field, this book has been thoroughly revised according to the latest USA Standard Drafting Manual, Y 14, including the American Standard on Dimensioning and Tolerancing for Engineering Drawings. Technical sketching and decimal dimensioning are emphasized. More than half the book is devoted to illustrations and problems.

1967 882 pages $9.95

ENGINEERING GRAPHICS

By the late FREDERICK E. GIESECKE; the late ALVA MITCHELL; HENRY CECIL SPENCER; IVAN LEROY HILL; and ROBERT OLIN LOVING, The Illinois Institute of Technology

Based largely on the authors' classic text, *Technical Drawing*, this book incorporates an all-new section on descriptive geometry that covers points, lines, and planes; parallelism and perpendicularity; developments; line and plane tangencies; cartography, geology, and spherical geometry; and graphical vector analysis. Valuable appendices, illustrations, and problems are included.

1969 881 pages $10.95

ENGINEERING GRAPHICS PROBLEMS
Series I

By HENRY CECIL SPENCER, IVAN LEROY HILL, and ROBERT OLIN LOVING

1969 114 sheets paper $5.95

Write to the Faculty Service Desk for examination copies.

THE MACMILLAN COMPANY
DEPARTMENT C
Riverside, New Jersey 08075

In Canada, write to Collier-Macmillan Canada, Ltd., 1125B Leslie Street, Don Mills, Ontario

Intersection Between Curved Bodies in a Single Projection Drawing

UZI ZAMONSKI

1. INTRODUCTION

As a complement to a previous paper*, the author tried to develop a method to construct the line of intersection between cylinders and cones in axonometric projection, when accuracy demands the use of an ellipse to find the line of intersection.

The approach, in this paper, enables one to find intersections between cones and cylinders, which are given in axonometric projection, accurately and, in several cases, quickly. This kind of drawing serves especially well for book illustrations, slides and placards for teaching Descriptive Geometry and Engineering Drawing.

This paper presents only isometric examples, but one may use this method for axonometric and perspective drawings as well.

2. HOMOLOGY AND AFFINITY

In this section, projective geometry terms will be defined without proof merely to mention the terms that will be used

Homology and affinity are connections between two geometric forms existing in one plane. With these relations one may transfer a point or a line from one form into a point or a line in the other form that will be homologic or affined to the first. These are one to one transformations. We shall define each of the transforma- seperately.

Homology is a relation between two plane geometric forms which yields the following rules;

a. A pair of homological points exists on a ray through a fixed point denoted as V and called the origin (or center) of the homology.

b. A pair of homological lines intersect in a line which passes through homological points. This line, denoted by u, is the homological axis.

c. The homological picture of a circle, or an ellipse, yields one of the conic sections. We shall deal only with the ellipse to circle transformation.

Affinity is a special case of homology in which the center V moves to infinity. Therefore our first rule will be defined as follows:

> "Affined points exist on lines parallel to a given line called the director of the affinity."

3. DETERMINATION OF A CIRCLE HOMOLOGIC TO AN ELLIPSE WHICH IS THE PROJECTION OF THE BASE OF A CONE

Let the projection of a general cone be defined by its center O and the cone vertex V (Figure 1). The base projecting into an ellipse is defined by points on conjugate diameters or axes. In Figure 1 the ellipse is defined by the axes AB and CD. An homological form is to be found so that the homological center will be the vertex V and the transformation of the ellipse will yield a circle. In order to determine this transformation, the axis u must be located.

Both of the generators which are tangent to the ellipse in its projection (the contour generators) will also be tangent to the homological circle. Therefore, we can begin the construction by any circle which is tangent to the contour generators, and denote its center by $\bar{O}$ ($\bar{O}$ is not homologic to O). Now it is possible to find the points A^V, B^V, C^V, D^V which are the end points of chords homological to the ellipse axes. The axis u is obtainable by the intersection of the ellipse diameters AB and CD with their homological view A^VB^V and C^VD^V. The choosing of the homological points, as well as the axis, has one out of two possibilities. Any given straight line t, will yield its homological line t^V by two

---

* R. Shapira and U. Zamonski, "A New Solution Method For Cylinder and Cone Problems", JOURNAL OF ENGINEERING GRAPHICS, Volume 32, 1968, pp. 55-56

