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JOHN HOWARD PORSCH
Distinguished Service Award

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CONVENTIONS !

During the past several years conventions and meetings of the American Society for Engineering Education as well as those of the Engineering Design Graphics Division have become somewhat boring. Fortunately, many of the attendees have an opportunity to renew old friendships and, in fact, look forward to this. However, the main purpose for these gatherings is to receive and to impart information that may be useful to the individual engineering faculty member.

Although much is learned over a cup of coffee - or other types of refreshment - it is during the various sessions that the "learning" should begin. However, one cannot be expected to continuously listen without raising questions. It becomes more confusing and tiresome when each of three, four, five or more speakers, during a given session, cover different topics as has been done on several occasions. After two or three such meetings many of our colleagues have no desire to attend another. This situation can cause a deterioration of a necessary organization since it leads to diminishing interest and therefore to a diminishing roster.

Many people are unhappy with the American Society for Engineering Education because they feel that it is a "dean's club". Although this may be so, it is the Division or Committee upon which an individual must depend. It is the Division that must impart and help to impart the information which we are seeking. This is done through the Division's publication and at meetings. When meetings become boringly longwinded, the information may be there but is not absorbed and therefore of no value.

The program announcements for meetings have become quite interesting to our membership and many look forward to receiving this document. In most cases there in no intention of going to the meeting. The interest lies in the number of people that can be squeezed into an hour or an hour and a half program, and how many more participants will face the audience than during the last convention. Some of us are also interested in counting the number of times one particular individual is invited to speak at these conventions. Of course, the more a person is heard, the more convincing he becomes - unless he is heard too often.

Perhaps there is another underlying reason for so many speakers at one meeting. Since our membership may feel that the conventions are of little value, they may not be anxious to attend. A multitude of participants will insure some sort of attendance. When someone is asked to take part in a program, he can use this as an excuse to receive an allowance from his school. Could it be that schools are under the impression that the ASEE as well as its Divisions and Committees are strictly social organizations with no educational value? If so, we are remiss in the performance of our obligations.

At one time it was an honor to be asked to speak, act as a moderator, or serve as a discussion leader at our annual and mid-year meetings. Some people have been invited so often that they feel as though they are doing the program a favor by accepting - and these people are doing the program a favor by accepting. Others who accept soon realize that they are merely filling time so that the program may be "complete". Therefore, many speakers are so poor that a large portion of the audience will take the opportunity to catch up on some needed sleep.

Is it any wonder that members are planning to drop their membership in ASEE? These people feel that the organization is not worth the dues nor the time. These people feel that the purpose of the organization is not being fulfilled. These people feel that they are not a part of the organization. Something must be done to benefit all of our members and to include all of our members in future planning.

Those who attend the meetings of the Division would, very much, like to take part in the discussions and in the arguments. Fifteen speakers and three moderators do not leave much time for anyone else during a one and a half day or two day convention. A fifteen minute question and answer period does not allow for a great deal of audience participation especially when one of the audience as well as a speaker is somewhat prone to enjoy the sound of his own voice.

Something must be done! But, what and how?

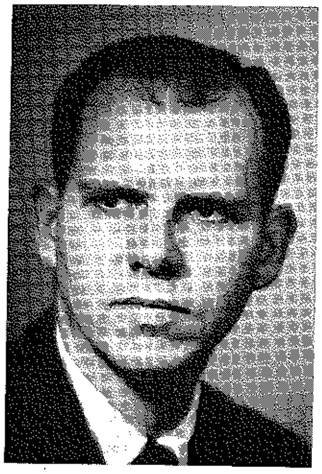
Programs must be planned to include every attendee to the meeting. Plans should be made so that each individual will go home with a useful package of learning. Arrangements must be made to have "learned" papers printed in the Journal for all of the membership to read.

For a person's name to appear on the printed program, he need not be a speaker. There are important services to be performed by those who are not good speakers but who have other outstanding abilities. Workshops may be planned and the names of the leaders printed on the program.

