THE JOURNAL OF ENGINEERING GRAPHICS

Winter 1968 Volume 32 Number 1 Series 94

Dr. GEORGE J. COWELL, University of South Florida, program chairman and coordinator of the 1968 mid-winter meeting of the Division of Engineering Graphics in Tampa, Florida

Published by the Division of Engineering Graphics, American Society of Engineering Education

ASPEN, COLORADO PHOTO BY: BERKO

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Frank Oppenheimer

The Journal of Engineering Graphics

Winter 1968 | Volume 32 | No. 1 | Series 94

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Published for teachers and others interested in Engineering Graphics. It is published three times per year ---Fall, Winter, and Spring.
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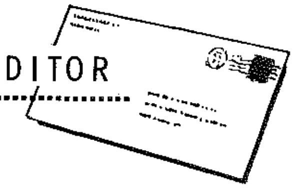
LETTERS TO THE EDITOR



Professor Borah L. Kreimer
Northeastern University
Suburban Campus
Burlington, Massachusetts

Dear Professor Kreimer:

Congratulations on an excellent first editorial. You have instilled into the Journal an aura of objectivity seldom witnessed within the Graphics Division. Imagine admitting that "Perhaps it might be best to eliminate graphics and basic design from the engineering curriculum."

If this thought has ever passed through any of our minds, it was carefully guarded from verbal expression. Some of the most difficult questions for a person to ask himself are "Is what I am doing, and have been doing all my life unnecessary? Can it be possible that I am wrong? Should I make recommendations and take action to put myself out of business?"

Difficult questions for good reasons -- we have vested interests. We are authors, college faculty, with our very livelihood dependent upon anwering these questions in a certain way. But are not the proper questions "Is this good for engineering education? Is what I am doing going to be valuable to my students? Is it good for society as a whole?"

When we can ask ourselves these questions it is then that we will be able to listen honestly to the "somewhat vague" arguments of our colleagues in other disciplines -- to listen with entirely objective and unprejudiced minds.

Now I am sure that I can present a very good case for Graphics in any debate, at least as good a case as anyone I know could present. But I am sure that I would be fooling myself if I though that I knew the answers to the last questions. The reason is that we are not dealing with absolutes. The answers to these questions were different yesterday and they will be different tomorrow.

Therefore, I once again praise your promise of objectivity and your intent to present a forum on goals, needs and methods in Graphics.

Very truly yours
W. D. Cibulskis
I. I. T.

Dear Professor Cibulskis:

Your letter concerning my first editorial expresses the policy that I would like to pursue in the Journal. The Journal is not only for me and the other members of the editorial staff, but for the entire membership of the Division. It seems that letters and articles by various individuals could help us to find the necessary answers to the necessary questions. I believe that we have a great deal to offer students in engineering education which would be of value to them. Our problem is to determine what it is that we should offer and how to present it.

Thank you for the encouragement in presenting the policy of open forum in the Journal. I am sure that previous editors would have liked to do the same, but they needed people like yourself to carry it out. This cannot be done by one individual.

Please continue to write your opinions either in the form of letters, as you have now done, or in the form of an article, which I would be very happy to print.

Sincerely,
Borah L. Kreimer
Editor

Professor Borah Kreimer
Northeastern University
Suburban Campus
Burlington, Massachusetts

Dear Borah;

I want to congratulate you on your splendid job on the new journal. It's positively excellent. I like the articles, refreshing new arrangement, over-all organization, etc., etc. Well done.

Cordially,
Herbert W. Yankee

Dear Herb:

Thanks for your encouraging words, but we must remember that one man cannot do the job alone. Let us congratulate those who contributed to the last issue of the Journal as well as the competant staff that I have.

Sincerely,
Borah L. Kreimer
Editor

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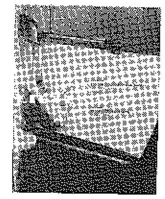

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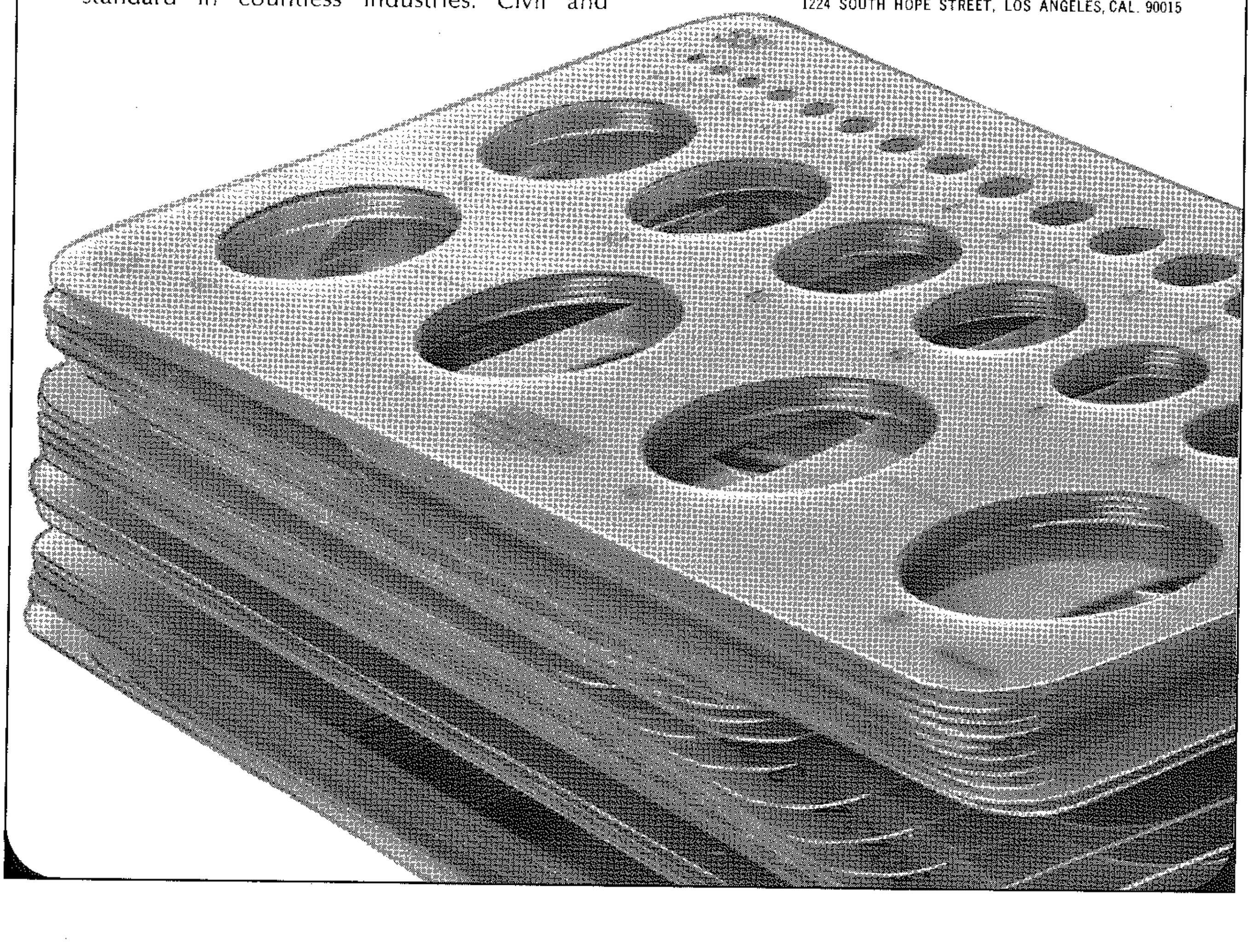


GRAPHICS, ANALYSIS AND CONCEPTUAL DESIGN

SECOND EDITION

By ALEXANDER S. LEVENS, *Professor of Mechanical Engineering, University of California, Berkeley, California.*

"We cannot start too early to give the student the experience of confronting and solving the "open-ended" type of problem. The first year in engineering education is not too soon"— A. S. Levens in his Preface.

This is the major revision of the most respected and advanced graphics text on the market today. What sets it apart from the others in the field is its approach to making the engineering student graphically literate. While other texts aim to teach drafting, Levens teaches engineering graphics and design. The current edition has already been adopted by more than 120 schools, both four year engineering, and technical institutes.

Author Levens stresses engineering graphics and design. He does not teach drawing techniques. If the student has had no earlier exposure (high school), he can rapidly pick up the basic manual techniques on his own. The audience is the engineering student, not the draftsman.

In this new edition there is greater emphasis on freehand sketching. There is a new and expanded chapter on Conceptual Design. There are hundreds of new problems and illustrations, many selected from aerospace and the computer industry. A new chapter on Dimensions and Specifications for Precision and Reliability includes the newest ADA standards. Treatment of many figures by shading and air-brush add eye appeal.

This book is also suitable as a basic text for those high school seniors and junior college students "committed" to study engineering in preparation for an engineering career.

1968 771 pages $10.95

JOHN WILEY & SONS, Inc. *605 Third Avenue, New York, N.Y. 10016*

Editors' Board

THE CHALLENGE OF LEADERSHIP -

Leadership is a rare quality among men. It demands talent, plus the willingness to accept full responsibility for the pursuance of a goal. It also demands a dedication, courage and conviction of purpose. In return, the exercise of leadership is rewarded with the respect and recognition of society.

Perennial critics can never be leaders. They are the worst enemies of leadership. Their destiny is mediocrity and wasteful strife. True leaders, on the other hand, criticize little and always try to ascertain the possible merits of any approach while never loosing sight of the ultimate goal. They work quietly and incessantly, probing every approach in earnest until, inevitably, success in one form or another crowns their efforts.

Graphics is facing an enormous challenge today, A challenge that demands imaginative and bold leadership. If that challenge is not properly met our courses will be obliterated and along with them will disappear much that is essential for the realistic education of engineers.

We are yet in a good position to introduce the necessary changes in our courses and command the respect and following of our colleaques in other disciplines, but to reach that goal it is essential to adopt a lofty view of our ultimate responsibilities as engineering educators without parochialisms or dogmatic rigidity.

When I hear the expression "we have to save graphics ! " my enthusiasm falters. Why should we take such defensive and pusillanimous attitude? Don't we believe in the usefulness of our subject matter enough to permit it to impose itself if properly presented? If we believe in its usefulness, why not demonstrate it conclusively rather than indulging in wasteful lamentations or attempting to persuade others with verbal arguments?

To persuade others effectively it is necessary to offer proofs in support of our arguments, and since the conventional teaching of graphics evidently lacks persuasive power, it becomes essential to present graphics in a context in which its usefulness as an engineering discipline would be unquestionable.

The logical context for the teaching of graphics is engineering design. Design is the field in which graphics finds its widest engineering use, not only as a means of communication but as an expedient tool of analysis and conceptualization as well. It is in the context of design operations that graphics attains its full spectrum of utilization.

Engineering design brings together all the basic disciplines which often seem unrelated when presented in the stereotyped departmental fashion. Teaching graphics as a natural vehicle of design helps knit together other elements of engineering education into a meaningful whole. At the same time the discussion of comprehensive engineering situations characteristic of design problems helps convey to the students a very realistic view of their future career, even if their natural academic limitations restrict their analysis to mere first order approximations. After all, that is the first step when exploring any design situation.

An approach such as this will introduce into the conventional engineering curriculum a new and much needed methodology which has been almost completely ignored by our detractors from other disciplines. Such approach will place our group so far ahead of all other branches of engineering education that we will be able to look back at them and aggressively demand that they review their antiquated methods and follow our lead.

It is not necessary to sacrifice much of what we consider basic in our subject. All we must do is trim the fat from our beloved courses and instead of our classical academic problems introduce quasi-real engineering design situations, selected to take full advantage of the theory.

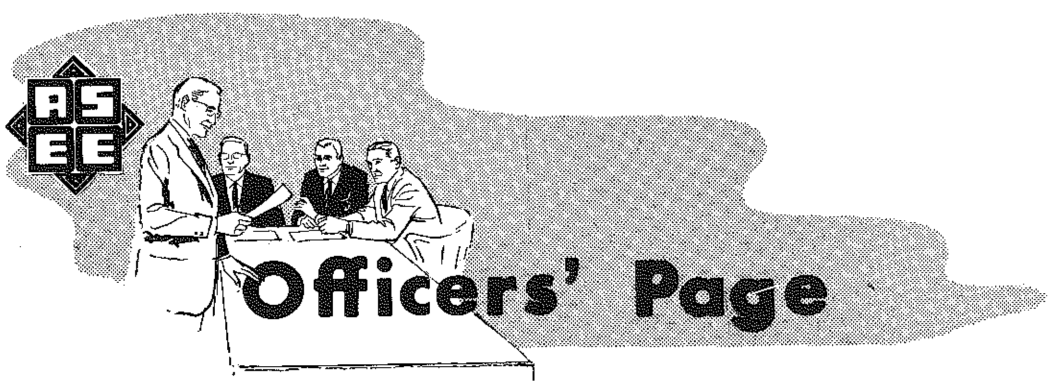
The preparation of those new courses and the development of suitable teaching methods constitutes a real challenge to our profession. Experimentation and leadership in this area of engineering education would bring full recognition again to the importance of graphics as an engineering tool and, if the proper methodology is developed, such approach would have a tremendous impact on the teaching of engineering at all levels.

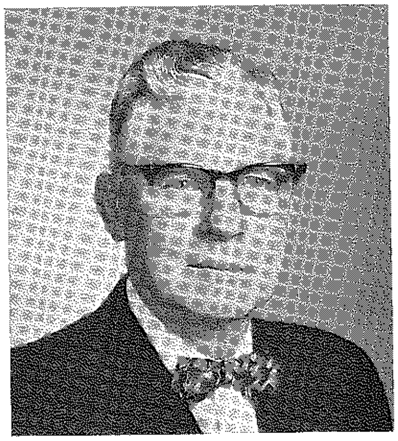
Only through the exercise of such leadership will we be able to make a real contribution to engineering education and cease to defend ourselves meekly from our critics. Only by exercising our talents in that direction will we become trail blazers instead of dragging followers.

The professional rewards and satisfaction will be enormous.

Are you willing to accept the challenge of leadership?

Ernesto E. Blanco





OFF AT THE DEEP END

by

Earl D. Black
General Motors Institute

Have you ever speculated on what would happen to our society if all engineering education -- in schools and within industry -- would suddenly cease? Someone has said that the best way for us to determine the future is to look backwards and then extrapolate into the future based on historical facts.

Looking backwards, about the first thing one would be aware of should education in engineering technology suddenly stop, would be an upsurge of prices on all products made by today's industry, and the premium on such know-how would begin an elevation of engineering importance to all of us. Within a short time many products, which we may buy at a reasonable price today, would no longer be offered for sale except on "black markets" at very unreasonable prices. This scarcity of items would become more noticeable as the older members of the profession pass away. Present automobiles and modern means of travel would soon no longer exist, new highways would be only in time past, radio and television would disappear, and many of today's conveniences which we think of as necessities would cease to be available. A great depression would evolve upon us following high prices, hungry mobs would stalk the streets, cities would no longer be alive and booming, and mankind would have to go back to the farm where methods and mechanical operations would, by this time, have reverted to those used by our forefathers. All of us would be thrown back many years beyond today's standard of living. Within just a few years the discontinuing of technical education would lose many of the last discoveries to our generation and would have to be rediscovered by our children's children. Engineering education would soon become predominently theoretical rather than practical to the extent of uselessness to mankind. In fact, a general political unrest undoubtedly would soon exist throughout our land due to a scarcity of the production that is our heritage. Income taxes would be on the downgrade and unemployment would be commone to us all.

But so much for theory and the past; let us examine the facts as they are today.

Engineering education, properly balanced with theory and application, has encouraged industrial specialization through magnitude of scope. It has become progressively more difficult for any one individual to master all phases of the sciences involved in engineering practice. This widening scope has divided general engineering into specialized fields and increased the responsibility of college and university administration in determining the required basics to all. In many instances, changing technology has made obsolete the basics of a few years past and has created a need for reexamining new technology with regards to the future impact on engineering education. New techniques and methods should be used which prepares the student for a world of rapid change. The unforeseeable demands of the future requires the continuing of education throughout our adult life and should be a normal expectation of all of us.

Too frequently so-called courses of study are merely course outlines rather than the psychological order required for effective learning by the student. Desire to learn on the part of the student is basically fundamental for progress under such conditions. The course outline should be likened to a blueprint which spells out the specifications to the learning processes and the learning accomplishments are measured by the end results in ability to use what is learned. Any job performance or laboratory project assignment should be used as the vehicle of instruction. Selection of assignments should permit adjustment and frequent revision to meet new technology as it is developed. Progression should be from the simple to the complex. The student should see some reasonableness and personal value to the act of learning. There should be some relation between new learning and previous experiences encountered by the student. How can the student design something new unless he places confidence in his experience of the past?

The man who knows "how" will have little trouble in finding a job, but he is likely to work for the man who knows "why".

Most teachers assume too much knowledge on the part of students. The answers to why should be learned along with what, how, who, where and when. The teaching situation should give the needed information meaning to the student and create an interest on his part as well as a desire to learn. Informing the student is not enough.

Directions for doing work are usually communicated in oral instruction, written instruction, by graphical instruction (drawings), or a combination of the three methods. The use of graphic instruction for supplementing oral and written specifications is rapidly increasing in industrial work. Government safety laws require specific documentation of procedures and safety considerations that can be audited. There must be an accurate record.

The answers to many of the "why" questions are found in the field of science. A comprehensive program of engineering education should include both why and how. Answers to both should be synthesized in ability to perform in practice. Courses should not be taught as strictly isolated subjects, but should be integrated to the point of proper relation and practical use under general technological systems. Engineering graphics is no exception.

Engineering graphics should be considered as a scientific supplement to other methods of communicating technical ideas accurately. It should be a shortcut to understanding and simplify the complex. Standard practices make of it a universal language. The student should understand its full usefulness and have ample practice in its use.

He who has an idea of worthiness is useless to his profession unless he can adequately record it and communicate it to his fellow workmen. The new emphasis on creative design emphasizes the need for accurate methods of communication. This is the function of Engineering Graphics. The successful practicing engineer can have no less.

STUMBLING BLOCKS FOR THE BEGINNING TEACHER

by
Earl D. Black
General Motors Institute

1. Failure to analyze the teaching situation. (He should list and organize objectives and items to be taught).

2. Failure to become acquainted with nomenclature and subject terminology. (He should learn the meanings of usual technical terms used by those active in the particular field of learning).

3. Failure to isolate unimportant from important items to be taught and organize them in logical teaching order. (Importance and use should be a constant part of teaching).