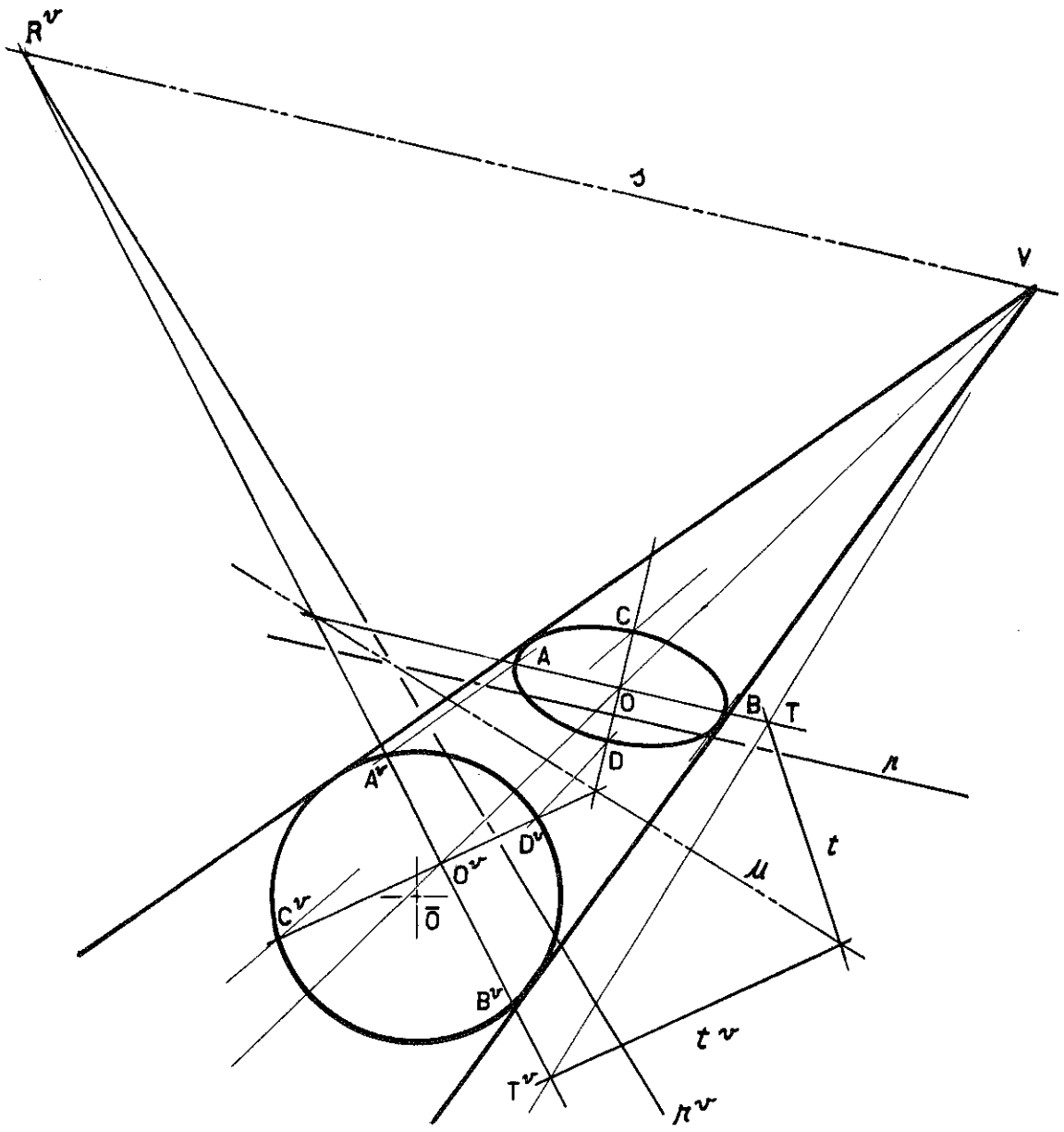


Figure 1

The construction of a homological circle to an ellipse.

homological points on it. In this case we use the intersection point between t and u^V (a point homologic to itself) and the intersection point between t and AB. We shall notice that a diameter in one form will not be a diameter in its homological form. Also, parallel lines in a given form will not be parallel in its homological form unless the given lines are parallel to the axis u (meeting the axis u at infinity). For example, the lines A^VB^V and r^V will intersect in R^V on the line s through V. The line s intersects AB and r at infinity (parallel to them).

Applying this method to circular cones and cylinders, one can see the similarity to the drawings in the aforementioned paper.

4. INTERSECTION OF CONES AND CYLINDERS

The determination of intersection points between cones and cylinders in any kind of projection, orthographic or axonometric, is based upon the intersection of generators which are in the same plane. Since the projection of the base yields, in most cases, an ellipse, a method to deal with a circle instead of an ellipse is to be found. This can be done by a homological transformation. If the generators of the homological form will coincide with the projected generators, one can save the effort of transferring generators from one form to its homological form. This coincidence between generators

will be realized if the vertex of the cone is the center of homology or, in the case of a cylinder, if the direction of the affinity coincides with the axis of the cylinder.

In the previous paper the authors constructed a section of the body yielding a circle in the projection. In this paper, we save the effort of finding the plane of intersection and get a similar picture by homological transformation. While finding the line of intersection some preliminary work has to be done, not all of which depends on the method of solution. Not in all cases will it be justified to solve the intersection problems by this method because of the laborious preliminary work.

Isometric drawings, in the case of intersections, are meant mostly to give visual meaning and illustration to the intersection line. In most of the cases we can choose the relative position of the bodies at our convenience, such as the isometric projection, being a single projection drawing, does not define the relative position of the bodies.

The line of intersection may be constructed, in some cases, without recourse to the orthographic projection. Only these cases will be explained in this paper.

5. LINE OF INTERSECTION BETWEEN TWO CYLINDERS PARALLEL TO THE COORDINATE AXES

Let two circular cylinders with axes m and n be given in their orthographic projection (Figure 2a) and in their isometric projection (Figure 2b). Their line of intersection is to be found. As the isometric projection does not define the relative position of the cylinders in space, we shall use the orthographic projection although it will not be needed in the following construction.

In the determination of the line of intersection, we intersect the cylinders by planes parallel to the axes of the cylinders; for example planes α_i and α_j in Figure 2b which intersect the base planes of the cylinders at a_i, b_i and a_j, b_j. These lines intersect each other on the line t. t being the line of intersection between the base planes of the bodies. This line of intersection is sought in the isometric projection.

If the axes of the cylinders were to intersect each other, the plane α, determined by the two axes, would intersect the base planes of the cylinders by lines a and b through the center of the bases while a and b would intersect on (t). This enables us to construct the line (t) through

