ENGINEERING DESIGN GRAPHICS JOURNAL

FALL 1976, VOLUME 40, NUMBER 3, SERIES 121

Gene Paré

Distinguished Service Award

ENGINEERING DESIGN GRAPHICS PROBLEMS I
By James Earle, Samuel Cleland, Lawrence Stark, Paul Mason, North Bardell, and Timothy Coppinger

A brand new, *design-oriented* problems workbook. Filled with a variety of problems in both engineering graphics and descriptive geometry and aimed at getting freshmen thinking and communicating in graphics. Features include: numerous photos keyed to appropriate problems, industrial examples to add realism to the problems, SI units incorporated throughout, and answers to all problems available in a solutions manual.

Contents: General · Lettering · Instruments · Scales · Geometric Construction · Orthographic Sketching · Pictorial Sketching · Orthographic Projection · Auxiliary Views · Sections and Conventions · Points, Lines, and Planes · True Length of Lines · Edge Views of Planes · Cut and Fill and Outcrop · Angles Between Lines and Planes · Skewed Lines · Angle Between Line and Plane · Revolution · Intersections and Developments · Vectors · Data Analysis · Empirical Equations · Nomograms · Graphical Calculus · Dimensioning · Threaded Fasteners · Working Drawings · Computer Graphics · Working Drawings.

ENGINEERING DESIGN GRAPHICS, SECOND EDITION
By James Earle

This standard freshman engineering graphics text is built on a contemporary design format. Students are introduced to engineering design through the application of descriptive geometry and graphical principles. Topics examined include team dynamics, gathering data, human engineering, patents, technical reports, oral presentation, and final implementation. Illustrations are all by Professor Earle himself and offer considerable clarity and impact. This second edition features an expanded coverage of the more traditional subjects like working drawings, data analysis, and dimensioning.

Contents: Introduction to Engineering and Design · The Design Process · Problem Identification · Preliminary Ideas · Engineering Drawing Standards · Design Refinement · Fundamental Spatial Relationships · Primary Auxiliary Views · Successive Auxiliary Views · Revolution · Intersections · Developments · Design Analysis · Vectorial Analysis · Analysis of Design Data · Design Finalization · Pictorial Presentation · Decision · Implementation · Design Problems.

DESCRIPTIVE GEOMETRY
By James Earle

Descriptive geometry is presented as a problem-solving tool in this text and as a means of developing solutions to technical problems. A large number of photos of products and equipment demonstrate the applications of descriptive geometry to actual engineering design problems. Programed instruction techniques permit the student to move at his or her own pace through topics such as applications of descriptive geometry, fundamental spatial relationships, and vectors, among others.

Contents: Introduction to Descriptive Geometry and Graphics · Application of Descriptive Geometry · Fundamental Spatial Relationships · Primary Auxiliary Views · Successive Auxiliary Views · Revolution · Intersections · Developments · Vectors · Analysis of Design Data.

DESIGN DRAFTING
By James Earle

This book covers all the necessary fundamentals for a first course in mechanical drawing. Practical applications, photographic examples, and a chapter showing the relationship of design to drafting contribute greatly to student interest and motivation. A unique and extremely useful feature of the text is a chapter on careers in engineering, technology, and drafting.

Contents: Introduction to Drawing · Technical Careers · Lettering · The Use of Instruments · Geometric Construction · The Design Process · Orthographic Projection · Orthographic Sketching · Pictorials · Auxiliary Views and Revolutions · Sections and Conventions · Fasteners · Dimensioning · Working Drawings · Cams, Gears, and Sprints · Graphs and Data Analysis · Intersections and Developments · Technical Illustration · Architectural Drafting · Introduction to Descriptive Geometry.

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If you would like to be considered for complimentary examination copies or would like more information, write to Alfred Walters, Information Services, Addison-Wesley. Please include course title, enrollment, and author of text now in use.

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EARLE AND THE GANG HAVE GOT YOU COVERED

ENGINEERING DESIGN GRAPHICS JOURNAL

ENGINEERING DESIGN GRAPHICS JOURNAL is published - one volume per year, three numbers per volume, in Winter, Spring, and Fall - by the Engineering Design Graphics Division of the American Society for Engineering Education, for teachers and industrial practioners of Engineering Graphics, Computer Graphics, and Design Graphics, and Creative Design.

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MICROFILM COPIES
A complete file of back issues is available on microfilm from Xerox University Microfilms, 300 N. Zee Rd., Ann Arbor, Mich. 48106.

ENGINEERING DESIGN GRAPHICS JOURNAL OBJECTIVES:

The objectives of the JOURNAL are:

1. To publish articles of interest to teachers and practioners of Engineering Graphics, Computer Graphics and allied subjects.
2. To stimulate the preparation of articles and papers on topics of interest to its membership.
3. To encourage teachers of Graphics to innovate on, experiment with, and test appropriate techniques and topics to further improve quality of and modernize instruction and courses.
4. To encourage research, development, and refinement of theory and applications of engineering graphics for understanding and practice.

REVIEW OF ARTICLES

All articles submitted will be reviewed by several authorities in the field associated with the content of each paper before acceptance. Current newsworthy items will not be reviewed in this manner, but will be accepted on the basis of the judgement of the editors.

DEADLINES FOR AUTHORS, COORDINATORS, AND ADVERTISERS

The following deadlines for the submission of articles, announcements, or advertising for the three issues of the JOURNAL:
Fall--October 1
Winter--December 1
Spring--February 1

STYLE GUIDE FOR JOURNAL AUTHORS

The Editor welcomes articles submitted for publication in the JOURNAL. The following is an author style guide for the benefit of anyone wishing to contribute material to Engineering Design Graphics Journal. In order to save time, expedite the mechanics of publication, and avoid confusion, please adhere to these guidelines.

1. All copy is to be typed, double-spaced, on one side only, on white paper, using a black ribbon.

2. Each page of the manuscript is to be consecutively numbered.

3. Two copies of each manuscript are required.

4. Refer to all graphs, diagrams, photographs, or illustrations in your text as Figure 1, Figure 2, etc. Be sure to identify all such material accordingly, either on the front or back of each. Illustrations cannot be redrawn; they are reproduced directly from submitted material and will be reduced to fit the columnar page. Accordingly, be sure all lines are sharply drawn, all notations are legible, reproduction black is used throughout... and that everything is clean and unfolded. Do not submit illustrations larger than 8-1/2 x 11. If necessary, make 8-1/2 x 11 or smaller photo copies for submission.

5. Submit a recent photograph (head to chest) showing your natural pose. Make sure your name and address is on the reverse side.

6. Please make all changes in your manuscript prior to submitting it. Check carefully to avoid ambiguity, to achieve maximum clarity of expression, and to verify correct spelling throughout. Proofreading will be done by the editorial staff. Galley proofs cannot be submitted to authors for review.

7. Enclose all material unfolded in large size envelope. Use heavy cardboard to prevent bending.

8. Send all material, in one mailing, to:
Paul S. DeJong, Editor
408 Marston Hall
Iowa State University
Ames, Iowa 50011

CALENDAR

ASEE ANNUAL CONFERENCES

1977-University of North Dakota
June 27-30, 1977
1978-Fresno State College

EDGD MIDYEAR CONFERENCES

1976-77--Ecole Polytechnique
Montreal, P. Q., Canada
January 5-7, 1977
1977-78--University of Alabama
January, 1978

THE AMERICAN SOCIETY FOR ENGINEERING EDUCATION

Engineering Design Graphics Journal

FALL 1976 VOLUME 40 NUMBER 3 SERIES 121

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EDITOR'S PAGE

It is a great honor to have been elected to this position; it is also a little humbling to know one must try to fill such shoes as those belonging to Jim Earle, Al Romeo, Borah Kreimer, and so many other fine and capable men. They truly make a "tough act to follow".

It is also an honor to work with such a fine group of people. Publishing and maintaining a high-quality journal is an immense task, and Garland Hilliard, Clyde Kearns, Leon Billow and now-secretary Bob Foster and their predecessors deserve a great deal of credit and thanks for their past and continuing efforts. Ed Knoblock also joins the staff as associate editor to contribute his talents from his Milwaukee offices.

Any publication like the JOURNAL has an important role to fulfill in maintaining a viable society. Moreover, the unusual character of our division creates some additional facets to that role. The JOURNAL staff is taking every opportunity to develop new and positive programs to promote your interest and participation in the activities of the Society and our Division.

PROFESSIONAL DEVELOPMENT

First, naturally, the JOURNAL must provide a vehicle for disseminating knowledge gained from the activities of its members, and this role should be strengthened. To this end, every effort will be made to have all submitted articles evaluated by impartial reviewers as outlined on Page 2. In general, these reviewers will recommend publication, improvements, or rejection, based on writing, completeness of thought, and, most important, contribution to the body of knowledge or state of the art. In addition, we are asking reviewers to submit a comment on the article for publication with it. While this program is just beginning, we hope you will see its development in coming issues.

Reviewers will be needed to carry out this program. If you would like to act in this capacity, please send a resumé of your qualifications to the editor.

ENJOYMENT

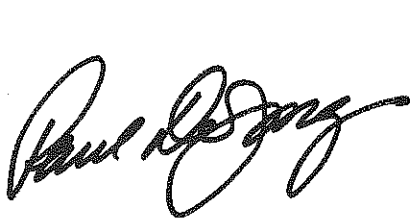
Samuel Florman, in his book, The Existential Pleasures of Engineering, argues that engineers should consciously enjoy their profession more than they do. Along this line, the JOURNAL should be a great deal more than simply a "Transactions of the EDGD". It should be a place where the reader finds something to smile or laugh about where it is appropriate, germaine, and in good taste. I hope that we will see more "Limerick Laureates" (even if limericks are "cockroaches in the basement of poetry") and articles like "The Anderson-Hennigan Syndrome" (Spring 1975), "Design Simplification" (Winter 1976), or even the parable on Page 6 of this issue.

This does not mean the JOURNAL will become a humor magazine. It must stand on its technical merit, and the staff will work to maintain its high professional level.

INTERACTION

This is your JOURNAL, and as such it should also serve as a forum for member input and debate. In order to promote reader interaction and involvement, the JOURNAL will have a "Letters to the Editor" page or column in succeeding issues. Your comments and suggestions on the JOURNAL, its articles, editorials, current issues, conferences, and the profession in general are invited.

Your move...



BELIEVE IT OR NOT, IT WORKS

A PARABLE

"AND IN THOSE DAYS, BEHOLD, there came through the gates of the city, a salesman from afar off, and it came to pass, as the day went by, he sold plenty. They that were the grouches smiled on him and gave him the hand that is glad. The tightwads opened their purses to him.

"And in that city were they that were the order takers, and they that spent their days in adding to the alibi sheet. Mightily were they astonished. They said one to the other, 'What the Hell; how doth he get away with it?' And it came to pass that many were gathered in the back office and a sooth-sayer came among them. And he was one wise guy. And they spoke and questioned him saying, 'How is it that this stranger accomplished the impossible?'

"Whereupon the sooth-sayer made answer: 'He of whom you speak, is one hustler. He ariseth very early in the morning and goeth forth full of pep. He complaineth not, neither doth he knock. He is arrayed in purple and fine linen, while ye go forth with faces unshaven and pants not pressed.

"'While ye gather here and say one to the other, "Verily! this is a terrible day to work," he is already abroad. And when the eleventh hour cometh, he needeth no alibis. He said not to the mass, "Behold they that are in this town are a bunch of boneheads." Nor doth he report that they cannot be sold.

"'He knoweth his line and they that would stave him off, they gave him orders. Men say unto him, "Nay, Nay," when he cometh in, yet when he goeth forth he hath their names on the line that is dotted.

"'He taketh with him two angles -- "Aspiration" and "Perspiration." He knoweth whereof he speaketh and he worketh to beat Hell. Verily, I say unto you, go and do likewise.'"

Chairman's Page

Clarence E. Hall
Louisiana State University

As members of the Engineering Design Graphics Division and teachers of engineering graphics, descriptive geometry and other engineering fundamentals, we can take pride in knowing that these disciplines have served as essential ingredients of most engineering curricula for nearly 200 years. Not only can we celebrate this Bicentennial year of nationhood with our countrymen but also we can look upon this era as the beginning of the third century for engineering graphics.

In this vein of consideration your Chairman wishes to encourage all teachers of these disciplines, and this includes teachers in our two-year institutions, to examine and reevaluate their role in the educational progress of their students and to alter their teaching strategies as needed so as to enhance the effectiveness of these courses in modern-day society.

As educators we would be remiss in our responsibility and obligation to society should we fail to point out the fact that progress in technological developments moved at a snail's pace prior to the development of descriptive geometry. Since then, e.g., during the past two hundred years, this rate of progress has greatly accelerated and the leveling-off period is not yet in sight. We should also make note of the fact that hardly anything of significance is manufactured today without the aid of a drawing. Drawing often becomes a vital part of many contractural records, especially where real estate transactions, construction and manufacturing is involved.

In education, it seems that many educators have forgotten or overlooked the dual role that graphics can play in the educational career of young engineers. Graphics is not only a problem-solving tool for students and teachers, but also it becomes a pedagogical tool for the learning of other disciplines such as mathematics and science. The denial of students the privilege of studying graphics can result in curtailing or limiting their professional potential. Since the study of graphics would not comprise more than 3 percent of their education curriculum the value to be gained by its study far exceeds the cost of its exclusion from the curriculum.

Leading engineering educators of yesteryears understood well the value of graphics in the engineering curricula and so do the present day industrialists. The technological accomplishment of this nation during the two great wars of this century can be attributed to the well-prepared professional engineers, for no nation has risen to the status of a world power without the assistance of its engineers. And very few engineers, if any, have attained recognition of eminence whose educational preparation was void of graphics. The creative genius of design engineers would be lost without the aid of graphics.

Engineering educators should not overlook the fact that engineering graphics courses offer students their first opportunity to gain tangible results from their studies. Many of us recall seeing the students' reaction of self-confidence after completing their first working drawing. We must not lose sight of this opportunity to serve and assist our students.

As we enter the last quarter of this century many of us are aware of the shortage of experienced graphics teachers, especially those who are well-grounded in descriptive geometry. The leadership of the Engineering Design Graphics Division is aware of this shortage, and plans are well underway to sponsor an International Conference on Descriptive Geometry, to be held in conjunction with the Annual ASEE meeting in 1978. Other announcements pertaining to this Conference appear elsewhere in this publication.

Let it not be said that we have been slack in reminding educators of other engineering disciplines of the historical role that descriptive geometry has played in their respective engineering curricula and its significance in modern-day engineering practices of the 20th century. History reveals that shortly after Gaspard Monge announced the development of his descriptive geometry near the close of the 18th century that some of the keenest of intellectual minds of France undertook the task of expanding the new discipline and applying it to their work. Truly this discipline is the science of modern-day mathematical drawings. When referring to the value of his discipline, Monge once said,

> "The charm which accompanies these studies will conquor the repugnance which men have in general for intense thought, and make them find pleasure in that exercise of their intellect which almost all regard as painful and irksome."

THE AMERICAN SOCIETY FOR ENGINEERING EDUCATION

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THE DIVISION OF ENGINEERING DESIGN GRAPHICS

American Society for Engineering Education

has bestowed upon

Eugene G. Paré

its highest honor

THE DISTINGUISHED SERVICE AWARD

for his invaluable contributions to the Division and to Engineering Education, and as an expression of the high esteem of his professional colleagues.

Scholar, teacher, and leader, Professor Eugene G. Paré has served education, the engineering profession, its students and practitioners, for over thirty-five years. His achievements as an engineering educator include that of an author, teacher, counselor, initiator of inventive educational activities, and friend and confidant of both students and colleagues. In his own quiet way, he has significantly influenced the content and direction of engineering graphics programs.

Professor Paré joined the Society and the Engineering Design Graphics Division in 1943. Following service on many committees, the Division benefited further from his able leadership as Editor of the Engineering Design Graphics Journal, Treasurer of the Division, Vice-Chairman, and with distinction, as Chairman in 1968. As a Past-Chairman, he has continued his active service to the Division and as advisor to succeeding administrations, Professor Paré has represented the Division with dignity and has given encouragement and inspiration to all who have known and worked with him.

In appreciation for his leadership, his untiring efforts for improvement of engineering education, his unselfish service to the Division, and as a token of friendship and esteem, the Division presents to Eugene G. Paré the Distinguished Service Award for 1976.

Presented this day June 15, 1976
at the Annual ASEE Conference, The University of Tennessee

Robert D LaRue
Chairman

Paul S DeJong
Secretary-Treasurer

Distinguished Service Award

EUGENE G. PARÉ

I am grateful for this honor since I know that our ASEE division has a multitude of fine teachers. I am particularly grateful for this recognition since I believe that in our division the competition for honors is really tough. You know, I initiated our student creative design competition back in 1968 with the expectation that I could garner some glory for Washington State University students. The competition is really tough, we haven't won a single award.

I trust you will agree that we continue to have some real giants and innovations in the field of engineering education. We need to take a back seat to no one. Certainly our division has been the leader in many ASEE activities. We have an excellent journal that a few others are striving to emulate. We have a proud tradition of awards for teachers and students. We continue to hold fine mid-year meetings and summer schools that others should also initiate. We were the first segment of ASEE to express our desire to enhance the educational prospects for women and minorities. Yes, we need to take a back seat to no one.

I am convinced that our division was primarily responsible for the somewhat recent desirable shift from essentially science theory to the current emphasis on engineering design applications.

Hardly the least of our guiding examples has been the beautifully illustrated textbooks and workbooks produced by so many of our members. Surely in many areas of engineering education, we have been in the driver's seat; and I trust that shortly we shall be the first division to complete our shift to the SI metric system.

On behalf of Marjorie and myself, may I sincerely thank you for this recognition.

Eugene G. Paré
Washington State University

The Knoxville Thrill

or

1976 Convention Highlights of the EDG Division ASEE at the University of Tennessee

One sometimes wonders "why look back?" "water over the dam" let it flow! etc.

Perhaps the main reason to discuss the so-called highlights of past programs is to help sell future conferences to the membership. This is a dingy assignment, because no matter how high the light of past performance is held it just doesn't bring the sacrament of the sessions out of the shadows. It doesn't compare with being there!

So the big pitch to date is: Participate—Care! Be there! Make it unnecessary to report the highlights of past performance by spotlighting the future.

However—at last—a parting pass at the past.

In summary, it was a good conference. Some of the summary is as follows:

The formal conference began early Monday morning (June 14) with Menno DiLiberto serving as moderator for the Creative Design Graphics Display Judges Orientation. Judging from the judging that was achieved later on, it was a good session.

The display itself upheld the excellent tradition of the past few conferences and certainly must be listed as a skylight amongst the highlights of the conference. The winners appear in a separate article in this issue.