4. Failure to plan the teaching procedure for effective learning. (The student should be prepared for learning).

5. Inability to adjust teaching techniques to the needs for individual differences in students. He tells rather than teaches. (He should help the student to know why he is learning and that he is progressing. He should attract the student's interest

and curiosity and build up his confidence in his own ability to learn).

6. Inability to choose proper projects, jobs or assignments for effective teaching. (All assignments should be considered and examined in light of teaching objectives).

7. Inability to adjust teaching speed of presentation and instruction for complete learning. (Should encourage the student to ask questions and should give the student a chance to "think things out.").

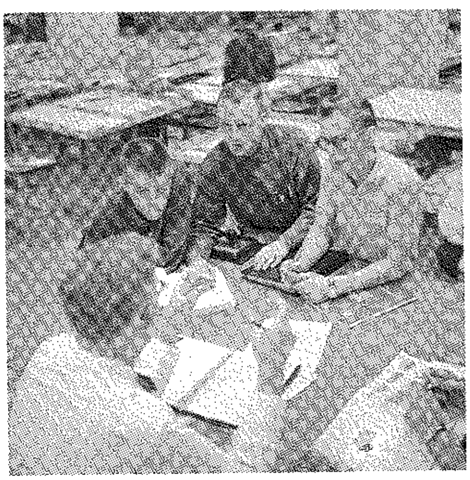
8. Lack of enthusiasm - teaches mechanically and in stero-typed fashion -- poor speaking voice and grammar. (Should not depend upon "cold-storage" learning. Should be available to students).

9. Failure to give the student an opportunity for application of the lessons learned. (Should lead the student to give more value to a good job than fast completion).

10. Failure to adequately test the student for correctness and adequate learning. (Do not let poor work "get by". Don't let the student loaf).

11. Failure to do remedial teaching after tests have shown inaccurate or insufficient learning. (Incorrect learning or too little learning about a subject can be dangerous and expensive).

12. Failure to take stock of what he knows by analyzing his knowledge and ability by comparing himself honestly and factually with his fellow teachers. (He should be alert to new developments in his chosen field. He should be aware of how his fellow teachers are doing).



EARL BLACK (Division Vice - Chairman) at work

IN THE DIVISION

MID-WINTER GRAPHICS MEETING 1968

Delegates from the forty-eight states and the provinces of Ontario and Nova Scotia assembled at the International Inn, Tampa, Florida, to discuss the "Gemini of Graphics," i.e. the communicative aspects of graphics versus the analytical approach to the solution of problems.

Those arriving early were invited to tour the Univeristy of South Florida Campus, an institution that is unique because it was planned on a drawing board before the first building was fabricated. On a 1734 acre campus there are 26 major academic and residential areas currently valued at more than 35 million dollars that serve more than 10,000 students.

The Engineering College, a recent addition to the physical plant, was the focal point of the tour. At the door the dean and members of student organizations of the ASEE met and escorted their guests around the school. After a thorough inspection of engineering facilities, Dr. Downey presented some facts on the artificial kidney located in the technitarium.

At 3:00 o'clock the members convened at the Planetarium to hear and see a presentation of "Cosmic Fireworks" by Professor Joseph Carr, Curator of the planetarium.

In the evening when officers and selected guests were gathered in an executive session, the other members and wives dined at the Columbia, a gourmet restaurant, known for its delicacies throughout the United States. Those able to travel on a full stomach went on to the Jai Alai, a Basque game that is exciting and adventurous.

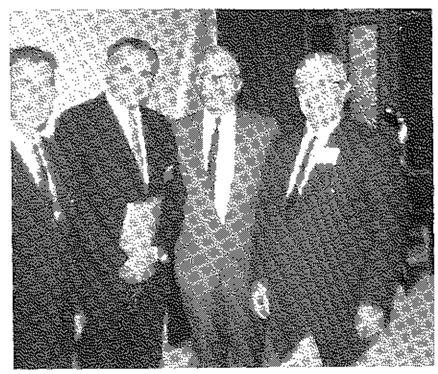
On Friday morning the session was opened with words of greeting from the Dean of the College of Engineering. Professor Ivan Hill, who M'c'd the morning session introduced Steve Slaby who spoke on the "Duality Concept of Graphics." Henry Davison, who followed him to the podium, presented his case for the communicative aspects, and John Twigg, the last speaker whose topic involved the analytical method of problem solving, found it necessary to decline because of illness. The host, Dr. George Cowell, substituted.

In the afternoon, Professor Leighton Wellman presented Percy Hill from Tufts who elaborated on the "Megalopolis and Tube Flight," an article appearing in a recent issue of the ASEE Journal. Dr. Huum from the Marine and Oceanographic Institute followed with many applications of graphics to oceanographic research. Most exciting and perhaps most receptive were two films shown by John Fike from N.A.S.A. that graphically portrayed space trajectories and methods of determining the nature of those paths analytically. Thus, in one afternoon it was possible to communicate from the planet Mars to the bottom of the

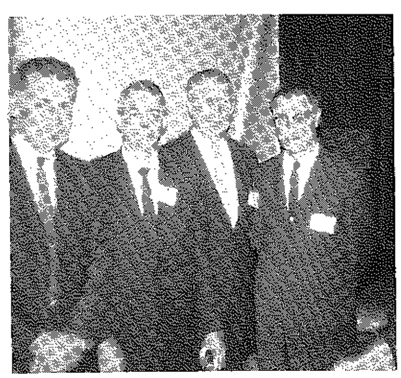
After committee meetings the membership was invited to a social hour hosted by friends of the University. Music was provided by a string quartet from the faculty. The annual banquet was honored by the attendance of Dr. John Allen, President of the University of South Florida, and his executive staff. It is interesting to note that the President carried home the door prize, a slide rule, presumable to use in making up the University budget. The speaker, Vice-President Robert Mautz of the University of Florida, indicated the great need for engineers in this modern world. Music was furnished by the Madrigal Singers, a choral group from the University of South Florida.

On Saturday morning, Earl Black reviewed opinionaires on the Design Summer School, and Herb Yankee presented a panel that discussed the many aspects of "Conceptual and Creative Design." At the conclusion of the session members dispersed, some to the pool, some to the tracks, and others to pursue their favorite sports.

Thanks are in order for the Citrus Commissson who furnished orange juice, the University which provided the entertainment, and our friends who set up the social hour.



Friday morning session: Professors Henry D. Davison, Steve Slaby, George J. Cowell with moderator Ivan Hill.



Friday afternoon session: Dr. Harold J. Huum, John Fike, Professor Percy Hill with moderator Professor B. Leighton Wellman

NOMINATIONS for 1968-1969

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Jerry Dobrovolny, University of Illinois

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Peter Z. Bulkely, Stanford University

Division Editor
Herbert W. Yankee, W.P.I.
Robert J. Christman, G.M.I.

Nominating Committee
R. H. Hammond, chairman
J. H. Porsch
R. L. Ritter
W. Falbarth
B. L. Wellman

Appeal for Articles - A Plea for Papers

Friends, Americans, Fellow Division Members. Lend me your ideas!

An editors job is to solicit, edit, and submit or return for refinement.

Please provide material so that I can earn the title to the position to which you elected me.

Send articles or papers concerning Engineering Education (Graphics might well be mentioned!) to your Division Editor for submission to the ASEE Journal. Remember "Areas of major interest are curriculum, teaching methods and practices, teacher education, administration, improvement of instruction, new techniques and equipment, goals and principles, professional ideals and standards, ethics, graduate study, changing conditions, new programs, research reports and reviews, and the like. Papars presented at the ASEE meetings may be presented for consideration.".

I am eagerly awaiting the deluge.

Prof. Gordon Sanders
Iowa State University
Ames, Iowa 50010

TENTATIVE PROGRAM for ENGINEERING GRAPHICS DIVISION at the ANNUAL MEETING ----- U.C.L.A.

Sunday-June 16, 1968
6 - 10:30 P.M.
Executive Committee Dinner & Business Meeting. (Gene Pare presiding)

10 A.M.-10 P.M.
Display of Introductory Creative Design Projects. (John Barylrki, chairman)

Monday-June 17, 1968
8 A.M. - 10 P.M.
Display & Judging of Projects Continued (Al Hoag, display chairman)

10 - 11:45 A.M.
Conference
"Introductory Design Projects"
(Vehicle for Engineering Orientation)
Presiding - Peter Bulkeley
Panel -
Dean George Beakley
Arizona State University
Michael Besel
University of Wisconsin, Milwaukee
Gordon Sanders
Iowa State University
Roger Keech
California State Polytechnic Institute, San Luis Obispo

Tuesday-June 18, 1968
12 - 3:30 P.M.
Luncheon & Business Meeting
(Gene Parè presiding)

Wednesday-June 19, 1968
10 - 11:45 A.M.
Conference
"Graphics & Design at the Community College"
Presiding - Dr. George Cowell
University of South Florida
Panel -
Richard Prouty
Shoreline Community College
Delbert Eklund
Oregon Technical Institute
Philip Brach
North Virginia Community College
Shaikh Matin
Prince George Community College

6 - 9 P.M.
Engineering Graphics Division Annual Dinner. (Gene Parè presiding)

Distinguished Speaker -
Lee Harrisberger
Oklahoma State University

Topic -
"Kludgemanship"

Engineering Graphics will support the Civil Engineering Conference - Tuesday-June 18, 1968: 3:45 - 5:30 P.M.

Engineering Graphics will also support any Digital Computer sessions that do not conflict with our own program

CERTIFIED DESIGN CONSULTANT COMMITTEE

The Summer Scool Follow-Up Survey indicates a need for a "Certified Design Consultant" Committee as a means for further follow-up activity in support of the Goals of Engineering Education Study.

It seems advisable that this committee should be organized to provide assistance to those schools and universities that did not send participants to the Summer School. This proposal is not intended to imply inability on the part of any school faculty. It should rather provide a comprehensive method of exchanging problem projects and methods or techniques of teaching engineering graphics and design. It should provide liaison between engineering graphics and design teachers and broaden the scope and ideology of engineering graphics and design. It should also promote deserved Divisional recognition of outstanding teachers in this area of engineering education.

Members of this Certified Design Consultant team may be asked to provide both consultant services and lecture demonstrations. They should be on call to those who may wish assistance in developing programs, courses and faculty dealing with the design aspect recommended by the Goals Report.

For the present, the consultant will be asked to give his personal time without charge except for his living and travel expenses. Members are expected to get their school's official approval for any short period of time during which they are on consultant call without reduction of base pay. All requests for consultant service should be made at least one month prior to the time of service schedule in order that home-school teaching schedules can be adaquately adjusted.

Those being first proposed as members of this committee are geographically located in various areas of the United States. This distribution should hold travel expenses relatively low. These people were also active participants in the Engineering Graphics Summer School.

All Certified Design Consultants approved by the executive committee should be included on the Divisional Committee roster. They should establish objectives which should be recorded with the Divisional Secretary. Complete communication should keep all members informed and the chairman should not only make regular reports to the division, but an annual composite report should be submitted to the Journal of Engineering Graphics for publication.

The chairman of this committee should be appointed by the executive committee.

The names of those first proposed for this committee are as follows:

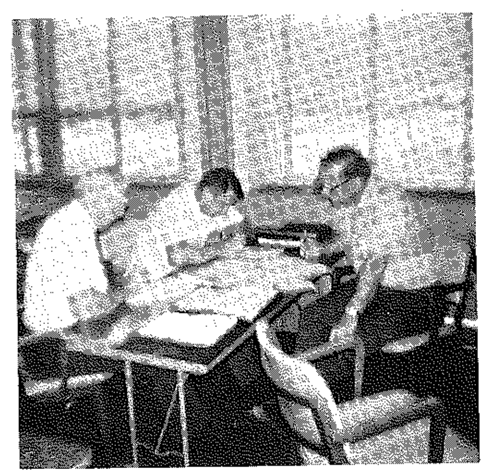
East Coastal Area
Percy H. Hill, Tufts University
E. W. Jacunski, University of Florida

Central Area
Jerry S. Dobrovolny, University of Illinois
James H. Earle, Texas A&M University

West Coastal Area
Peter Z. Bulkeley, Stanford University
William S. Chalk, University of Washington

These people have accepted appointment to this committee and were approved by the executive committee of the division.

Any teacher of graphics and design may be added to the original list by petition from his fellow teachers, officers of the division, or on recommendation of the active Consultant Committee, subject to the approval of the Divisional Executive Committee.



Graphics professors studying

COMMITTEES for 1968-1969

A number of committees are appointed by the chairman-elect and these appointments should be made and accepted for approval by the Executive Committee at the annual conference preceeding the school year. I am certain that you have a special interes in some committee activity. It would help me to make appropriate appointments if you will check you interests and return it to me as soon as possible.

Earl D. Black, Vice Chairman
ASEE Div. of Engineering Graphics
General Motors Institute
Flint, Michigan

I am interested in becoming an active member of the committees checked. I understand that I may be appointed to the committee (s) which, in the judgement of the executive officers, best promotes the interests of the Division of Engineering Graphics.

NAME______________________________

TITLE______________________________

SCHOOL (COMPANY)______________________

ADDRESS____________________________

____

____

____

Committees and their objectives:
(place a check mark on the blank line to the left of each committee name in which you would like to become active)

___ AWARDS: To determine the kinds and names of awards to be given by the division. To prepare a statement for each award established as to purpose, scope, monetary value, requirements, rules for nominating, and details regarding presentation.

___ BIBLIOGRAPHY: To disseminate a list of publications to division members and to provide reviews of publications available in engineering graphics and design texts.

___ GRAPHIC & DESIGN CONSULTANT: To assume the responsibilities previously assigned to the Inter-disciplinary and Scope of Engineering Graphics Committees. To provide a means of exchange of information and coordination between the division and degree-granting as well as related service departments. To alert members of the division to current trends, and broaden both scope and ideology of engineering graphics and design by personal guidance and creative development in organized procedures.

___ DISPLAYS: To invite and manage displays at all mid-year meetings which are consistant with the ASEE Goals of Education and acceptable to physical facilities and operating policies of host institutions.

___ EDUCATIONAL RELATIONS: To promote communication and distribution of noteworthy information among educational institutions. Committee membership should be drawn from all classifications of educational institutions (college, university, technical, etc.).

___ INDUSTRIAL RELATIONS: To promote a mutual understanding and interchange of information regarding the problems of both industry and engineering education by way of technical background, tools, methods of implementing design ideas, and solicitation of real design situations from industry in various levels of sophistication where graphics and design are predominately used in analysis and solution.

___ Membership: To promote and enroll members for ASEE who are especially interested in the objectives and activities of the Division of Engineering Graphics.

___ PUBLICATION & EDITORIAL BOARD OF THE JOURNAL OF ENGINEERING GRAPHICS: To expedite, edit, and publish the Journal of Engineering Graphics in accordance with more detailed duties and procedures as approved by the Executive Board.

___ TEACHING TECHNIQUES: To collect from whatever sources available and disseminate information regarding new methods and techniques useful in the teaching of graphics and design. To make frequent reviews of established techniques of teaching such as use of chalkboard, film strip, overhead projector, opaque projector and models.

AN OPEN LETTER TO THE DIVISION

Dear Colleagues:

Today is George Washington's birthday. Now this fact may not be of sufficient magnitude to cause any amount of patriotic fervor among the constituents of the Division, particularly the young, but had it not been George's Anniversary, this note probably would not have been accomplished. Regardless of any significance the date may hold for you, we in California observe the event as a State Holiday. While schools and state offices lose their personnel to the beaches, parks and freeways, some of us have a brief reprieve from routine.

I have been asked to write an article re the Introductory Creative Design Display scheduled for the ASEE Annual meeting at UCLA in June. I am sure before summer you will be overcome with dates, room numbers, directions and a list of the variety of existing fun and games available in the Los Angeles vicinity. Professor Leighton Collins has been asked to publicize the Display in both the Preliminary and Final Programs. To facilitate this, John Barylski, Display Committee Chairman has submitted this copy:

> "The Introductory Creative Design Graphics Display located in Boelter Hall, rooms 3564 and 3677, is well worth your time and attention. You have the opportunity to examine and judge an excellent array of competitive student projects with prototypes.
>
> The Engineering Graphics Division of the ASEE has vividly demonstrated that the creative engineering design approach at the freshman and sophomore level does fulfill the needs of a more meaningful engineering curriculum, The new look and philosophy of the Engineering Graphics Division will be ready for viewing Sunday, June 16 at 10:00 A.M."

To assist your visualization of the Display parameters and the award criteria to be implemented, I will quote directly from correspondence with Al Hoag, Award Chairman:

> "Awards will be made in four categories:
>
> 1. Freshman individual projects
> 2. Freshman team projects
> 3. Sophomore individual projects
> 4. Sophomore team projects
>
> In each of these categories, certificates will be awarded for three levels of merit:
>
> a, Outstanding design project
> b. Excellent design project
> c. Honorable mention design project
>
> Finally, in each category a First Grand Prize and a Second Grand Prize will be awarded to the top projects, chosen from those in the Outatanding level. The Grand Prize Awards will consist of appropriate certificates plus cash awards totaling $750, divided as follows

Category	First	Second
1.	$ 50	$ 25
2.	200	100
3.	50	25
4.	200	100

In addition, Al writes, "Because of the diversity of methods and approaches used at various schools, the criteria for judging must cover broad areas rather than specific items. A major portion of the weight in judging will be placed on the suitability and quality of the graphical methods used to illustrate the design. Other areas considered will include the format, quality and completeness of the design project report or presentation, and the effectiveness of the design as a solution to the design problem."

You should know that Charles Simpson and his staff at UCLA have been exceptionally cooperative, and have made my liaison work very pleasant and profitable. Before the meeting, (June 16), I expect to bring in a "Beatnik", or rather, an avante-garde "hippy" group to decorate the area in "good" artistic taste. I jest, of course, but nevertheless, I do plan for artistic assistance from either the UCLA or Immaculate Heart College Art Department.

John Barylski indicated to me that twenty schools have registered with him and will participate in the Display. Since I have arranged for accommodations to show 99 displays, John's total makes me apprehensive about our heralding this event as the "greatest show on earth." Imaginative tinsel and bright lights will certainly enhance the display area, but without your prototypes and designs we could very well be promoting something other than a magnificent show.

If your graphics efforts are creative, original and within the new concepts of freshman-sophomore design, and heading toward those horizons defined by the new "Goals" report, your own reputation and concern for personal development should be a factor in the decision whether to display or not to display. And too, why let the other fellow always be first?

I was asked to write an article. But articles tend to be the reporting of a collection of data, or a sociological concept, sometimes new, but more often a belaboring effort. This has been my friendly letter to Division colleagues. Some very few I know, many hundreds I do not. I have found very late in my professional life that the best way to achieve and to achieve well, is to confide in one's collegues. Sharing experiences quickly enriches the individuals involved and eventually the Division.