Seminars may be included with invitations for participation, as well as for leadership, extended to several individuals. There are many ways and means by which better programming can be accomplished. The program with many speakers - most of them boring - must come to an end and the participation of all in attendance must begin.

BORAH L. KREIMER

MID-YEAR MEETINGS A PROPOSAL



JAMES H. EARLE
Division Chairman

The Division of Engineering Design Graphics has made many changes during the last decade that have improved various aspects of our courses, objectives and activities related to the Division. Changes are a healthy sign of a vigorous organization.

I am proposing another change that is believed to be an improvement to our present method of conducting the business of our Division. This proposal involves the mid-year meeting that is held each year between November and February. In the past, these meetings have been held on university campuses except in two instances when meetings were held in a hotel in Tampa, Florida.

PROPOSAL

First, I am proposing that all mid-year meetings of the Engineering Design Graphics Division be held on off-campus locations where the housing, meal and meeting facilities can be consolidated into a central location to add convenience to our meetings. Motel and hotel facilities are available to cater to meetings such as ours where service can be expected to be superior to that on most campuses where this is an additional burden on the regular responsibilities. The cost of a meeting at a motel need not be significantly higher than a meeting held on a college campus

INDUSTRIAL MEETINGS

Another consideration for our Division should be the content of our meetings. Some have observed that most of our programs are designed so that we "talk to ourselves", meaning that most of our presentations are given by teachers to teach in the same discipline. It would be more beneficial, to us, if programs could be organized to permit us to visit important industries and to have presentations given by members of industry. This will familiarize us with the current applications in our field and will serve as an input of new information.

For example, a meeting could be scheduled near an industrial center such as an automobile manufacturer, space program center or other form of engineering operation. Our program activities could involve visits to various industrial sites and provide first hand contact with current engineering problems involving the applications of graphics and design.

EDUCATIONAL MEETINGS

On alternate years the mid-year meetings could be organized as educational meetings and the program would focus on teaching problems that are important to our objectives. These meetings could be held in any location, not necessarily adjacent to an industrial complex.

SELECTION OF PROGRAM SITES

If the foregoing arguments are valid, it would seem appropriate that our mid-year meetings be scheduled on alternate years near important industries for an industrially-oriented programs. On the other years, when educational objectives are stressed, the meetings could be scheduled for interesting locations where transportation would be as convenient as possible. This would reduce travel time and expenses as well as make the time expended as productive as possible.

The selection of a meeting site city and location - should be the first concern. This need not be a city in which a university is located. Once the best location is agreed upon, then a host institution should be selected. This need not be a university that is located in the same city as the meeting, but simply one in that general area. This is in reverse of our present procedure of selecting the university host first and then having the meeting at that location regardless of the facilities and offerings that are available. The host institution could direct the hotel in charge of the meeting in making the arrangements. This will require less effort from the host institution than when held on their own campus.

POSSIBLE SITES FOR INDUSTRIAL MEETINGS

Examples of sites where industry could be involved are;

1. Houston, Texas (site of the 1971 meeting)
   - Home of NASA
   - Petroleum industries
   - Ship channel operations
   - Domed stadium
   - Good travel connections

2. Seattle, Washington
   - Boeing Corporation
   - other industries
   - Good travel connections

3. Huntsville, Alabama
   - Spacecraft Development Center
   - Fair travel connections

4. Detroit, Michigan
   - Automobile industry
   - related industries
   - Good travel connections

Many other locations are available from which a selection can be made that would afford excellent travel connections, industry contacts and facilities.

SITES FOR EDUCATIONAL METHOD MEETINGS

Examples of sites where educational and instructional methods may be discussed during alternate years;

1. Las Vegas, Nevada
   - Excellent facilities
   - Excellent entertainment
   - Good travel connections

2. Denver, Colorado
   - Good scenery
   - Good entertainment
   - Good travel connections

3. New Orleans, Louisiana
   - Warm weather
   - Interesting city
   - Many facilities
   - Good travel connections

4. El Paso, Texas
   - Warm weather
   - Mexico
   - Horse racing
   - Excellent travel connections

These are only a few of the locations across the nation that would offer many benefits in addition to a site for a meeting. Providing scenery and interesting locations should increase our attendance and attract more members of the family than in the past. A prime consideration should be travel connections.