"Design Graphics Education in America's Century III," moderated by George Pankratz, The University of Toledo, featured B. J. Whitworth, Hughes Tool Company, Houston, Texas, in Changes Ought to Wear White Hats and Amogene DeVaney in Minutemen at Selected Community Colleges—a determination of trends, similarities between JUCOS and Universities in engineering curricula.

The now familiar Rap session on Design (where Pro and Con - found speeches foment and flurry through foamy lips) was a feature event. Although carried out in subdued light it was, nevertheless, a very illuminating get-together and for some a very high night if not a highlight.

Tuesday, June 15, featured a continuation of the design display, industrial exhibits and another Rap session on the possibilities of a division name change. The "aginners" outnumbered the "changers" so for them a highlight and for the "changers" a twilight—but nobody walked out!

The Annual Awards Banquet on Tuesday evening featured not only good food but also the usual fine awards for winners of the creative design display competition, and the recipient of the Distinguished Service Award (a great day for Gene Paré).

Highlights of Wednesday, June 16, included an early morning session on the why and how for enhancing the creative abilities of students. Participants were P. F. Pfaelger of San Francisco University and A. J. Brainard of the University of Pittsburgh.

The Business Luncheon and two events co-sponsored with the Engineering Technology Division, the Electrical Engineering Division, and the Engineering Design Committee were also well attended and received.

The final division event, "Creativity and its Development," kept the membership blinking from 3:45-5:30 with Percy Hill's bottle caps and Paul DeJong's mystery boxes (to promote visualization by the sense of touch).

So, with all the other division meetings, social gatherings and "wonerful-wonerful" hosts and hostesses, the highlights were many and very illuminating and with all those highlights there just couldn't be any shadows!

Thank y'al - 'Twas very nice to be - Guests of U of Tennessee!

C. Gordon Sanders
Director of Programs
Iowa State University

1976 CONFERENCE: ASEE MEMBERS FACE THE METRICATION ISSUE

Klaus E. Kroner
Associate Professor
Industrial Engineering & Operation Research
University of Massachusetts

That metric conversion is becoming an important issue in engineering education was evident by the number of sessions at this year's Annual Conference devoted to the topic and by the good attendance at these events. The majority of the five metric sessions were sponsored and planned by ASEE's Metrication Coordinating Committee with our Division co-sponsoring a couple of them. Some of the points made by the various speakers follow:

* The earlier in their lives youngsters learn about the SI system, the sooner the U. S. will have completed the conversion process.

* The SI system promises to unify the industrial world by a common language, paving the way for truly international engineering standards and for easier trade relations.

* The Metric Conversion Act of 1975 was written so as to let the private sector take the initiative and to find the best means to implement the conversion process.

* The tables of standard tolerances and of preferred fits and sizes (using metric units) established by the ISO are convenient to use and will, if properly implemented and publicized, help minimize the cost of materials and tools.

* It is imperative that we do not become satisfied with mere soft conversion but that hard conversion of all materials and products be initiated without delay.

* Resistance to the SI system is more prevalent among faculty than among students.

* Engineering educators should lose no time in personally adopting SI and vigorously fight for its speedy acceptance among their students as well as among the public.

* Students graduating in 1977 should at least be familiar with SI, and from now on only textbooks which include treatment of SI should be used.

* There is no longer any excuse for continuing to use customary units in teaching today's engineering students.

* Manufacturing firms are rapidly converting to metric because of their concern regarding expansion of their markets and reduction of manufacturing costs.

* During industry's transitional period, future graduates should be comfortable working in either system of measurement.

It can be generally said that all the speakers--and most of them were from industry--spoke with a sense of urgency about the need to conduct engineering education in the metric language. There also seemed to be a consensus that the metrication process in the country should not be drawn out over too many years, although it appears to be difficult to agree on just the right length of time. Admittedly, different industries, professions, and sectors of our society will require varying conversion periods.

The ASEE committee will again run numerous metric-oriented events at the 1977 Annual Conference, and plans are already underway for '78 as well. Journal readers should note that metrication is also on the agenda of the Mid-Year Division Conference in Montreal this coming January.

SYMPOSIUM ON FREIGHT PIPELINES
December 5-7, 1976

Under the sponsorship of the U.S. Department of Transportation, the Department of Civil and Urban Engineering at the University of Pennsylvania will conduct an International Symposium on Freight Pipelines in Washington, D. C. on December 5-7, 1976. A number of international experts have been invited to present papers on various aspects of the subject including slurry, pneumatic, and capsule pipelines. Anyone interested in the symposium should contact I. Zandi, Room 113A Towne Building/D3, University of Pennsylvania, Philadelphia, PA. 19174.

INTERACTIVE DESIGN SYSTEMS CONFERENCE
April 13-15, 1977 Stratford - upon - Avon

This conference will bring together an international group of experienced users of interactive graphics-based design and manufacturing systems. The goal is to produce a state-of-the-art report of value to users and suppliers alike, reflecting current experience and future requirements. The Program is to be in four parts: Suppliers' presentations, Detailed Users' case studies, Forum Discussion of Experience, and Research Sessions.
Attendance will be by invitation only and full proceedings will be published. Persons interested in participating as speakers, chairmen, or attendees, should indicate with B. Gott, Chief Consultant, The Computer Aided Design Centre, Madingley Road, Cambridge, England, CB3 OHB., indicating their topic of expertise.

Creative Engineering Design Display

The June, 1976 "Creative Engineering Design Display," at Knoxville, Tennessee, was the ninth annual display since its initiation in 1968. It is sponsored by the Engineering Design Graphics Division of the ASEE. To this writer, it appears to be one of the highlights of the yearly ASEE Convention. One has to only listen to comments made by engineering educators as they inspect each project in the display area. Their remarks reflect feelings of pride regardless of whether or not they were involved in the student design project. Approximately 50 student design projects were on display and I would guess that over 3,000 people came through the area to see the kinds of projects that engineering students are involved with. Most remarks from these people indicate their amazement at the ability of "College Students" in formulating and developing their solutions to the many different design problems. Little do they know that they were providing us with remarks which insure the attainment of a primary objective of the "Creative Engineering Design Display" —

> "to encourage students to expend their best efforts on projects to be displayed and recognized nationally."

HIGHLIGHTS

The highlight of each year's program is probably the awarding of prizes at the yearly banquet. If only all students involved with each of the projects on display could attend this banquet it would add that missing dimension to the overall competition.

A total of 55 student design projects were on display at this year's conference. The number of entries in each category were as follows:

Freshman	32
Sophomore	5
Junior	5
Senior	12
Graduate	1
Total	55

JUDGES, EVALUATING, AND AWARDS

The judging of each design entry took place in two rounds. There were 29 judges with each judge evaluating five different projects each round. These evaluations were in the form of "rating" sheets. Scores on these sheets were summed up by Ron Pare and winners in each category were as follows:

FRESHMAN

First Place: Frigidhair: A Cool Motorcycle Helmet
Arizona State University

Second Place: Automatic Passenger Restraint System
California State University-Northridge

Third Place: (Tie) Help: Adjustable Desk to Aid Handicapped Children in Learning
Arizona State University

Removing Rivets from Cutter Bars
Ohio Northern University

SOPHOMORE

First Place: Proposed Architectural Facility for Alfred State College
S.U. of N.Y. - Ag & Tech. College

Second Place: Aggie Scooter: The Design of an Astronaut Mobility Unit
Texas A&M

JUNIOR

First Place: A Microprocessor Controlled Intersection
Milwaukee School of Engineering

Second Place: Mobile Skills Developer
University of Wisconsin-Milwaukee

SENIOR

First Place: A Self-Starting and Reversible Steam Engine
Milwaukee School of Engineering

Second Place: Dental Medical Power Source
Marquette

Third Place: Porous Breakwater
U. S. Naval Academy

GRADUATE

Second Place: An Implementation of the Loutrel Algorithm
Iowa State University

Without the help of judges the evaluation of each project could not be accomplished. For a job well done, the committee wishes to acknowledge the following individuals who gave of their

time and expertise to evaluate this year's entries:

Prof. Matt W. Abbitt, Jr.
General Motors Institute

Mr. Albert Ackoff
Eastman Kodak Company

Prof. Don K. Anderson
Michigan State University

Prof. Daniel L. Babcock
University of Missouri-Rolla

Dr. Lionel V. Baldwin
Colorado State University

Dr. Fred J. Benson
Texas A&M University

Mr. E. R. Brown, Jr.
Union Carb. Corp., Linde Div.

Dr. Maurice Carlson
Lafayette College

Mr. Paul Doigan
General Electric Company

Mr. M. L. Douglass
Vought Corporation

Prof. Lawrence J. Henschen
Northwestern University

Prof. A. R. Holowenko
Purdue University

Mr. Carl H. Hough
The Boeing Company

Prof. Lawrence A. Jehn
University of Dayton

Prof. Israel Katz
Northeastern University

Prof. William M. Lee
U. S. Naval Academy

Dr. Ivon Lowsley
University of Missouri-Rolla

Dr. Richard D. Mathieu
U. S. Naval Academy

The committee also wishes to gratefully acknowledge the following companies for their financial support allowing us to award plaques and certificates to each of the winners:

The Boeing Company
Celanese Corporation
E. I. duPont deNemours and Company
Ford Motor Company
General Motors Corporation
Monsanto Company
Olin Corporation
Union Carbide Corporation

In addition, we gratefully acknowledge the Memorial Award for the family of James S. Rising.

THE COMMITTEE

The committee for this year's design display is listed below together with their assigned responsibilities:

Menno DiLiberto, Ohio University, Chairman
Ron Pare, Cogswell Tech., Evaluation and Awards
Leon Billow, U. S. Naval Academy, Judges
Mary Jasper, Mississippi State, Publicity
Peter Miller and K. E. Botkin, Purdue Univ., Program Directory
Clair Hulley, Univ. of Cincinnati, Division Banner

A special thanks from me and from the division to all of them. Since I have once again accepted the chairmanship for the display for next year at North Dakota, I'm hopeful that most of the committee will continue with their assignments.

OBSERVATIONS

Although the committee felt that this year's Creative Engineering Design Display was, as usual, a successful one, there were some areas of concern that I, as chairman, wish to point out.

1. Over 900 initial letters were mailed to schools all over the country. The final number of entires was 55 student projects. I don't believe this is a good return and, therefore, recommend that our mailing list be reviewed and possibly include only those schools with faculty membership in our Division.

2. Since this is a "student design" display, isn't it possible to get more students involved in the conference activity? Why can't we invite all students who attend the conference and have a design project entered in the competition to our yearly banquet as our guests?

3. Approximately 60% of this year's entries were in the freshman category. A look at last year's entries revealed a similar percentage of entries. Should we concentrate our efforts toward the freshman level for the competition in view of the limited number of entries in the other categories?

The committee would appreciate any comments you may have with respect to this year's display. We also welcome any suggestions regarding future displays. Let us hear from you by writing to the committee chairman.

In conclusion, on behalf of the committee, I wish to thank all those who helped make the 1976 Creative Engineering Design Display a success.

Respectfully submitted,

Menno DiLiberto
Engineering Graphics Dept.
Ohio University
Athens, Ohio 45701

Candidates for Office

At the annual conference of ASEE in Knoxville, the accompanying slate of candidates for division offices was proposed and approved, pursuant to ART. IV, section 1(a) of the Bylaws. It presents as imposing an array of talent and personality as can be found anywhere; surely it will be difficult to decide how to vote. Please study the slate of candidates so you will be prepared to vote when Secretary Bob Foster sends your ballot in February.

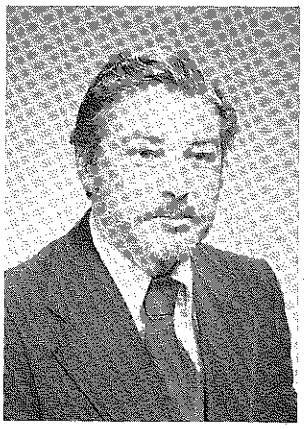
VICE-CHAIRMAN (1977-78):

CLYDE H. KEARNS
Ohio State University

Clyde is Professor and Chairman of the Department of Engineering Graphics and Professor of Computer and Information Science at The Ohio State University. He has been a member of OSU faculty since 1946 except for four years in industry with Union Carbide. Currently completing his fifth year (two terms) as Circulation Manager and Treasurer of Engineering Design Graphics Journal. Clyde is also a member of CoED and ERM Divisions of ASEE.

KLAUS E. KRONER
University of
Massachusetts

Klaus has been a member of ASEE since 1953. He taught at N. Y. U. and the University of Maine before joining the "UMASS" faculty where he teaches other engineering courses as well as engineering graphics. He has chaired several Division committees, was advertising manager of the JOURNAL and is completing a term of Director of Liaison. Other professional interests include visual teaching aids, computer-aided instruction, and metric conversion affairs. He is founder and president of a firm dealing in wind and solar equipment.



CIRCULATION MANAGER (1977-80):

GARLAND K. HILLIARD
North Carolina
State University

Garland is Senior Advisor and is in charge of graphics in the Freshman Engineering and Student Services Division at N. C. State, which staff he joined in 1964. Besides teaching, he has 20 years experience as a craftsman, designer and consultant in the graphics arts industry. He has been an active member of ASEE and the EDG Division since 1968. He has served as Associate Editor of the EDG Journal since 1973 and ran for Advertising Manager in 1975. He is the co-author of several graphics workbooks and papers on self-paced instruction in engineering graphics.

J. TIM COPPINGER
Texas A&M University

Tim, a registered Professional Engineer, is an Associate Professor of Engineering Design Graphics and a member of the Graduate College. He joined the staff in 1968 after two years as a project engineer. He has degrees in Mechanical Engineering and a Doctor of Environmental Design in Architecture. At A&M, he has developed and taught several Graphics-related courses and has co-authored graphics problem books and JOURNAL articles. He has served on the Industrial Relations Committee, the Educational Relations Committee, and as Chairman of the Creative Engineering Design Display in 1975.

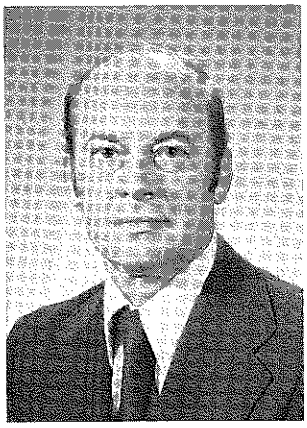
During its meeting, the executive committee discussed nomination at length. It is argued that nomination of two candidates for office guarantees election by the membership, not by committee. On the other hand, it is an extremely rare procedure, and half of the deserving candidates will be disappointed. It is also argued that Art. IV provides for nomination from the membership if the slate seems inappropriate. Because of its importance, the executive committee voted to place the question on the ballot, where it may appear in slightly different form than shown here. Please consider it carefully and submit comments by Dec. 1 for the winter issue.

QUESTION: SHALL THE DIVISION CHANGE ITS PRESENT PRACTICE AND BYLAWS, ART. IV, SEC. 1(a), AND REQUIRE THE NOMINATING COMMITTEE TO PLACE ONLY ONE NAME ON THE SLATE FOR EACH OFFICE?

DIRECTOR: PROGRAMS (1977-80)

ARVID R. EIDE
Iowa State University

Arv is a Professor and Chairman of the Department of Freshman Engineering. He received his B. S. in 1962, his M. S. in 1967 and his Ph. D. in 1973; he is a registered Professional Engineer in Mechanical Engineering and has worked as a test engineer and for a heating-air conditioning firm. He has presented papers on instructional innovation at EDGD meetings and is an Oppenheimer Award recipient. He has been a member of ASEE since 1964. He received the Dow Young Outstanding Faculty Award in 1974.



BYARD HOUCK
North Carolina
State University

Byard worked seven years as a professional engineer and has taught in engineering for the past eleven years. He has developed a number of courses and programs in computer graphics (CG). He has served two terms as chairman of the CG Committee of EDGD. He is a member of two ANSI committees which are evolving national standards for CG and for computer generated drawings. He is currently a member of ASEE Minorities Task Force, and he was program chairman for the EDGD annual program in 1975.

DIRECTOR: LIAISON COMMITTEES (1977-80):

JACK C. BROWN
University of Alabama

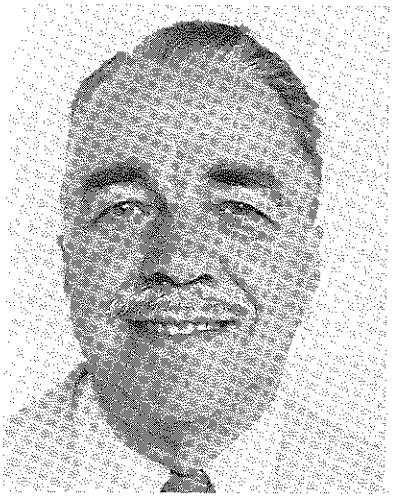
Jack is an Assistant Professor of Engineering Technology with twenty years teaching experience in the graphics area. He holds a B. S. (CE) from the University of Alabama, an M. S. in Graphics from I. I. T., and a Ph. D. from Texas A&M. He has served the EDG division as division Program Chairman for the 1976 ASEE annual conference, chairman of the Computer Graphics committee, and as faculty member for the computer graphics summer school held in Lubbock, Texas. He has served as secretary, vice chairman, and chairman of EDG in the Southeast section, and will be host for the Mid-year conference at Alabama in January, 1978.

FRANCIS A. MOSILLO
University of Illinois
at Chicago Circle

Francis is a graduate of Illinois Institute of Technology. He has twenty-one years of teaching experience at the University of Illinois in Chicago, and has also had experience in industry and university administration. In conjunction with his teaching, he has published papers on design graphics and computer graphics, as well as a workbook-text in the areas of engineering drawing, descriptive geometry, design, and computer graphics. He has been a member of the ASEE and EDGD since 1955 and currently is the chairman of the Division's Computer Graphics and Zone II Committees.

Mid-Year Conference

ÉCOLE POLYTECHNIQUE



Claude De Guise
General Chairman
Mid-year Conference

For the first time in the history of the ASEE Engineering Design Graphics Division, Ecole Polytechnique of Montreal, Canada, will host the annual mid-year convention this coming January 5-7, 1977.

We, at Poly, will be glad to show something different from the hot weather of the south, but we hope to offer a warm hospitality.

The City of Montreal

Montreal, built on an island around magnificent Mont-Royal on the sweeping St. Lawrence River, is the second largest French-speaking city in the world. Rich in Nouvelle-France traditions, its churches, "Man and his World" Exhibitions, "Olympic City and Grand Strand," modern French and English universities and excellent shops, combined with superb restaurants, sports and entertainment facilities, make it one of the most pleasurable cities in the world. Discovered by the French and conquered by the English, Montreal has accepted immigrants from all over the world and is now a cosmopolitan metropolis.