All the planning by the Display and Awards Committees and the liaison work accomplished to promote good will and eapport with our host will have been quite futile if the individual members are not producing or are not concerned. Our to achieve the goals Gene Pare has ably set, anything of worth, or even the presentation of a mediocre display, will not really matter, since members of other dividions rarely expect us to be noticeably different. We spend much time defending our lot, while actually deciding how to slide out from under the old stigma. However, some few are now planning to carry the ball! Why not join them at the UCLA Display? Now, I have sounded a bit sociological, and I meant to be entirely friendly.

If you have disgarded the registration form mailed to you months ago, why not write to:

John R. Barylski
Chairman, Displays Committee
SMTI College of Engineering
New Bedford, Massachusetts
02742

Inform John immediately of your desire to partcipate. However, if some of you expect to arrive at UCLA on the 15th of June with your display material and without reservation, expect to encounter a beautiful hostess, whose job, in addition to just being aesthetic, will be to announce that space is not available for your work.

After informing John of your intentions, ship or deliver materials, with arrival date scheduled before June 15th, to this address:

Professor Robert L. Ritter
Engineering Graphics
c/o ASEE Annual Meeting - Instrumentation Facility
Department of Engineering
University of California
405 Higard Avenue
Los Angeles, California 90024

John Barylski, Frank Oppenheimer, Wallace Reynolds, Al Hoag and I expect to be busy with set-up and decorations on June 15. Send in those projects and make our set-up job a difficult one.

Best wishes.

Bob Ritter
Loyola University
Los Angeles, California
90045

P. S. A more detailed report on the Display can be found in the November issue of the Journal of Engineering Graphics on the Officers' Page.

John Barylski, SMTI
Chairman, Displays Committee

Fill out the form, below, for reservation of space in the Design Display at UCLA and send it to John Barylski. DO IT NOW!

Dear John:

Please reserve space in the Design Display for the following:

Freshman Individual Projects________ (number)

Freshman Team Projects__________ (number)

Sophomore Individual Projects_______ (number)

Sophomore Team Projects_________ (number)

School________________________________

Address_______________________________

____

Instructor_____________________________

J. NORMAN ARNOLD
1904 - 1967

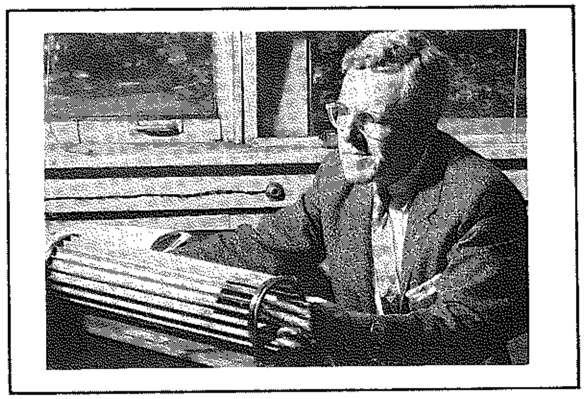
J. Norman Arnold, Professor of Engineering Graphics, passed away on 25 November 1967, at Home Hospital, Lafayette, Indiana. Professor Arnold, who had been on the faculty of Purdue University since September 1930, was 63 years old. After an illness of only several days, he succumbed to a massive cerebral hemorrhage.

Born 17 June 1904, in Alamogordo, New Mexico, he spent his early days in New London, Ohio, graduating from high school there. He attended the University of Cincinnati and received the EE degree in June 1927. As a cooperative student, he worked part of the time for the Cincinnati Gas and Electric Company. After graduation he continued for a while in the employment of Cincinnati Gas and Electric Company in electrical transmission design and then became associated with Stone and Webster. He accepted an instructorship in engineering graphics at Purdue University where he pursued and acquired the MSEE degree in June 1933. While in industry he was married to Elizabeth Jenkins on 6 August 1928.

Not one to be idle he spent his summers in a variety of activities, among which were his contacts with industry. He worked again with Cincinnati Gas and Electric Company, also with Lockheed Aircraft, DuPont de Nemours, U. S. Steel, and Western Electric. He held exchange professorships at the University of Illinois in 1937 - 38, and at the Massachusetts Institute of Technology in 1949 - 50.

He was the author or co-author of several text books on Graphics and the Slide Rule. He was an authority on the construction of slide rules and nomographs and served as a consultant to industrial organizations. In addition to his textbooks, he authored many articles for professional magazines and journals.

His other journalistic activities were as a partner in Balt Publishers, and as Engineering Editor for the Schools of Engineering. With Balt Publishers, started in 1943, he was responsible for editing and arranging for printing more than twenty publications - all but a few authored by Purdue faculty members. As Engineering Editor since 1953, he had general editorial responsibility over engineering publications, such as Abstracts of Engineering Staff Publications, Research Activities, and the Engineering Catalog. Twice a year an engineering newsletter incorporated in the Purdue Alumnus to alumni of Purdue had been supervised by him in consultation with the Dean of Engineering.



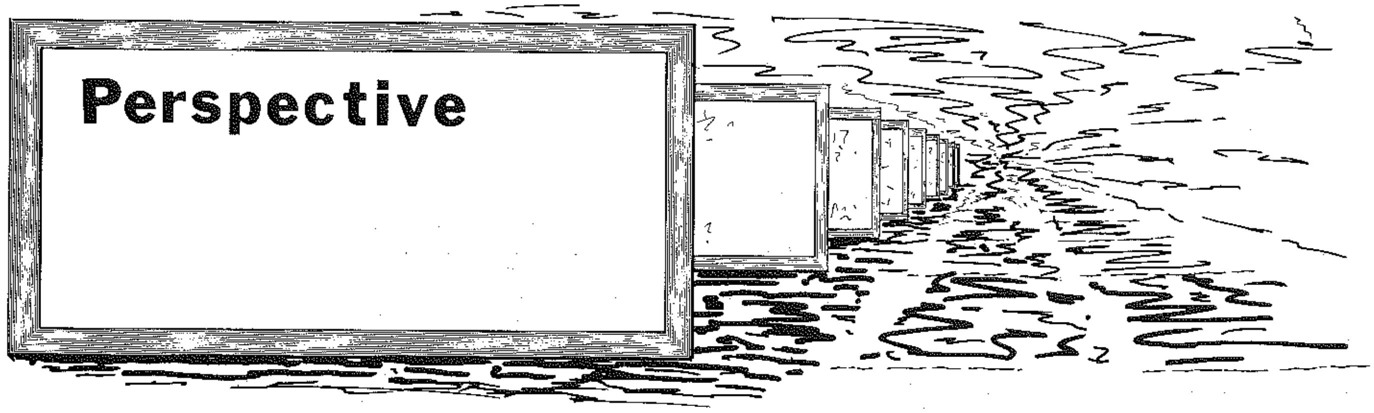
He was a member of Sigma Xi and Eta Kappa Nu, and held memberships in the following professional societies: Institute of Electrical and Electronic Engineers; American Association of University Professors; Society of Technical Writers and Publishers, Incorporated; National Society of Professional Engineers, of which he had served as secretary of the local chapter; and the American Society of Engineering Education. Active in the Division of Engineering Graphics of that body, he served on its executive committee, as chairman of the Nomography Committee, and as Circulation Manager of the Journal of Engineering Graphics, a publication of the Division.

He was a member of the First Methodist Church and served on its Building Committee, and was a member of the Exchange Club of which he was President in 1954.

Survivors include his widow, Elizabeth Jenkins Arnold, Lafayette; two daughters, Mrs. Glen Brown of Richardson, Texas and Mrs. Ward Litton of Iowa City, Iowa; his stepmother, Mrs. Alice Arnold of New London, Ohio, and a brother, George G. Arnold of Heath, Ohio; and seven grandchildren.

Professor Arnold was soft spoken, friendly, sincere, and seeminglyc easy-going but firm in his adherence to principle. He was conscientious in the performance of his manifold duties and almost maticulous in his concern for their details. He was a strong right arm ready to serve his administrative superiors, his colleagues, and his students. Those associated with Professor Arnold will miss him because of his sterling qualities and also because of his warm companionship which they enjoyed as he shared with them the varied experiences of his full and useful life.

S. B. Elrod
W. E. Howland
W. J. Luzadder
J. H. Porsch



ENGINEERING GRAPHICS DIVISION
of the
NORTH MIDWEST SECTION

The Engineering Graphics Division had a very successful meeting Monday, October 9, 1967 at 10 A. M. in the '39 room of the Iowa State University Memorial Union, Ames, Iowa, with about 35 persons attending, approximately half of this number being visitors.

Robert O. Butler, Assistant Professor of Engineering Graphics at Iowa State University, and member of the General Committee of the North Midwest Section Annual Meeting, presided.

James S. Rising, Head of the Department of Engineering Graphics at Iowa State University, delivered a welcome to the group.

Paul S. DeJong, Assistant Professor of Engineering Graphics at Iowa State University, spoke on the topic "Trends and Techniques in Design." He pointed out that before a freshman student loses sight of the primary goal of engineering, as he becomes engulfed in a seemimg morass of theory, he should be impressed with the basic role of the engineer as a designer ---------not an analyst; a creator with his basic medium of communication in the graphic area rather than verbal. Graphics was, therefore, held to be the most appropriate place in which to introduce Creative Design.

Following a short coffee break, C. Gordon Sanders, Associate Professor of Engineering Graphics at Iowa State University, gave a report on the introduction and progress of Creative Design in the Engineering Graphics courses at Iowa State University.

Group discussions followed with questions and comments from off-campus conferees, including spontaneous display of a student design model by one of the conferees.

The meeting adjourned at approximately 11:40 A. M. with most of the group going through the cafeteria just outside the '39 Room for an informal luncheon, which terminated at approximately 12:30 P. M.

Part of the success of the meeting in terms of attendance ia attributed to the personal letters of invitation sent by the ISU Department of Engineering Graphics to all the persons in the section known to have an interest in the meeting.

Submitted by
Robert O. Butler

DESIGN - A Definition

Several months ago a two-day meeting of the North Central Section of A. S. E. E. was held at Ohio State University, and a significant part of the program was devoted to design in engineering education. Several speakers remarked about the difficulty or impossibility of defining "design" and during the night the writer lost considerable sleep thinking about the elusive definition. It was a surprise that these thoughts could be remembered but before breakfast the next morning a definition was scribbled out in the exact words below. All later attempts to improve it have been unsuccessful.

> DESIGN is the procedure followed by one or more persons utilizing talent, ingenuity, judgement, knowledge, experience, and available reference information, to control the combining of materials, devices or actions, of appropriate characteristics in patterns and proportions to produce an intended useful or desired article or effect.

The definition is broad enough to cover an entire range from a single person designing women's hats, to a team of many thosands of people designing the equipment to put a man on the moon. Although the definition was written with engineering design in mind, it actually might include all creative products such as a painting, a musical composition, a sculpture, a new square-dance routine, a landscaping arrangement, etc.; it certainly includes all mathematical factors involved in design.

Frank H. Smith
Univ. of Michigan

HIGH SCHOOL GRAPHICS COMPETITION

Northeastern University will have its Eighth Annual Technical Drawing Compatition on May 17, 1968. The participants, all from High Schools throughout Massachusetts, are given a preliminary examination in March, under standardized conditions. These exams are administered by local High School Technical Drawing teachers who grade them and submit the top 25% to Professor Franklyn K. Brown of Northeastern University's Department of Graphic Science. The exams are evaluated by Professor Brown who will then invite the 35 highest scorers to the Boston Campus where they are given a final exam in two 2-hour sessions. The contenders are the guests of the University at luncheon. All finalists, and their teachers, are invited to attend the Awards Banquet in the evening of the Final Exam, at which they are presented with certificates of achievement. Special certificates and cash awards of $250, $100, and $50 are awarded to the top scorers.

The Massachusetts Technical Drawing Teachers Association also contributes special awards of drawing instruments, books, etc. to Honorable Mention participants.

Although the competition was small when begun in 1960, it involved 110 schools and 1500 students in 1967. The subject matter covered in the exams usually includes geometric construction, orthographic views, auxiliary views, isometric and oblique pictorials, sketching, sections and conventions, and dimensioning. Although not tested as such, linework and technique are considered and often tip the scale in cases of ties for winners.

The competition is administered by Professor Brown, but ather members of the department pitch in to help correct the final exams immediately, so that the winners can be announced at the Awards Banquet the evening of the exam.

Professor Brown will be glad to exchange ideas and opinions with other colleges involved in similar competitions, or to answer inquiries if any college becomes interested in starting a Competition in High Schools of their own state.

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THE BYLAWS

for the

DIVISION OF ENGINEERING GRAPHICS

A S E E

Article I
NAME AND OBJECTS

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

Section 2. The objects of this Division shall be to coordinate and to promote the interests and activities that pertain to the field of Engineering Graphics.

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 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	1 year
Treasurer	5 years

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

Section 2a. CHAIRMAN

Section 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.

Section 2a(2). He shall be the junior member of the Division on the Executive Board of the ASEE Council of Technical Divisions and Committees.

Section 2a(3). He shall be responsible for the preparation and publication of the programs of all meetings of the Division and of the Executive Committee. At his discretion he may appoint the local chairman at a sponsoring institution as Program Chairman for the midyear meeting and the Vice Chairman of the Division as Program Chairman for the annual meeting.

Section 2a(4). He shall submit the annual budget of the Division to the Executive Secretary of the Society as prepared by the Vice Chairman after consultation with the Chairman. (A request for an itemized budget is received from the Executive Secretary of the Society early in the month of May.) The Chairman shall receive and transmit to the Executive Secretary of the Society all claims for reimbursement.

Section 2a(5). He shall prepare a written report of his term of office and furnish copies to the Division secretary and to his successor.

Section 2a(6). He shall keep the Vice Chairman informed during the year with copies of correspondence of activities of the Division, and at its close shall transmit other pertinent materials to maintain continuity of the Division.

Section 2a(7). He shall appoint all Bylaw and/or Non-Bylaw committees, except for the Nominating Committee. He may appoint other Non-Bylaw committees that are necessary for the adequate functioning of the Division. See Article VII. He shall designate the chairman of each committee except where it is specified by the Bylaws.

Section 2b. VICE CHAIRMAN

Section 2b(1). He shall serve as Vice Chairman of the Division and the Executive Committee for the year following election.

Section 2b(2). He shall preside over business meetings of the Division and the Executive Committee in the absence of the Chairman. He shall represent the Chairman on the Executive Board of the ASEE Council of Technical Division and Committees if the Chairman of the Division is unable to act or should request the substitute representation.

Section 2b(3). He shall assist the Chairman in the operation of the Division.

Section 2b(4). He shall, through the Chairman, keep informed on the current problems and operation of the Division so that he may maintain continuity of the activities of the Division. He shall assume the duties of Chairman in the event the elected Chairman is unable to carry out the duties of his office.

Section 2b(5). He shall assume the Chairmanship of the Division for the year following his term as Vice Chairman.

Section 2b(6). He shall appoint the Nominating Committee subject to approval by the Executive Committee at the annual meeting in June.

Section 2b(7). He shall be 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.

Section 2b(8). He shall prepare an annual budget for the Division for his term of office as Chairman after consultation with the Chairman of the Division. He shall submit it to the Chairman of the Division for transmission to the Executive Secretary of the Society.

Section 2b(9). He shall appoint members to the several recognized Bylaw and Non-Bylaw committees prior to the annual meeting, and upon their acceptance he shall prepare a printed list of committees for presentation to the Division. Printed copies of the list of committees for his term of office as Chairman shall be made available to the Executive Committee and to all persons in attendance at the annual meeting.

Section 2 c. SECRETARY

Section 2c(1). He shall be Secretary of the Division and of the Executive Committee.

Section 2c(2). He shall keep an up-to-date membership list. He shall prepare the membership list in a printed form and shall send copies to the Circulation Manager of the Journal, the Vice Chairman, and the person in charge of the midyear meeting.

Section 2c(3). He shall keep complete records of all meetings of the Division and of the Executive Committee, and within thirty (30) 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 of 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 midyear business meetings.

Section 2c(4). He shall receive and preserve copies of all reports and papers presented at the meetings of the Division and of the Executive Committee.

Section 2c(5). He shall receive and, upon approval of the Executive Committee, transmit to the Museum of Science and Industry, Chicago, Illinois, 60637, and/or to the Engineering Library of the University of Illinois at Urbana, Illinois, 61801, such items as may properly be deposited there.

Section 2c(6). He shall supply to the officers of the Division up-to-date copies of these Bylaws with all amendments, within thirty (30) days following the annual meeting of the Society.

Section 2c(7). He shall send to each new member of the Society who has indicated an interest in the activities of the Division, a card or letter of welcome. Information concerning the Division and its activities, also may be included.

Section 2 d. TREASURER

Section 2d(1). He shall receive any division money, except that which is part of the income of the Journal of Engineering Graphics and under control of the Publishing Board, and shall place on deposit such money in an account in a local bank under the name of the Division.

Section 2d(2). Division funds shall be disbursed only upon the approval of the Chairman and the Treasurer of the Division.

Section 2d(3). The Treasurer shall submit an annual financial report to the Division at the annual business meeting.

Article IV
ELECTION AND SUCCESSION OF OFFICERS

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

Section 1a. A slate of two candidates, for each office to be filled, shall be prepared by the Nominating Committee. An eligible candidate must be a member of 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 November issue of the Journal of Engineering Graphics.

Section 1b. A candidate for any elective position may be nominated by a written petition 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 placed on the ballot by the Nominating Committee.

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

Section 1d. On March 1, and returnable before April 1, the Secretary shall mail to each member 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). Ballots shall be sent only to current ASEE members of the Division of Engineering Graphics.

Section 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.

Section lf. Newly elected personnel shall take office ten (10) days after the close of the annual meeting of the Society.

Section 1g. If any of the elected persons, other than the five members-at-large of the Executive Committee, is unable to perform the duties of his office, these duties shall be assumed by a member of the Executive Committee, except where succession is specifically stated. Eligibility for assuming such duties shall be in the order of maximum length of service until the next regular election. Vacancies among the five members-at-large on the Executive Committee shall be filled by appointment by the Chairman of the Division, such appointees to hold office until the next annual election.

Article V
MEETINGS

Section 1. ANNUAL MEETING. There shall be an annual meeting of the Division to be held concurrently with the annual meeting of the Society, and it shall include the annual Division dinner meeting, one or more conference sessions, and a luncheon business meeting. The annual meeting shall be planned to include and interest teachers of technical institute and junior and senior college levels. Joint conferences with other Divisions of the Society are to be encouraged.