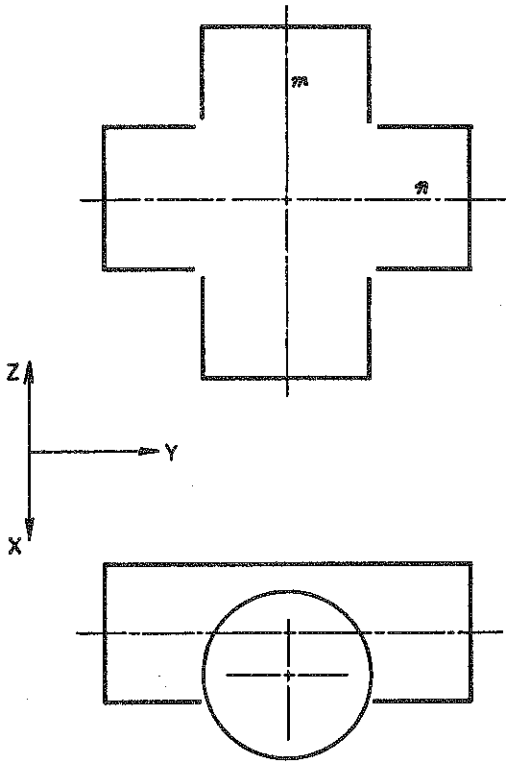


Figure 2a

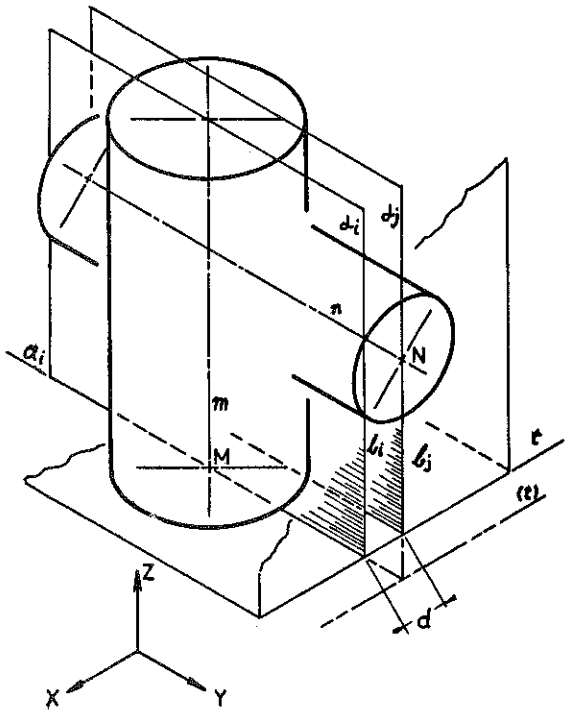


Figure 2b

Figure 2

Orthographic and isometric drawings of two intersecting cylinders.

the point of intersection of a and b parallel to the x axis. a is a line through M parallel to the y axis and b through N parallel to the z axis. However, this is not the common case.

When the axes of the cylinders are skewed, let us assume that m precedes n by a distance d. We can cut the base planes by a plane through m yielding a_i, b_i. The line t, which appears in Figure 2b, will pierce the two planes with distance d between the piercing points. t being the line of intersection between the base planes and the piercing points will be on a_i and b_j. By choosing the proper line t parallel to (t) (Figure 2b), one can determine the distance between the axes of the cylinders without the use of orthographic projection.

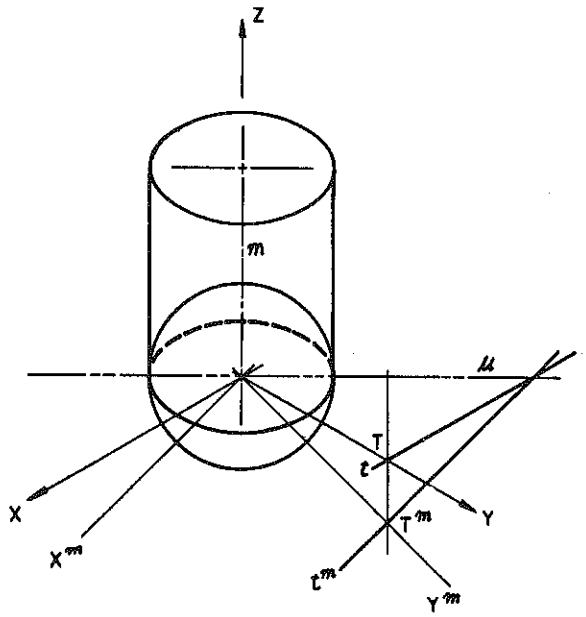


Figure 3

Affined circle to a cylinder base.

6. AFFINED CIRCLE TO CYLINDER BASE IN ISOMETRIC PROJECTION

First, we shall introduce the construction of affined lines and circles. Let an isometric projection of a cylinder be given by its conjugate axes. These axes are parallel to the X and Y axes and form a 120^o angle with the axis of the cylinder (Figure 3). An affined circle is constructed. Its axis, u, contains the major axis of the ellipse. The given conjugate diameters will become perpendicular diameters which form a 45^o angle with the cylinder axis. If a line t is given, its affined line can be constructed by two points. The first is the point of intersection with the axis u; the second is the point of intersection with one of the conjugate diameters (the point T, on the y axis which becomes T^m).

In this case, there is no need to construct the ellipse because the major axis, with an additional point, is enough to determine the ellipse as well as the affinity. In the given example, t is parallel to the x axis, and therefore there is need for only one point on t -- its intersection with the u axis -- while its direction forms a 45^o angle with the axis of the cylinder.

7. CONSTRUCTION OF THE LINE OF IN-BETWEEN CYLINDERS

Now we have the means to construct the line of intersection between cylinders. Let two cylinders with axes m and n be given (Figure 4). The affined image of the bases is constructed as described in the previous section. (The circles are drawn separately from the bases.) The line t is determined as described in section 5, so that m will precede n by the distance d. The affined lines to t are then constructed; t^m with respect to the cylinder m, and t^n with respect to the cylinder n. Any plane parallel to the cylinders will intersect the base planes of the cylinders by the lines a and b as given by their affined lines a^m and b^n. These lines determine the plane. Each sectioning plane determined by a^m yields two generators through the points of intersection of a^m with the base M. To complete the construction, the line b^n is sought. a^m yields T^m on t^m which is affined to T on t. From T, one proceeds to T^n on t^n which is affined to t with respect to n. The line b^n through T^n yields points on the circle n giving the intersecting generators on the cylinder n. The four (4) resulting generators will give four (4) points of intersection.

The sections in Figure 4 give contour points of the intersection. It is also possible, with this method, to distinguish between visible and invisible points as will be illustrated in section 8.

In the present case, it is possible to shorten the work in defining the sectioning planes. Instead of traveling from t^m to t^n through t, we we can make use of a line w passing through the meeting point of a^m and b^n. The line w, because of symmetry, is parallel to t. In order to construct this line, one has to find a point on it. This point is obtainable by the line t and the lines t^m and t^n. If there is no importance to the exact relative situation of the bodies, one can get w, in a similar manner, from t, with the aid of the affined lines to a and b, when the sought distance (d) is greater than d.

$$\frac{(d)}{d} = \cos 15^o$$

or, (d) is greater than d by approximately 5%.