Jacques Cartier was the first white man to see the village of Hochelaga in 1535 and in 1642 Paul Chomedey de Maisonneuve chose the site and founded Ville Marie, now Montreal.

From a population of 5,000 people in 1760, Montreal now has over 2 million people.

Ecole Polytechnique

One of the oldest engineering schools in Canada, l'Ecole Polytechnique de Montréal celebrated its centenary in 1973.

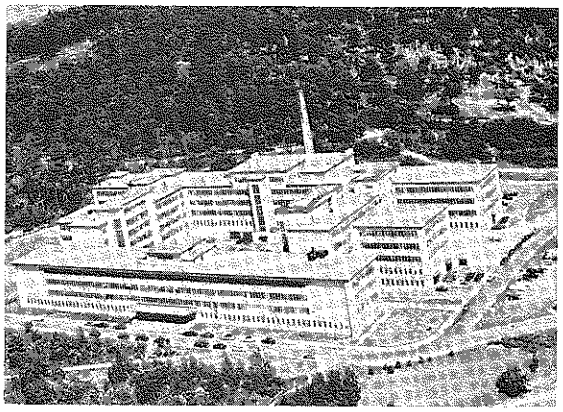
In 1958, Polytechnique moved from the downtown St. Denis building where it was located for more than fifty years to the Campus of Université de Montréal on the Mont-Royal. The building occupied 460,000 square feet of floor space. With its new addition completed this year the 650,000 square feet will be able to accept 2,500 students at the baccalaureate level and 500 at the master and doctorate level.

The story of Polytechnique is similar to that of most Canadian institutions for applied sciences. It is a story of sometimes difficult but always constant progress that has brought the school today to the very top in number of students. Since its opening, more than 6,000 engineers have graduated from the school and occupy top positions in the province and abroad.

The great industrial development which followed the second World War led to a number of mixed specialities at the school: Civil, Mechanical, Electrical, Chemical, Metallurgical, Geological, Mining, Physical, Industrial, Mathematical, Nuclear and Biomedical Engineering. With the Research Center, the Nordic Engineering Center and the Institute of Mineral Exploration Center, the school is at the climax of Canadian industry. Such is the reputation of the school that students have come from all over the world, specially for its French teaching.

The traffic is a two-way thing too. Each year a group of the school's graduates take post graduate courses in Europe and in the United States.

Both graduates and professors of Polytechnique have played major roles in many of the great engineering enterprises of our time. The St. Lawrence Seaway, Expo 67, Montreal Metro which is considered the most successful of its kind in the world, the Manicouagan-Outarde complex with its immense dam, Hydro-Quebec, the



Ecole Polytechnique

Lafontaine tunnel under the St. Lawrence River made of the longest cast sections ever constructed, and the James Bay project and the facilities for the 1976 Olympics are examples.

Polytechnique places the accent on technological foresight.

The Conference

Technical sessions will be held in the sixth floor new amphitheatre and committees in the center of the new building.

As it is the first time the meeting will be held outside the United States, the theme will be "International Outlook for Design Graphics."

To show our visitors the beauties of our Canadian winter, the social highlight will be the "Laurentian Friendship Dinner" to be held at the "Mont-Gabriel Lodge" nested in the heart of the beautiful Laurentian mountains (thirty miles from Montreal) where we expect to show them the ski resort and the beauty of Canadian winter.

Busses will be waiting at the Hotel Meridien, at the Seaway Motor Inn, and in front of Ecole Polytechnique.

A special program for the ladies will permit them to visit Montreal underground shopping centers, visit the Metro and the different interesting places of the Metropolis.

For those who should like to spend the weekend in Montreal or want to do some skiing up north in the Laurentians, it will be possible to make special arrangements.

You should be receiving some information describing registration details. We want to show that it is interesting to stay in Montreal where French and English live together with the sun in summer and the snow in winter and where the French hospitality of the Old Montreal is so close to the skyscrapers of the modern city.

PROGRAM

ENGINEERING DESIGN GRAPHICS DIVISION

"INTERNATIONAL OUTLOOK FOR DESIGN GRAPHICS"

WEDNESDAY, JANUARY 5

3:00 - 5:00 REGISTRATION
Hotel Meridien

6:00 EXECUTIVE COMMITTEE DINNER
Hotel Meridien

7:00 - 9:00 REGISTRATION
Hotel Meridien

8:00 SOCIAL HOUR
Hotel Meridien

THURSDAY, JANUARY 6

All meetings at Ecole Polytechnique, sixth floor.

All day exhibits from producers of educational media.

8:00 - 9:30 REGISTRATION
Ecole Polytechnique

9:30 - 11:45 GENERAL SESSION

9:30 - 9:45 WELCOME

Roger P. Langlois
Director, Ecole Polytechnique

9:45 - 10:30 "Design Graphics and Appropriate Technology, their Impact on Development in Third World Countries"
Steve Slaby, Princeton University

10:30 - 10:45 COFFEE BREAK

10:45 - 11:45 "Representation of Curved Surfaces by Computer Graphics"
A. Rotenberg, Senior Lecturer
University of Melbourne

12:10 BUSINESS LUNCHEON

Centre Social Université de Montréal
Presiding: Clarence Hall
Louisiana State University

2:00 - 4:15 GENERAL SESSION

2:00 - 2:45 "3-D Simplified"
Marc Sauvageau
Ecole Polytechnique

2:45 - 3:00 COFFEE BREAK

3:00 - 4:15 "The Role of Graphics in Design Internationally"
(Panel Discussion)

6:00 LAURENTIAN FRIENDSHIP DINNER
Mont-Gabriel Lodge (In the Laurentians)

Board Busses at Ecole Polytechnique, Hotel Meridien, and Seaway Motor Inn.

FRIDAY, JANUARY 7

9:00 - 12:15 GENERAL SESSION

Presiding: Roland Doré
Ecole Polytechnique

9:00 - 10:15 "A New Approach to Design"
S. F. Love
Designectics International, Inc.

10:15 - 10:30 COFFEE BREAK

10:30 - 11:45 "Metrication Application in Industry and University"
F. Dugal
Canadian Metric Commission, Ottawa

12:30 LUNCHEON

Centre Social Université de Montréal

1:45 VISIT OF MONTREAL

LADIES PROGRAMME

WEDNESDAY, JANUARY 5

8:00 - 10:00

SOCIAL HOUR
(Part of the conference programme)

To help the registrants and their company to get acquainted. Free hors d'oeuvre will be served during registration. Cash bar.

THURSDAY, JANUARY 6

9:30 - 3:00

VISIT TO UNDERGROUND CITY
AND OLD MONTREAL
(Especially organized for the ladies)

For knowledgeable travellers, this visit is a unique experience. Montreal being a northern city, the downtown expansion was planned for maximum utilization during winter months. It is possible to go from the Meridien Hotel to theatres, shopping centers, fashionable restaurants, and to reach the Olympic site without having to put on a winter coat.

Participants will take the underground transportation system (METRO) to visit the points of interest of the underground city, including Place des Arts, Place Ville-Marie and Hotel Bonaventure Shopping Center. Before lunch at the oldest operating restaurant in America, le Vieux St. Gabriel, the visitors will see the interior of Notre-Dame Church, a pseudo-Gothic style. After lunch, there will be an opportunity to explore some of the cobblestone streets of old Montreal, the fashionable residential area of the 18th century, now the site of delightful restaurants and botiques. The visit will terminate in time to prepare for the Laurentian Friendship Dinner.

6:00 - 11:00

LAURENTIAN FRIENDSHIP DINNER
(Part of the conference programme)

A formal dinner will be held at the Mont-Gabriel Lodge nested at the summit of 1200 acres in the heart of the beautiful Laurentians, thirty miles from Montreal. Besides delectable food and flagons of wine, the participants will have the occasion to admire the beauty of Canadian winter in this skiers' paradise.

FRIDAY, JANUARY 7

12:30

CLOSING LUNCHEON
(Part of the conference programme)

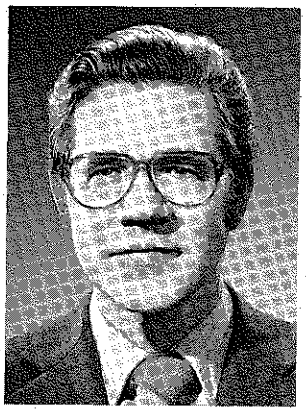
A closing luncheon will be given by the organizing committee at the Centre Communautaire de l'Université de Montréal. It will be an excellent occasion to have a short visit of the campus and of Ecole Polytechnique.

2:30

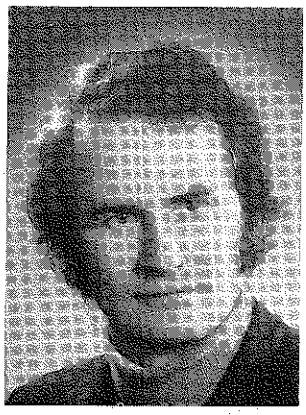
VISIT OF MONTREAL
(Part of the conference programme)

The tour of the city in panoramic busses will take the visitors to many points of interest in Montreal, such as St. Joseph Oratory, Westmount, the old city, the Olympic site, etc.

J. Bernard Lauigueur, President
Ecole Polytechnique



Roger P. Langlois, Director
Ecole Polytechnique



Roland Doré, Chairman
Mechanical Engineering Department

Dr. Moshe Boleslavski
Technion-Israel Institute of Technology

The Dilemma of Descriptive Geometry

It is no exaggeration that the discipline known as Descriptive Geometry has been undergoing a crisis throughout the world for the last three decades. In many universities it was dropped from the curriculum altogether or replaced by assorted forms of Engineering Graphics; where it still survives, it has shrunk badly in terms of both syllabus and time quota.

Many engineers, while not denying its inherent attraction, insist that it is absolutely irrelevant to everyday engineering practice. Such views are common even within the universities. As for its proponents, they usually try to "sell" it either as a theoretical background to engineering drawing or as a means to three-dimensional perception. Both arguments are admittedly weak: it is too well known that engineering drawing can be taught to students who never heard of Descriptive Geometry, while three-dimensional perception can be-- and is--equally well served by the design exercises included in any engineering curriculum.

To put things in the proper perspective, let us take a look at a serious textbook on Descriptive Geometry, of the type in use a few decades ago. It usually contains the following sections.

1. Basic concepts and theorems of projective geometry; homology; affinity; Monge's method.
2. Projection of points, lines, planes, solids, parallelism, perpendicularity, piercing point true shape and size.
3. Axonometric projection, intersections, developments.
4. Topography, perspective, shades and shadows.
5. Plane and space curves, helical curves.
6. Curved surfaces, kinematic surfaces, surfaces of rotation, lined surfaces, helical surfaces, basic concepts of cyclic surfaces.
7. Osculation and tangency, curvature.

The practical value of the above syllabus for, say, a mechanical engineer, is obvious (except perhaps, parts of item 4, which are intended for

architects). The chapter on curved and helical surfaces alone for example, should bring to mind such items as plane wings and fuselages, turbine wheel blades, ship's hulls, as well as screw threads, spiral drills and propeller blades.

Why then this decline in the appreciation of the discipline?

As I see it, it has been brought about by the internal make-up of the standard courses, in which too much emphasis is placed on the introductory chapters dealing with the basic concepts and construction techniques, with the exercise classes devoted mostly to tricky problems which call for sophisticated solutions but are largely irrelevant to industrial practice. Two representative samples, collected in two techological universities, are:

1. Given a sphere and a straight line in a general position; draw a cube, all planes of which are tangent to the sphere while one plane contains the above line.
2. Given two skew straight lines in a general position; find on these lines two respective points whose spacing is minimum.

(Presented with such an assignment, the student wastes considerable time in the search to the key to the solution; this no doubt helps sharpen his mind, but contributes little else.)

The final chapters, in which the above techniques would be used for practical problems with close relevance to modern technology (design of cutting instruments, mechanisms, etc.), are "skimmed over" or omitted altogether, because of the limited time quota available to the teacher. The resulting "truncated" course leaves the student with a set of graphical techniques, but without a clear idea of what they are good for; and in due time even they are forgotten.

To sum up: Descriptive Geometry today is being gradually supplanted by a so-called "Graphic Science", with a few chapters (of secondary importance) of Descriptive Geometry "smuggled in", and with the subject matter arbitrarily chosen by the teacher, who, incidentally, is usually a mathematician or a nonpracticing engineer not always aware of what is really important. My personal experience convinced me that the students acquire neither sufficient knowledge of basic Descriptive Geometry, nor satisfactory skill in draftsmanship.

To remedy this situation, in my opinion, all graphical construction techniques of Descriptive Geometry (parallelism, perpendicularity, etc.) should be presented and exercised in condensed form within the first 6-8 hours of the course; the exercises should be more illustrations of the techniques, and sophisticated problems should be avoided. Then stress should be made on para 5-7 of the above syllabus. Remaining class time should be devoted to application of all these techniques in solving problems drawn from everyday industrial practice (no matter how difficult). To remedy the time shortage, all freshman candidates should be put through a preparatory summer school before being admitted to the regular studies. At this school they would be taught the fundamentals of engineering drawing, the basic concepts and techniques of Descriptive Geometry, and perhaps some chapters of higher mathematics. As teachers, only industrially experienced engineers should be employed. This approach should naturally be reinforced by suitable composed textbooks, stressing applications of the discipline to real engineer-problems. In this context, attention should also be drawn to the reluctance of many able engineers to take up Descriptive Geometry as an object of instruction because of the mistaken notion that it presents no opportunity for research. In fact, multidimensional Descriptive Geometry, stereoscopy, and last but not least computerized graphics, open wide vistas for creative thought.

Interesting experiments, at least partly related to these ideas, are in progress in engineering departments of some German technical universities, with staff members of the department in question (for instance: experienced mechanical engineers --or the mechanical faculty) acting as teachers or as instructors in laboratory classes. Results so far are generally very satisfactory, and in some cases even excellent.

In concluding the discussion, I wonder whether these problems have ever been fully aired at a suitable forum. This could be done at an international conference of teachers of Descriptive Geometry and Engineering Graphics, to which representatives of relevant fields of engineering would also be invited.

It seems to me that this is the only way to prevent further decline of a very useful and important discipline.

International Conference on Descriptive Geometry

Amogene F. DeVaney
Amarillo College
Amarillo, Texas

The Spring issue of this Journal carried an article about the World Congress that was being planned by the Engineering Design Graphics Division. These plans have now been finalized, and a summary of the plans are given below.

The Engineering Design Graphics Division is sponsoring an INTERNATIONAL CONFERENCE ON DESCRIPTIVE GEOMETRY on June 15-18, 1978, to commemorate the 50th Anniversary of the Division. This conference will be outstanding for a number of reasons.

First, the conference is being held on the beautiful campus of the University of British Columbia, Vancouver, British Columbia. The university is located on a forested campus overlooking Howe Sound and adjacent to Totem Park. During the summer months the university turns its facilities into a convention center which can comfortably accommodate a large number of people. The conference will begin Thursday evening with an informal gathering, and it will close on Sunday morning, June 18th. The ASEE Annual Conference begins on Monday, June 19th at this same location.

Second, the conference will provide an intellectual challenge to the participants through its program and through the outstanding authorities in descriptive geometry from many countries who will attend the conference. The objective of the conference is to assess the theoretical developments in descriptive geometry and its relevance to engineering education and modern society. This objective will be considered under three Subject Areas:

I. Recent Developments in Theoretical Descriptive Geometry

II. The Position of Teaching and Research in Descriptive Geometry

III. The Relevance of Descriptive Geometry to the Solution of Problems which Satisfy Societal Needs

Third, the format of the conference will make it possible for everyone to participate in the discussions. The morning sessions will have a major paper presentation related to one of the Subject Areas. This will be followed by two or three position papers which refer to the major paper. In the afternoon small discussion groups will discuss the major topic, and in the evening the entire group will hear reports from the discussion groups. On Saturday evening there will be a dinner with entertainment, and Sunday morning the conference will end with a general meeting to summarize the conclusions reached and to consider recommendations for future action. The proceedings of the conference will be published, and future conferences and programs will carry out the recommendations that come out of the INTERNATIONAL CONFERENCE ON DESCRIPTIVE GEOMETRY.

Make your plans now to attend this outstanding conference.

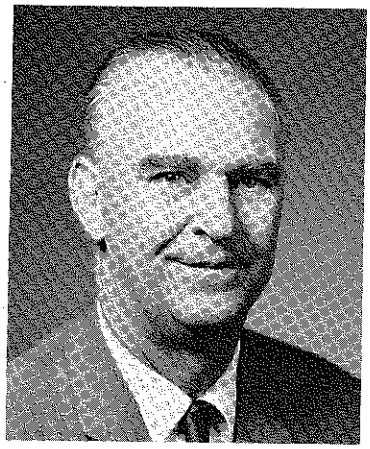
Papers Anyone?

The program for June 1977 at Grand Forks, North Dakota, is now in the planning stage. The program chairman is eager to know what kinds of events you want to have presented. There is still time to send her an abstract of your paper for review. Any paper that cannot be used in the June 1977 meeting might very well be appropriate for a future meeting. Drop a line to:

Margaret Eller, Program Chairman
142 Atkinson Hall
Louisiana State University
Baton Rouge, Louisiana 70803

MEMORANDUM

ECPD & YOU:



TO: Members of the Engineering Design Graphics Division

FROM: Bob Hammond

A year ago at the 1976 Mid-year Division Meeting, Bob LaRue appointed a committee to make recommendations to the Division as to a possible list of standards for Freshman Engineering Criteria for ECPD accreditation. After correspondence from the committee members and other interested people, the committee has come up with the tentative proposal shown below. This is really a minority report as input from all committee members was not received. However it does give a starting point. I now call on all members of the E.D.G.D. to read the proposal and then to send to me, or any of the members of the committee, their suggestions, changes, additions, and/or deletions. This should be done in time that such remarks can be incorporated in the proposal to be presented at the 1977 Annual Meeting.

George C. Beakley
Arvid R. Eide
Robert D. LaRue
Fred O. Leidel
William B. Rogers
David W. Teeter

Robert H. Hammond, Chairman

Freshman Engineering Criteria

1. The requirements which must be met by students seeking admission to the freshman engineering program should be clearly stated in the official catalog of the institution.

2. In addition to meeting other institutional undergraduate requirements (i.e., physical education, English, ROTC, etc.), the freshman engineering program should include the following:

   a. Mathematics - Analytic Geometry and Calculus (2 Semesters/3 Quarters)

   b. English - Sufficient to meet institutional requirements with a minimum of 1 Semester/Quarter emphasis on composition.

   c. Chemistry - General Chemistry with accompanying laboratory (2 Semesters/3 Quarters)

   d. Physics - General Physics to include light, sound, mechanics, electricity, and magnetism. (Pre or corequisite: first semester of Calculus--may be in Sophomore year)

   e. Engineering Graphics - Minimum of one Semester or equivalent. To include representational graphics and industrial practices.