Section 1a. PROGRAM FOR ANNUAL MEETING. At the midyear meeting, prior to the luncheon business meeting of the Division, there shall be a meeting of the Executive Committee. At this meeting the Chairman shall present the program for the annual meeting and items of business of interest to the Division. Written reports of committees shall be considered.

Section 1a. (1). The Chairman shall transmit the annual program to the Secretary of the Society. Should the midyear meeting 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 midyear meeting. Programs for all annual meetings shall be published in the Journal of Engineering Graphics as a record for the Division.

Section 2. MIDYEAR MEETING. There shall be a midyear meeting to be held on an appropriate date each year between October 15 and April 15, and shall include a Division midyear dinner meeting, one or more conferences, and a luncheon business meeting. Prospective host institutions may proffer invitations to the Division through the Executive Committee which shall give proper consideration to each and accept those most advantageous to the Division.

Section 2a. PROGRAM FOR MIDYEAR MEETING. At the annual meeting, prior to the luncheon business meeting, there shall be a meeting of the Executive Committee and the officers-elect. At this meeting the Vice Chairman shall present the proposed program for the midyear meeting, the roster for committees for the new year, and items of business of interest to the Division. Written reports of committees shall be considered. Programs for all midyear meetings shall be published in the Journal of Engineering Graphics as a record for the Division.

Section 3. Division members are urged to plan group meetings of drawing teachers in connection with sectional meetings of ASEE, and are urged to make those meetings of interest to teachers of junior and senior college levels with a view of including such teachers as members of the Division.

Section 4. Members of the Society and other interested persons are eligible to attend all open meetings of the Division.

Article VI
EXECUTIVE COMMITTEE

Section 1. DUTIES

Section 1a. The Division shall have an Executive Committee whose duty shall be to administer the affairs of the Division at the midyear and annual meetings.

Section 1b. The Executive Committee shall schedule and arrange for annual meetings, midyear meetings, and summer schools. It shall administer such other activities as may be desirable for the promotion of the purposes of the Division, including the appointment of special committees. See Articles VII and VIII.

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

Section 3. MEMBERS shall be:

Section 3a. THE IMMEDIATE PAST CHAIRMAN. He also serves as the senior member of the Division on the Executive Board of the Council of Technical Divisions and Committees of the Society.

Section 3b. FIVE DIRECTORS. A director is to be elected each year for a term of five years. The member elected in 1965 and every fifth year thereafter (1970, 1975, 1980, etc.), shall serve as Treasurer of the Division for the full time of his term. (See Article III, Section 1)

Section 3c. DIVISION EDITOR. He also serves on the ASEE Editorial Committee - elected for one year.

Section 3d. PUBLISHING BOARD of the Journal of Engineering Graphics. It is composed of the Editor, the Advertising Manager, and the Circulation Manager-Treasurer -- one elected each year for a term of three years.

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 Society.

Section 5. DUTIES OF DIVISION EDITOR ON ASEE EDITORIAL COMMITTEE.

Section 5a. He shall serve the interests of the Division on the Editorial Committee of the Journal of Engineering Education. This includes reviewing and recommending papers referred to him by the Editor of the Journal of Engineering Education.

Section 5b. In consultation with the Division Chairman, he shall collect, prepare and write, recommend, and submit appropriate material for publication to the Editor of the Journal of Engineering Education with particular emphasis on recommendations of papers presented at the midyear and annual meetings.

Section 5c. He shall cooperate with the Editor of the Journal of Engineering Graphics and the ASEE Editorial Committee.

Section 5d. He shall recommend material to the Editor of the Journal of Engineering Graphics and to other channels for publication provided:

Section 5d(1). Permission for publication in other channels is granted by ASEE.

Section 5d(2). The articles are of such a nature as to win interest in Engineering Graphics.

Section 5e. At the expiration of his term of office, he shall furnish his successor with Engineering Graphics material and publishing recommendations from the last ASEE annual meeting.

Section 6. The PUBLISHING BOARD of the Journal of Engineering Graphics shall have the power to act in matters pertaining to the Journal of Engineering Graphics, including the fixing of advertising rates, size of Journal, financing, etc. Changes in subscription rates, as recommended by the Publishing Board, must be approved by the Division at the annual meeting before becoming effective.

Section 6a. The EDITORIAL BOARD which is comprised of the elected Editor and two assisting members shall select and edit all articles and arrange for publication of the Journal of Engineering Graphics. The Editor or Editor-elect shall annually nominate two candidates for the Editorial Board to serve for the Succeeding year. The nominations shall be submitted for approval of the Executive Committee at the annual meeting of the Division. The Editorial Board shall work in close cooperation with the Division Editor, recognizing that ASEE has a prior claim on any papers presented at the midyear and annual meetings of the Division. The members of the Editorial Board are on the Publishing Board for the Journal of Engineering Graphics, but only the Editor shall serve as a member of the Executive Committee.

Section 6b. The ADVERTISING MANAGER shall procure advertising for the Journal, shall deliver advertising copy to the Editor, and shall bill and shall pay money received in advertising fees to the Circulation Manager-Treasurer.

Section 6c. The CIRCULATION MANAGER-TREASURER shall solicit subscription fees; he shall keep the subscription list up-to-date and attend to the mailing of each issue of the Journal to the subscribers; he shall receive all advertising fees, pay all costs connected with the publication of the Journal and in general handle all financial affairs; it shall be his responsibility to keep the Journal accounts in a standard bookkeeping form, have these accounts audited once each year, and present this audit at the annual meeting of the Division. At the end of his term of office, he shall transmit to his successor all financial and circulation records, together with all monies in the Journal account. Monies accrued by the Journal of Engineering Graphics may be expended only upon the approval of the Executive Committee, except for those expenses directly associated with the operation of the Journal.

Section 6d. If the Publishing Board desires, a member of the Division from each school or college may be designated to solicit subscriptions, collect subscription fees, and transmit them to the Circulation Manager-Treasurer.

Section 7. The Chairman of the Division may invite guests to the Executive Committee meetings. Any member or other interested person having a worthwhile contribution to make for the betterment of the work of the Division is encouraged to submit his thoughts in writing to the Chairman at least ten days before a scheduled meeting of the Executive Committee so that he may be invited to attend if his presence is deemed to be desirable.

Article VII
COMMITTEES

Section 1. Each committee chairman is expected to prepare a written report to be filed by the Secretary as part of the permanent record of the affairs of the Division. A committee chairman at the request of the Chairman of the Division shall, or at his own volition may, supply copies of his report to all members who are present at the annual meeting. In general, any report that is to be discussed at a business meeting of the Division should be made available to all in a printed form prior to the meeting.

Section 2. BYLAW COMMITTEES

Section 2a. A NOMINATING COMMITTEE Shall be appointed by the Vice Chairman to be approved by the Executive Committee at the 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 who are present at the annual meeting and two other qualified members. To be qualified the members must:

a. be present at the annual meeting
b. not hold a Division office
c. not be a member of the Executive Committee

The chairman of the nominating committee shall be the senior past chairman.

Section 2b. The COMMITTEE ON ELECTIONS 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 Chairman of the Committee.

Section 2b(1). The Chairman of the Committee on Elections 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 Journal of Engineering Graphics for publication in Spring (May) issue of the Journal. The Chairman of the Committee on Elections shall report the results of the election to the Division at the annual business meeting.

Section 2c. 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 USA Drafting Standards submitted to it by the ASEE as sponsor in accordance with the policy of the Society.

Section 2d. 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 parent 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 that none of the nominees fully meet the requirements set forth herein by the Division. The Award shall be based upon the following:

(1) Purpose. To recognize and encourage outstanding contributions to the teaching of students of engineering graphics, descriptive geometry, and other graphics courses.

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

(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 section (e) shall not be omitted.

(a) Success as a teacher must be established both as to competence in subject matter and ability to inspire students to high achievement.
(b) Improvements of the tools of, and conditions for, teaching. Evidence of such achievement may consist of subject matter (textbooks, etc.); courses or curricula; diagrams and models; laboratory and other teaching equipment ; and other similar activities.
(c) Improvements of teaching through various 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 Division of Engineering Graphics of ASEE as evidenced

(1) By regular attendance at its meetings as an indication of interest in the improvement of teaching.
(2) Service on its committees or an officier with a record of definite achievement.
(3) Contributions to its publications or summer school program.

(4) Nominations. Nominations may be made by any member or group of members of the Division except members of this Award Committee.
(5) The report of this Committee shall be made only at the annual dinner of the Division.

Section 3. NON-BYLAW COMMITTEES that are necessary for the adequate functioning of the Division may be appointed by either the Chairman or the Executive Committee of the Division. See Article III, Section 2a(7) and Article VI, Section 1b. The Chairman shall designate the chairmen of these committees.

Article VIII
PARLIAMENTARY AUTHORITY

Section 1. The rules contained in Roberts 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 Consititution 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 IX
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 this 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 Society at Dupont Circle Building, 1346 Connecticut Avenue, N. W., Washington, D. C. 20036, mailed by the secretary of the Division; the amendment being approved if two-thirds or more 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 the ASEE Executive Secretary.
d. By unanimous vote of the Policy Committee of the Division.

Approved - June 1967

ENGINEERING DESIGN
and
ENGINEERING GRAPHICS

E. W. Jacunski
University of Florida

Until recently, engineering graphics, as a significant area of instruction in the pre-engineering core of subjects, traveled a very rocky road - a road that was rapidly leading it to extinction. A view-point had arisen and is still widely accepted that basic graphics, though necessary in engineering, was merely technical training in drafting and a manipulative skill - that it could be performed by others and supplied to engineers as needed. It was argued that en engineer need not know how drawings are made nor have any skill in making them -- that they would be made for him by a design draftsman who would translate and develop the engineer's design concepts perfectly.

This line of reasoning arose when accreditation committees became overzealous in applying the professional - scientific yardstick of the 1952 Grinter Report with greater rigidity than the report actually intended. Our advancing and expanding technology brought new material and new knowledge and room for them had to be made. In the academic re-organization that ensued many time - tested professional courses in engineering were either revamped into scientific conformity or phased out of the engineering picture. In many instances engineering departments having marginal curricula climbed the passing bandwagon of science, contrary to the needs of their students or the regional objectives of their areas. As a consequence, a very small percentage of their students attained the newly revamped educational heights. The majority, lacking academic zeal, financial means or mental ability, ended up frustrated as plain engineers and unqualified for the science-minded research and development. The hungry industrial world absorbed them and in time pressed them into a diversity of productive molds.

When the Grinter Report condemned the traditional "bread and butter" type courses in engineering drawing and descriptive geometry it made engineering graphics, as a method of communication, a critical but controversial element of engineering education. To many administrators this was a signal to reduce their value and to reduce the time devoted to teaching them. In several schools it was eliminated entirely and placed the burden of assimilating basic graphical knowledge on the student himself either through a non-credit remedial course or by self-education or not at all.

This de-emphasis of graphics also threw a challenge to its loyal proponents. The entire Division of Engineering Graphics that with the explosive advances in scientific and technological knowledge there was a greater, rather than lesser, need for graphical knowledge; that its applications on the engineering horizons had increased rather than decreased; that not one course but a sequence of courses were necessary to fully implement the design concept in professional - general engineering. Through its mid-year and annual meetings and through its Journal of Engineering Graphics it encouraged experimentation, restructuring and revitalizing graphics in order to make it more meaningful and an integral part of the main stream of thought and development in engineering education.

The conviction grew that engineering design is central to the practice of engineering and therefore central to engineering education. This current thinking is today demonstrated by new and revised texts on engineering graphics emphasizing a creative engineering design approach at the freshman and sophomore levels.

In many schools, administrators in engineering education, recalling the dull experiences of their own days, literally stifled its expansion along up-to-date lines. Others became aware of the philosophy that had been developing within the Graphics Division over the past few years and of the advanced thinking that was being generated and incorporated into graphics courses. They recognized its identification with engineering design activity and encouraged fuller development at all levels. As a result a significant number of energetic graphics educators very successfully experimented with their engineering graphics courses and introduced the concept of engineering decision making as it applies graphically and analytically to engineering analysis and design. This approach has met with remarkable success at Stanford, Dartmouth, Tufts, UCLA, Case Institute of Technology, Carnegie Tech, and others. This is being done in a number of ways -- through greater use of open-end problems, through case studies, and through design projects designed to involve and stimulate the students in the engineering process of decision making. The motivation lacking in the old courses became vibrant under the new.

The Engineering Graphics Division realized that the taeching of design in engineering education was no longer debatable and that new life could be infused into graphics if its members became tutored in this new technique of instruction. Based on this conviction its officials decided that their sixth summer school should be the vehicle for this purpose -- its theme "THE DESIGN CONCEPT IN ENGINEERING THROUGH GRAPHICS".

The proceedings of the summer schoolcan be obtained by writing to Prof. James H. Earle, Department of Engineering Graphics, Texas A&M University, College Station, Texas.

ENGINEERING PROBLEMS MANUAL, Fifth Edition

by Forest C. Dana and Lawrence R. Hillyard, Iowa State University

This manual is designed for instruction in engineering problems solving methods and tools as taken by beginning engineering students.

318 pp. — Paperbound — $3.75

ENGINEERING PROBLEMS WORKBOOK, Fifth Edition

by Forest C. Dana, Lawrence R. Hillyard, and Gerald W. Smith, Iowa State University

This manual is to be used as a supplement to the ENGINEERING PROBLEMS MANUAL.

160 pp. — Wire Coil — $3.95

WORKBOOK FOR A ONE TERM COURSE IN ENGINEERING PROBLEMS, Third Edition

by Lawrence R. Hillyard and Gerald W. Smith, Iowa State University

134 pp. — Wire Coil — $2.75

WORKSHEETS FOR BASIC GRAPHICS

by M. E. Hamilton and C. Edward Hotchkiss, New Mexico State University

Exercises in this laboratory manual cover the major areas required in a beginning graphics course. They help students acquire knowledge of the field of graphics and its relation to all fields of engineering.

93 pp. — 11" x 17" — Wire Coil — $5.75

PROBLEMS IN ENGINEERING GRAPHICS

by B. R. Henry, Lamar State College of Technology

This workbook is made up of orthographic projection, auxiliaries, planes and lines, true lengths and point views of lines, interesting lines, angle between planes, intersecting lines and planes, intersections, developments, mining problems, topographical problems, cuts and fills, and vectors.

48 pp. — Envelope Bound — $2.25

ENGINEERING GRAPHICS PROBLEM BOOK

by George Cowell, University of South Florida

This one semester book of problems is designed for engineering students who need to make use of graphical methods in the analysis and solution of engineering problems.

110 pp. — Wire Coil — $4.00

DESCRIPTIVE GEOMETRY PROBLEMS

by Kenneth G. Shiels, University of Wisconsin

The problems in this workbook are designed to give the student rigorous drill in the fundamental principles of the subject and ample experience in applying these principles in the solution of practical problems.

97 pp. — Wire Coil — $3.25

PROBLEMS FOR BASIC GRAPHICS, DRAWINGS AND DESCRIPTIVE GEOMETRY, SERIES B

by R. D. Springer, L. G. Palmer, W. A. Kleinhenz, and P. W. Bullen, University of Minnesota

This workbook contains problems designed to implement the textbook, BASIC GRAPHICS, written by the same authors.

80 pp. — Duo-Tang Bound — $2.50

ENGINEERING SLIDE RULE MANUAL

by Thomas N. Wilson, El Camino College

This manual was prepared to make available for classroom use a collection of exercises sufficient in number and scope to insure that engineering students learn to operate the slide rule with accuracy, speed, and confidence.

110 pp. — Wire Coil — $3.00

SURVEYING INSTRUMENTATION

by Jesse E. Fant and LeRoy T. Boyer, University of Minnesota

This text presents accurate surveying measurement theory and techniques.

138 pp. — Wire Coil — $4.75

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DESIGN PROBLEMS IN SYSTEMS ANALYSIS

by James H. Earle

Engineering design is the fundamental function of the practicing engineer in most areas of the profession. The engineer is responsible for providing solutions to problems where no ready-made solutions are available. In some cases, this becomes a task of selecting a combination of pieces of equipment that will give optimum performance under a given set of conditions. Often it is necessary to modify an existing design or to design a unique solution with original innovations. Whether selecting and integrating components or developing an original solution, this function can be referred to as design.

Any new or unfamiliar device must be presented in an understandable format to enable the design to be implemented. Consequently, design problems are dependent upon the engineer's ability to communicate his idea. Thus, the subject area of engineering graphics is well suited to the introduction of engineering design and its communication in graphical and written form. Most engineering graphics programs are structured to involve graphical communication of concepts (working drawings and data) and problem solving (descriptive geometry). Where these are separate courses, it is very easy to organize them to center around design projects while covering fundamentals.

Design can be categorized into two basic areas that will relate to each course - (1) Systems design and (2) Product development. Product development, being more specific, involving hardware and structural analysis solved by vector graphics, is more applicable for inclusion in descriptive geometry. On the other hand, elementary systems analysis and design can be integrated into the first basic course covering engineering communications.

As applied to engineering graphics, systems design is considered to be the study of local field problems that include the integration of several areas of study that must be considered by the student. These problems should be sufficiently simple to not discourage students while introducing them to the total considerations of a systems problem.

The Engineering Graphics Department of Texas A&M University has structured its courses to encompass systems design and product development as integral parts of two graphics courses. Each course meets six hours per week in three two hour periods.

Classes are randomly assigned to four man design teams with the teams being divided equally among three of the problems. A team approach exposes each student to the advantages and problems of working with associates and organization of effort. Teams are excused from class for four, two hour periods at intervals throughout the semester as shown in Figure 1. This allows each team a total of 32 man hours per project. Teams are encouraged to budget their work within this time allotment as part of the problem.

	PERIOD 1	PERIOD 2	PERIOD 3
Week 2			ASSIGN PROBS.
Week 4		FREE PERIOD	
Week 6		FREE PERIOD	
Week 7		VISITING ENGRS.	
Week 9		FREE PERIOD	
Week 11		FREE PERIOD	
Week 12		REPORTS DUE	
Week 13		INFORMAL PRESENTATIONS	
Week 16	6 BEST TEAMS DEVELOP FINAL PRESENTATION		
Week 17		PRESENTATION TO CLASS AND VISITING ENGRS.	