The advantage to this method is its accuracy, little preparation and short working time.

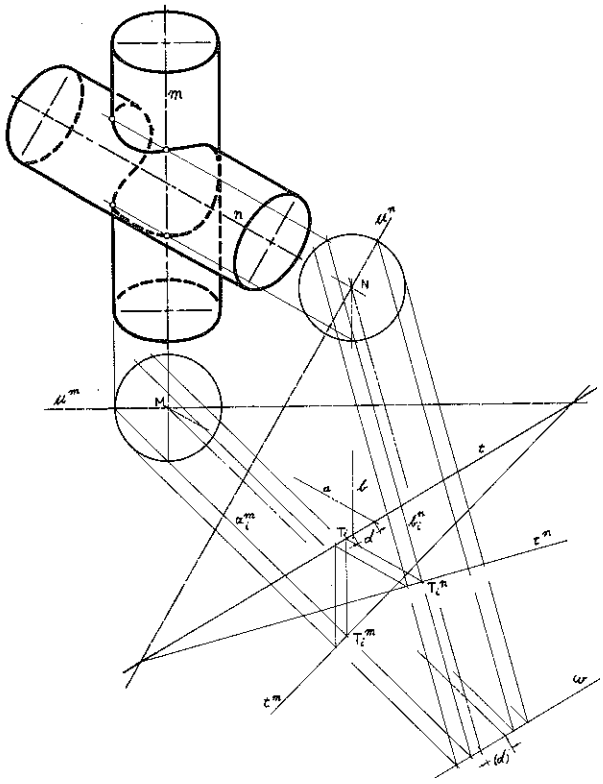


Figure 4

Line of intersection between two cylinders.

8. LINE OF INTERSECTION BETWEEN CYLINDER AND CONE

In this section, the line of intersection between a cylinder and a cone will be introduced step by step and by separate drawings because of the intensive work in the construction.

Let an isometric projection of a circular cone and a circular cylinder be given. The cone's vertex is V and its axis is m perpendicular to the horizontal projecting plane. The axis n, of the cylinder, is perpendicular to the frontal projection plane (Figure 5).

In this case, the bodies are sectioned by a fan of planes through s. s is a line through V parallel to n. s pierces the base plane of the cylinder at point P, whose construction will be explained later. As in the last example, we shall assume that if the axes intersect one another, then lines a and b (lines through the centers of the bases, as described in the previous example) would intersect on line t and lines s and b would also intersect. However, this is not the common case. If d is the distance between the axes, we can find t as described in section 7 and point P will be on f, above its intersection with a and t. This means that its distance from b in the x direction is d. This is the preliminary work for finding the line of intersection which does not depend upon the solution method.

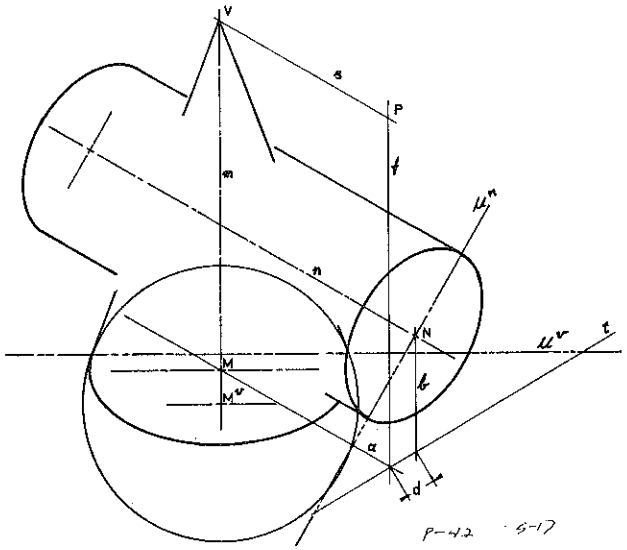


Figure 5

Intersection between cone and cylinder; basic preliminary work.

We continue with Figure 6 in which we perform the preliminary work typical to this solution method. We begin with the construction of the circle M^V which is the homological picture of the cone's base ellipse. The axis u^V is the line between the tangent points of the cone's contours to the ellipse of the base, while V is the homological center (Figure 5).

This construction does not depend on the solution method as it serves to build the contour generators of the cone accurately. Figure 5 was constructed with the help of an orthographic projection, but there was no need for this. The next stage is the construction of the circle N^n which is the affined image of the cylinder base with u^n as its axis, as illustrated in Figure 5. In this example we work simultaneously with homologic and affined transformation.

Now we can construct t^V homologic to t which is obtained by the point of intersection of t with the axis u^V, and the point I, which is the intersection of t with the line of the ellipse diameter. t^n, affined to t with respect to the cylinder, is obtained as described in section 5.

P, which is the origin of the rays b_i (determining the sectioning planes) transforms into P^n R, which is the common point to the lines a_i^v (homologic to the sectioning lines a_i), is the point of intersection of s and A^vB^v (the point R is out of the limits of the drawing).

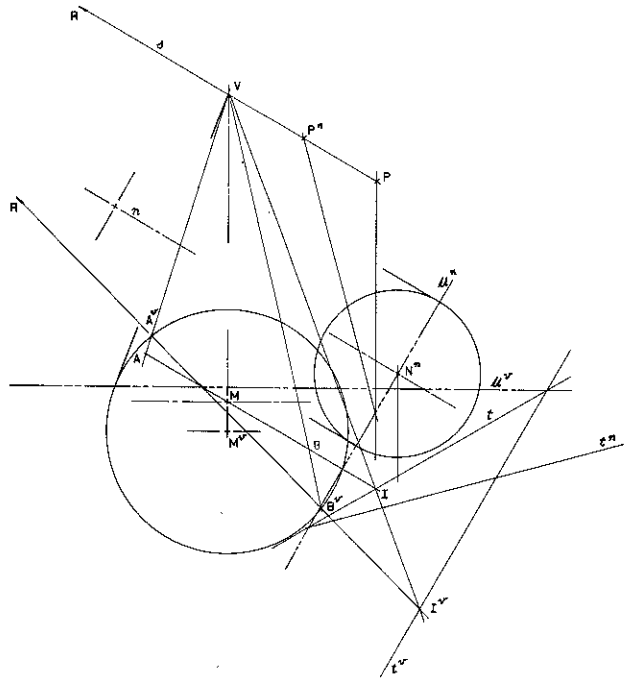


Figure 6

Intersection between cone and cylinder; homologic and affined transformation.