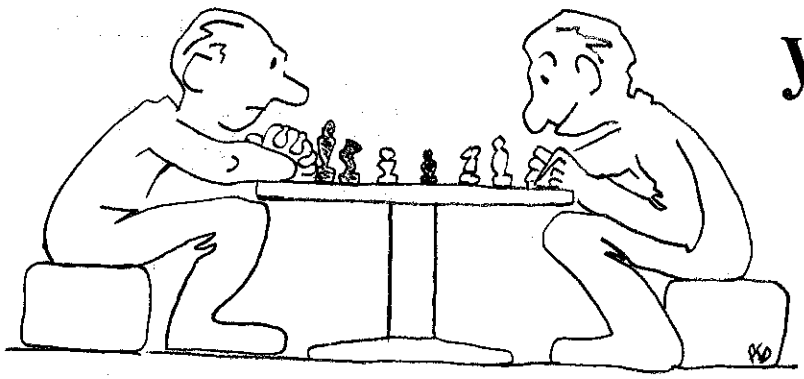
   f. Engineering Fundamentals - Minimum of one Semester or equivalent. To include an introduction to engineering fields and engineering design.

3. The freshman engineering program should be interdisciplinary with the following purposes:

   a. To introduce the freshman student to the engineering profession and its various fields and functions.

   b. To assist the freshman student to intelligently choose his major field of study.

   c. To adequately prepare the freshman student, through foundation courses basic to all engineering disciplines, for further study and practice in his chosen engineering field.



your move...

Involved?

Want to become more personally involved (PI) in the Engineering Design Graphics Division? Join a Technical-Professional Committee. Technical-Professional Committees are the means for accomplishing what is sometimes in-depth research, and at other times, superficial examination of questions that arise in the course of events. Not all committees can be expected to be active all of the time; but when a committee is active, the committee members gain knowledge, and when that knowledge is shared with the Division members at annual and semi-annual meetings, the Division members are also rewarded.

Of the approximately 200 Division members who have indicated that the EDGD is their first choice, a fair estimate of the number involved in Technical-Professional Committees is in the neighborhood of 50-75. Don't let a few have all the fun! If you are not now involved, or if you wish to change your involvement to another committee, or if you wish to join an additional committee, drop a line to the chairman of the committee in which you are interested. The following list of Technical-Professional Committees contains the names and addresses of the current chairmen.

Margaret Eller, Director
Technical and Professional Committees

Technical and Professional
Committees and Chairmen

GRAPHICS TECHNOLOGY
Professor Barry Crittenden
Division of Engineering Fundamentals
Virginia Polytechnic Institute and
State University (VPI & SU)
Blacksburg, Virginia 24061 (703) 951-6555

COMPUTER GRAPHICS
Professor Francis Mosillo
Department of Systems Engineering
University of Illinois at Chicago Circle
Box 4348
Chicago, Illinois 60680 (312) 996-3444

HUMAN FACTORS IN DESIGN
Dr. John Kreifeldt
Department of Engineering Design
Tufts University
Medford, Massachusetts 02155

TEACHING TECHNIQUES
Professor Cletus R. Mercier
Department of Engineering Graphics
Iowa State University
Ames, Iowa 50010 (515) 294-3117

THEORETICAL GRAPHICS
Professor Mary F. Blade
Mechanical Engineering Department
The Cooper Union
Cooper Square
New York, New York 10003 (212) 254-6300

ENGINEERING DESIGN EDUCATION
Professor Mary Jasper
P.O. Box 155
Mississippi State College
State College, Mississippi 39762

METRICATION
Chairman to be appointed

your move again...

Richard I. Hang
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Computer Graphics Using a Plasma Panel

The Department of Engineering Graphics at Ohio State University has recently purchased a plasma panel display. The total display device is marketed by Applications Group of Maumee, Ohio, although the actual display panel is a product of Owens Illinois Co. of Maumee, Ohio. The display panel is called Digivue by the Owens Illinois Co. Basically the display panel consists of two glass plates about 9 or 10 inches square placed face to face with a small space for a neon gas mixture between the plates. The plates are sealed along the edges much like a thermopane window. An ingenious electronic circuitry coupled with near-transparent conductors vacuum deposited on the inner faces of the glass plates permit 262144 separate positions of the display to be activated as a tiny dot of glowing neon gas. The dots, about .01 inch in diameter, are arranged in a 512 x 512 matrix with dots spaced 60 to the inch. While the display has a certain coarseness when viewed extremely closely, a viewing distance of two or three feet effectively masks the dot pattern of any drawing placed on the display. The fact that any dot in the display can be activated or deactivated independently of any adjacent dots lends a flexibility to the display not found in all CRT displays. Because the actual display panel is nearly transparent, the electronics of the system have been placed around the edges of the panel and it is possible to project slides or other pictures onto a screen directly behind the display panel. Computer generated graphics can be effectively overlaid onto a conventional picture.

The display is stable so long as power is applied to the panel. Thus any dot or group of dots that are "lit" will remain lit until actually turned off by an outside command or, or course, turning off the power. The plasma panel has some desirable characteristics of a storage type CRT since it requires no computer memory or CRT memory to keep a display active. Because of the ability to erase or set of dots without erasing the entire screen, the panel avoids one disadvantage of the storage CRT and gains some of the advantages of the refresh-type CRT. Like all computer graphics displays, the plasma panel has an unique set of advantages and an equally unique set of disadvantages. It is the intent of this paper to describe a few of each.

The AG60 display was received with no software to drive it. However, the display has some built-in hardware functions which simplify the development of a graphics language to drive the display. The hardware functions have counterparts in any CRT system and are easy to understand. The hardware can draw a vector, erase a vector or merely move the starting point of drawing operations by a simple input of the desired X-Y coordinates to the panel. The MOVE, DRAW or ERASE functions of CRT systems are duplicated by this system. With vectors (straight lines) being hardware generated, the computer software to drive the panel is greatly simplified. The panel can also MOVE, DRAW or ERASE one dot at a time. This is the increment mode and has the

advantage that it needs less input information than the vector mode. Incremental mode is used to draw curves and produce shading patterns among other uses. The panel also has two sizes of characters which can be drawn by simply outputting the ASCII bit pattern to the panel. Characters may be positioned on the display by commanding a vector MOVE to the proper spot before starting character drawing. The entire standard ASCII character set is available. The panel also has a bulk erase feature which permits erasing the entire screen instead of a dot by dot method.

One feature of the hardware is the programmable character generator which permits predefining up to 26 special characters of 8 x 16 dot pattern size. The 8 x 16 pattern may be positioned and drawn anywhere on the screen by a simple command. Unfortunately, the programmed generator memory is not permanent and must be reloaded each time the display is turned off and on. Needless to say, one of the first programs written was a programmable generator reload program. The programmable generator has two modes of operation, either to overlay existing dot patterns with the 8 x 16 pattern or erase the existing material in the 8 x 16 pattern area and write the programmed pattern.

Vector, incremental, small character and large character modes remain in effect until reset so that it is necessary to have programming commands that can set the mode to the type of drawing desired. Outputting characters to the display while it is in vector mode will produce a garbage vector for every four characters sent to the panel. Conversely, sending vector information to the display while it is in character mode will cause four garbage characters to be drawn for each vector sent to the display. (Drawing a vector requires four very specially formatted groups of 8-bit information to be sent to the display. Standard ASCII character information is also 8-bit groups of data.)

The first operation in establishing a viable graphics system after locating a host computer is to develop software to draw vectors, draw incrementally, draw characters, erase the screen and set the modes. Our host computer is a PDP10 computer owned and operated by our Department of Computer and Information Science. The students of the department who normally operate the computer developed the basic package of these commands, assisted by Professor Anthony Lucido of the department. Except for the vector commands, developing the basic command package presented no problems. But the drawing of vectors requires specific timing delays on the part of the computer as it outputs the vector information and must wait for the vector to be drawn. Finding the proper timing for this operation required considerable experimenting on the part of the students writing the command program. The nucleus of the command language is a set of FORTRAN-callable routines VECTOR, INCRE, ERASE, SETMOD and PUTCHR. A special command was developed to return the display to the characteristics of a teletype after doing graphics so that regular keyboard input and output can be done using the panel as a teletype.

It was my lot to determine some of the kinds of graphics presentations that could be done on the panel. This meant mainly trial and error experimenting to see just how the display reacted to various operations. In the course of this experimenting, it bacame evident that the plasma display was capable of considerably more versatile graphics than the usual line drawings.

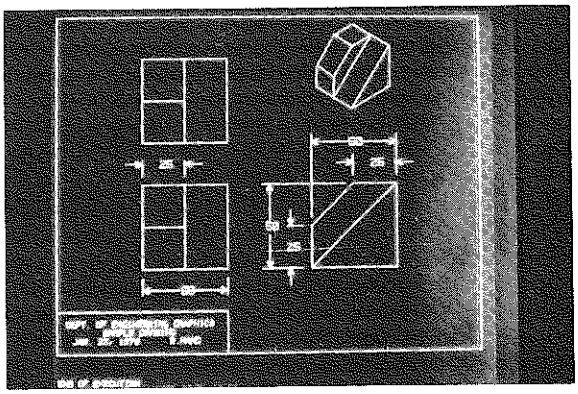


Figure 1: A line drawing on the AG 60 screen.

The first displays produced were simple line drawings made from digitized data. Figure 1 is a photograph of such a display on the display panel. A number of FORTRAN subroutines were developed to assist in producing such line drawings. One major problem encountered in using FORTRAN as a language to drive the display stems from the fact that FORTRAN considers the display to be a teletype terminal. This is partly because the display uses what is essentially character material (ASCII) as input. This greatly simplifies linking the display system to the computer but introduces an interesting quirk in using the display. The usual way of outputting a FORTRAN literal or Hollerith is complicated by the fact that FORTRAN issues a carriage return and line feed to the "teletype" every time a format is entered or reused. Attempting to write character material in the center of the screen will erase all material currently on the screen in a horizontal strip one character high from the left edge of the screen to the point where the characters are to be drawn. I resolved this problem by writing my own character drawing routine to avoid getting FORTRAN I/O into the act. An additional problem is created by several characteristics of the screen. The origin of the screen coordinate system is the upper left corner. Thus positive Y values increase from top to bottom of the screen. Also the addresses that must be used to locate a point on the screen are the integer values 0 to 511. An interesting quirk of the addressing

scheme is that the screen is wrap-around. An attempt to draw a line from X = 55 to X = -1 will actually draw a line from X = 55 to X = 511. This is quite a shock the first time it happens.

The second phase of experimenting included learning how to draw curves on the screen. To one familiar with Calcomp routines, drawing a circle is simply drawing a regular polygon of a large number of sides. But such a technique does not work well on the plasma panel. Curves need to be drawn incrementally, that is, a dot at a time. Developing such algorithms needs a new frame of thought but is not difficult to do. Algorithms to draw circles, ellipses and general curves were easily developed during this phase.

The third phase of experimenting centered around shading and cross-hatching patterns is large, obviously limited by what you can do with uniformily spaced dots. Since the programmed generation of characters is an 8 x 16 matrix of dots, any pattern that can be formed so that additional 8 x 16 blocks merge with preceding is a useful shading pattern. But shading that is some multiple of 8 units wide and 16 units high is unlikely to fit practical areas to be shaded. It became apparent that an algorithm to erase the unwanted shading beyond the desired boundaries was needed. But such an algorithm would present a problem it two adjacent areas were to be shades, erasing the excess shading outside the boundaries of one would likely erase material inside the boundaries of the other. It was decided that generating shading patterns dot by dot would be more profitable so that no erasing would be needed. The erasing algorithm eventually became a composite algorithm to either erase or shade within convex polygon boundaries. The shading patterns generated by this method were tied to screen addresses so that complex shapes could be broken into simpler polygons and shaded individually with the junction of shading merging perfectly. This technique could not have been used if it were not for the fact that screen addresses are integer numbers from 0 to 511. Every handicap carries its own compensation.

Figure 2 shows a shades and shadows problem drawn from digitized data which was used to verify the shading algorithm and experiment with shading densities. It is obvious that a realistic effect is given and the program is not so obviously easy to write. The shading patterns used in creating this effect are shown in greater detail by a close-up of the screen in Figure 3. The reproduction of this photograph may not permit some of the dot detail to appear but the varying brightnesses of areas is strictly due to dot density and not to dot brightness which is constant. The display is bright enough to be viewed under drafting room lighting levels as is witnessed by Figure 4 which is a view of the plasma display system with the display of Figure 2 on the screen. This picture does not include any computer equipment.

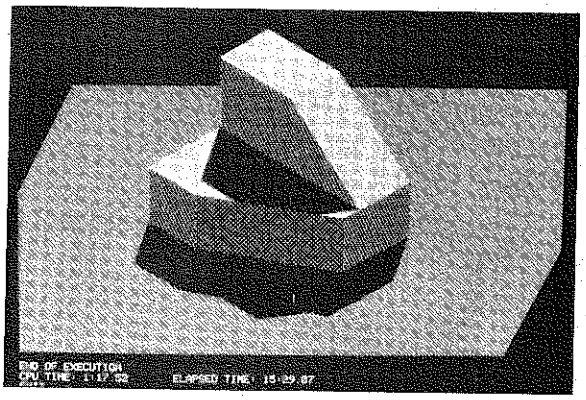


Figure 2: A display of a shades and shadows example on the AG 60 screen.

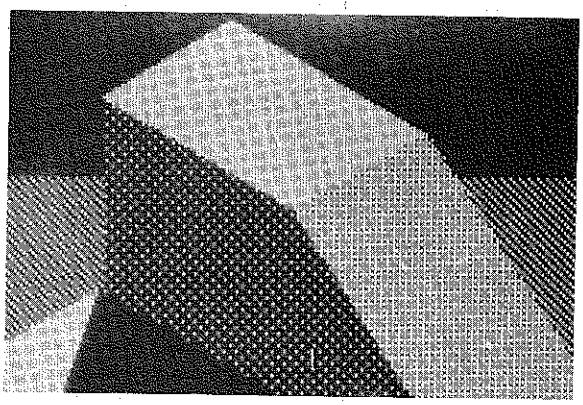


Figure 3: A close-up detail of the picture shown in Figure 2.

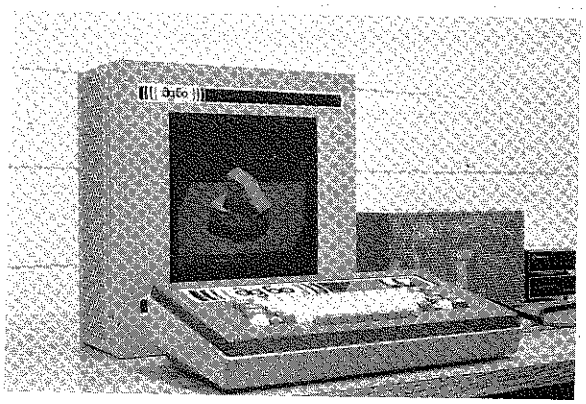


Figure 4: The AG 60 graphics display system with the picture of Figure 2 on the screen. Lighting is at the standard drafting room level.

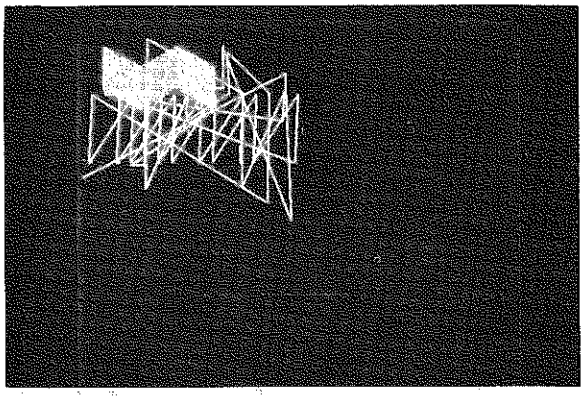


Figure 5: A jumbled drawing caused by computer transmission error.

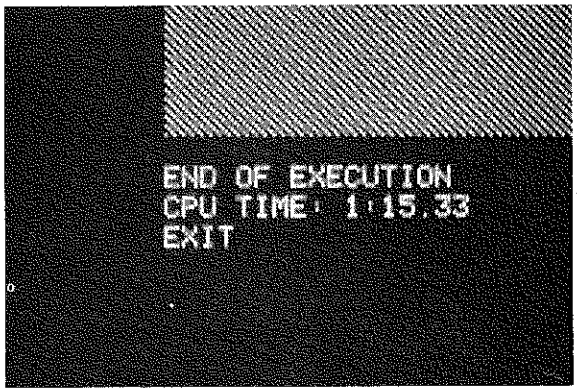


Figure 6: A display on the screen that gives the execution time.

It would seem that the plasma panel is well suited to displays requiring shading or cross-hatching of irregular areas. A bar chart was drawn using the shading techniques and was most successful. One observer commented about the display of Figure 2 that you could almost reach out and touch the object on the screen.

Here is a new graphics display having unique advantages which can be used for some dramatic pictures.

Every advantage seems to generate a corresponding disadvantage, however. The very simplicity of the method of transmitting data to the display also means that if an error in data transmission occurs, the net result is total chaos. Figure 5 shows a display partly drawn when a tranmission error occurred. The drawing was intended to be shading patterns only; any lines in the drawing are a mistake. The "interesting" pattern of random lines drawn by such an error may be fascinating to observe but usually do not enhance the original drawing.

Even the ability to erase any point or vector selectively is not without its drawbacks. Because any vector at an angle other than some multiple of 45^{o} will be drawn in stairstep fashion, the exact stair step pattern must also be erased. Basically this means that a vector must be erased in exactly the same fashion it was drawn. In other words, you can't erase from the wrong end of the vector nor is it likely that you can erase half a vector successfully. To do that you must erase all of the vector and then redraw the desired half. Another fascinating fact is that in erasing a vector drawn from Point A to Point B, the erase algorithm will not erase the dot where the erase operation starts but will erase the dot where the erase operation halts. In erasing a vector from A to B a dot will be left at A but none at B.

The Digivue display and the AG60 display system offer some advantages of the refresh CRT in the selective erase feature with much of the economy of price and operation of the storage CRT. Although not the perfect solution to a cheap selectively erasable display, it is a livable compromise. After two months of experimenting, I can state that it has been a challenge but it has been fun.

The figures used in this article appeared erroneously in the Spring 1976 issue of the JOURNAL. We extend our apologies to Prof. Hang for this unfortunate confusion. -ed.