CONCLUSIONS

The mid - year meeting of our Division is too important not to be planned as thoroughly as possible. By selecting a location with good transportation connections, desirable weather, points of interest to visit and a self-contained meeting center at a hotel, our meetings will attract more members than in the past. Our efforts could be better directed to our objectives at hand with a minimum of confusion associated with most on - campus meetings at universities that are overcrowded with their growing student bodies.

The result should be a more pleasant environment and more relevant programs with close cooperation from industry on alternate years. I would like to have your reactions to this proposal so that the appropriate action may be taken to accomodate our Division's membership.

DISTINGUISHED SERVICE AWARD

DIVISION OF ENGINEERING GRAPHICS
OF THE
AMERICAN SOCIETY
FOR
ENGINEERING EDUCATION

RESOLVED:

THAT, WITH THE PRESENTATION OF THIS AWARD, THE ENGINEERING GRAPHICS DIVISION OF THE AMERICAN SOCIETY FOR ENGINEERING EDUCATION BY THIS TOKEN ACKNOWLEDGES THE MANY DISTINGUISHED SERVICES RENDERED BY

JOHN HOWARD PORSCH

THROUGH THE YEARS 1929-1970

THE SOCIETY EXPRESSES ITS DEEP APPRECIATION FOR THOSE SERVICES, AND THE GREAT PERSONAL PLEASURE OF THE INDIVIDUAL MEMBERS IN HAVING HIS FRIENDSHIP.

PRESENTED THIS TWENTY-FOURTH DAY OF JUNE IN THE YEAR OF OUR LORD NINETEEN HUNDRED SEVENTY.

Chairman of the Division

Secretary of the Division

CITATION

A longtime member of the Division of Engineering Graphics, Professor J. Howard Porsch has served on many of the Division's most important committees. He has attended every summer school and has rarely missed an annual meeting. From 1955 - 1960 he was a member of the Executive Committee of the Division. His election to the office of Vice-Chairman in 1964 lead to his becoming Chairman of the Division for the 1965-66 year. As was to be expected, he served with distinction. Following his term as Chairman, he was appointed to the Policy Committee where his leadership became even more apparent when important matters required involved decisions.

As a representative of the American Society for Engineering Education, Professor Porsch served for several years as a member of the editorial board of the Y14 Sectional Committee of the American National Standards Institute (formerly the American Standards Association). The excellence of many of these graphical design standards attest to his devotion and dedication to this task. On record is the fact that he also served on a special committee that prepared a national standard covering graphical symbols.

Professor Porsch has become nationally known as an author in his chosen field. His first text, "Descriptive Geometry and Related Algebraic Methods" (1940) was used at his own institution and elsewhere for more than fifteen years. In addition, he was one of the contributing authors of a later text titled "Introductory Graphics" (1958).

Professor J. Howard Porsch, a native of Ft. Wayne, Indiana, received his degrees from Purdue University in his home state. He was awarded a B.S. degree in Civil Engineering in 1928 and an M.S. degree in the same field in 1932. He is a Registered Professional Engineer in Indiana.

He taught courses in engineering drawing while he was still an undergraduate. Upon receiving his B.S.C.E. degree in 1928 he accepted a full time appointment as an instructor. In 1946 he became chairman of the Engineering Graphics Department. He has been a full professor since 1947. In 1932-33 he taught engineering drawing and descriptive geometry at Ohio State University as an exchange professor. He has done considerable consulting work in his field of competence.

Professor Porsch has been an active member in many organizations. Some of these memberships are:

American Society of Civil Engineers
American Society for Engineering Education (since 1929)
Triangle Fraternity
Tau Beta Pi
Chi Epsilon
Scabbard and Blade
Rotary Club of Lafayette (Treasurer for many years)

Edward W. Jacunski

RESPONSE TO CITATION

by

J. HOWARD PORSCH

"Mr. Chairman, Ladies and Gentlemen:

To one who has witnessed the giving of the Distinguished Service Award since its inception, to one who has listened to the recitation of the notable achievements of its twenty recipients, and to one who knows from personal associations their additional qualities and character, it is indeed beyond my expectations that I should be deemed worthy of this high honor and the distinction of joining this notable group. So I am sincerely grateful to you in the Division for suggesting my name, to the Committee for its generous consideration, and to Dean Jacunski for his kind words.