Figure 1 Schedule for Systems Design Problems

Problem Selection

Problems were selected to familiarize the student with the broadness of problems encountered in the engineering profession while limiting assignments to the scope of his engineering background. Assignment of problems that required the collection of data and field information have proved most effective in involving teams in real projects. These problems are grouped into the following general categories: (1) Feasibility Study, (2) An Experimental System, (3) Planning for the Future, and (4) Modification of an Existing Facility.[1] These problems are given below:

1. FEASIBILITY STUDY - Swimming Pool

Analogy: A common engineering-management problem is that of plant location in a given area. An analysis must be made of the company requirements, community requirements, and the mutual benefits derived by each prior to execution of the final plans. Engineering problems must be studied concurrently with management problems. Predictions are made on the available information whether from like situations previously tried or from entirely unproven critieria.

The study of the needs of a swimming pool and the prediction of its success will provide an experience in a problem related to an engineering-management feasibility study.

SWIMMING POOL

Problem: Assume that a group of students wished to construct a swimming pool on your campus that would be self-supporting. Your team is commissioned to determine the feasibility of this venture.

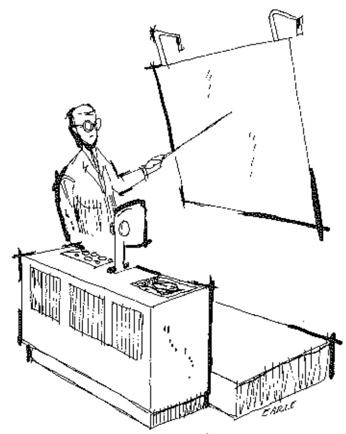
You must determine the general cost of the pools, the area and students they would serve, their locations, the optimum number (if more than one) and the equipment necessary. Consideration should be given to providing protection from cold weather. Determine a system assessing those using the pool in order that it will be economically sound.

Give a general layout showing the location of the pools with drawings to explain your plan and significant details. Present your final decision of the feasibility of this project.

2. AN EXPERIMENTAL SYSTEM - An ideal Instructional System

Analogy: Today's engineer must be able to adapt available designs and components into a composite usually referred to as a system. Highly sophisticated and unique designs may be achieved through a combination of independent mechanisms.

The design of an ideal instructional system will require consideration of a combination of units to obtain a single objective. Thinking must also extend to psychological and environmental needs.



AN IDEAL INSTRUCTIONAL SYSTEM

Problem: Your team has been assigned the responsibility of developing an ideal classroom for providing the most effective and efficient instruction possible. It is possible that you will revise the total approach to instruction to be compatible with an experimental environment.

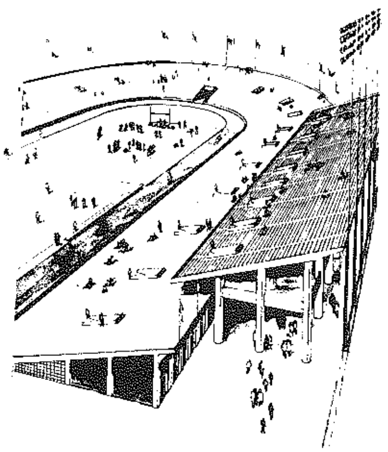
Determine the optimum class size, the room layout, lighting requirements, choice of furniture, and other factors of this type that affect environment. Considerable study should be devoted to the development of a visual aids console that would incorporate the latest projectors, recorders, and devices used in the instructional process. Suggest how this console could be used effectively in a usual class. Provide a means for using all of these visual aids with the minimum of effort on the teacher's part.

Prepare the necessary drawings to explain your system. Make an estimate of cost for the entire system.

3. PLANNING FOR THE FUTURE - Football Stadium

Analogy: Engineering problems require that much consideration be given to tomorrow's needs in order to allow for an expandingpopulation and technology. The economic survivial of entire communities and cities will be determined to a great extent by today's designs. Lack of foresight could result in inadequate facilities and systems necessary for normal modifications, expansions and development. The engineer must be prepared to utilize historical data as a basis for extrapolation of future needs prior to the employment of the more conventional engineering sciences.

The modification of a football stadium to meet the needs of tomorrow will necessitate the student to project his thinking to the predicted needs of 1978. He must analyze space requirements, population increases, and vehicular needs.



FOOTBALL STADIUM

Problem: Your team has been commissioned to study your present stadium to determine its adequacy for 1978. Your concern must be with the total problem including stadium capacity, modification of the structure, parking and access to major traffice arteries.

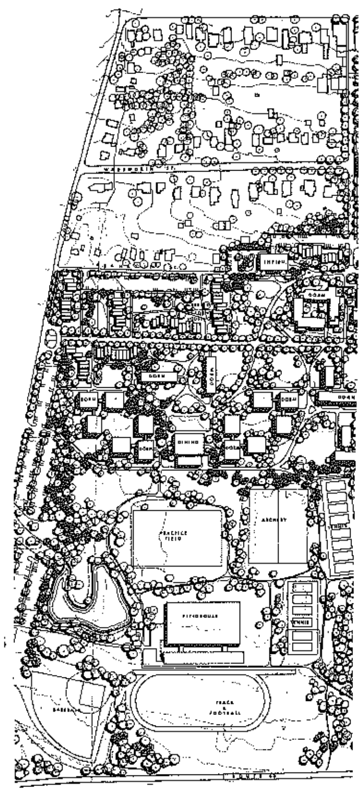
Consider the possibility of portable seating, sheltered seating, visibility of the field, aisle sizes and exit locations.

Give your recommendations concerning (1) leaving your present stadium as it is, (2) modifying and expanding your stadium, or (3) planning an entirely new stadium.

4. MODIFICATION OF AN EXISTING FACILITY - Parking Area

Analogy: A major problem confronting engineers is the routing and management of traffic flow whether it is pedestrians, vehicles, or products. Considerations must be given to a wide range of areas, with alternate systems for augmentation in case of emergencies. City traffic flow affects the socio-economic welfare and well-being of the majority of the nation. The solution of this complex problem requires that the engineer have the capacity to interact with other professionals in law, politics, social areas, and medicine.

The problem is constructed to introduce the freshman student to the many complexities of this type of engineering design.



PARKING AREA

Problem: Select a parking area on your campus that is not effective as it is presently being used. Analyze this situation to determine the reasons for inefficiency and weakness of design.

Prior to suggesting a design modification investigate how the parking area is used and by whom. Your team may suggest an improved system of issuing permits to improve its utilization. Study possible layouts for better utilization. Traffic flow into and out of the area should be analyzed for improvement. Study the possibility of enlargement of the area to improve capacity and function. Determine a reasonable parking fee to support additional expenditures.

Problem Specifications:

The four man design teams were required to approach their problem with consideration for the total problem. This involved an evaluation of needs in a number of areas-(1) social needs, (2) human factors, (3) legal requirements, (4) economy, and (5) engineering principles, Figure 2. Routine data that would be required by most teams was provided in the form of handout sheets to reduce the expenditure of time in obtaining this data. Information of this type was, population figures, football attendance records, number of cars registered, and etc.

Each team was required to prepare a written report incorporating the necessary presentation of data and drawings to fully explain their solution. Preliminary sketches and developmental work was included in the appendix to outline the evaluation of team designs from its conceptualization to finished form. This report emphasized the importance of graphics as a means of supplementing the written report in communicating complex problems.

Each team was required to give an oral presentation of their solution before their class. Communication and explanation of team solutions to a live audience necessitated the application of graphical methods to prepare visual aids to present concepts and design solutions.

Results:

Systems problems provided an excellent medium for relating the student to the broadness of engineering and the relationship of engineering graphics principles to the design process. Team projects provided a realistic situation, that established a tangible need for the fundamentals of engineering graphics which made course content more meaningful.

System design problems required that most of the team's effort be devoted to the identification of the problem needs and the collection of pertinent data and information. Since local field problems were used, teams

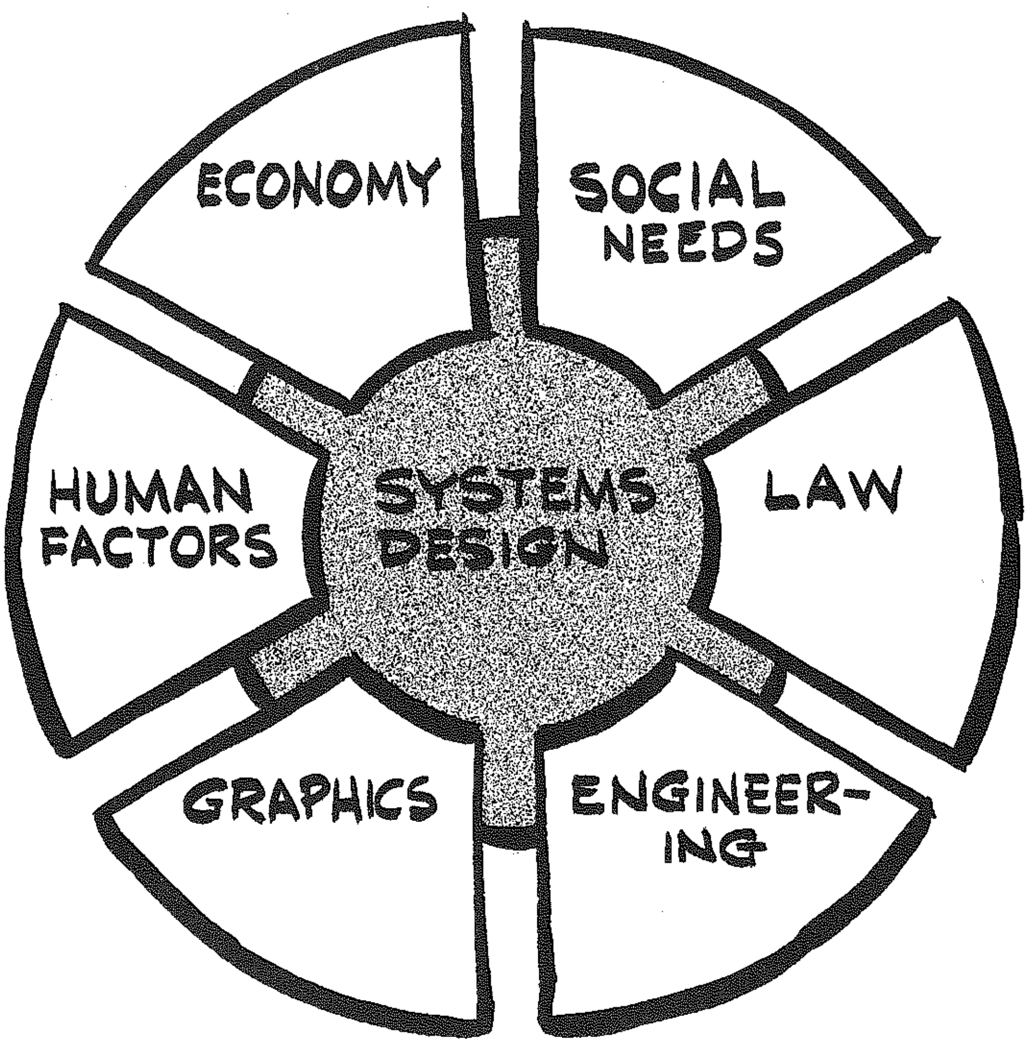


Figure 2 The systems design problem is related to many overlapping areas of study

could obtain most of their information from the problem site. Space requirements, traffic flow, and environmental needs affecting the problem could also be obtained from on-the-site surveys and observation.

The breadth of the team problems extended beyond the domain of conventional engineering to include related, non-engineering disciplines. This overlap into other areas emphasized the need for a generalized education supplementary to technical areas of study. Conclusions of a team's project effort may have indicated that there was no need for a design as assigned, or else, no feasible solution that would be economically practical. The formulation of a supportable conclusion through an independent analysis of background information, whether positive or negative, is a major responsibility of the engineer. Many unsolved engineering problems, such as water and air pollution, require the same degree of study and analysis in reaching the optimum relationship between variables affecting the problem.

Team reports were better prepared and illustrated than are most reports prepared for an English course. This was due to the interest factor of teams involved in realistic problems affording an expression of student ideas related to his major interest of engineering.

The final team presentation of their completed project provided a valuable experience in communicating ideas, concepts and solutions in an organized fashion. The importance of visual aids and graphical presentation of information became apparent. Teams were very competitive in all phases of their problems, but this was particularly noticeable in their presentation. Presentations stimulated many questions and ideas from the class which required the presenting team to defend their solutions with facts. Figures 3 and 4 illustrate student presentations being taped for future showings on closed circuit TV.

Conclusions:

Recent emphasis has been placed on (1) generalizing engineering education to include more humanities and liberal offerings dealing with social needs, (2) the involvement of the student in projects that require creativity and innovations rather than problems with single solutions, and (3) improvement of the engineer's communication process. The systems design problems described here have proven to be effective in achieving these objectives while strengthening the fundamental principles of engineering graphics. These problems are typical of the type that can be assigned as an introduction to systems on the freshman level.

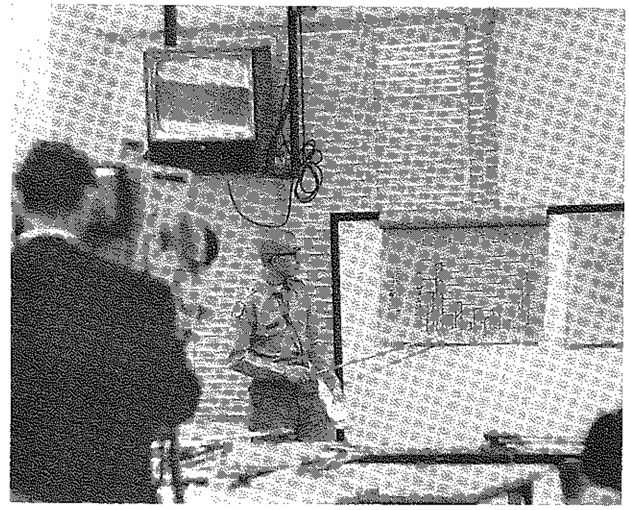


Figure 3 A student presents his solution to a panel of engineers and the entire class. Presentations are taped for future showings on closed circuit television

Design oriented problems are practical assignments in any size engineering graphics program. Over 900 students were involved in this systems approach during a single semester with no difficulty. Classes varied in size from 30 to 60 students.

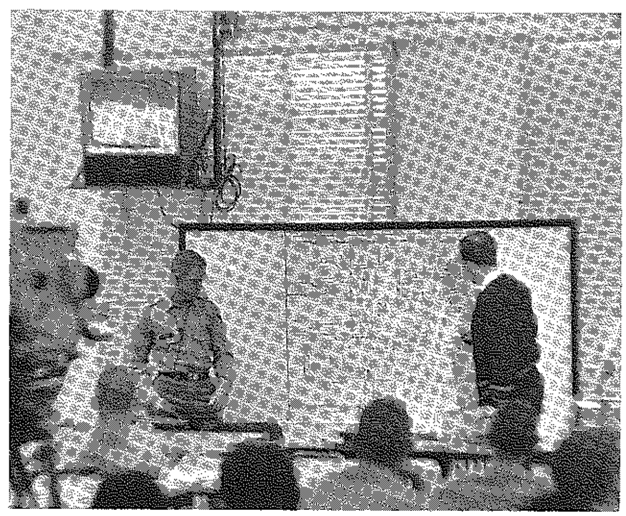


Figure 4 Graphical methods are necessary to effectively present engineering concepts

Engineering graphics courses can be structured to provide traditional fundamentals while offering experience in solving engineering design problems, report writing, and oral communication. No course can offer a higher interest stimulant to the freshman engineer while exercising his talents in as many areas as engineering graphics.

[1] Earle, J. H., Cleland, S. M., Oliver, J. P., Stark, L. E., Mason, P. M., Bardell, N. B., and Guerard, M. P., ENGINEERING GRAPHICS AND DESIGN PROBLEMS 2, Addison-Wesley Publishing Co., Reading, Massachusetts, 1968

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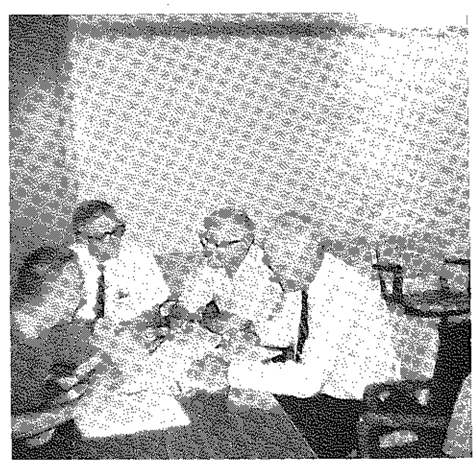

"WHO HAS A GOOD IDEA FOR A DESIGN?"

COMPUTER GRAPHICS

by
Giles L. Ross
Associate Professor
Process Engineering
General Motors Institute

"Computer Graphics" can quite logically be presented in the theme "The Future of Graphics." Computers are very much a part of the future of graphics. No attempt will be made here to sharply define "Computer Graphics." The term has varying implications and connotations. It is used often to refer to an emerging technology described as "Computer", "Graphic Data Processing", or "Real Time Man/Machine Communications." All three terms will be used in this paper, and the term "Computer Graphics" will be used to discuss what is more appropriately termed "Computer Displays." Graphics implies a picture, and may, therefore, be limited to something other than alphanumerics. This paper will be developed in four major parts:

1. Role of digital computers to date
2. Graphic devices now in use
3. Bottlenecks in Computer Graphics
4. New developments and a look into the future

ROLE OF DIGITAL COMPUTERS TO DATE

Up to the present time, the digital computer has been usefully employed as an analysis device for rapid solutions of well structured problems. Nearly any kind of data that can be expressed in words and numbers can be input and processed by digital computers.

Success of computer applications in many fields of engineering and science are well known and will not be elaborated here. However, the use of the computer has been limited to the ability of the user to express his problem. Yet, there are 23,000 general purpose computers in use today compared to only 100 fifteen years ago.

Not all engineering data are efficiently expressed in terms of letters and numbers. Graphs and drawings are more natural expressions for many situations. Engineers rely on graphs; sketches are used to visualize ideas, to develop concepts, and to communicate information to others. Graphics is the principle language of design. The role of the digital computer to this date has been limited by its ability to communicate in both directions with graphics.

To date, there has been graphic output from computers, but very little input and the output has been in batch mode as have other kinds of output. Printer graphics of bar graphs and charts in business applications have been common as have X-Y plotter line drawings for engineering problems. The use of 35 mm film recorders on Cathode Ray Tubes in batch mode is prevalent and is essentially computer graphics as it exists today. There are no serious technical problems with film recorders. They operate satisfactorily, but are expensive.