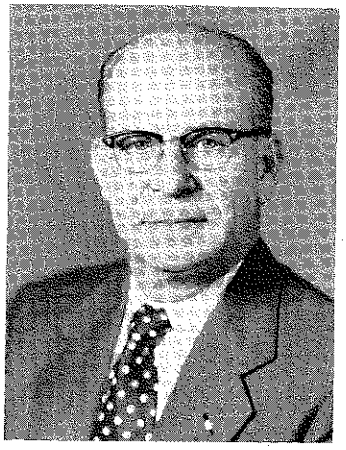
Jobs

The Engineering Design Graphics Department of Texas A&M University is seeking applicants for an assistant or associate professorship. Duties will include the teaching of engineering graphics and descriptive geometry to freshman engineering students. Applicants should be competent in and able to teach specialty courses such as computer graphics, electronic drafting, pipe and vessel drafting, nomography, etc.

It is preferred that applicants have a doctor's degree with at least one degree in a field of engineering. Salary is open based upon the qualifications of the applicant. Texas A&M is an equal opportunity, affirmative action employer.

Graduate Assistantships and part-time teaching positions are also available in the Engineering Design Graphics Department.

Contact James H. Earle, Engineering Design Graphics Department, Texas A&M University, College Station, Texas. Phone (713)845-1633.



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A History of the Engineering Design Graphics Division

FOREWORD

The history of the Division will be presented in six chapters, starting in this issue with Chapter 1 - Early History. Chapters 2, 3, 4, 5, and 6, covering the 1930's, 1940's, 1950's, 1960's and 1970's, will be in succeeding issues. The last chapter will be presented in the Spring issue 1978. If you wish to retain the full set you may do so. Limited numbers will be saved by the publisher to sell at a fixed price (bound) at the conclusion of our 50th Anniversary in 1978.

Should you have anything of historical significance that should be called to my attention for future chapters I would be pleased to hear from you.

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CHAPTER 1 - EARLY HISTORY

Our parent society was formed from a special committee called Division E (Engineering Education), Worlds Engineering Congress. At an annual meeting of this gathering they decided to form their own organization. This meeting was held in Chicago, Illinois, on July 30 - August 5, 1893, during the World's Fair. There were 70 Charter Members, and officers were established as President, two Vice Presidents, Secretary, Treasurer, and a 21 member Council. The name given the new organization was Society for the Promotion of Engineering Education, (SPEE).

For many years the place of meetings was governed by time and place of meeting of the American Association for the Advancement of Science, or of some one of the National Engineering Societies. By 1903 the membership had increased to 271. Programs were established by the Officers and Council, and arrangements made by the host institution in accordance with their facilities available sometime in the months of June or July.

The SPEE held its 1903 meeting in conjunction with that of the American Institute of Electrical Engineers in Niagara Falls, New York, July 1-3. President Calvin M. Woodward, Dean of the School of Engineering and Director of the Manual Training School, Washington University, St. Louis, in his annual address stressed the "Promotion of Engineering Education Through Improvement in the Secondary Schools." He cited primarily the work in Manual Training Departments which usually handled the students exposure to Mechanical Drawing in an abbreviated fashion. He cited the work in many cities as it was developed, and recommended that every city include this training in their high schools. St. Louis, Philadelphia, Indianapolis, Boston, Chicago, and many others he discussed, and dealt particularly with Technical High Schools which concentrated more thoroughly on preparation for engineering.

EARLY TEACHERS: The salaries in early teaching were so low that it was necessary to do outside work through the school year, as well as in the summer to eke out a confortable living even though it was stressed that a professor's whole duty was to his students. It is a matter of common observation

that the great teachers of engineering are those who either are doing or have done, in years gone by, a great deal of outside work. Many engineering teachers have acquired world-wide fame through their work outside of teaching, as authors, lecturers, consulting engineers, or experts in scientific research. Their fame enhanced that of the University in which they taught. Their personal qualities usually were such as to obtain the admiration and love of their students, and their friendship was cherished by students as a prized possession.

EARLY COURSES: Starting with the time SPEE was established, Descriptive Geometry was the oldest drawing course being taught in the United States. The United States Military Academy was the first to establish engineering education, in 1802. Albert E. Church, professor of mathematics at the Academy, in 1864 wrote a text on Descriptive Geometry, as well as a problem book to accompany this book. He followed the principles as developed by Gaspard Monge' of France in 1795. Because of the unprecedented lengthy use of this book, together with such a historical background and unchanged revision up to 1892, the publishers' note on its first revision is quoted in full.

PUBLISHERS' NOTE

This book was originally published in 1864. The preface to the first edition states: "Without any effort to enlarge or originate, the author has striven to give with a natural arrangement and in clear and concise language, the elementary principles and propositions of this branch of science, of so much interest to the mathematical student, and so necessary to both the civil and military engineer."

Professor Church succeeded so well in his efforts to produce a practical and well-adapted treatise that now, nearly forty years after its publication, it is still in use as a textbook in the United States Military Academy and in many other academies, technical schools, and colleges.

The continued demand for this favorite text-book has rendered necessary a renewal of the plates. The publishers have submitted the book to several eminent mathematicians, and by their advice have retained the text unchanged as not being capable of improvement. The new edition, however, appears with larger and more legible type, displayed to greater advantage on the page.

Preface to 1902 Edition
DESCRIPTIVE GEOMETRY
Albert E. Church, Prof. of Mathematics, in The United States Military Academy

(The copyright opposite this preface to the 1902 edition reads:

Copyright, 1864 by
Barnes & Burr
Copyright, 1892 and 1902 by
Margaret A. Blunt)

The start of the 20th Century saw marked changes in graphical representation. Dean Gardner C. Anthony whose early Technical Drawing Series had wide usage was credited with the designation of "graphics". He was also one of the first authors to use the third angle projection method exclusively. Professor Thomas E. French was credited with the successful attempt to change basic drawing course nomenclature from mechanical drawing to "engineering drawing", as well as establish the name for departments teaching drawing exclusively. Prof. French was also author of the first text on "Engineering Drawing", in 1911, and its adoption was phenomenal. Drawing, as such, was taught earlier in many colleges and universities, as a division of department - Mathematics, Engineering Mechanics, Civil, or Mechanical. Courses began to improve in number and content; trends will be taken up more in detail as they are encountered through the years in the chapters to follow.

In 1913 the membership of SPEE had risen to 1,158, and the Annual Conference was held at the University of Minnesota on June 24-26. This was one of the few times that one of our group had presented a paper before the society. During the early years there was only one program since no divisions, as such, were operating. Travel to these meetings was by train only, and with little travel money available in most areas, conventions were never overcrowded.

Because of the title and interest in its historical significance in establishing the name of our division which 15 years later was approved as the first in the SPEE, this early paper is printed in full.

[Editor's note: The paper given at the 1913 conference by Prof. French, "The Educational Side of Engineering Drawing", appears in full at the end of this chapter. It is recommended to the reader for its many interesting points.]

Prof. French gave a similar paper before the Annual Conference of SPEE ten years later at the Cornell meeting in Ithica, New York. The title of this paper was "The Content of a Drawing Course." He used several quotes from his previous presentation, and treated the subject in four divisions: A - The method of writing the language, B - The theory of shape description, C - The theory of size description, D - The applications to practical drafting.

ENGINEERING DRAWING DIVISION APPROVED:

There were few drawing teachers in attendance at the early annual conferences of SPEE, but those that did attend always grouped together and discussed various things going on in their schools, with enough to fill up a good-sized luncheon table, where real sessions developed. Those who were fortunate enough to get to these meetings would return to brief their department at staff meetings on what was going on around the country. Thus the interest spread to the point where our luncheon group felt the need to set up their own programs at the Annual Conferences, since it became increasingly difficult to get recognition at the main sessions. In 1928, Society membership was 2,025. On the train, June 26, 1928, going to Chapel Hill, North Carolina, to attend the Annual Meeting of the SPEE, were several of our drawing group. Dean Harvey H. Jordan of the University of Illinois, Clair V. Mann of the Missouri School of Mines, Fred G. Higbee of the University of Iowa, and Thomas E. French of Ohio State University, drew up a petition to present to the SPEE Council to form the Engineering Drawing Division of SPEE. Both Mann and French were members of the Council, and they presented the petition to the governing body. Dr. W. E. Wickenden, Director of Investigation of Engineering Education (1923-1929), and his assistant, H. P. Hammond, supported the motion which was unanimously approved, and thus we became the first such Division. We will celebrate our 50th Anniversary, June 1978.

At the organization meeting of the Division, the following officers were elected to serve:

Chairman - Thomas E. French
Secretary - Randolph P. Hoelscher
Executive Committee -
Harvey H. Jordan
Fred G. Higbee
Harry M. McCully
William G. Smith
Clair V. Mann

This same group served through the year 1929 until June 1930.

THE WICKENDEN REPORT

The Society for the Promotion of Engineering Education during the years 1922 - 1929 conducted one of the most extensive studies of Engineering Education ever attempted by a professional society. This investigation was under the direction of W. E. Wickenden, and associate director H. P. Hammond, and involved thousands of people including committees and subcommittees in every engineering school and technical institute in the United States.

It was realized that there had been a relatively static condition in engineering education for a decade, following a half century of rapid increase in the number of schools (from less than half a dozen to well over a hundred), with corresponding increase in attendance and a notable expansion in the scope of the curricula. Medical education and influential schools of law enjoyed enlarged public recognition and financial support with pronounced advance in educational standards.

In World War I, the achievements of science and industry were most impressive. Then came the after-war reaction. The validity of the older order was doubted. Educational systems in general were questioned, as to objectives, methods, and results.

During the progress of the investigation it became increasingly evident that engineering education cannot be cast in a fixed mold.

The investigation through the schools and organizations dealt with:

21 - Designated Correspondents
117 - Faculty Committees - questionnaires
6 - Special Committees - questionnaires for data
(a) Students and Graduates
(b) Admissions and Eliminations
(c) Teaching Personnel
(d) Facilities and Costs
(e) Economic Content
(f) Cooperative Courses
7 - Bureaus and Societies
(a) Bureau of Education U. S., Curricula
(b) Miscellaneous Engineering Societies-Data
(c) ASME - Special
(d) ASCE - Special
(e) AIEE - Special
(f) AIME - Special
(g) MMSA - Special

In addition to organization of agencies, there was a definite organization of the several parts of the study. The various projects comprising it have been grouped in five principal divisions (subdivisions of each not listed because they were too extensive), as follows:

1. Studies Relating to Personnel - Students, Graduates, and Teachers.
2. Studies of Curricula and Methods of Instruction.
3. Studies of Supplementary Services of the Engineering Colleges and the Cost of Engineering Education.
4. Studies of the Relationship of Engineering Education to the Professions and to American Industry, and Complications of Opinions Concerning Engineering Education.
5. Studies of Engineering Education in Europe.

The reports received were voluminous. Only a few reports and conclusions of general interest will be mentioned here.

Drawing and the principles of graphics were recommended to be included in all engineering curricula . . . Modern foreign language should not be required, offered only as an elective. . . General economics should be included in all engineering curricula, preferably extended throughout a complete academic year. . . History, political science, and sociology should be included in engineering curricula, either required or elective. . . Sectioning according to ability, in operation many places; some used it effectively in large freshmen classes, some for upper class students where extra graduate credit might be obtained. . . It was noted that when some of the Humanistic subjects were added to the curricula, time was reduced on Shop Courses, English, and Graphics.

Our National Engineering Societies aided materially in the SPEE Investigation by securing through their committees the opinions of professional engineers concerning educational policies and practices. They also, together with Engineering Foundation, contributed financially to the endeavor.

TECHNICAL INSTITUTES

Concurrently along with the extended investigation of Engineering Education, our SPEE Committee made a Study of Technical Institutes (1928 - 1929). Since many teachers and departments in our Division are involved in these schools, some of the principal findings and conclusions are here included.

Many graduates of these schools advanced to a professional status, principally those who found their bearings early and sought intensive preparation for chosen lines. Training was both for technical pursuits, planning and control; and for supervisory position.

In the years investigated, manufacturing industindustries estimated their normal requirement of four-year engineering graduates to be 2.2-3.9 per cent of their total force. The same industries estimated the desirable quota of employees having approximately two years of training above the secondary level, at 6.0 to 8.3 percent of their total force.

Graduates of technical institutes showed adaptability to the requirements of industry in the following order: supervision in operating departments; plant operation and maintenance; getting along with workmen; technical services (drafting, designing, testing, inspection, etc.); teamwork with associates; cooperation with executives; construction and erection in the field; accepting plant hours and conditions; and technical sales work. The largest groups are supervisors, engineering personnel, and business proprietors. From the viewpoint of industry, a thoroughly trained technician or operating supervisor frequently is more acceptable than a half-baked or illadjusted engineer.

SUMMER SCHOOL FOR ENGINEERING TEACHERS

As a collateral project to the general Investigation of Engineering, the Summer School for Engineering Teachers was established. It has proven to be one of the most fruitful means of advancing engineering education. The summer school has as its primary purpose, practical aid to the engineering teacher solving the problems that confront him in the classroom. With that consideration in mind, the following specific aims of the Summer School were adopted:
. . . to bring about a better understanding of the fundamental laws of learning and of teaching.
. . . to establish the general principles that should underlie a sound teaching process.
. . . to determine the relative usefulness of the several kinds of teaching procedures and the conditions under which they might be combined to best advantage.
. . . to select, in a given field, those elements of theory and practice that are of primary importance and of secondary importance, then having established the essential core of principles study its organization into a course of instruction.
. . . to present something of the history of the subject in question, in order to provide a background from which to teach it.
. . . to study the technique of teaching.
. . . to stimulate the teacher to self-improvement.
. . . to give a broader conception of engineering education, and of the profession of engineering.
. . . to develop a scientific attitude toward teaching problems, and to stimulate experiement and research.

The first Summer School for Engineering Teachers was held in Cornell University, July 6-26, 1927, and the Program of Session on Mechanics, July 6 - 27, with 41 members and 17 staff present.

The Engineering Drawing Division presented the 6th Summer School Session of SPEE at Carnegie Institute of Technology in Pittsburgh, Pennsylvania. An account will be given in the next issue of the Engineering Design Graphics Journal.

THE EDUCATIONAL SIDE OF ENGINEERING DRAWING.

By Thos. E. French
Professor of Engineering Drawing, The Ohio State University

[Presented at the Annual Conference of the Society for the Promotion of Engineering Education. University of Minnesota, June, 1913]

I am not sure that this title is self-explanatory. It suggested itself from the wide diversity in the present methods of teaching drawing, and the rather general feeling of unrest, as indicated partially by the abnormal number of text-books on drawing, and particularly on descriptive geometry, that have been appearing recently. The prevailing tone of defense or explanation in the introductions of these books echoes in a way the lack of satisfaction in some of the schools and a desire to do something for a change. To say that drawing is a fundamental subject in a technical school seems so trite as to be needless. It is of course recognized as a subject necessary for the student as preliminary to all his engineering work.

DRAWING AS A LANGUAGE

The analogy between drawing and language is often referred to. I prefer to go farther in saying that drawing, as a mode of thought expression, is a real and complete written language, with its orthography, its grammar and its style, its idioms and abbreviations; and that in teaching it we are not only preparing the student in a subject needed in his course but, from the very nature of it, have in our hands an exceptional cultural subject for strengthening the power and habit of exact thinking, that most difficult of all habits to fix, and for training the constructive imagination, the erceptive ability which enables one to think in three dimensions, to visualize quickly and accurately, to build up a clear mental image. This ability, with the power of recording the visualized impression and expressing it to others, is a requirement absolutely necessary for the young designer, and its study will develop a part of his mind which has previously had practically no exercise.

As one has said, it is "the power and habit of observing accurately that marks one of the fundamental differences between the incapable man and the man of power" - and in this connection I regard memory drawing as a valuable exercise.

THE NEED AND VALUE OF DRAWING

As to the need of drawing, let me quote from an address of a few years ago by President Eliot of Harvard University.

"I have recently examined all the courses offered by the University, and I find but one (the course of theology) in which a knowledge of drawing would not be of immediate value (and even there I think it might help in some cases)."

"The power to draw is greatly needed in all the courses, and absolutely indispensible in some of them. A very large proportion of studies now train the memory, a very small proportion train the power to see straight and do straight, which is the basis of industrial skill."

As to the value of drawing, to quote again, this time from Dean Shaler:

"The value of drawing in all departments of science, not only as a language, but as a discipline of the mind, can hardly be overestimated. Many students entering Harvard University can think in one dimension, some few in two dimensions, but those who can think in three dimensions are exceedingly rare."

With this conception of the subject, that it is at once the foundation upon which all designing is based, and preeminent in its value for mental discipline and training in space intuition, engineering drawing becomes, with the possible exception of mathematics, the most important single branch of study in a technical school.

The emphasis of this discussion is directed to calling attention to the danger that the course in engineering drawing may be regarded as only for the purpose of teaching how to draw. That some school authorities do not regard its higher value and possibilities but think that drawing means only learning to hold a T-square and make lines with a ruling pen, is indicated by the subordinate position often given to the department, in placing it in the care of inexperienced and low-salaried instructors, or often carrying it as an annex to another department.

OLDER METHODS FOR TEACHING DRAWING.

Many of you remember the old courses in drawing, when there were fewer books and Warren was the standard. They were good old books, full of theory. The student of those days could project anything anywhere, but he could not make much of a working drawing. Afterwards Faunce's well-known book came in. The plates of this little old classic are not worn out yet, and although it has been obsolete for twenty years the book is still being sold on its record.

You will recall the amount of time spent on revolutions, and "shades and shadows," and the laborious tinting of cylinders and spheres and niches, a relic that persisted in the schools long after the

necessity for it had passed. The schools, we all realize, are often somewhat behind current engineering practice. But in drawing they kept persistently behind. After blue-printing came in they continued the tinting and pricking and making fine-line tracings. You remember the transition from the first to the third angle, and the fierceness of the wars that were waged in the drafting rooms, and back and forth in the American Machinist. It was mainly the school-trained men vainly defending the system they had learned, against the opinions and experience of the self-made shop men. The late Professor S. W. Robinson, whose memory we all revere, was one of the earliest advocates of the third angle, but the first angle was still taught in his university, as well as in many others, for years longer than it should have been, in spite of these pioneer progressives.

In those old days there was however something of a recognized standard orthodox method of teaching drawing, encumbered as it was by the French adaptations and archaic methods. In the reaction against what is seen now to have been an excessive amount of theory, and with the attempt if not to govern at least to follow commerical practice, there has been so much variance of opinion that I believe it can be said that there is at the present time a greater diversity of method in the teaching of drawing than in any other branch in a technical school.

EDUCATIONAL VALUE OF INSTRUCTION IN DRAWING

It is in the present-day demand for the "practical" that there lies some of the danger of losing sight of the educational value of a subject that has in it the greatest combination of possibilities for the correlation of theory and practice.

In trying to show him in the quickest possible time how to make a working drawing, and how to place dimensions and letter a title, we are apt to miss the opportunity of training in the student the power of space conception, and clear thinking.