In June of 1930 I had the privilege of attending that memorable Summer School for engineering drawing teachers at the Carnegie Institute of Technology. I could not envision then that from it would blossom the Division as we know it today, so I am going to say a few words about this Division in those intervening years.

At that time the parent body was known as the Society for the Promotion of Engineering Education, and Divisions as separate entities were unknown. In fact, that first summer school was referred to as "The SPEE at Carnegie Tech." There were no precedents to follow - no summer school had been conducted by any group in the Society, but those strong leaders had it well planned, and provided an inspiring program and a capable staff. The approximately one hundred in attendance were enthusiastic, and talked about the continuation of this group along with others having similar interests.

The question often ran through my mind then and later as to how long such a newly met group could and would continue to exist, and while existing be a strong, purposeful, and producing organization.

But now as we look back over the years, what only would be your and my answer? Fortunately we have something tangible to guage our evaluation. We are growing! We have for many years met for mid-year meetings in addition to the annual meetings! We have conducted six summer schools in addition to that first one! We were the first to publish a Journal, which over the years has proved to be not only an outstanding publication but THE outstanding Division publication of the Society! All of these, and others too I am sure, despite many critical outside pressures that would have folded up other bodies having less strength and character. Less tangible are the benefits we derived from those meetings and from the articles we read by bringing home new sparks and introducing new ideas and approaches into our teaching. These are the accomplishments of which we all should be proud.

But to what can this vitality be attributed? I attribute it to you - each of you - as a contributor in one form or another. The human body is composed of many parts, each, no matter how small or seemingly insignificant, with a function to perform, and therefore vital to the operation as a whole. Credit for the success of an organization is often given disproportionately to its officers, and while I in no way take deserving credit from them for their qualities and leadership, they could not function without you as an audience to participate in their programs, without the results acquired from your committee studies and reports, without performing the multitudinous details in behind-the-scenes activities, and without the mass-media through which our newer and younger members could gain the experience for their later responsible leadership. So I repeat, you - each of you - in one form or another, has a vital part in the success of this organization. It has been this kind of participation that has carried us through these forty years to make this Division the strong group it is.

Today you have a group of officers just as devoted and capable as in the past. Today, as evidenced by this large turnout, you are as interested and dedicated as in the past. If this Division continues to have this kind of resource material and responsiveness, as I am sure it will, there is no reason for any diminution in the strength of this Engineering Design Graphics Division.

I have been proud to be associated with you over these many years, and to be so recognized by you tonight is a recognition never to be forgotten. Thank you again.

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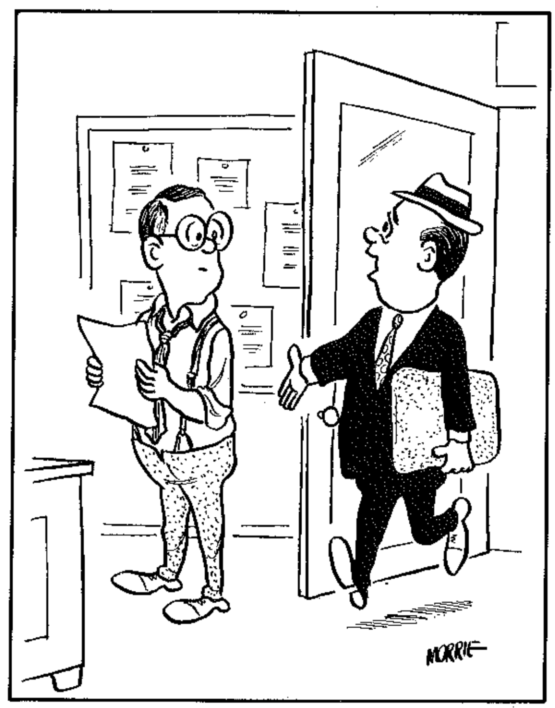

"One word kept me from being a success today ----- 'NO'!"