GRAPHIC DEVICES NOW IN USE

Besides the computer itself, graphic data processing equipment fall into two categories:

1. Output devices
2. Input devices

Output devices are further advanced and in far wider present usage because there is more need for graphic output. Basic types of graphic output devices in use today include:

Printers and Typesetters
Plotters
Drafting Machines
Cathode Ray Tubes

While printers and typesetters are normally used for alphanumeric output, they can be adapted for certain special types of graphic displays, and are therefore included in this discussion. Printers are the oldest type of graphic output device. They can produce 18" wide output and in any required length. Special characters can be substituted for alphanumerics to achieve some degree of flexibility. Wider drawings are made by taping sections together. One printer operates 600 lines per minute, using a standard 48 character chain.

Typsetters utilize special type slugs added to character chains of printers to provide a wide range of graphic capability at low cost. Various sets of type chains can be easily interchanged for flexibility. A typical machine with 120 character chain operates at 272 lines per minute. There are various ways of utilizing the computer to prepare output for printers and typesetters.

X-Y Plotters are normally used off line. The computer prepares magnetic tape, punched paper tape, or punched cards which are fed into the plotter. Normally a digital to analog conversion unit feeds pulses to a pen mechanism moved over the paper. Accuracies, speeds, and sizes of plotters vary, but typical accuracies of ± .050" and speeds up to 200" per minute are found in sizes 10 x 50" to 40 x 60".

Special computer programs can be used to prepare complex drawings with plotters. Subroutines of the computer programs could contain formats of commonly used standard drawn shapes.

Drafting machines are currently in use for producing highly accurate drawings. Drawings up to 6 x 20' are being produced to accuracies of ± .003 at 200" per minute. One or more pen colors are under control of the operator. Usually run off-line from punched paper Numerical Control Tape, these devices are expensive. Depending upon size, accuracy and accessories, cost is $25,000 to $150,000. Drafting machine accessories include printing heads, multiple turrets and various options in control circuits. Small special purpose computers can be attached to drawing machines to provide flexibility in data manipulations before it is actually drawn. Examples are scaling and rotating data. Drafting machines can be fitted with line scanning or line following devices to operate in reverse. That is, from a given line, the machine produces the drawing coordinates which define the line. Extensive development effort is underway in both drafting machines and software programs for them.

There are two major types of display units which can be used for computer output. Both utilize Cathode Ray Tubes. One type of Cathode Ray Tube displays only alphabetic, numeric or special characters. The other type includes a Cathode Ray Tube which can display line drawings and alphanumerics at random positions on the scope face. The latter is, of course, more flexible and more costly. Images are displayed on the tube as a series of points and lines. Normally, the Cathode Ray Tube is operated on line with the computer. Its advantage, in addition to providing a graphical display, is its speed of operation.

The main components of a Cathode Ray Tube system, whether alphanumeric or line drawing, are the Cathode Ray Tube and circuiting for accepting computer-generated digital commands and converting these commands to analog drive signals.

The Cathode Ray Tube is fundamentally an analog device similar to the common television tube. However, different scanning patterns are used. Digital X and Y coordinates are converted to analog drive voltages using linear scales. These voltages are used to focus a beam of electrons on the face of the tube. Some Cathode Ray Tubes also accept digital intensity values which are converted to analog voltages to control brightness of the light spot.

A regeneration of the beam at the rate of 30 to 50 cps is required to prevent flickering of the image on the tube face caused by phosphorescent coating used in the tube having low persistance. This regeneration of the display on the tube face can be accomplished by repetitive signals from the computer or a display buffer between the computer and the Cathode Ray Tube. Utilizing a buffer releases the central processor for other work except when a change in the display pattern is generated. For multiple console applications, the buffer approach is desired.

Cathode Ray Tubes fitted with light pens or voltage pencils can be used as input devices. The light pen is photosensitive. When the light pen is energized and senses light on the tube face, the interfacing computer or display processor identifies the item pointed to by reaching an address in the processor. Indicating coordinate positions with the light pen is more difficult. The computer must follow the movement of the user by displaying a symbol and moving the symbol to new pencil locations on the screen.

The voltage pencil generates direct X and Y coordinate data when the pencil touches the tube surface. Voltage pencils cannot see light; it is difficult to correlate voltage pencil to the display, therefore, some technique is required to determine the location of the Cathode Ray Tube beam and the voltage pencil. Hardware circuits to accomplish this are available and eliminate extensive software.

The light pen has been popular to date because of its simplicity. However, the application of the two types depends upon specific needs. For example, the light pen cannot pick up a dark part of the screen, the voltage pencil can. Function switches on a keyboard are integral parts of input systems with either light pens or voltage pencils. Pressing one or several function switches as the operator indicates an element on the display tells the monitor computer program what action to take.

Other types of input devices are Film Scanners, Printed Circuit Tablet Devices, Analog to Digital Data Converters, Optical Line Scanners, et cetera. Much development work is being done on these devices. However, at this time, direct graphic input is not a reality and punched cards represent the most common input medium.

BOTTLENECKS IN COMPUTER PROGRAMMING

A serious obstacle to efficient communication with a computer has been the batch mode of operation. Turn-around times of even one hour less are unnatural and awkward for the user. It is necessary that there be a rapid interplay of information between user and computer. In other words, man must control the machine at his own pace.

Time-shared use of computers is the key to this problem.

Another bottleneck has been computer memories and data retrieval systems. Speed, and thereby cost of data retrieval must be controlled. Low-cost, high-speed memories are required to make computer graphics economically attractive.

I.B.M. now offers three times as much disc pack memory as it did a few years ago for the same price. New, exotic types of information storage in computers (film chips) will further cut memory costs.

Software programs to manipulate graphic data need to be developed. General purpose programs such as FORTRAN, ALGOL, MAD have been successfully used by engineers in problem solving when the problem is well formulated. However, for graphical analysis, the languages are clumsy. In the future, it will be necessary for the user to communicate in languages most natural to him -- in this case, graphics. Graphics is by nature an assembly of elements related in such a way that complex (associative) data structures are important. Software languages for easily establishing complex data structures are not available.

Graphic input to a computer continues to be the major hardware and software development area. At the present time, most data are input from digitizers or created by software programs.

Lack of standards is causing waste in Computer Graphics. There is a great proliferation of graphic devices. Many systems utilize a form of the Cathode Ray Tube for output with the light pen attachment for input. Yet, fairly elaborate combinations of equipment can be built up at the terminal -- all from the same manufacturer. Computer manufacturing has achieved a higher level of standards than graphic components. Thus, you cannot readily buy an S/360 computer and attach another manufacturer's Cathode Ray Tubes.

NEW DEVELOPMENTS

New computer hardware and peripheral devices, operating in real time plus improved software programs, will allow the digital computer to be used in solution of complex design problems. The restriction of slow man-machine communication will be alleviated. Most experts regard time-sharing use of computers as the most significant current development. Time-sharing infers capabilities of remote computing and multi-access. It fundamentally involves the connection of a number of remote input stations to a central computer. Remote stations can be either teletypewriters or graphic consoles, where data can be entered and received.

It is the graphic display console, the Cathode Ray Tube, with its light sensitive pen which allows graphical communication not restricted to a set of alphabetical, numeric or special characters. The designer may identify elements on the scope face and the computer can display graphical information for interpretation. Drawing directly on the scope face continues to be a poorly structured problem.

A complete graphic data-processing system has the foloowing three capabilities:

1. Accept information in graphic form, convert it to digital form, and store it for random access.
2. Make the stored information available in graphic form for manipulation and at the same time remember the original information.
3. Reconvert digital information back to graphics and record.

The main elements of one such system are a film scanner, a film recorder, and a display unit.

The film scanner is an input device that scans microfilm images and transmits them in digital form to computer storage. Images are on 35 mm film. Four (4) million addressable points are identified on the Cathode Ray Tube plots as "on or off" or above or below a determined light intensity. Special programs are written to interpret the images.

The film recorder is an output unit which receives information from computer storage in digital form and records it in graphical form on microfilm. The recorder also contains a character generator that can print alphanumeric characters at high speeds -- up to 20,000 lines per minute and 20,000 pages per hour.

The display unit presents instantaneously a graphical image of digital information in the computer. By moving a light-pen over the screen, the operator can modify lines, delete lines, add points, et cetera. A keyboard can be used to input data or, with special programming, make manipulations.

In actual operation, drawings previously photographed are manually modified at the display unit. Then the results (modified digital information) are again recorded on microfilm and printed. Enlarged copies of the image replace the original drawings. The entire process may occur in a matter of minutes.

THE FUTURE

Advances in technology have created new

requirements for managing design information. The complexity of our products is reflected in the interrelationships of different drawings. Associative data structures and multiple graphic display consoles will be required for manipulating information in the computer graphics system. Associative data structures represent a mechanism for handling input-output operations on an S/360. They are constructed in such a way as to achieve flexibility of data manipulation. For example, an associative data structure can produce dynamic output if just one of the data blocks are incremented, because data blocks are linked (associated) to any number of interrelated data lists.

Applications programs will be required which can manipulate input or output to the user's needs at any graphic console. However, controls must be developed to prevent all users from having access to all information. Privacy of data storage involves both security and catastrophe.

Although the use of line drawing displays in time sharing computer systems is largely experimental, there is little doubt that such usage will accelerate in the future. A recent study by Harvard Business Review estimates that by 1973 22% of computer hardware expenditures will be for graphic input/output devices.

The most valuable application for computer graphics in the future will be in Design. Design is essentially a process of synthesis and subsequent evaluation -- an iterative process requiring communication with the computer. The biggest pay-off in terms of dollars saved through computer graphics will come to those who apply computer graphics in design areas where the problem can be readily identified and structured to the graphic system.

This new technology has its implications for educators in Design, also. In the future, design students will be relieved the tedium of routine projection and computation. Graphic display consoles will supplement slide rules as tools for creative expression. Far more complex models and systems will be created in classrooms as more time becomes available for creative thinking. The challange to the educator is to blend the computer into the educational process without enslaving the student to previously defined routines. To become a sound learning experience, the computer graphics consoles must be ustilized to enable the student to converge upon solutions based upon all of his prior knowledge and skills. Further, the graphic console will make the entire pedagogical process a more personal affair, providing the most effective teaching --- that which is tailored to the needs and abilities of the individual.

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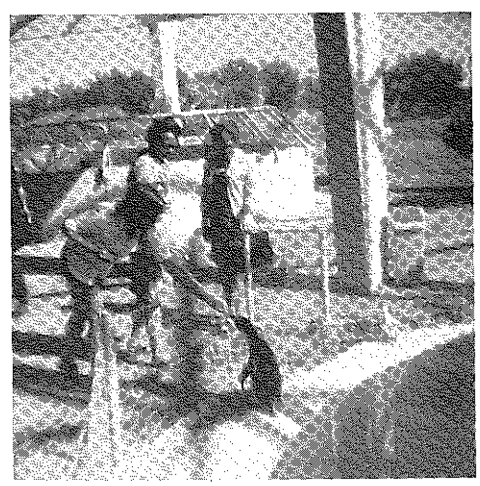


Taking advantage of 1968 mid-winter meeting in Tampa, Fla.

TWO REMARKABLE CONSTRUCTIONS

by Dr. Prof. Luisa Bonfiglioli
Technion, Israel Institute
of Technology

The essence of the constructions.

There are problems of plane geometry that depend on the possibility of constructing a triangle, similar to a given one, whose vertices lie on parallel lines which start from the vertices of another given triangle. And so there are problems of spatial geometry related to the construction of a tetrahedron, similar to a given one, whose vertices lie on parallel lines which start from the vertices of another given tetrahedron. This article reports our solution to these two particular constructions; the next one will review their application to special sections of a triangular prism of the space of three dimensions and of a quadrangular prism of the space of four dimensions.

The First Construction.

Given any two triangles ABC, $D^*E^*F^*$; it is required to construct a new triangle DEF, similar to $D^*E^*F^*$, whose vertices D, E, F are connected to the corresponding vertices A, B, C of ABC by means of parallel lines. On the base BC, of the given triangle ABC, draw a triangle CGB similar to the second given triangle $D^*E^*F^*$ (Fig. 1) and intersect the line BC at R, R^* with any arc of circle passing through G and A. Through R draw the line m which is inclined towards the line BC according to an angle equal to angle GRA $= \alpha$.
Intersect m at Q with the line AR^* and at E, F with the parallels to AR^* which pass respectively through B and C. The triangle AEF

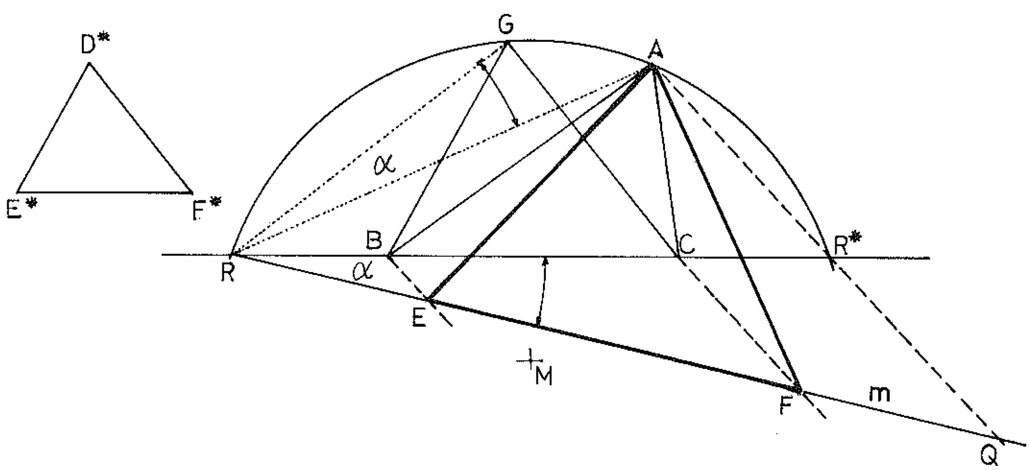


Fig. 1

is similar to $D^*E^*F^*$ therefore if we assume the point A as the vertix D this is the required triangle.

Indeed, the triangles QAR and R^*GR are similar because: angle ARQ = angle GRR^*=angle ARC + α; angle R^*AR = angle R^*GR (as angles inscribed inside a same arc of circle) and therefore angle AQR = angle GR^*R.

It follows: GR:AR = RR^*:RQ.

The two new triangles GRB and ARE are also similar because: Angle GRB = Angle ARE and GR:AR = RR^*:RQ = BR:ER.

Consequently: angle BGR = angle EAR and GB:AE = BR:ER.

Analogously, the triangles GRC and ARF are similar because: angle GRC = angle ARF and GR:AR = RR^*:RQ = RC:RF. Therefore: angle CGR = angle FAR and GC:AF = CR:FR. It follows that angle CGB = angle CGR-angle BGR is equal to angle FAE = angle FAR - angle EAR and GR:AE = BR:ER = CR:FR = GC:AF Q. E. D.

The ratio σ between the lengths of BC and EF depends on the location of the point R on the line BC; it is worthwhile showing how to locate R according to a known given value of σ.

Because of the proportion GR:AR = GB:AE = GC:AF = CB:EF we deduce that GR:AR must be equal to σ and therefore R must lie on the locus of the points whose distances from G and A have a constant ratio equal to σ.

This locus is a circle determined by that of its diameters, which lies on the line AG and whose ends X and Y are the two points that divide the segment AG according to the ratios: GX/AX = σ and GY/AY = σ. (Fig. 2)

This circle generally intersects the line BC at two different points, therefore there are two triangles satisfying our request; they are equal but their location is different.

When the radius of the circle $RGAR^*$ increases until infinity, the circle degenerates into two lines; one is the line AG and the second is the line at infinity. Accordingly R moves to infinity and R^* to U. It follows that AU gives the direction of the projecting lines and, because: $\lim_{R\to\infty}$ GR/AR = $\lim_{R\to\infty}$GR/AG +GR = $\lim_{R\to\infty}$ 1/AG/GR + 1 = 1, the triangle AEF is equal to GBC. Therefore it can be constructed by intersecting the projecting lines through B and C with suitable arcs of circle whose center is A.

When R moves to the point T, whose distances from A and G are equal, the ratio GT/AT is again equal to one and also in this case the triangle AEF is equal to GBC and can be constructed according to the general construction.

The Second Construction.

Given any two tetrahedrons ABCD and $E^*F^*G^*H^*$. It is required to construct a new tetrahedron EFGH, similar to $E^*F^*G^*H^*$, so that the lines connecting A with E; B with F;

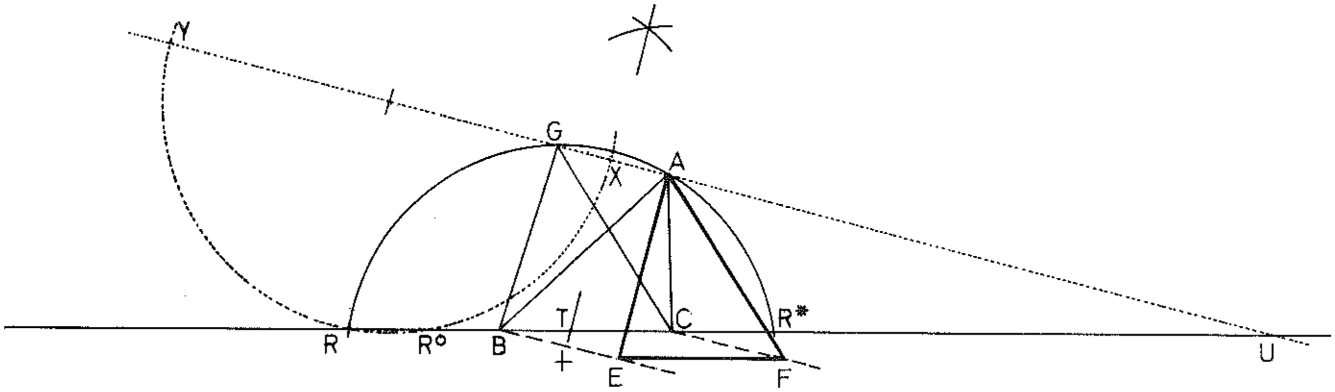


Fig. 2

C with G; D with H are parallel.

As the problem is a spatial one the given data and the proposed solution are worked out by exploiting the method of orthogonal projections. In the frontal projection of ABCD (Fig. 3) draw perpendiculars B_2L_2, D_2M_2 to the edge A_2C_2, from B_2, D_2, and in the frontal projection of $E^*F^*G^*H^*$ draw F_2N_2, H_2O_2 perpendiculars to E_2G_2. Owing to the location of the tetrahedrons the horizontal projection of B_2L_2, D_2M_2 coincide with B_1C_1; C_1D_1 and the angle $B_1C_1D_1$ gives the true value of the angle between the skew spatial segments BL and DM. (See figure 4 which gives the pictorial view of the solved problem; the edges AC, EG are assumed coplanar and their plane is used as Frontal Projection Plane F. P. P.)