His mathematics is given him for subsequent use, and for exercise in reasoning. This training of the perceptive ability and imagination in drawing may seem apart from pure reasoning, yet if you will agree that the foundation of right reasoning is accurate perception, it ought greatly to strengthen the power of logical demonstration.

You will recall what Young says in his "Teaching of Mathematics."

"Mathematics makes constant demands upon the imagination, calls for picturing in space (of one, two or three dimensions) and no considerable success can be attained without a growing ability to imagine all the various possibilities of a given case."

I trust I am not misunderstood - all of this can be taught while he is making his working drawing if we will do it.

I am not advocating pure theory - as in Gauss' remark - you recall Gauss' famous toast - "I drink to pure mathematics, the only science which has never been defiled by practical application."

PRESENT METHODS OF INSTRUCTION IN DRAWING

Disregarding the copying courses, the giving of a series of plates to be copied by the student, which with the conception of drawing as a language to be studied and taught in the same way as any other language, does little more, as has been said elsewhere, aside from showing certain standards of execution, than copying paragraphs from a German book would do in beginning the study of the German language, disregarding these and the interminable geometrical courses, the methods now in use, with all their variations, may be divided into two general classes:

1. Those which begin with the theory of the point, line and plane, and progress to the solid.
2. Those which begin with the solid, and afterwards take up the analysis of lines and surfaces.

THE SYNTHETIC METHOD

Considering the first division, all of the older books on drawing from Binns to Faunce began with the projection and revolution of the point, and a few of the later books still adhere to this method. The schools using this method, however, generally begin immediately with a text-book on descriptive geometry. This system was ably defended in a paper read at the Cleveland meeting of this society.

This synthetic method, as it might be called, seems logical, but experience has shown that the student has much difficulty in understanding it clearly. He starts in with a hazy idea of what it is all about, and often never comes to a clear realization of its purpose or its beauty. (We all know the not infrequent case of the good student who "flunks it dead" the first time, and gets his vision with startling suddenness on the "second trip".) In a subject which depends wholly on clarness of perception, and whose value is entirely lost if the mental picture is confused, the possibility of this condition is most unfortunate. It is this failure in comprehension on the part of the student that gives descriptive geometry its traditional bad reputation.

And when after all this elaborate theory he finds, as he believes, that it was only intended as preparation for the drawing of some simple objects, and developments, similar to those he may have made in the high school, it is little wonder that he loses his respect for it.

When we consider that many men after leaving college fail to appreciate the perceptive development and mental training that they have unconsciously received from their study of descriptive geometry, how much more is it true that the young student with his undeveloped mind, thrown head-first into this

new subject, cannot realize that it has any value, cultural or practical; and accepting the principle that the highest benefit cannot be gained from any study without the interest that comes from involuntary attention, the full benefit of descriptive geometry cannot be attained from this class except in isolated cases.

THE NATURAL METHOD

While there is of course more than one route to a given destination, the second method, taking up the explanation and practice of orthographic projection by using the solid, practical mechanical drawing if you please to call it, and afterward descriptive geometry as the term is generally understood, not only has the support of abundant proof in experience, but can be defended psychologically as well. As variations, some teachers begin both subjects at once, as at Annapolis; some avoid the use of the term descriptive geometry altogether. Some have a beginning term consisting entirely of free-hand sketching. Dean Anthony has done more than any one else to show that projection drawing can be taught more easily by beginning with the solid. Without question the student gets his space intuition more clearly by handling concrete forms than by at once attempting to imagine lines and points revolving in space.

This beginning course should include both orthographic projection and the various pictorial projections, and the objects chosen should be real machine or structural parts so far as practicable. It may go well into intersections and developments including triangulation. These problems given as drawing are worked readily and with interest. The same figures when given as special cases of descriptive geometry problems are found to be very hard.

Lettering ought to be taken up at the first of the course, freehand single stroke lettering is meant, and continued in short intensive periods through the term. But another relic, the mechanical caricatures of letters made with compass and ruling pen, should be scrapped in the same 'hell-box' that already contains the fancy titles and other typographical flourishes and curiosities of our forefathers. See Figure 1.

ENGINEERING DRAWING

While it is really descriptive geometry, I prefer to call all this "engineering drawing" - engineering drawing rather than "mechanical drawing". The term mechanical drawing is an unfortunate misnomer, which may mean either drawing with mathematical instruments or the drawing of mechanical things. Engineering drawing covers the whole field of technical drawing; and the important part of it could be taught with only a pencil and a pad of coordinate paper.

It would seem entirely beyond the scope of this topic to attempt to outline a course in drawing.

A Drawing Title.

A variety of neat lettering is shown in the accompanying illustration of a title for a drawing.

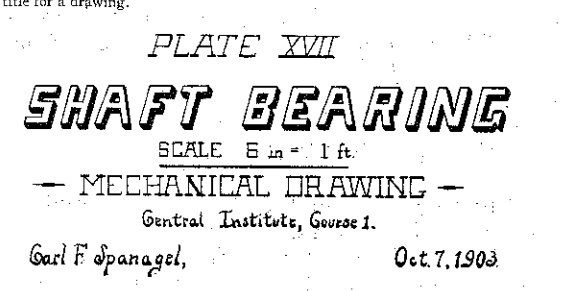


Figure 1.

It may however not be out of place to offer a few suggestions, perhaps more or less disconnected, that have to do with teaching drawing in a way to use the pedagogical opportunities.

In the first place there should be an explanation of the purpose of the subject, calculated to arouse interest and enthusiasm (such a suggestion as this will be almost resented by the good teacher in any subject, but I have seen so many courses started with no preliminary description of aims or reasons or what was coming and why, that I am constrained to let it stand).

The good teacher will follow this later with descriptions of shop methods as they apply and of drafting room methods and organization and management.

There should be insistence on good form in the handling of the drawing instruments and on high standard of execution of the finished drawings. It is a graphic language and the beginner must have skill in its recording. While not the largest proportion of graduates start as draftsmen yet they must know good work from real experience with it, and while it should be explained that the execution, the making of drawings, with whatever labor and neatness and care, is not the whole purpose but, rather, incidental, the argument of the student who says "I never expect to work in a drafting room" should be met gently but firmly. He will soon find that a good drawing can be made just as quickly as a poor one.

After accuracy comes speed. Time limits carefully estimated and set, so that it is considered derogatory rather than meritorious to be putting in extra time in the drawing room. As "faith without works" so is accuracy without speed. Instead of the old extensive course in geometrical drawing there should be no geometrical figures except such as a draftsman uses. I would trace most of the plates on cloth instead of inking and require both pencil drawing and tracings. The common beginner's fallacy that careless pencilling can be corrected in inking is thus destroyed. There are many principles whose application can be worked

without making finished plates, by using the "study sheet" method, working the problems in pencil only on note book sheets. Much time may be saved by giving the printed problem ready for solution. In our own case this manifolding is done on the neostyle.

VALUE OF THE RECITATION IN THE DRAWING COURSE.

The time spent on the blackboard recitation, say one hour per week, is good investment. It is in these recitations that the first exercise in writing the language and reading the language may be had. It has been our practice to begin at once in working up the visualizing ability by such methods, the instructor making the pictorial view of an object, building it up or cutting it up, the students working up the three views. They really enjoy their own introspection. This is followed by incomplete views, drawing from description, etc. Comparatively early in the course isometric and oblique, with special attention to the latter, should be taken up, first for their own sake, but more particularly for their use in translating. As soon as they are handled readily the process above is reversed and the instructor carries through the series in "orthographic" while the students interpret or translate them by sketching, in some pictorial form.

This practice has been found to be of great value. It is followed up by giving commercial blue prints from which certain parts may be assigned to be read. Details may be picked out from assembly drawings and illustrated. Difficult and puzzling shapes can by this time be deciphered; and during all these reading exercises the value of a ready ability to sketch pictorially is being unconsciously but indelibly impressed.

TRAINING IN VISUALIZING FORMS

Getting back to orthographic projection, models may be introduced and dimensioned sketches made. I believe in the judicious use of models. They aid in visualizing not only shape but size. The first practical experience of nearly all young draftsmen is the same. After making the half-size or quarter-size drawing of a piece they are suprised at first sight of the casting in seeing how big it is.

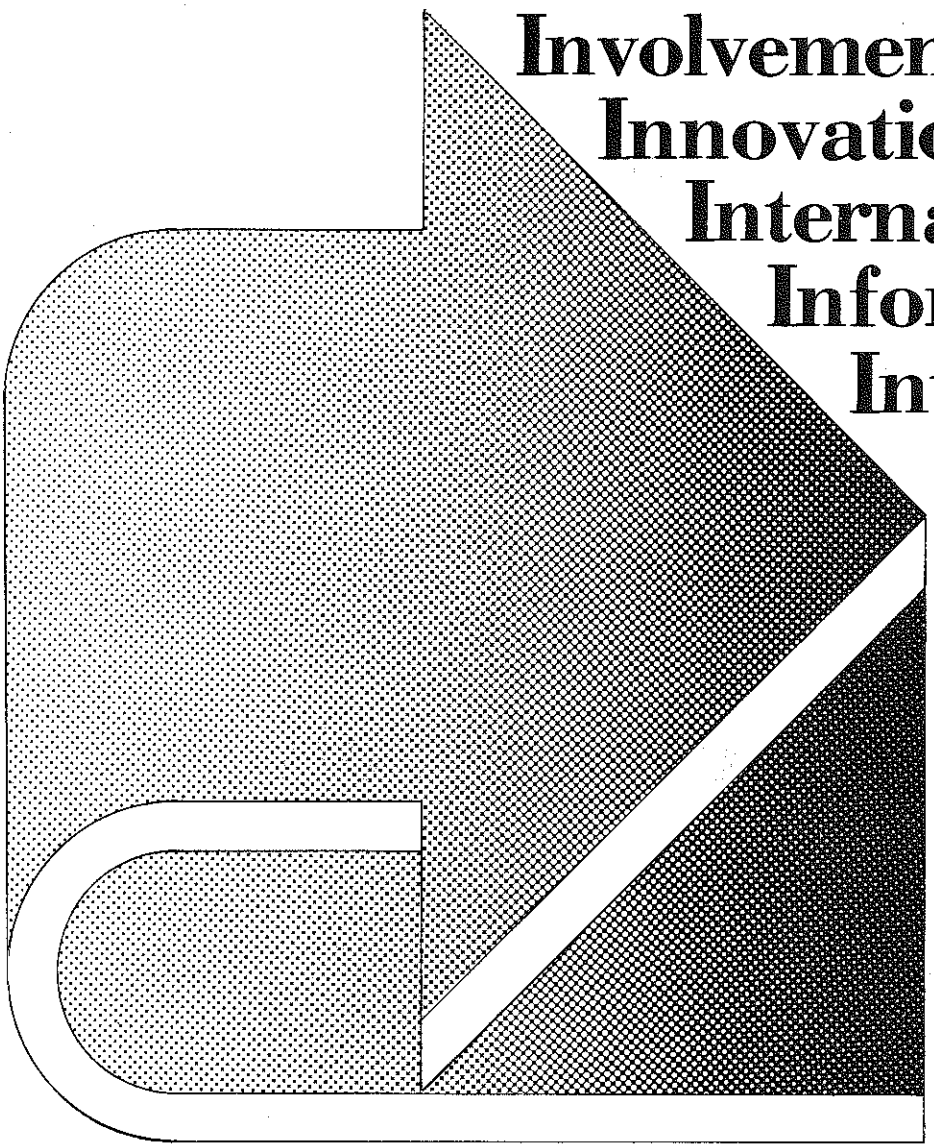
The student should be able to look at the drawing and see the object. He should also be able to look at the object and see the drawing, i. e., to decide quickly what views would best represent it. There should be much sketching and working drawings. In these he gets the application of all the principles. He now begins to appreciate "style" in the language, not in the execution but in the composition. Some drawings have all the information but are hard to read, some are redundant and tautological, some may even have split infinitives in the dimensions!

In developments and intersections, which have been preceded by auxiliary projections and the true length of a line, the classification of surfaces can be referred to with profit, and as has already been mentioned this work may be carried on into problems such as are often given as "special cases" toward the end of the descriptive course.

With a preparation such as this, and the consequent power of reading description from lines, descriptive geometry if introduced now becomes real and fascinating. It will be appreciated for its own beauty and for its aid in solving problems whose difficulty is now recognized and whose applications are understood.

In conclusion let me contend for a better recognition of the general department of engineering drawing, including descriptive geometry. Let it be preferably a separate department, manned by a corps of efficient, experienced, well paid instructors. I believe in the rule that all drawing instructors must have had practical experience on the board, not primarily for the effect on the student, with whom the respect for practice is so marked that it often even exaggerates the real value, but principally for the instructor's view point; and it requires more than the $600 or $800 minimum to find men with the teacher's instinct and bring them from commerical work. These are difficult subjects to teach. One of the leading mathematics men of the country has said that descriptive geometry is the hardest known mathematical subject to teach well. The reason is of course understood as being on account of the wide variation in imaginative ability among students of the same mental capacity. Some have strong powers of visualization, some are almost destitute of mental imagery (as you remember Galton found his men of science to be). I have sometimes said that it takes five years to make a descriptive-geometry teacher.

Finally, let us have drawing taught well and understandingly, for its own sake, for the sake of the subjects following, and for the students' sake, for whom, with the power it awakens, it really becomes drawing in relation to life.



Involvement, Innovation, International, Informative, Intellectual, Inquisitive, Interest, Initiative, Interaction, Influence, Interface with Industry

An Invitation . . . to the In Crowd

Infiltrate ASEE . . . get IN!

American Society for Engineering Education
One Dupont Circle, Suite 400
Washington, D.C. 20036

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Associate Professor of Mathematics
Technion-Israel Institute of Technology

Using Inversion to Solve a Construction Problem

This paper offers a solution to a problem that appeared when designing an elbow corner of a pipe header branching through an elliptical cone reducer needed for technical purposes.

There is a well-known method to find the intersection of a torus with a cone of revolution, if the axis of the cone and center-circle of the torus are in the same plane. We use non-concentric spheres with centers simultaneously on the axis of the cone and on tangents to the center circle of the torus (1). Things change when we have an elliptic cone instead of the right circular. There then is a method to construct the intersection line in such a case using also non-concentric spheres. The centers of these spheres could be found by simple auxiliary constructions based on inversion.

The solution is divided into two steps:
A. First we find the direction of the circular intersections of the elliptic cone. This is done by intersecting the cone with a sphere center $T(T_2)$, radius $R = T_3U_3$ (Fig. 1). The radius is determined in the partial side view (2). Planes, parallel to the obtained circular intersection of the cone and sphere, cut also the cone in circles. The centers of these circles will be on a straight line joining point V_2 with the vertex of the cone; see Fig. 1.

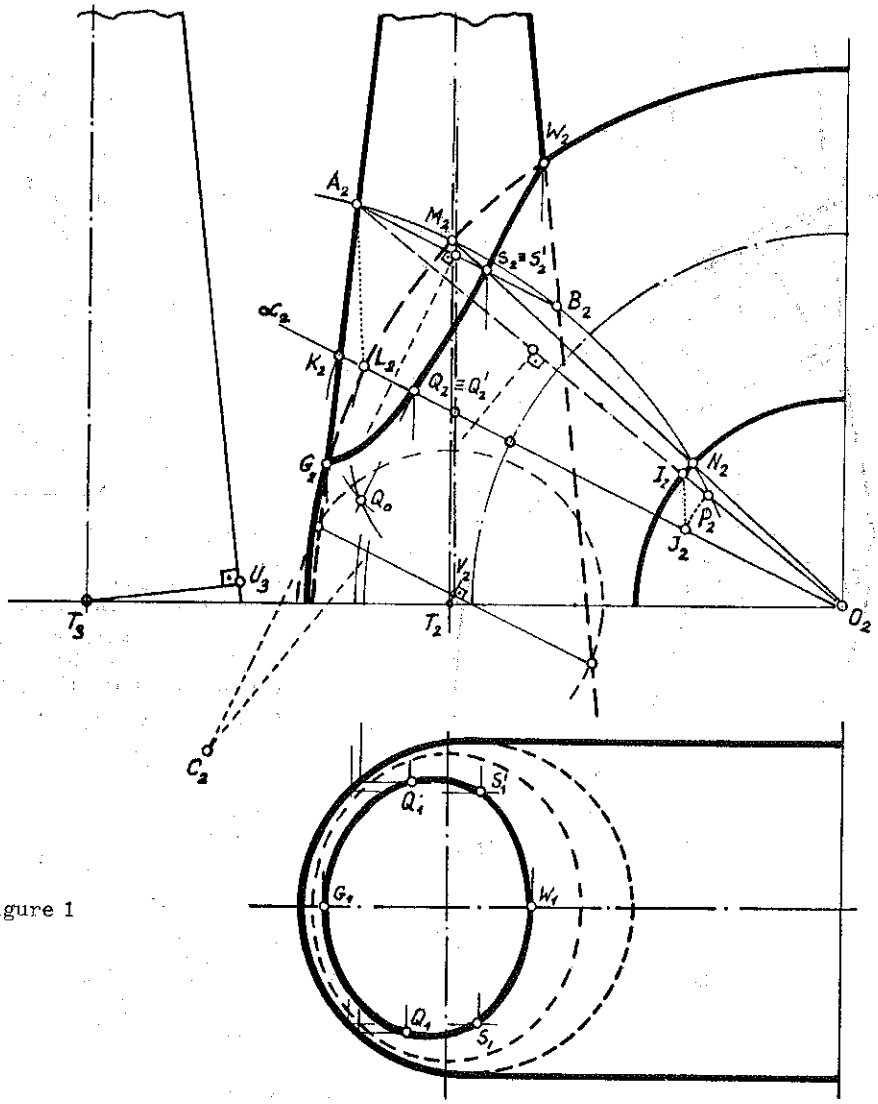

Figure 1

A plane in the above-mentioned circular intersection direction, that passes through the axis of revolution of the torus (in projection--α_2 through O_2), intersects both the cone and the torus as circles. In Fig. 1 the projections of these circles (segments on Π_2) are signed by the points taken on them $K(K_2)$ and $L(L_2)$. This plane can be called "Main circular intersection plane".

By the way, the two mentioned circles intersect in a pair of common points - Q and Q' of the given surfaces. The projections $Q_2 \equiv Q_2'$ are found by an auxiliary projection on the spot (see Q_o). In Fig. 1 there are also shown the highest and lowest intersection line points W and G.

B. The second step is to find a set of other points of the intersection line.

For that purpose we use non-concentric auxiliary spheres. The way to find the center of every sphere is shown by an example (Fig. 1).