Now we can proceed with the determination of the intersecting points as described in Figure 7. Any sectioning plane will intersect the base plane of the cylinder by a line whose affined image is P^nG^n. This line will intersect the circle N^n in the affined points C^n and D^n, and will yield two sectioning generators. G^n on t^n yields G on t by affined transformation; G^v on t^v is obtained from G by homological transformation. G^vR is constructed to intersect the circle M^v in F^v and E^v, yielding other sectioning generators, F^vV and E^vV. The points of intersection of the generators will give four (4) intersection points between the bodies. The generators through E^v and C^n are visible, yielding a visible point of intersection. One can continue to find additional points of intersection, including the important points, by sectioning with the aid of P^n and R simultaneously. The final result appears in Figure 8 and also includes some of the invisible lines.

9. CONCLUSION

This article suggests a method for solving intersection problems given in a single projection. As a single projection does not define

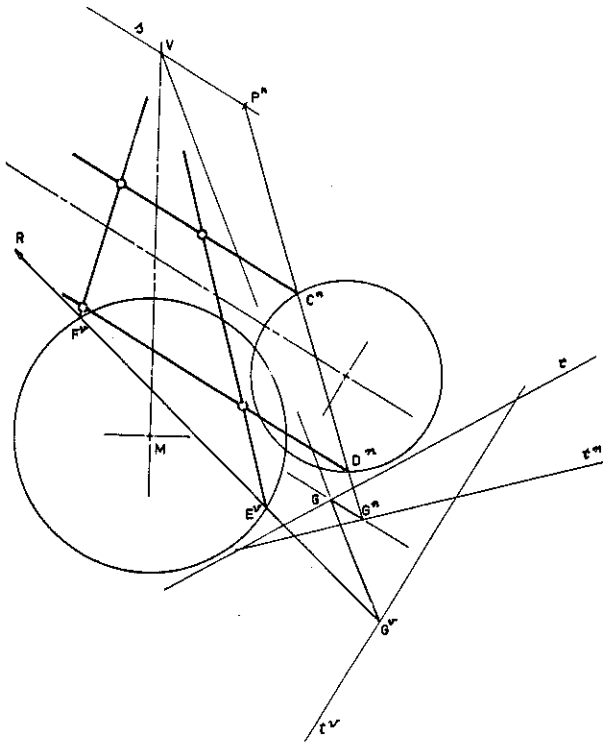


Figure 7

Intersection between cone and cylinder; determination of points of intersection.

the relative situation of the bodies, an arbitrary should be given, such as the line t. This method enables us to construct the intersection between oblique curved and plane bodies. In more complex cases, the increased work will not justify this method. In the cases of circular cylinders and cones this method can be helpful to the draftsman working on illustrative examples. Problems given in orthographic projection may sometimes be solved in a single projection. The reader may try to solve the case of two cones, given in the previous paper (section 9), with the aid of this method.

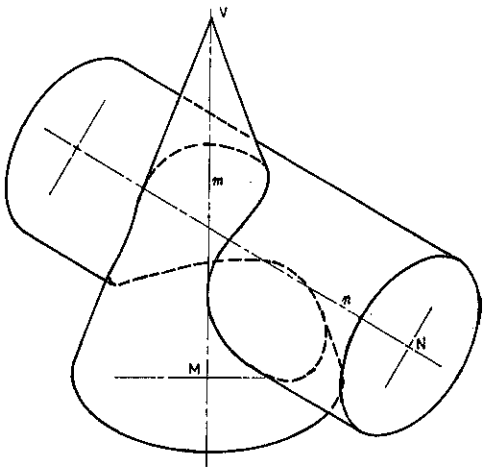
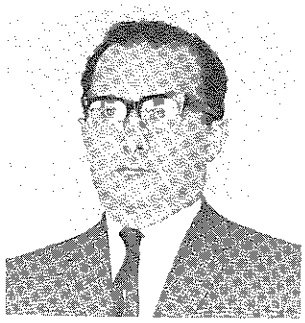


Figure 8

Intersection between cone and cylinder; final result.

ADVERTISERS' INDEX



How Many Views?

A. ROTENBERG
Lecturer in Mechanical Engineering
University of Melbourne

With the method of orthographic projections, solids are commonly represented on a drawing by showing traces on the projection planes of the cylindrical surfaces enveloping the solids and having their straight-line generators normal to the respective projection planes (Figures 1 and 2). Any visible or hidden "edges" on the surface of the solid are also represented on the drawing, and sections of the solid may be added to improve clarity.