Analogously the angle $F_1G_1H_1$ is equal to the angle between the skew spatial segments FN, HO; in addition F_1E_1 = FN and G_1H_1 = HO as well as B_1C_1 = BL and C_1D_1 = DM.

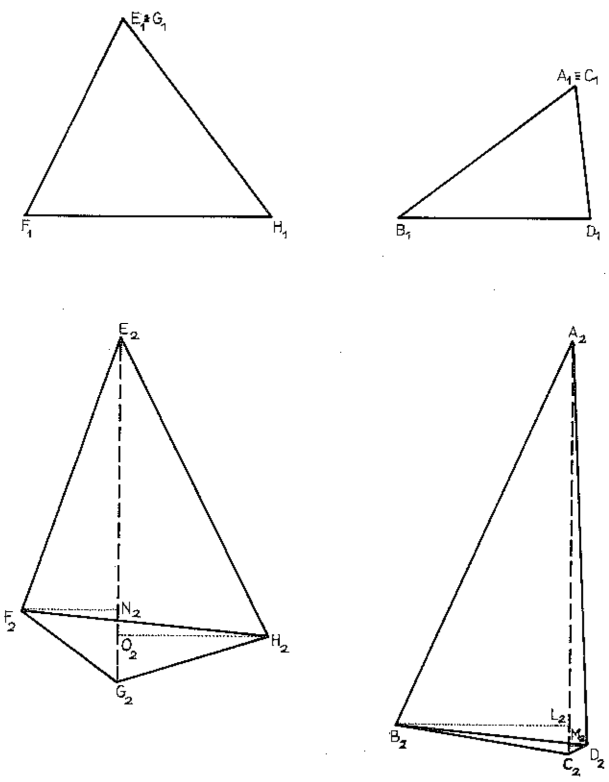


Fig. 3

Furthermore: A_2L_2; L_2M_2; M_2C_2; E_2N_2; N_2O_2; O_2G_2 are equal to the corresponding spatial segments AL, LM, MC; EN, NO, OG and (See figure 4) BB_2 = FF_2 and DD_2 = HH_2 because the segments BF and DH are parallel to F. P. P. and also BB_2, FF_2, DD_2, HH_2 are all perpendicular to F. P. P. Moreover B_2F_2 and D_2H_2 are parallel as projections of parallel segments.

The orthogonal projection of the segments LB, BD, DM on a plane α, perpendicular to AC, is a triangle B'C'D' equal to the given triangle $B_1C_1D_1$ of figure 3 and the orthogonal projection of the segments NF, FH, HO on a plane β, perpendicular to EG, is a triangle F'G'H' equal to the given triangle $F_1G_1H_1$. The projections of the points B_2, D_2 are two points B'_2, D'_2 of the line of intersection between the F. P. P. and α and the segments $B'B'_2$, $D'D'_2$ are respectively equal to BB_2, DD_2 and perpendicular to the segment $B'_2D'_2$.

Analogously: F'_2, H'_2 lie on the line of intersection between the F. P. P. and β; $F'F'_2$, $H'H'_2$ are equal to FF_2, HH_2 and perpendicular to $F'_2H'_2$. If the line $F'_2H'_2$ is transposed until it coincides with $B'_2D'_2$ and G' coincides with C' the mutual location of the triangle B'C'D' and the transposed point F'; as well as D' and the transposed point H' lie on lines parallel to the line $B'_2D'_2$ and all the segments $B'B'_2$, $D'D'_2$, $F'F'_2$, $H'H'_2$ are perpendicular to $B'_2D'_2$.

This last configuration can be easily obtained by applying the "First Construction" to the given triangles $B_1C_1D_1$, $F_1G_1H_1$ (Fig. 5a) in such a manner that $1P/1C_1$ = $B_1D_1/F_1/H_1$ (For the sake of simplicity, points such as R, R^*, are denoted by means of numerals 1, 1^*; 2, 2^*....... expressing the sequence of the constructions).

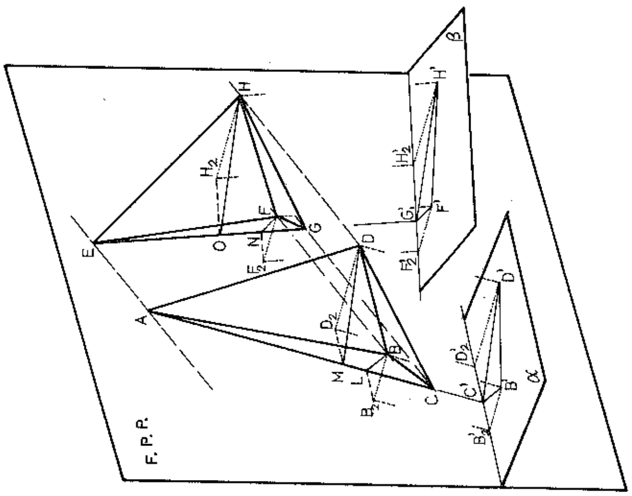


Fig. 4

Project the points B_1, D_1, F_1, H_1 perpendicularly on the line $C_1 1^*$ and denote them with B^1, D^1, F^1, H^1. On the vertical line (Fig. 5b) plot segments AL, LM, MC equal to A_2L_2, L_2M_2, M_2C_2 of figure 3 and on the perpendiculars to AC, through L and M plot segments LB^1, MD^1 equal to the segments C_1B^1, C_1D^1 of figure 5a. The figure 5c is similar to figure 5b but the segments EN^1, N^1O^1, O^1G^1 are equal to the segments E_2N_2, N_2O_2, O_2G_2 of figure 3 and N^1F^1, O^1H^1 which lie on the perpendiculars to EG^1 passing through N^1, O^1 are equal to C_1F^1, C_1H^1 of figure 5a.

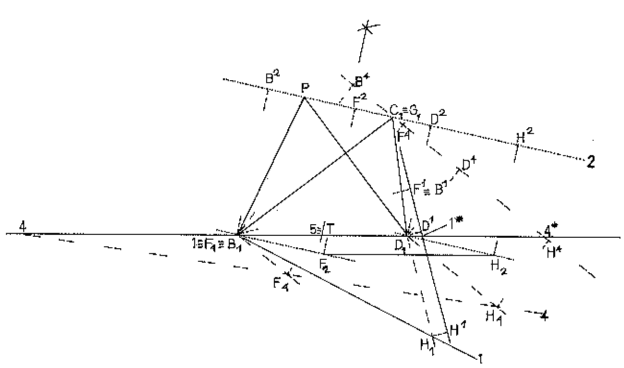


Fig. 5a

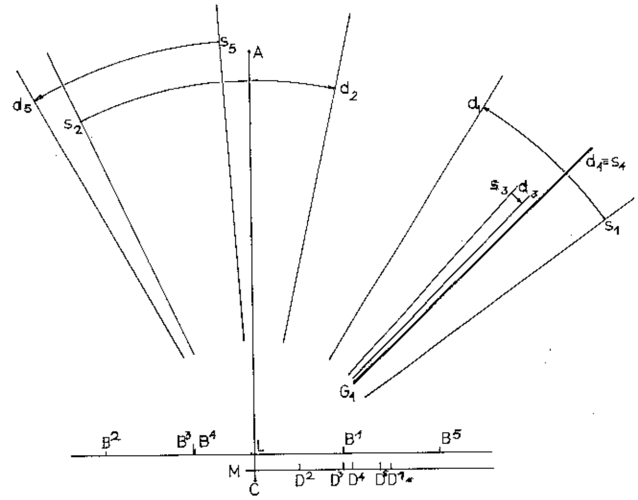


Fig. 5b

The triangles AB^1D^1, EF^1H^1 are therefore equal to the triangles AB_2D_2, EF_2H_2 of figure 4 and now they must be adapted to each other in such a manner that the lines B^1F^1 and D^1H^1 are parallel.

This can be accomplished by using the "First Construction" but in order to speed up the graphical work we can trace the points E, F^1, H^1, G^1 on a superimposed transparent sheet which is successively transposed on figure 5b so that E coincides with A. Then the tracing paper is rotated around E until the lines B^1F^1, D^1H^1 are seen as parallel lines. The exactness of the construction can be improved if we previously draw in figure 5b parallel lines through B^1, D^1 and we adapt the points F^1, H^1 on parallel lines. Anyway the line s_1 which connects the point C of figure 5b (which is seen through the transparent sheet) with the point G^1 is not generally parallel to the lines B^1F^1, D^1H^1 whose direction is denoted by d_1.

It follows that the line s_1 forms a certain angle with the parallel to d_1 passing through C. This angle's direction can be clockwise or the opposite one; e.g. in figure 5b the direction is counter-clockwise. The reason for which s_1 is not parallel to d_1 is that the size of $E^*F^*G^*H^*$ does not fit the size of ABCD.

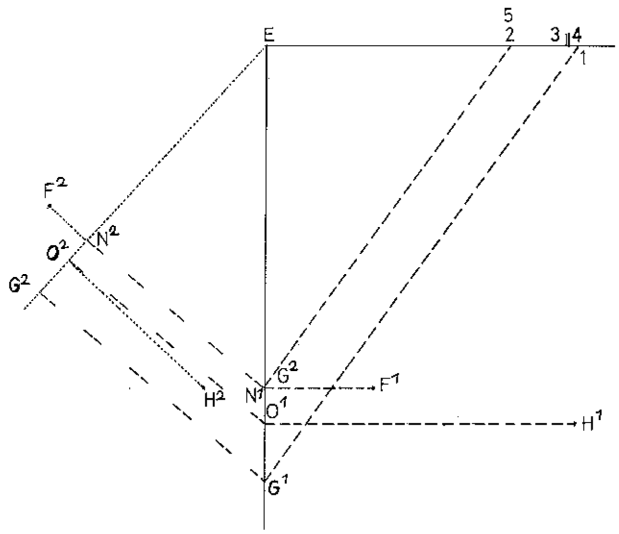


Fig. 5c

Therefore it must be enlarged or reduced, similarly to itself, until the lines similar to s_1 and d_1 coincide.

This implies the repetition of the previous graphical operation several times; but also this work can be speeded up, as follows: first of all construct in figure 5a the triangle $C_1F_2H_2$ which is related to R at infinity.

On the line E1 of figure $5c^1$(the segment E1 = F_1H_1 of figure 5a) plot a segment E2 equal to B_1D_1 of figure 5a and diminish EG^1 so that: $E1:E2 = EG^1: EG^2$.

Plot the segment EG^2 on any line, starting from E, and on it plot the points N^2, O^2, so that: $EG^2:EN^2:EO^2:E2 = EG^1:EN^1:EO^1:E1$.

On the perpendiculars to EG^2, starting from N^2 and O^2 plot segments equal to C_1F^2, C_1H^2 of figure 5a and on the perpendiculars to AC, of figure 5b, plot segments equal to C_1B^2, C_1D^2.

Trace the triangle EF^2H^2 on a transparent sheet, transpose it on the figure 5b and rotate it around E, which coincides with A, until we get the new lines d_2, s_2 which, in this case, form an angle whose direction is clockwise.

Because the direction of the angle d_1s_1 is opposite to that of the angle d_2s_2 we deduce that the point R, suitable to the solution of our problem must lie between infinity and the point 1.

Another construction, at random, numerated 3, gives an angle d_3s_3 considerably small and whose direction is opposite to that of angle d_1s_1; therefore the appropriate R must lie between 1 and 3 very close to 3; it is denoted by 4. Incidentally; the angle d_5s_5 corresponding to the location of R coinciding with T has a direction always opposite to that of angle d_2s_2.

Finally (Fig. 5b) cut the line $d_4 = s_4$ with an arc of circle whose radius is equal to EG^4 and whose center is A. So we get the true location of the edges AC, EG and the two orthogonal projections of the solution can be completed (Fig. 6).

Dr. Prof. Luisa Bonfiglioli
Kiriath Bialik, August 14, 1967.

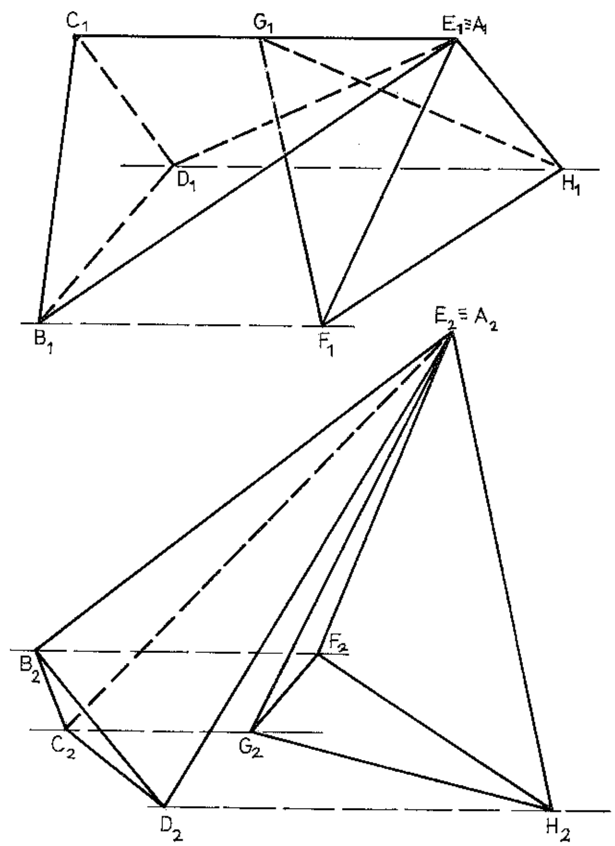
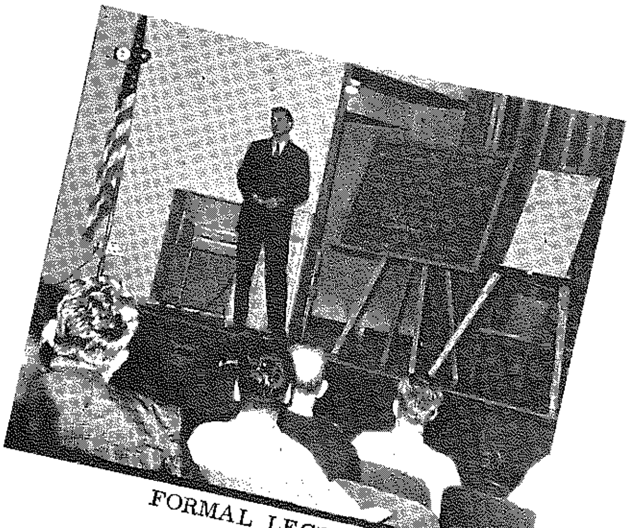


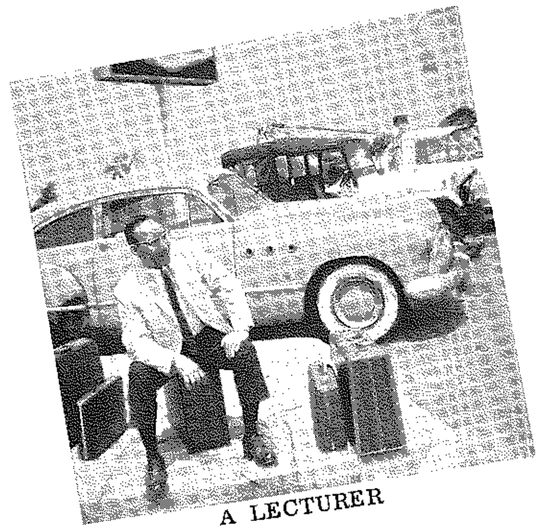
Fig. 6

The PRINCIPAL

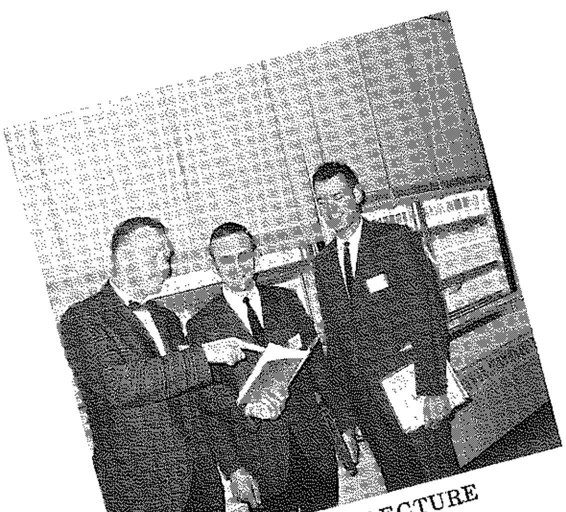
The COURSE DIRECTOR



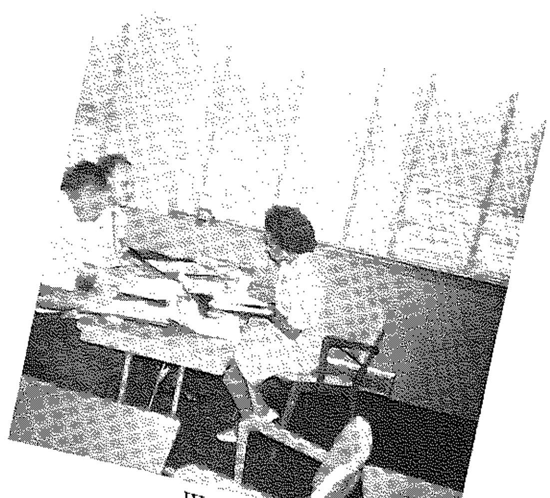
FORMAL LECTURE



A LECTURER



INFORMAL LECTURE

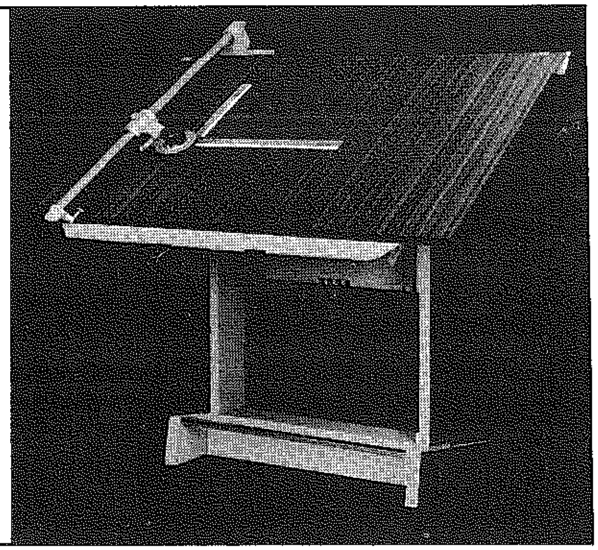


WORK

MID - WINTER MEETING ----- 1967

The UNIC CL Drafting Table

It's what happened when design engineers did something for themselves.