1. In any place on the contour of the cone we take a point, for instance $A(A_2)$.
2. Through that point we draw a circular section $AB(A_2B_2)$ of the cone (in a plane parallel to the main circular intersection plane-α).
3. A ray O_2A_2 intersects the inner contour-circle of the torus in point I_2.
4. We join A_2 to L_2 by a straight line.
5. A line through I_2 parallel to A_2L_2 gives the point J_2.
6. From center O_2 we mark on the ray O_2A_2 the point P_2 so that
$$O_2P_2 = O_2J_2 .$$
7. The center of the auxiliary sphere will be the intersection point $C(C_2)$ of perpendicular bisectors of the segments A_2B_2 and A_2P_2.
8. A sphere with radius C_2A_2 intersects the cone and torus in circles $AB(A_2B_2)$ and $MN(M_2N_2)$, which in turn give a pair of common points S and S' ($S_2 \equiv S_2'$) of the desired intersection line.

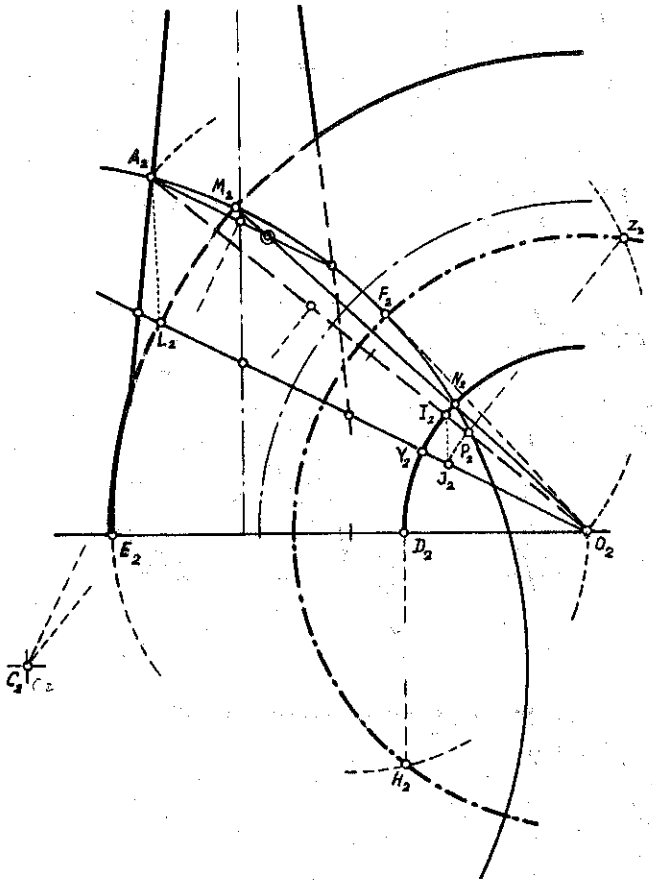

Figure 2

The proposed solution is based on an inversion.

Consider the projection of the intersecting surfaces shown in Fig. 2. We take O_2 as the center of the inversion whereby the projection of the outer contour of the torus corresponds to that of the inner one (and vice-versa). The circle of inversion can be drawn with radius $R = O_2H_2$, found through two paired points E_2 and D_2; (H_2-- intersection of semicircle O_2E_2 and perpendicular through D_2) [4].

M_2 and N_2 are also paired points in this inversion belonging to the contours of the torus:

$$O_2M_2 \cdot O_2N_2 = R^2 = (O_2F_2)^2$$

This means that the sphere contour is orthogonal to the circle of inversion and in the present case corresponds to itself. It also means that the point A_2 taken on this contour corresponds in this inversion to a point belonging to the same contour. This point, marked as P_2, together with A_2 and B_2 are sufficient to find the center of the sphere.

Point P_2 can be fixed by a routine inversion construction: semicircle O_2A_2 intersects the inversion circle in point Z_2. A perpendicular to A_2O_2 through Z_2 gives the point P_2.

Once demonstrated, the same point could be found by a shorter construction, excluding the drawing of the inversion circle.

As $O_2L_2 \cdot O_2Y_2 = O_2A_2 \cdot O_2P_2$

$$\frac{O_2L_2}{O_2A_2} = \frac{O_2P_2}{O_2Y_2} \quad ...(1)$$

a) Draw $I_2J_2 \quad A_2L_2$

then $$\frac{O_2L_2}{O_2A_2} = \frac{O_2J_2}{O_2I_2} \quad ...(2)$$

From (1) and (2)

$$\frac{O_2J_2}{O_2I_2} = \frac{O_2P_2}{O_2Y_2}$$

As $O_2I_2 = O_2Y_2$ – radius of the inner contour of the torus.

We have

$$O_2P_2 = O_2J_2$$

b) Intersect ray O_2A_2 with an arc of radius O_2J_2 and get the point P_2.

The proposed method includes a control of accuracy. If the accuracy of the drawing is satisfactory, the prolongation of M_2N_2 passes through O_2.

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BYLAWS
for the
ENGINEERING DESIGN GRAPHICS DIVISION
OF THE
AMERICAN SOCIETY FOR ENGINEERING EDUCATION
(1975)

Article I
NAME AND OBJECTIVES

Section 1. The name of this Division of the American Society for Engineering Education shall be the Engineering Design Graphics Division.

Section 2. The purpose of this Division shall be to promote the science and practice of graphical representation, communication, design, and analysis.

Section 3. The objectives of the Division shall be to:

a. Provide leadership and guidance for those engaged in the teaching of conceptual design and graphical analysis and their use in industry.
b. Investigate matters relating to engineering graphics and to inform the membership of current developments.
c. Encourage the early participation of engineering students in the areas of graphics and design.
d. Promote, stimulate, and provide opportunities for the professional interchange of ideas among the membership.
e. Maintain a liaison with industry and government.

Article II
MEMBERSHIP

The membership of this Division shall consist of all those members of the American Society for Engineering Education who have indicated Engineering Design Graphics as an area of interest.

Article III
OFFICERS AND DUTIES

Section 1. The Division shall have the following officers whose terms of office shall be as indicated:

Chairman	1 year
Vice-Chairman	1 year
Secretary-Treasurer	3 years
Directors (5)	3 years

Section 2. The duties of each officer of the Division shall be those usually associated with his respective office including the following:

2a. CHAIRMAN

2a(1). He shall be Chairman of the Division and of the executive committee and ex officio member of all other committees of the Division. He shall preside at all business meetings of the Division and of the executive committee.

2a(2). He shall be the senior member of the Division on the executive board of the ASEE Council for Professional and Technical Education.

2a(3). He shall review the annual budget of the Division as prepared by the Secretary-Treasurer [See ART. III, Sec. 2c(6)]. The Vice-Chairman shall be consulted during this review. If necessary, adjustments in the budget will be made and discussed with the Secretary-Treasurer. When finalized, the budget shall be presented by the Chairman to the Executive Committee for final approval or revision. Upon approval the budget shall be submitted to the Executive Director of the Society (ASEE).

2a(4). He shall prepare a written report, including budget expenditures, of his term of office and furnish copies to the Division Secretary-Treasurer.

2a(5). He shall keep the Vice-Chairman informed of all activities of the Division,and at the end of his term transmit other pertinent materials to maintain continuity.

2a(6). He shall appoint all bylaw committees except the Nominating and Elections Committees, designating the chairman except where the chairman is specified by the bylaws.

2a(7). He shall appoint the chairman and, at his discretion, other members of committees not specified by the bylaws but considered necessary for the adequate administration and operation of the Division, and assign such committees to the Vice-Chairman or appropriate Director for administrative control.

2a(8). He shall review and approve the composition of all committees.

2a(9). He shall assure the effective operation of the Division by revoking the appointment of any appointee who is not, in his judgement and the judgement of the appropriate Director, satisfactorily performing the duties of the position to which the appointee was designated.

2a(10). He shall, with the advice and consent of the Executive Committee, request the resignation of any officer of the Division who is not adequately fulfilling the obligations of that officer's elected office, and shall appoint another member of the Division to serve in that office for the remainder of that term.

2a(11). He shall be responsible for all meetings of the Division and the Executive Committee.

2a(12). He shall arrange for each new member of the Society, who has indicated an interest in the Division, to receive a card, or letter, of welcome. Information concerning the Division and its activities should be included.

2a(13). He shall be responsible for the functioning and performance of the Policy Committee whose duties and composition are defined in ART. VII, Sec. 1c.

2b. VICE-CHAIRMAN

2b(1). He shall serve as the Vice-Chairman of the Division for the year following his election.

2b(2). He shall assume the chairmanship of the Division for the year following his term as Vice-Chairman.

2b(3). In the event that the Chairman is unable to perform the duties of his office, the Vice-Chairman shall assume the office of Chairman.

2b(4). He shall preside over business meetings of the Division and the executive committee in the absence of the Chairman.

2b(5). He shall be the junior member of the Division on the executive board of the ASEE Council for Professional and Technical Education.

2b(6). He shall assist the Chairman in the operation of the Division.

2b(7). He shall, through the Chairman, keep informed on the current problems and operations of the Division so that he may maintain continuity of the activities of the Division.

2b(8). He shall appoint the nominating committee and the elections committee subject to the approval by the executive committee at its annual business meeting.

2b(9). He shall be the chairman of the election committee. He shall, with the aid of the other members of the election committee, count the election ballots and submit a confidential report of the results of the election to the Chairman of the Division.

2b(10). He shall prepare a printed list of committees for his term of office as Chairman for presentation to the Division. Printed copies of the list shall be made available to the executive committee and to all persons in attendance at the annual business meeting.

2b(11). He shall be responsible for the functioning and performance of the following Bylaws Committees: Nominating, Elections, and Distinguished Service Award. The duties and composition of these committees are defined in ART. VII, Sec. 1.

2c. SECRETARY-TREASURER

2c(1). He shall be Secretary-Treasurer of the Division and of the executive committee.

2c(2). He shall keep complete records of all meetings of the Division and of the Executive committee and within sixty (60) days following each meeting or group of meetings shall furnish copies of the minutes to all members of the executive committee and their proxies. He shall distribute to all the members of the Division who are in attendance at the annual business meeting in June copies of the minutes of the previous annual and mid-year business meetings.

2c(3). He shall receive and preserve copies of all reports and papers presented at the meetings of the Division and of the executive committee.

2c(4). He shall receive and transmit to the Engineering Library of the University of Illinois at Urbana, Illinois 61801, such items as may be properly deposited there.

2c(5). He shall supply to the officers of the Division up-to-date copies of these Bylaws with all amendments, within sixty (60) days following the annual conference of the Society, provided that changes were made.

2c(6). He shall prepare an annual budget and submit it to the Division Chairman for review prior to its presentation to the executive committee for final approval or revision.

2c(7). He shall receive any Division money, except that which is part of the income of the ENGINEERING DESIGN GRAPHICS JOURNAL and under control of the publication committee, and shall place on deposit such money in an account in a suitable repository under the name of the Division.

2c(8). He shall disburse Division funds upon the approval of the Chairman of the Division.

2c(9). He shall submit an annual financial report to the Division at the annual business meeting.

2d. DIRECTORS

2d(1). There shall be five Directors each elected to serve for a period of three years. No more than two (2) Directors shall be elected in any calendar year. Each Director shall be responsible for all committees in one of the following categories.

A. Liaison

B. Professional and Technical
C. Programs
D. Publications
E. Zone Activities

2d(2). GENERAL DUTIES OF DIRECTORS

Directors are responsible for establishing functions and guidelines for the operations of each of their assigned committees. Each year, prior to the Annual Conference, they shall recommend to the incoming Chairman the names of suggested committee Chairmen and members of committees under the Director's direction. A Director whose term of office is ending should consult with his elected replacement as to committee composition. Actual appointments should not be made until approved by the Executive Committee and the Division Chairman as designated in ART. III, Sec. 2a(8). Directors shall maintain contact with the chairmen of their assigned committees to insure the enactment of the committees' functions. Directors are responsible for the presentation of reports on the activities of their assigned committees at the Executive Committee meetings during the Annual and Mid-Year Conferences. Directors may recommend the creation of new committees (or the discontinuance of committees that have fulfilled their function) within the category under their jurisdiction. Recommended actions must be approved by the Executive Committee and Division Chairman. Directors shall be responsible for notifying the Division Chairman of the unsatisfactory performance of any individual under their jurisdiction which could invoke the provisions of Article III, Secs. 2a(9) and (10).

2d(3). SPECIFIC DUTIES OF DIRECTORS

2d(3a). DIRECTOR: LIAISON COMMITTEES

The Director is responsible for the functioning and performance of all liaison committees as defined in ART. VII, Sec. 2a(1).

2d(3b). DIRECTOR: PROFESSIONAL AND TECHNICAL COMMITTEES

The Director is responsible for the functioning and performance of all professional and technical committees as defined in ART. VII, Sec. 2a(2).

2d(3c). DIRECTOR: PROGRAMS

The Director is responsible for the programs of all Conference sessions during his term of office. The Director shall be responsible for issuing a call for papers to be presented at each Conference and shall receive all requests to participate at a Conference. The Director shall maintain a Manual of Procedures to aid the Program Chairmen in planning the Conference for which they are responsible, as well as keeping the Program Chairmen informed of all pertinent information regarding that Conference including papers submitted, requests to participate, theme and general guidelines. The Director will approve all proposed programs before submitting them for the approval of the Division Chairman and Executive Committee. He is responsible for insuring that all Program Committees are properly functioning and maintaining their time schedule.

2d(3d). DIRECTOR: PUBLICATIONS

The Director shall also serve as Editor of the ENGINEERING DESIGN GRAPHICS JOURNAL. He is responsible for the effective performance of all members of the Publications Committee.

2d(3e). DIRECTOR: ZONE ACTIVITIES

The Director shall encourage and suggest activities by maintaining contact with all Zone Chairmen to inform them of special activities being accomplished in other Zones as reported to the Director by those Chairmen.

Article IV
ELECTIONS AND SUCCESSION OF OFFICERS

Section 1. Elected personnel shall be nominated and elected according to the following procedures:

1a. A slate of two candidates, for each officer to be elected, shall be prepared by the nominating committee. An eligible candidate must be a member of the ASEE and the Division who has expressed a willingness to accept nomination and to serve if elected to the office to be filled. The slate shall be published in the Fall issue of the ENGINEERING DESIGN GRAPHICS JOURNAL.

1b. A candidate for an elective position may be nominated by a written petition addressed to the Chairman of the nominating committee bearing ten (10) signatures of members of the Division and accompanied by a statement from the candidate affirming his willingness to serve if elected. The names of candidates so nominated shall be added to the slate as prepared by the Secretary-Treasurer under 1d below.

1c. The nomination period shall close on January 31. A petition for nomination received after January 31 cannot be accepted.

1d. Not later than February 15, and returnable before March 15, the Secretary-Treasurer shall mail to each member of record (as provided by the ASEE Executive Director) of the Division

an election ballot bearing the slate submitted by the nominating committee together with additional names presented by petition. A candidate receiving the largest number of votes for the office sought shall be declared elected. Included in the mailing shall be an envelope for the return of the ballot. The envelope shall bear the name and address of the chairman of the election committee (Vice-Chairman of the Division).

1e. The holder of an elective position whose term extends beyond the current year shall not be eligible for nomination to another office or position.

1f. Assumption of office by newly elected personnel shall be concurrent with that of the offices of the American Society for Engineering Education.

1g. If any elected person is unable to perform the duties of his office, these duties shall be assumed by a member of the Division appointed by the Chairman with the approval of the executive committee, for the remainder of the term.

1h. In the event that both the Chairman and Vice-Chairman are unable to assume their offices, the executive committee shall elect a Chairman from its membership.

Article V
CONFERENCES

Section 1. ANNUAL CONFERENCE. There shall be an annual conference of the Division to be held concurrently with the annual conference of the Society, and it shall include the annual Divis- dinner meeting, one or more conference sessions, and a luncheon business meeting. The annual conference shall be planned to include areas of interest to instructors in technical education as well as those instructing at junior and senior levels and employers of graduates. Joint meetings with other Divisions and Constituent Committees of the Society are to be encouraged.

1a. PROGRAM FOR ANNUAL CONFERENCE. The program for the annual conference shall be considered by the executive committee at the mid-year conference of the Division. The Chairman shall present the annual conference program to the members of the Division at the mid-year luncheon business meeting along with items of business. Written reports of committees shall be received and distributed.

1a(1). The Chairman shall transmit the program for the annual conference to the Executive Director of the Society. Should the mid-year conference be held in the Spring, the tentative draft of the program shall be submitted when requested by the Society subject to modifications enacted by the Executive Committee at the mid-year conference. The program for the annual conference shall be published in the ENGINEERING DESIGN GRAPHICS JOURNAL as a record for the Division.

Section 2. MID- YEAR CONFERENCE. There shall be a mid-year conference to be held on an appropriate date each year between November 1 and January 31, and shall include a Division mid-year dinner meeting, one or more conferences, and a luncheon business meeting. The Executive Committee will be responsible for selecting sites for conferences.

2a. PROGRAM FOR MID-YEAR CONFERENCE. The program for the mid-year conference shall be considered by the Executive Committee at the annual conference of the Division. The Chairman shall present the mid-year conference program to members of the Division at the annual luncheon business meeting. Items of business shall also be presented. The program for the mid-year conference shall be published in the ENGINEERING DESIGN GRAPHICS JOURNAL as a record for the Division.

Section 3. Periodic Summer Schools shall be held at the direction of the Executive Committee.

Section 4. Division members are urged to plan group meetings of engineering design graphics instructors in connection with sectional conferences of ASEE, and are urged to make those meetings of interest to instructors in technical education and of junior and senior college levels with a view of including such instructors as members of the Division.

Section 5. Members of the Society and other interested persons are eligible to attend all open conferences and meetings of the Division.

Article VI
EXECUTIVE COMMITTEE

Section 1. DUTIES

1a. The Division shall have an executive committee whose duty shall be to administer the affairs of the Division and report to the Division at the mid-year and annual conferences.

1b. The Executive Committee shall convene for a meeting prior to the annual and mid-year business meetings in order to receive and discuss written reports from the Division's committees and to conduct such other business as required.

1c. The Executive Committee shall schedule and arrange for annual conferences, mid-year conferences and summer schools. It shall administer such other activities as may be desirable for the promotion of the objectives of the Division, including the appointment of special committees.

Section 2. OFFICERS. The officers of the Executive Committee shall be the officers of the Division.

Section 3. MEMBERS. The members of the Executive Committee shall be the officers of the Division and the immediate past Chairman.

Section 4. PROXIES. A member of the Executive Committee who cannot attend a meeting may appoint a proxy. If he fails to do so, the Chairman of the Division may appoint a proxy for him. Proxies must be members of the Division.

Section 5. The Chairman of the Division may invite guests to the Executive Committee meeting if he feels that it is in the interest and to the benefit of the Division. Any member, or other interested person having a contribution to make to the Division should submit his thoughts in writing to the Chairman at least thirty (30) days before a scheduled meeting of the Executive Committee so that he may be invited if his presence is deemed to be desirable by the Chairman.