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1970-1971

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ANNUAL COMMITTEE REPORTS

Membership

General: The Membership Committee agreed that the objectives for the year would be: (1) to solicit members from industry, (2) to solicit members from technical institutes, and (3) to solicit new subscribers for the Journal in a dual campaign. The Journal was considered to be an effective means of familiarizing prospective members with the Division's activities.

Results: During the last three years, this campaign has increased the Journal's subscription list by almost 300 subscribers to over 1000.

Activities: January 1, 1970 to June, 1970. Plans were made during the fall to continue with a mail campaign to solicit new subscribers for the Journal and new members for the Division. This approach was curtailed due to the lack of funding for postage and mailing materials during the fall. The committee was inactive during the spring.

Future Activities: Dr. Richard F. Vogel of Texas A&M has been appointed chairman of this committee. This is expected to be a very important and effective committee under his chairmanship.

JAMES H. EARLE
Membership Chairman
Texas A&M University

Disadvantaged Minorities

This reports covers a program started during 1969-70 as an outgrowth of the 1968 Resolution adopted at UCLA.

Realizing the need for assistance in the development of disadvantaged youth. The Engineering Graphics Division established an Ad Hoc Committee with a purpose of developing a program of Engineering Graphics designed to train disadvantaged youth for further education or immediate employment.

The report presents the purpose, objectives and suggested activities for 1970-71.

Introduction. This report is of the Disadvantaged Minorities Program Committee. The committee was established in 1969 as an outgrowth of the adopted resolution of the Resolution Committee at the Engineering Graphics Division of the ASEE meeting at UCLA.

Disadvantaged minorities as envisioned by the committee means persons of all races, creeds and colors who are in financial distress and or who through lack of exposure were unable to avail themselves of the opportunities to study Engineering Graphics.

Purpose. The committee has as its purpose to seek, identify and formulate programs in Graphics designed specifically for disadvantaged youth, who might not otherwise benefit from established programs.

Objectives:

1. To develop programs in Engineering Graphics aimed at preparing the following:

   a. Disadvantaged youth for employment in business and industry.

   b. Disadvantaged youth for college level work.

   c. Teachers to give instruction in pre-engineering graphics at the secondary school level.

   d. To encourage the inclusion of graphics programs in secondary schools.

   e. To seek funds from the Federal Government; professional societies, industries and businesses for the implementation of the aforementioned objectives.

Suggested Type of Programs

1. Training, secondary school teachers in Engineering graphics through:

   a. Summer institutes

   b. Workshops

   c. Short courses

2. Summer workshops for high school students identified as apt or directed toward graphics but who would be financially unable to pursue training in the field.

3. Continuing education programs for high school and college dropouts identified as apt but financially unable to pursue training. These programs would be of a type that would lead to immediate employment. They would operate on a yearly continuous basis and would allow a trainee to work and study.

Proposed Committee Activities for 1970-71

1. To formulate proposals for programs for presentation at the 1971 mid-winter graphics meeting for review.

2. To seek endorsement of industries and business for cooperative work-study ventures.

3. To seek out institutions which would serve as learning centers for programs.

4. To seek funding for operation of programs.

5. To develop instructional materials for programs.

Larry C. McGhee, Sr., Southern University
(Chairman)

Industrial Relations

Efforts of this Committee during the past year have been entirely concerned with getting started on the project to enlist the aid of industrial personnel, functioning through the power of their respective engineering societies, to influence the ECPD curricular requirements as they pertain to graphics courses. On the basis of informal discussion at the Penn State meeting and correspondence during the fall term, it was decided to approach the objective by means of a survey letter addressed to all Industrial Members of ASEE. It was also decided that the survey would be more effective if handled by a committee member from industry. In the committee meeting at Cal Poly on January 22, Mr. Herbert Gernandt of the Jet Propulsion Laboratory in Pasadena volunteered to spearhead the survey.