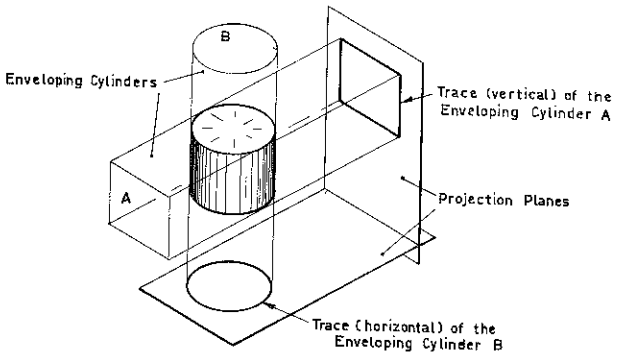


Figure 1

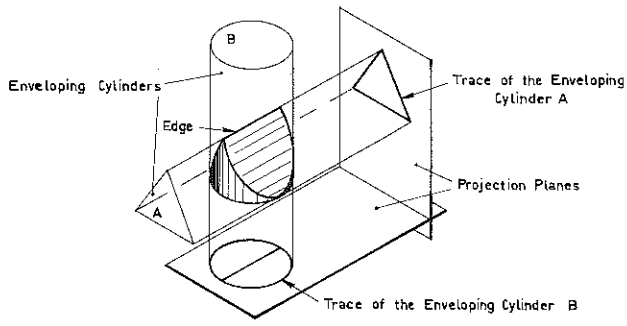


Figure 2

Professional draftsmen are, at least intuitively, aware of the fact that, in most practical cases, such representations are ambiguous if unaccompanied by special symbols or written statements. For example, in the simple cases shown in Figure 3 there is no unique answer to the question "What are the solids represented in (a), (b), (c) or (d)?" Figures 4(a), (b), (c) and (d) show some of the possible respective answers. Though extra views or sections may improve our understanding of these solids, such views or sections will not necessarily remove the possibility that the drawing may represent two (or more) different solids. For example, in Figure 5 a third view has been added to each of the solids shown in Figures 3(a) and 3(d), however, the drawings still remain ambiguous. Figures 6(a) and (b) show some of the solids that may be represented by Figures 3(a) and (d) respectively. Fortunately, there exist unstated assumptions by which, say, Figures 3(a), (b), (c) and (d) represent, respectively, a right circular cylinder, a regular circular cone, a regular pyramid and prism, unless information available on the drawing contradicts it. Without such assumptions, it would be impossible to read most engineering drawings.

On this subject, the American Drafting Standards Manual [1] states;

> "3-1.3 Choice of views. As a general rule, a view should be made in each direction in which the contour of a characteristic shape, necessary to the construction, would be shown."

This is followed by a number of rules such as;

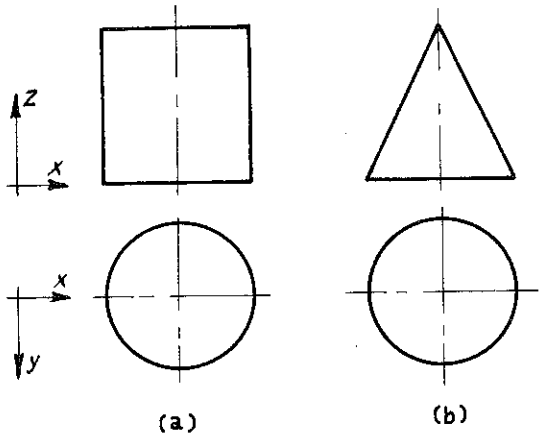
> "Only those views should be drawn that are necessary to clearly portray the shape of the part."

and

> "3-1.3.1 One view drawings. In general, two views are necessary as a minimum for the description of the shape of a single object.

Similarly, the following are quotations from some widely used textbooks on engineering drawing;

> "More than four principal views would rarely be required. Often, two views will represent a part adequately. When



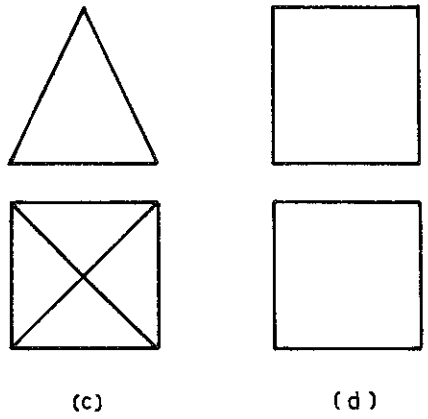


Figure 3

two views are sufficient, they will probably be the front view and, either, the top view or one of the side views" [4].

"For complete description (of solids bounded by plane surfaces) three views are almost always necessary" and, for solids bounded by plane and single-curved surfaces, "two views are sufficient even though three views are shown [3].

"Often, only two views are necessary. For example, a cylindrical shape, if on a vertical axis, would require only a front and top view; if on a horizontal axis, only a front and side view. Conic and pyramidal shapes can also be described in two views" [2].

Similar statements may also be found in in other text-books on engineering drawing.

Whatever such statements may mean, they are likely to leave the reader with the impression that, using the method of multiview orthographic projection alone (i. e. without additional conventions), it is possible to produce ambiguous representations of all or most real objects and, therefore, it only remains to decide on the number of projections required and to select the appropriate positions of the projection planes relative to the object represented.

We are unaware of the existance of any proof that a finite number of orthographic projections and/or sections of any solid alone may