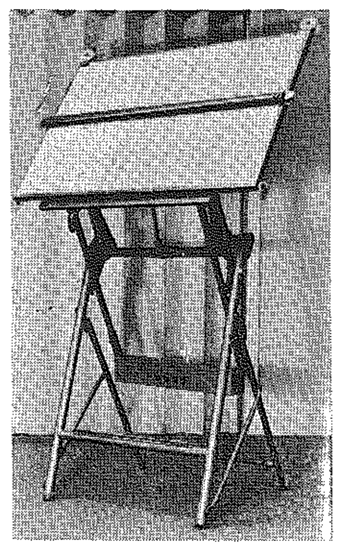


When engineers put together something for engineers, there's no margin for error. Trouble is, there's usually no margin for looks. The UNIC CL Drafting Table is different. It's the complete workhorse that stayed good looking. And Formica almost everywhere keeps those good looks looking good practically forever.

But the big question is how is it to work with? Try this for size:

- UNIC CL Drafting Tables are available with big 36 x 50" and 40 x 60" boards — with laminated cores, lacquered wood veneers and hardwood edges.
- The UNIC has a single, hand-controlled lever that takes care of all positioning. When the lever selects a position, it's there to stay — absolutely rigid!
- Then there's balance. Nothing else comes close; perfect balance is the prerequisite of any UNIC Drafting Table. Whether carrying a straight edge or a drafting machine, a finger's touch will control the table. The reason? An adjustable counterbalance with stabilizers accurate to fractions of an ounce.

Write for complete information.



Another popular UNIC model is the JS series. Constructed of round steel tubing, they're ideal for smaller board sizes. Other features identical to CL models.

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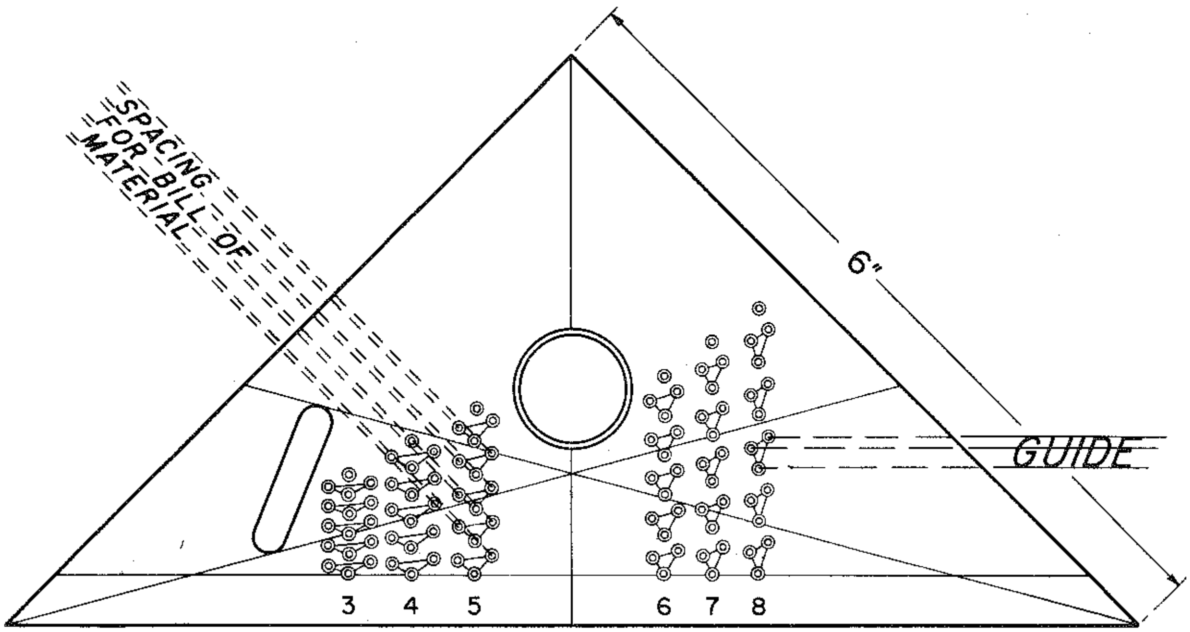

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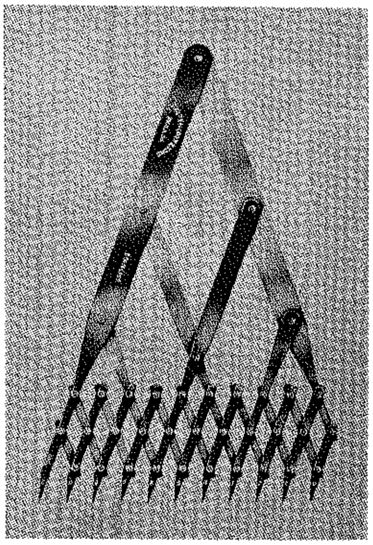

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In an underdeveloped country, somewhere in the far east, there is a village known as Phu Boc which is at an elevation of 300 feet above sea level. The water supply for this village comes from the Bon Son River which is at an elevation of 95 feet above sea level. Since it is necessary for the inhabitants of this community to travel to the river with containers, which are filled with water and brought back to the village, there is, obviously, difficulty in maintaining a proper supply for minimum necessities.

Modern conveniences such as electric power, automobiles, telephone and telegraph are strange to the Phu Bocans. Transportation is carried out by foot (human and oxen) which may or may not pull a hand made wagon, or by bycicle. The tools that are used are crudely made of stone, slate and/or wood. Communication with the world outside of the village is rare and permits very few of the people to know what is going on in other areas.

Consider that you are working with the Peace Corps with an assignment to help the people of Phu Boc. Your first thoughts are to assist them to improve their health conditions by devising a means for obtaining a sufficient supply of water without the hardships and inconveniences that they must now go through. The topographical map indicates the physical location of the village and river.

Shortly after arriving in Phu Boc you befriended several of its leading citizens. After making your decision to do something about the water conditions, you called a meeting of these people to work out the details. From this meeting several preliminary specification were developed.

List the preliminary specifications that you feel should be considered in the design to develop a means for obtaing the water in ample quantity. After these preliminary specifications are determined, sketch one or more concepts that would satisfy them.

Editor's Note:

The Journal Of Engineering Graphics would like to print some of the feasible solutions for both the specifications as well as concepts. Therefore, should any instructor receive a list of priliminary specifications or concept sketches, from students, please send them with the names of the students to

Professor Borah L. Kreimer
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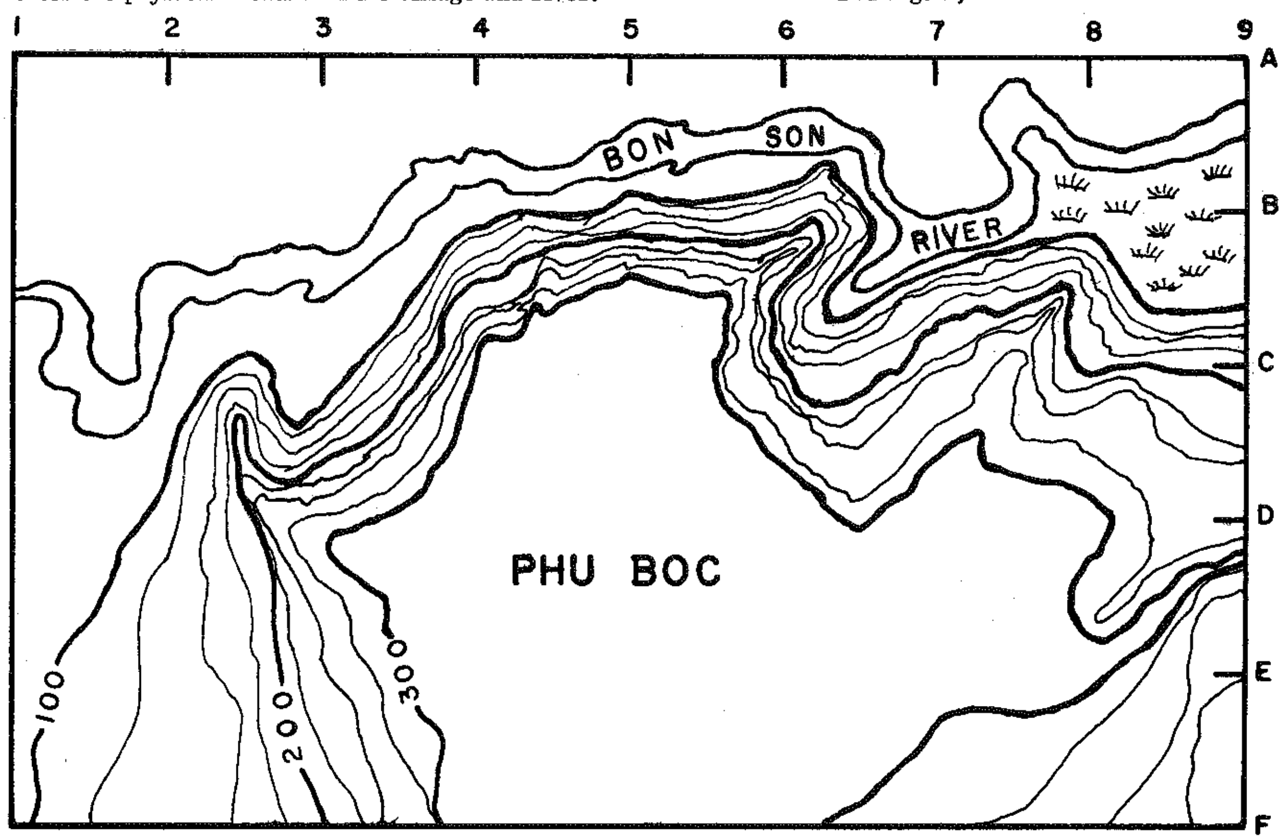

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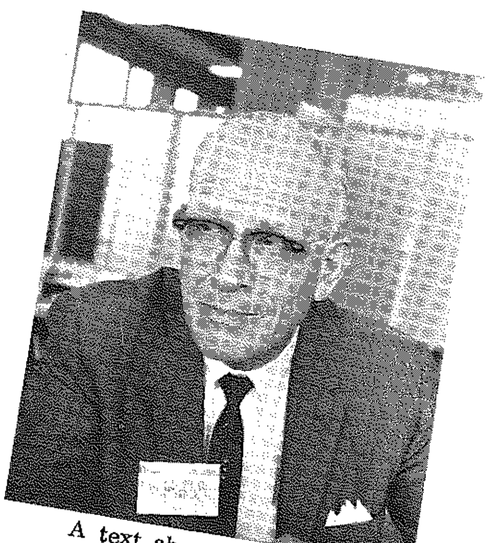
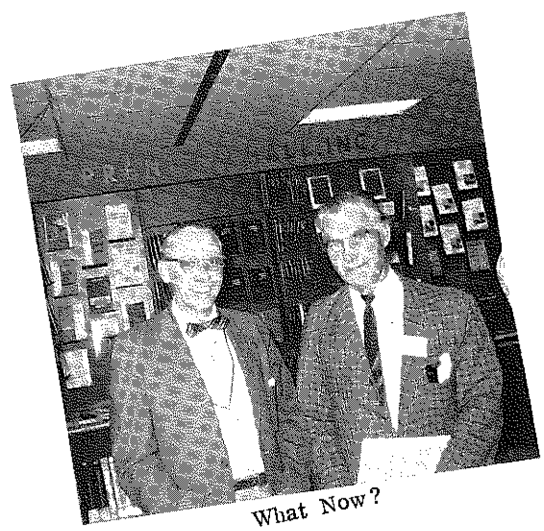


A text about Riverboat Conventions ---- 1969



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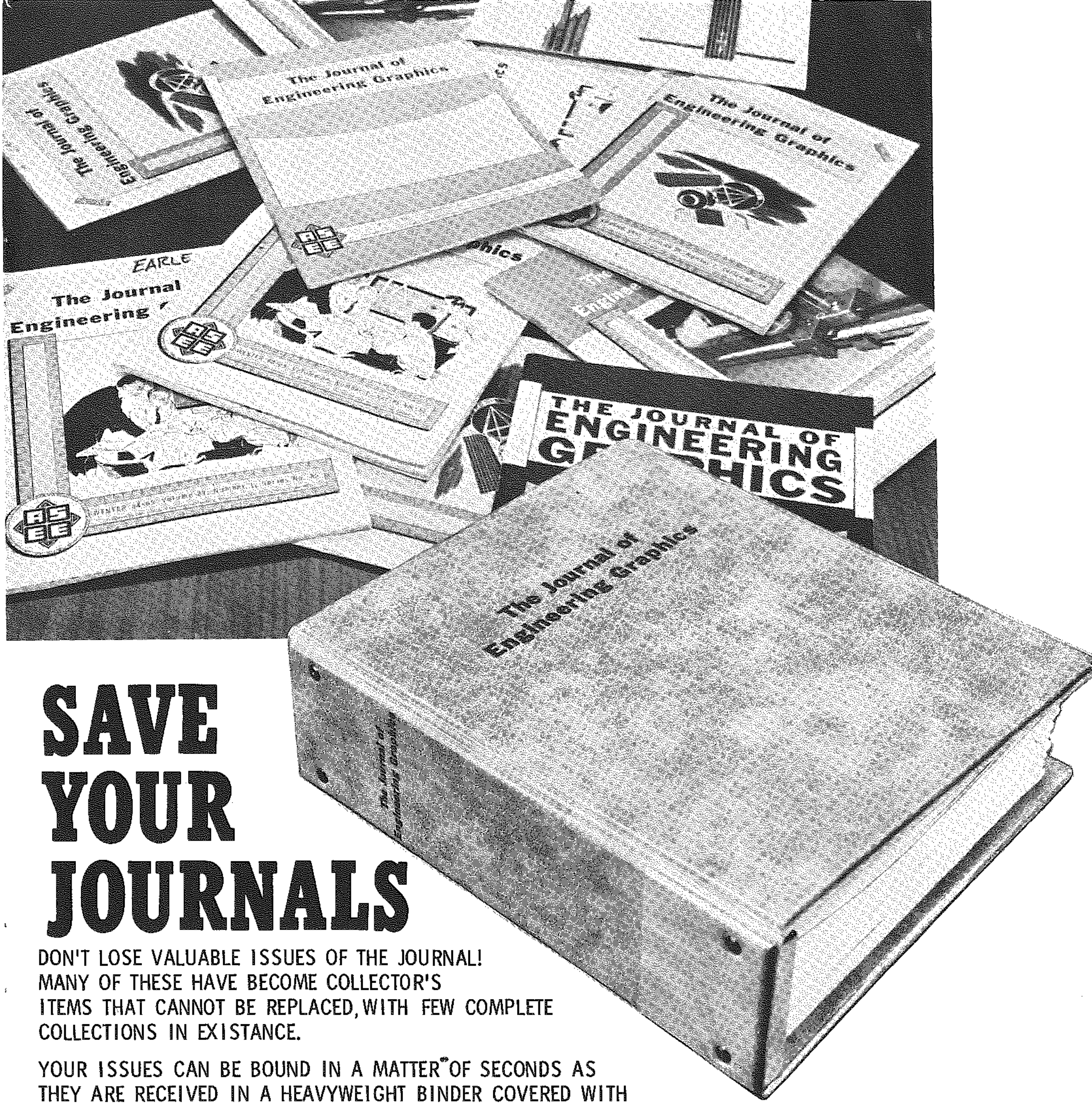

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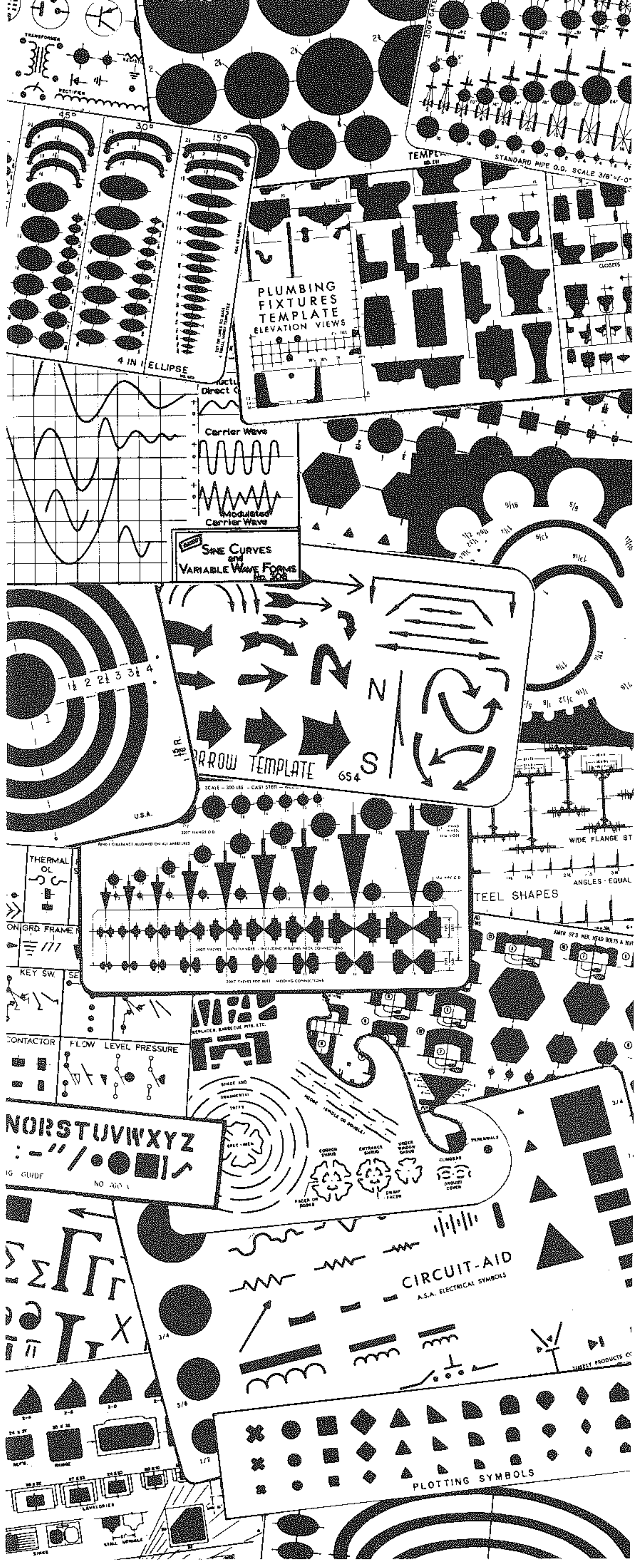

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