In collaboration with Professor Robert Butler of Iowa State University and drawing on background material from a survey which had been formulated by Professor Richard Springer in 1965, the attached letter was drawn up and mailed out to 227 Industrial Members of ASEE during the winter and early spring. Mailing costs being sponsored by Jet Propulsion Laboratory. The Committee will consider distributing the letter on a wider scope pending the results of the initial mailout. Early returns have resulted in the recruitment of three industrial personnel who have expressed much interest and have volunteered to serve on the I. R. Committee.

Results of the survey, to this date, are summarized in the attached report from Mr. Gernandt who has been a very active member of this Committee for the past half decade. The Committee expects to have some important conclusions concerning this project to report at the coming Mid-Year Meeting of EDGD.

Progress on the other objectives of the I. R. Committee continue to be largely a matter of individual activity on the part of Committee members as well as many other members of the Division, and particularly those who have involved industry participants in the Project Design type of graphics course.

R. Wallace Reynolds, Chairman
ASEE-EDGD, Industrial Relations Committee

REPORT ON THE LETTERS OF INVITATION TO INDUSTRY TO PARTICIPATE IN THE INDUSTRIAL RELATIONS COMMITTEE OF EDGD-ASEE

Letters of invitation were mailed to 225; the last letter was mailed May 21. As of June 12, twenty replies have been received.

These letters offered five answers to our invitation: Yes, Maybe, Pass-the-Buck, No With Comments and No.

The Yes, 3 in number, were graciously received and hopefully their representatives are at this meeting. The Maybe answers, also 3 in number, were more from timidity than from anything else. The feeling is, "we are interested but we don't do much graphics engineering," or, "we wanted to participate but are too busy right now". Further encouragement has been sent to them.

The one Pass-the-Buck included the name of a subsidiary organization, who, when invited to join us, declined.

The No With Comments, 4 in number, answered the questions posed in the invitation or sent samples of the work encountered.

The No answers, 9 in number, plus one referred by parent organization, offered several reasons, heavy work load, heavy commitment in other ASEE activities, nothing to offer the committee, etc.

It might be significant to note that the letters received with No answers were generally from persons in upper management positions. It is unlikely that knowledge of the everyday engineering problems, technical and managerial, would be available to the respondent.

The letters of invitation have been written for a very short time. I am still hopeful of receiving more replies as the letters filter down through the organizations and reach concerned engineers.

Herbert H. Hernandt, Member
Industrial Relations Committee
EDGD-ASEE

Educational Relations Committee

No great strides forward were made by the committee this year. Let me hasten to add that this was not the fault of the committee personnel but rather that of the chairman. After accepting the chairmanship last June a series of events "back home" prevented anything getting started during the school year since, as you know, the committee work is done almost entirely by mail.

Professor Ralph Coleman kindly consented to chair a meeting at the mid-winter meeting at San Luis Obispo. He reported that only two persons were present at the appointed hour and therefore no meeting was held.

This Spring, in May, a history of the Educational Relations Committee was prepared, based on committee correspondence turned over to me by Professor Klaus Kroner last June. It seemed to be a worthwhile idea to give to the committee members some idea of the origin of the committee and what it has accomplished to date.

As a result of the returns of a questionnaire sent to the committee members, several suggestions follow. Eight (8) of the seventeen (17) members responded.

Recommendations for Possible Future Action by the Committee (Comments taken from the questionnaires)

1. Complete the structural organization to insure at least one committee member from each of the

twelve (12) ASEE sections. This should make it possible to expect a reasonable committee representation present at any mid-winter and/or annual meeting no matter where the meeting is held geographically.

2. Specific steps should be taken to attract engineering graphics teachers in the technical institutes to our division.

3. Specific steps should be taken to schedule a funded summer school short course for technical institute and junior college engineering graphics instructors.