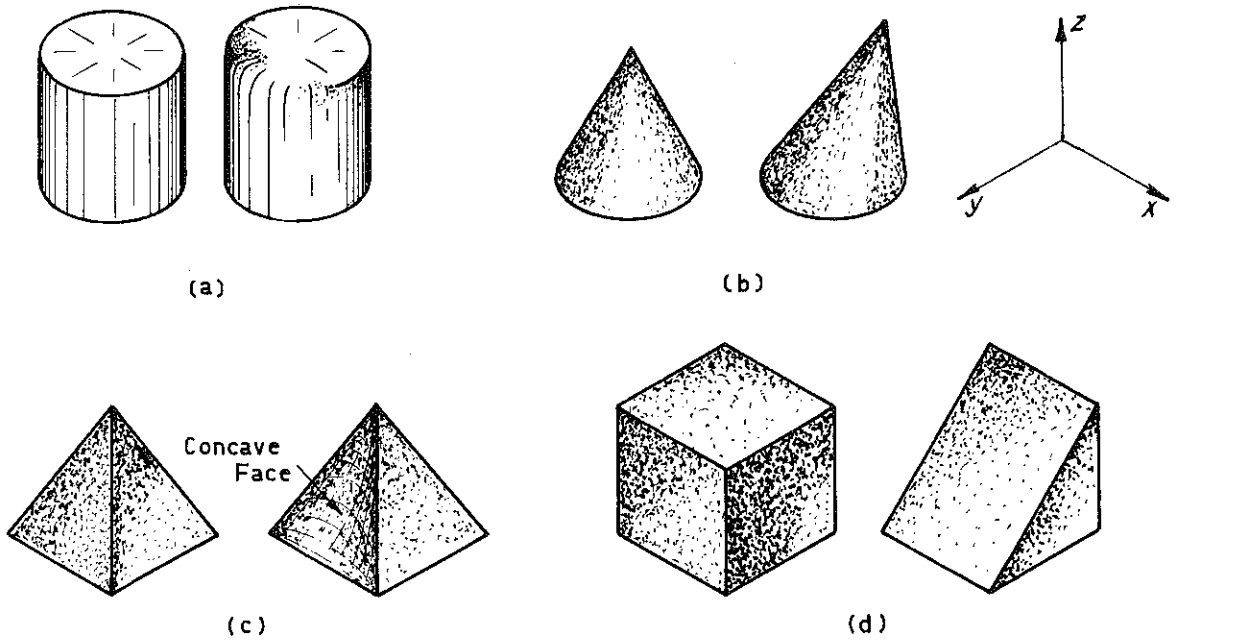


Figure 4

describe its shape unambiguously. It is conjectured here that this is not true. On the other hand, a convention such as

> All solids represented on drawings are bounded by planes and/or circular cylindrical surfaces unless otherwise indicated.

may (would?) enable unambiguous representation of solids using a minimum number of views.

Acknowledgement

My thanks are due to Dr. C. J. Pengilley for assistance in preparation of this paper.

ABSTRACT

This article discusses ambiguity in engineering drawings. It is conjectured that a finite number of orthographic projections and/or sections of any solid alone need not necessarily describe its shape unambiguously. A convention, that may enable the removal of ambiguity from engineering drawings, is suggested.

REFERENCES

1. American Drafting Standards Manual, ASA Y14.3 - 1957, Sections 3 - Projections. Published by the American Society of Mechanical Engineers.

2. T. E. French and C. J. Vierck, Graphic Science and Design, McGraw-Hill, 1970 p. 112.

3. R. P. Hoelscher, C. E. Springer and J. S. Dobrovolny, Graphics for Engineers, John Wiley & Sons, 1968, pp. 137-138.

4. F. Woodworth, Graphical Simulation, International Textbook Company, Scranton, Pennsylvania, 1967, p. 26.

KEYWORDS

Drawings 1405

Drafting practice
Engineering drawings
Graphic methods

Projective Geometry 1201

Descriptive Geometry

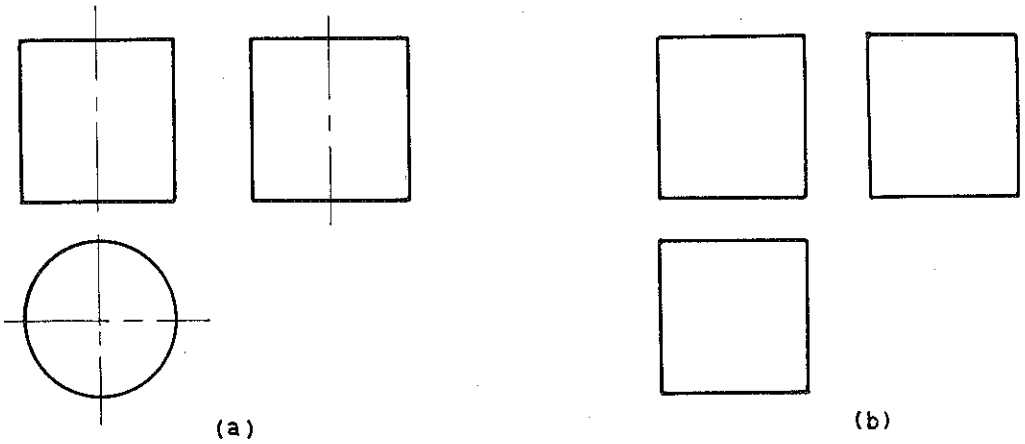


Figure 5

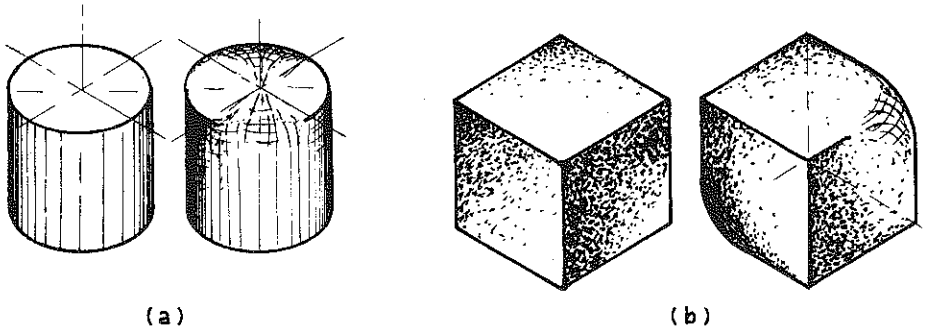


Figure 6

Just Published!

ENGINEERING WRITING

Ann W. Sargent,
California State Polytechnic College, Kellogg-Voorhis

Engineering Writing presents the special techniques and conventions of preparing specific engineering documents such as information reports, proposals, instruction manuals, specifications, and test procedures. It considers the purposes of various types of technical documents, the conditions under which the documents are prepared and used, and the general organization and style used by many companies. **1970—$5.95**

ENGINEERING DESCRIPTIVE GEOMETRY
Theory and Application

H. Crane and **J. Vogtsberger,**
Milwaukee School of Engineering

To facilitate the development of graphic communicative skills, this book integrates graphic technique with logical thinking and spatial orientation. Designed for use with classroom instruction and a related reference, the problems concentrate on principles which are essential to the development, refinement, and presentation of solutions. **1969—printed on green tint ledger paper—$7.95—cloth**

Notes on Graphical Calculus and Vector Analysis

D. H. Pletta and
W. George Devens
Virginia Polytechnic Institute

Notes on Graphical Calculus and Vector Analysis supplements text material used in the freshman engineering course. Topics covered include graphical calculus, vectors and vector algebra, and hyperbolic functions. **1969—$1.25**

Educate for Tomorrow

KENDALL/HUNT PUBLISHING COMPANY

131 SOUTH LOCUST STREET
DUBUQUE, IOWA 52001

THE ENGINEERING FUNDAMENTALS SERIES

Developed by
Virginia Polytechnic Institute

The ENGINEERING FUNDAMENTALS SERIES is specifically designed for a sequence of instruction that integrates the traditional courses in Engineering Drawing and Descriptive Geometry. Problems in the books on graphics consist of both freehand and instrument drawings that help the engineering student understand the application of graphics to the engineering profession. All drawing pages are printed on white ledger paper.