Article VII
COMMITTEES

Section 1. BYLAW COMMITTEES. Each chairman of a Bylaw committee is expected to submit a report to the Vice-Chairman of the Division well in advance of the Executive Committee meeting at the annual and mid-year conferences. The Vice-Chairman will consolidate the reports of his committee chairmen into a single report submitted to the Division Chairman. The report should be available for study, by members of the Executive Committee, prior to the meeting of the Executive Committee so that controversial or other critical issues may be intelligently discussed and action taken at the Executive Committee meeting.

1a. NOMINATING COMMITTEE. A nominating committee shall be recommended by the incoming Vice-Chairman to be confirmed by the Executive Committee at its annual meeting in June. The nominating committee shall consist of five members three of whom shall be the most recent past chairmen of the Division and two other qualified members. To be qualified, the member must not hold a Division office at the time committee action is taken. The chairman of the nominating committee shall be the senior past chairman, so appointed.

1b. ELECTIONS COMMITTEE. The elections committee for the following year shall consist of the Vice-Chairman in office and two members of the Division appointed by the Vice-Chairman. The appointments shall be subject to approval of the Executive Committee. The Vice-Chairman shall be the chairman of the elections committee.

1b(1). The chairman of the elections committee shall transmit the results of the election to the Chairman of the Division. The Chairman of the Division shall then inform each candidate (including those not elected) of the results of the election for his office and shall transmit the names of the newly elected officers to the editor of the ENGINEERING DESIGN GRAPHICS JOURNAL for publication in the Spring issue of the Journal. The chairman of the elections committee shall report the results of the election to the Division at the annual business meeting.

1c. POLICY COMMITTEE. A policy committee shall be recommended by the incoming Chairman to be confirmed by the Executive Committee at its annual meeting in June. The policy committee shall be composed of three or more members, three of whom shall be past chairmen of the Division. The policy committee shall consider all matters of policy for the Division that are assigned to it and make recommendations to the Division and the Executive Committee. The Committee shall act for the Division to approve or disapprove American National Standards Institute (ANSI) Drafting Standards submitted to it by the ASEE as sponsor in accordance with the policy of the Society.

1d. DISTINGUISHED SERVICE AWARD COMMITTEE. The distinguished service award committee shall be composed of the three immediate past chairmen of the Division. The senior past chairman shall serve as chairman of the committee. The committee shall consider as possible recipients of the Distinguished Service Award those nominees thought to be worthy of the award because of distinguished service to the engineering profession, the Division, and to education. Since this award is recognized, also, as one of the outstanding awards of the Society and the person receiving it is honored at the annual dinner of the Society as a person of considerable professional stature, the committee need not select a recipient in any year than none of the nominees fully meet the requirements set forth herein by the Division. The award shall be based upon the following:

1d(1). To recognize and encourage outstanding contributions to the teaching of students of engineering design graphics, descriptive geometry, computer graphics, and other courses within the interests of the Engineering Design Graphics Division.

1d(2). The Award. The award shall consist of a certificate presented at the annual dinner of the Engineering Design Graphics Division of ASEE.

1d(3). Requirements. In order to receive the Distinguished Service Award, a person must have made a clearly discernible contribution to the art and science of teaching courses in a recognized field of graphics in several of the following ways of which item (e) shall not be omitted:

(a) Success as a teacher must be established both as to competence in a subject matter and ability to inspire students to high achievement.

(b) Improvement of the tools of, and conditions for, teaching. Evidence of such achievement may consist of subject matter (textbooks, etc.), course or curricula, diagrams and models, laboratory and other teaching equipment, and other similar activities.

(c) Improvements of teaching through activities, including the development of teachers in a department or in other schools, testing or guidance programs, promotion of cooperation with other types of educational institutions or industry, development of testing and guidance programs, and the coordination of fields of subject matter.

(d) Scholarly contributions to literature, significant honors, etc.

(e) Service to the Engineering Design Graphics Division of ASEE as evidenced:
-by regular attendance at its meetings as an indication of interest in the improvement of teaching---
-service on its committees or an officer with a record of definite achievement---
-contributions to its publications or summer school programs.

1d(4). Nominations. Nominations may be made by any member or group of members of the Division except members of this Awards Committee.

1d(5). Nomination Form. A nomination form shall be prepared by the Distinguished Service Award Committee which will outline the qualifications and will provide space for a brief outline of a nominee's performance in each category. This form shall accompany the election ballot (See ART. IV, Sec. 1d).

1d(6). The report of this committee shall be made at the appropriate time and place.

Section 2. NON-BYLAW COMMITTEES. Non-Bylaw committees shall be assigned to one of the following described categories under the supervision of the appropriate Director. They may be designated by the Division Chairman or by the Executive Committee when such a committee is deemed necessary for the proper functioning of the Division. Some special purpose committees may be assigned under the control of the Chairman or Vice-Chairman.

2a(1). LIAISON. Committees in this category are those whose purpose is to provide a connection between the Engineering Design Graphics Division and other related or interested groups both within and without the American Society for Engineering Education.

2a(2). PROFESSIONAL AND TECHNICAL. The purpose of committees within this category is the advancement of knowledge in the many areas encompassed by the Engineering Design Graphics Division.

2a(3). PROGRAM. Committees in this category are responsible for planning and implementation of ongoing programs of the Division. There shall be an Ad Hoc Program Committee for each Annual and Mid-Year Conference, and it shall be responsible for all conference sessions sponsored totally or jointly by the Division during that conference. Each program committee shall be appointed at the conference occurring approximately 1-1/2 years prior to the conference for which it is responsible, and shall cease to exist following the conference for which it was formed. A Program Committee shall generally consist of the Division Vice-Chairman, the Director: Programs, a Program Chairman, and at least one other person closely allied with, or especially qualified to represent and act as liaison for, the institution or area in which the particular conference is to be held. This person could also be the Program Chairman.

2a(4). PUBLICATIONS. The function of this committee is defined in ARTICLE VIII.

2a(5). ZONE ACTIVITIES. Committees in this category are to increase and promote Section and local activities of Division members within the various Zones. There shall be a committee from each of the Sections in the particular Zone.

Section 3. COMMITTEE CHAIRMEN. Committee chairmen are responsible for following the guidelines established by their Director and for keeping the appropriate Director informed of the activities of their committee. The chairman directs the activities of the committee members within the constraints of those guidelines, and he may suggest to the appropriate Director such additional activities as he deems necessary for the committee's proper functioning. Each chairman shall prepare and submit reports to the appropriate Director in time for the reports required of the Directors to be prepared. Required reports are interim for presentation at Mid-Year Conference and annual for presentation at the Annual Conference.

3a. PROGRAM CHAIRMAN. Each Program Chairman shall submit proposed programs to his Director for approval. The Director will in turn submit the proposal to the Division Chairman and Executive Committee for their approval. Program Chairman for an Annual Conference and the Division Chairman shall attend the ASEE planning meeting for that particular

conference. The Program Chairman shall, with the assistance of his committee, determine the number, type, and specifics of all technical events, including participants and session moderators. Although it is the Director's responsibility to pass on to the Program Chairman all available papers, abstracts, program suggestions and other pertinent information that he has, it shall be the responsibility of the Program Chairman to select and schedule the actual events and participants after the program has been approved by the Director: Programs and the Executive Committee. He shall notify all participants of their selection and forward appropriate forms and information to them and make related arrangements requested by the National Headquarters or the committee.

The Program Chairman shall also be responsible for preparing feature articles or announcements publicizing the program in the appropriate Journal (s) and in other ways assist in the proper advertising and promotion of the program.

Article VIII
PUBLICATIONS

Section 1. PUBLICATIONS COMMITTEE. The Publications Committee shall be composed of the Director-Editor [See ART. III, Sec. 2d(3d)], the Circulation Manager-Treasurer, the Advertising Manager, and such Assistant Editors as are deemed necessary by the Director-Editor.

1a. The Publications Committee shall be responsible for the timely publication of the ENGINEERING DESIGN GRAPHICS JOURNAL, and any other Division publication, as authorized or directed by the Executive Committee. A minimum of three issues of the JOURNAL shall be published each year.

Section 2. ELECTION OF PUBLICATIONS COMMITTEE

2a. The election of the Director-Editor is covered in Article IV.

2b. The Circulation Manager-Treasurer and the Advertising Manager shall be elected to three-year terms in the same manner as presented in Article IV.

2c. The elections of the Director-Editor, the Circulation Manager-Treasurer, and the Advertising Manager will be staggered such that one is elected each year in order to provide maximum continuity to the Publications Committee.

2d. In the event that either the Circulation Manager-Treasurer or the Advertising Manager is unable to perform their duties, the provision of Article IV, Section 1g is applicable.

Section 3. DUTIES. The duties of the members of the Publication Committee shall be as follows:

3a. DIRECTOR-EDITOR. He shall be Chairman of the Publications Committee and Editor of the ENGINEERING DESIGN GRAPHICS JOURNAL and shall be a member of the Executive Committee.

3a(1). He shall have the responsibility of soliciting, selecting, and editing all articles published in the ENGINEERING DESIGN GRAPHICS JOURNAL.

3a(2). He shall cooperate with the Editor of the ENGINEERING EDUCATION JOURNAL as to articles referred to the ENGINEERING DESIGN GRAPHICS JOURNAL for publication and as to articles referred to the ENGINEERING EDUCATION JOURNAL for publication.

3a(3). He shall make such arrangements and agreements as are necessary for the publication of the ENGINEERING DESIGN GRAPHICS JOURNAL.

3a(4). He shall report on all matters pertaining to the ENGINEERING DESIGN GRAPHICS JOURNAL to the Executive Committee at all its meetings.

3a(5). He shall appoint such Assistant Editors as he feels are required to assist him in his duties, subject to the approval of the Executive Committee.

3b. CIRCULATION MANAGER-TREASURER. He shall be responsible to the Director-Editor for all matters pertaining to the circulation and finances of the ENGINEERING DESIGN GRAPHICS JOURNAL.

3b(1). He shall solicit subscriptions from members and from other sources and shall submit lists of such subscribers to the Director-Editor.

3b(2). He shall assist the Director-Editor in any way requested to expedite the mailing of the ENGINEERING DESIGN GRAPHICS JOURNAL.

3b(3). He shall handle all monies for the ENGINEERING DESIGN GRAPHICS JOURNAL in a standard bookkeeping form and deposit such monies in an account in a suitable repository under the name of the ENGINEERING DESIGN GRAPHICS JOURNAL.

3b(4). He shall receive all advertising fees from the Advertising Manager for deposit in the account above.

3b(5). He shall pay all costs connected with the publication of the ENGINEERING DESIGN GRAPHICS JOURNAL as submitted by the Director-Editor.

3b(6). He shall submit reports on the status of all his activities to the Director-Editor prior to the mid-year and annual meetings of the Executive Committee.

3b(7). He shall present the financial records for an annual audit by an audit committee designated by the Division Chairman.

3b(8). He shall, at the end of his elected term and the accompanying annual audit, transmit to his successor all financial records, together with all monies in the ENGINEERING DESIGN GRAPHICS JOURNAL account.

3c. ADVERTISING MANAGER. The Advertising Manager shall be responsible to the Director-Editor for all matters pertaining to advertising in the ENGINEERING DESIGN GRAPHICS JOURNAL.

3c(1). He shall actively solicit and procure advertisements from all appropriate sources.

3c(2). He shall conduct all business matters with advertisers.

3c(3). He shall submit all bills for advertising according to the current rates.

3c(4). He shall promptly transmit such monies received to the Circulation Manager-Treasurer.

3c(5). He shall maintain legs of advertising accounts, contracts, accounts receivable, and recommendations for advertising policy changes.

3c(6). He shall submit reports on the status of all his activities to the Director-Editor prior to the mid-year and annual meetings of the Executive Committee.

3d. ASSISTANT EDITORS. Their duties shall be assigned by the Director-Editor.

Section 4. ADVERTISING RATES. The Publications Committee shall fix advertising rates subject to the approval of the Executive Committee.

Section 5. SUBSCRIPTION RATES. The Publications Committee shall fix subscription rates subject to the approval of the Executive Committee.

Section 6. FINANCES. The Publications Committee will conduct an annual Financial review of the Journal and other publications financed from Journal funds and prepare an operating budget for the coming year. In addition to the operating fund, an emergency contingency fund of sufficient amount to finance Division publication for one year will, financial solvency permitting, be maintained in an insured financial institution in the name of the publication. Funds in excess of the operating budget and emergency contingency fund may, by action of the Executive Committee or at the discretion of the Publications Committee, be transferred to the Secretary-Treasurer for deposit in the Division fund to be used for any purpose the Executive Committee may approve. Available Division funds may, upon application of the Publications Committee to and subsequent approval of the Executive Committee, be transferred to the Circulation Manager-Treasurer, Publications Committee, to meet existing or anticipated deficits in operating funds or to finance special or unusual "one-time" projects. No separate account will be maintained by the Secretary-Treasurer of funds received from the Publications Committee, nor will funds made available to the Publications Committee by the Secretary-Treasurer be limited to amounts previously deposited.

Article IX
PARLIAMENTARY AUTHORITY

Section 1. The rules contained in Robert's Rules of Order (latest edition) shall govern this Division in all cases to which they are applicable and in which they are not inconsistent with the Constitution and Bylaws of the ASEE, the Bylaws of the Council of Technical Divisions and Committees, or the Bylaws of this Division; in other cases the Constitution and Bylaws of ASEE shall govern.

Article X
AMENDMENTS TO BYLAWS

Section 1. These Bylaws may be amended at any annual business meeting of this Division by a two-thirds majority vote of the members of the Division who are present.

Section 2. These Bylaws may also be amended by a letter ballot of the members of this Division as recorded in the office of the American Society for Engineering Education, mailed by the Secretary-Treasurer of the Division; the amendment being approved if two-thirds of the ballots returned within thirty (30) days are favorable.

Section 3. Proposed amendments may be submitted in only four ways as follows:

a. By a majority vote of the Executive Committee.

b. By petitions to the Chairman signed by not less than fifty (50) individual members of the Division.

c. By recommendation to the Division Chairman by the Constitution and Bylaws Committee of the Society through its executive director.

d. By unanimous vote of the policy committee of the Division.

AMERICAN SOCIETY FOR ENGINEERING EDUCATION
Suite 400, One Dupont Circle, Washington, D.C. 20036

INDIVIDUAL MEMBERSHIP APPLICATION

Date_____

I, _____, hereby apply for membership in the American Society for Engineering Education, and enclose $ _____ as my annual membership dues for the year. $5.50 and $1.50 of this amount are for a year's subscription to *Engineering Education* and *Engineering Education News* respectively. The undersigned member of ASEE stands as my sponsor. (If ASEE sponsor is not readily available, application may be submitted to ASEE Headquarters for continuing action.)

(signature)

_____ (print name of sponsor)

_____ (signature of sponsor)

Please complete the application form below, hand-lettering or typing all entries. Enter one letter or number per block, leaving a blank box for normal separation of words. Use standard abbreviations where possible. Send with your check for annual dues to ASEE (address above).

DUES SCHEDULE

Regular members: $25 for applications submitted between July 1 and January 31
$12.50 for applications submitted after February 1 (for membership through June 30)

Students: $10 ($5 after February 1) [Note: Student members must be full-time students at one of the educational institutional members of the Society. Verification of student status should accompany application and subsequent renewal notices.]

MAILING ADDRESS

Name (title, first, middle initial, last)

Institution (if applicable to mailing address)

Street Address and/or Department (if applicable)

City (If served by U.S. Post Office) **State** **Zip**

City & Country (International Applicants only)

PROFESSIONAL DATA (As it will appear in ASEE's Individual Member Directory)

Professional Position

Institution/Company Name

City (If served by U.S. Post Office) **State** **Zip**

City & Country (International Applicants only)

Date of Birth *(Month) (Year)*

Division/Committee Membership (Rank in order of preference)

FOR ASEE OFFICE USE
Sequence #

DIVISIONS

An individual ASEE member can become a member of any three Divisions and/or Committees as listed below. Please enter the code numbers of those you wish to join in the space provided above

Code	
10	Aerospace
11	Agricultural Engineering
12	Architectural Engineering
13	Chemical Engineering
14	Civil Engineering (Construction, Hydraulics, Sanitary, Soil Mechanics, Structural Surveying, Transportation)
15	Continuing Engineering Studies
16	Cooperative Education
17	Educational Research & Methods
18	Electrical Engineering
19	Engineering Economy
20	Engineering Design Graphics
21	Graduate Studies
22	Industrial Engineering

Code	
23	Liberal Studies (Economics, English, History, Languages, Psychology) (Specify other)
24	Computers in Education
25	Materials
26	Mathematics
27	Mechanical Engineering (Machine Design, Manufacturing Processes, Thermodynamics, Power)
28	Mechanics
29	Mineral Engineering (Geology, Mining, Petroleum, Metals, Ceramics)
30	Nuclear Engineering
31	Physics
32	Relations With Industry
33	Engineering Technology
34	Environmental Engineering

Code	
35	Instrumentation
36	Engineering Libraries
37	International
50	Biomedical Engineering

COMMITTEES

51	Ethics and Legal Phases
52	Ocean Engineering
54	Energy Conversion
55	Engineering Acoustics
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58	Engineering Design
59	Information Systems
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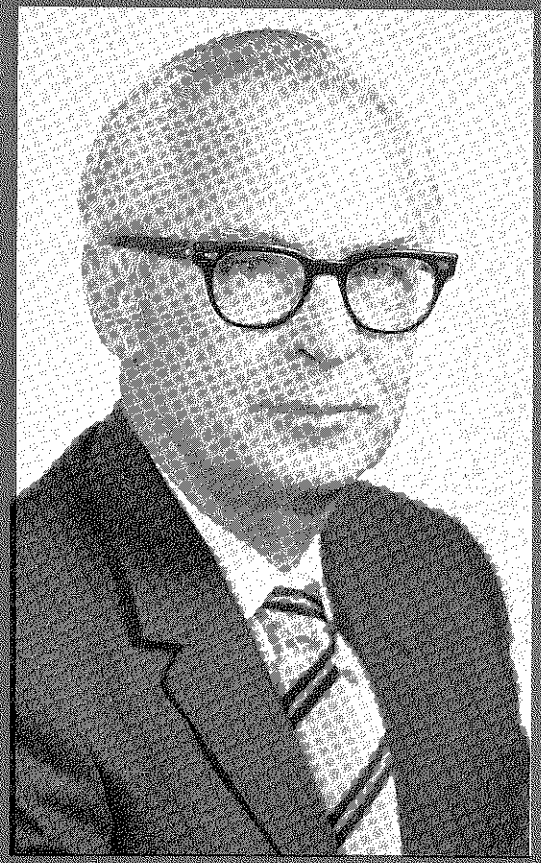
FALL 1976, VOLUME 40, NUMBER 3, SERIES 121



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