4. Alternate suggestion: Devote an entire mid-winter or June meeting to this group of people.

5. Expand the survey conducted under Professor Kroner's chairmanship to obtain better geographical coverage.

The above five items, in one form or another, were the most frequent ones occurring as responses on the questionnaire. The complete lists will be turned over to the next committee chairman.

W. M. Christman, Jr.
Chairman

Computerized Graphical Retrieval System Committee : What It Should Consider

ABSTRACT

The 1969-70 chairman summarizes a proposed plan of action for the 1970-71 Committee. Basic to this position paper is a proposed automatic Graphic Science Information Center housed in an academic environment operating on a subscription/cost basis. A specific software program is recommended, legal assistance is advised due to complex international and national copyright laws and other legal problems, a suggested administration and staff is outlined, and a proposed operating schedule is defined.

The purpose of this report is to set forth guidelines for the 1970-71 Computerized Graphics Retrieval Systems Committee, based on opinions of the 1969-70 chairman.

Since the chairman feels that there is a great deal of graphic science information not presently covered by any other indexing abstracting or bibliographic service, it is recommended that the 1970-71 committee consider a proposal to provide students, educators, scientists and industrial engineers with a Graphic Information Center. This might be thought of as a computerized version and extension of the publication, Graphic Solution of Technical Problems, by Prof. Frank A. Heacock. In addition to retrieving information, the proposed Graphic Information Center should repackage the available information for educational and dissemination purposes. This repackaged information could be sold on a subscription basis to recover the basic expenses.

The accompanying diagram illustrates the functions to be implemented by the proposed information retrieval system.

Hardware and Software. With the exception of peripheral off line equipment such as OCR typewriters and magnetic tape selectric typewriters (MT/ST), it is suggested that the proposed Graphic Information Center be developed based on existing computer systems and software, thereby utilizing minimal capital investments.

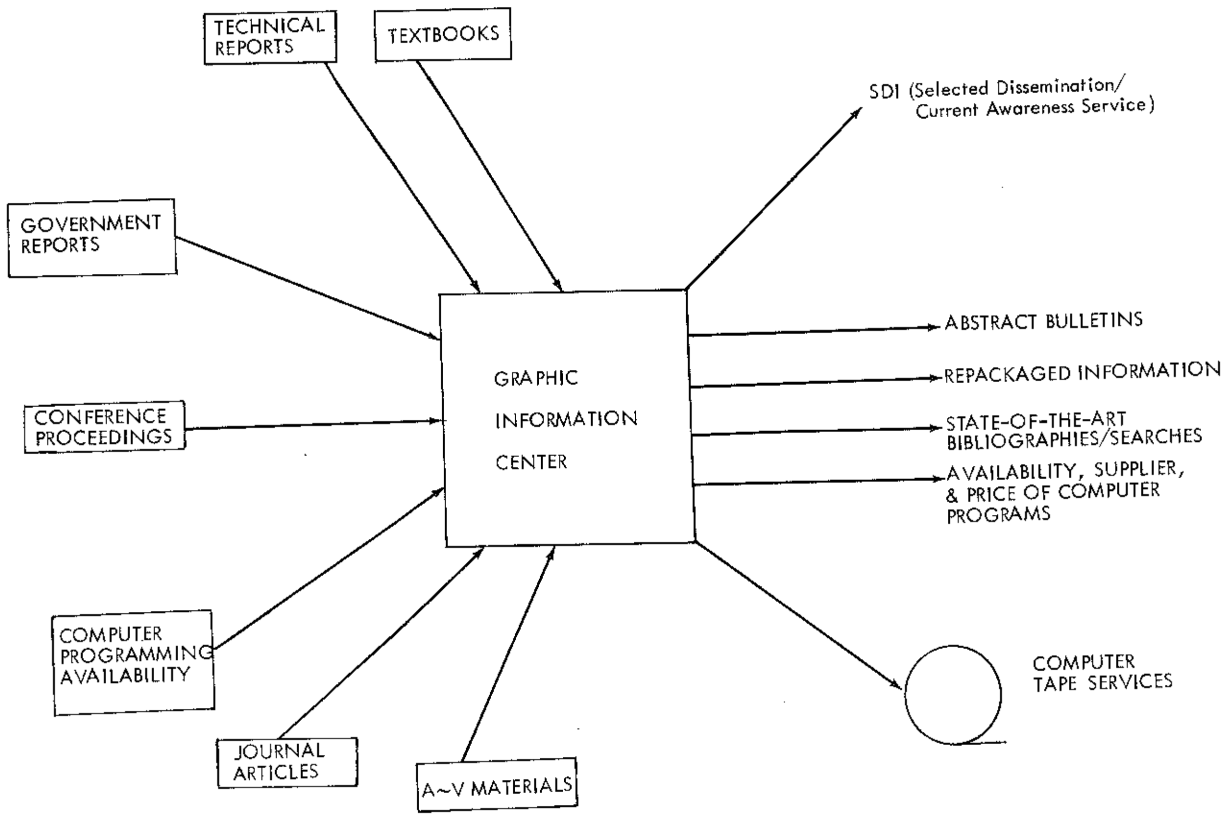
The basic concept of the information retrieval center is nothing new; however, the complexity of indexing graphic information is something that would present an extreme challenge to any of our currently existing information retrieval centers. Therefore TEXT-PAC/360 is suggested as the supporting software package, because it would make the output of the Graphic Information Center compatible with the output from Engineering Index, a world-wide engineering information service, and would eliminate the need for indexing by affording Natural Language retrieval. In addition, individuals buying the magnetic tapes from the Engineering Index might be interested in tapes generated by Graphic Information Center. With TEXT-PAC/360 the tapes would be compatible. The committee should also be careful to make certain that the Graphic Information Center does not overlap services already provided by Engineering Index. (Compendex)