Graphics—Books I, II, III

Joseph B. Dent and **W. George Devens**
Virginia Polytechnic Institute

Graphics—Book I **1968—$3.25**
Graphics—Book II **1968—$3.25**
Graphics—Book III **1969—$3.25**

An Introduction to Computers and Elementary Fortran—Book IV

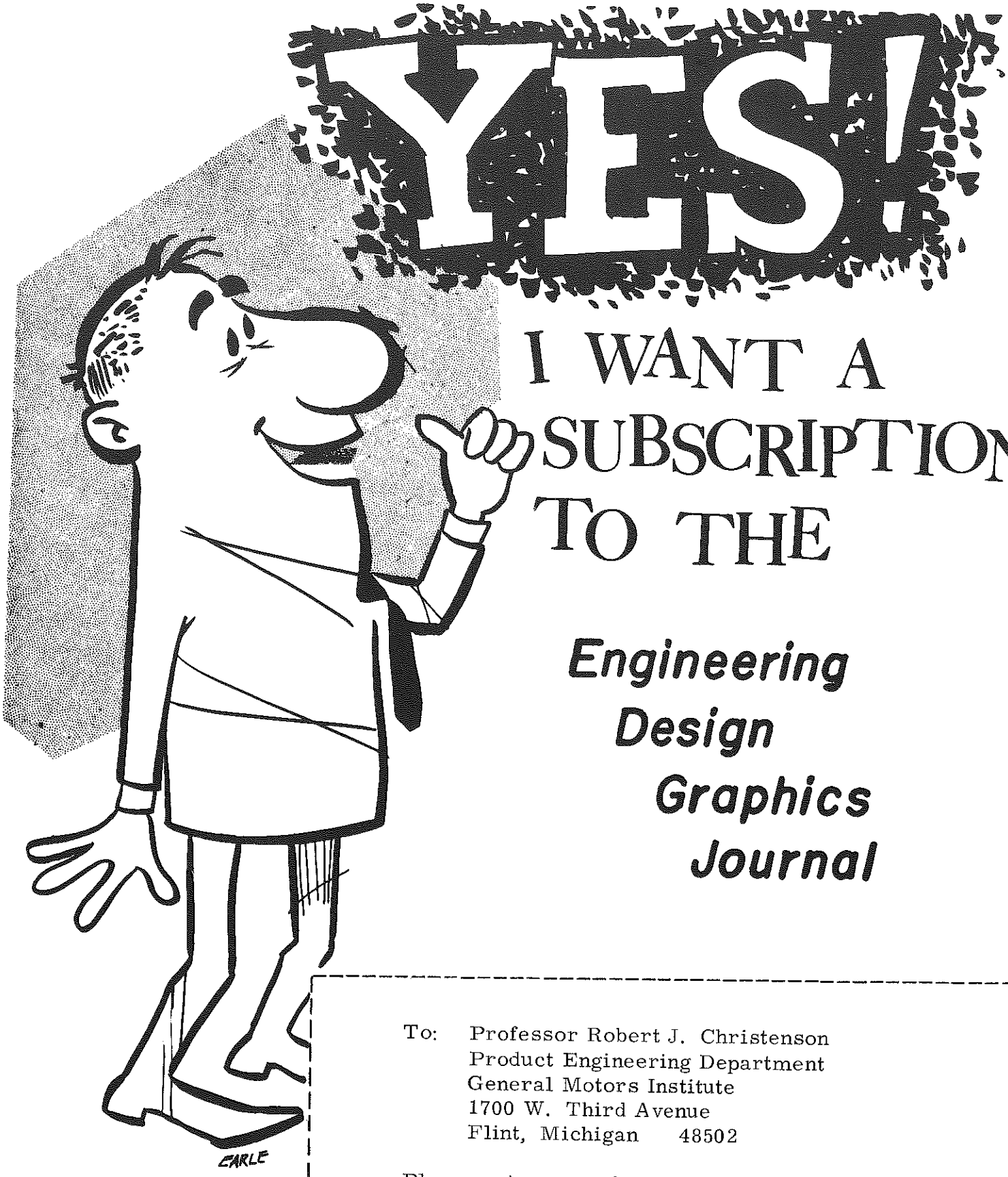
Robert C. Heterick and **James H. Sword**
Virginia Polytechnic Institute

1969—$3.25

PROBLEMS IN ENGINEERING GRAPHICS
Series B

Billy R. Henry, Lamar State College of Technology

Problems in Engineering Graphics is designed for the beginning student or those who have had drawing. Material was selected for use in all fields of Engineering, and the problems are designed in order that the instructor may select his own method of presentation. **1968—$3.75**



I WANT A SUBSCRIPTION TO THE

Engineering Design Graphics Journal

To: Professor Robert J. Christenson
Product Engineering Department
General Motors Institute
1700 W. Third Avenue
Flint, Michigan 48502

Please enter my subscription to the JOURNAL for

_____1 year @ $2: _____2 years @ $4: _____3 years @ $6

NAME _____

ADDRESS _____

CITY and STATE

ASEE

ANNUAL MEETING

TEXAS TECH

LUBBOCK, TEXAS

JUNE 1972