Legal Counsel. The services of legal counsel will be needed from time to time, mainly to consider and deal with copyright situations and other unforeseen legal matters. So, legal protection and legal compensation should be considered in the preparation of any proposal for an information center.

Administration and Staff. It is suggested that the project be housed within an academic environment and that a member of this academic community be responsible as the project leader. It is also suggested that an expert advisory board be recruited during the planning phase and continue on into an advisory function after the center is developed and operating. Supporting staff could be partially full-time and partially graduate student assistants. The thought here is that input could even be generated for multiple point with peripheral offline equipment such as OCR typewriters with student wives typing, or MT/ST generating magnetic tapes at multiple locations and then processed at one central point. Depending on the size of the data base, the budget would have to be based on the equipment necessary (the supplies, the materials and the computer services). Also, the computer rate would be dependent upon the rate at the computational center within the university, or if done on a contractual basis to a service bureau, this rate would have to be considered. Also, if any online device is used, that time, terminal expense, and transmission line expense must be calculated.

Schedule. Probably necessary are the following: a planning and negotiating period of about 6 months, a data collection and information resource center development of about two to three months, data collection and systems input which would be continuous from the beginning of the project, and a user study and service development which would probably take the first nine months.

KAREN TAKLE QUINN, Chairman
Computerized Graphics Retrieval System Committee
Division of Engineering Graphics - ASEE



Awards

ABSTRACT

The Awards Committee is responsible for the evaluation and recommendation to the Division Chairman, those who will receive the Kreidler Award for Graphics Research and the Frank Oppenheimer Award. During the past year an evaluation form has been developed for the Oppenheimer Award and the Committee has assisted in the awards activities of the Creative Engineering Design Graphics Display.

AWARDS COMMITTEE REPORT

1. Information regarding the Kreidler Award and the Oppenheimer Award have been sent to the National office to increase the knowledge of these awards to the total membership of ASEE.

2. With the change of the Division name, new Award Certificates for the Kreidler and Oppenheimer Awards have been prepared.

3. An evaluation form to assist in the judging of papers presented in competition for the Frank Oppenheimer Award was prepared. It was used for the first time at the Mid-Winter Meeting at the California State Polytechnic College. The form has been modified for use at the Annual Meeting. Continual review of the evaluation process will be made in order to develop an ideal evaluation form to assist the judges.

4. The Awards Committee will examine the evaluation process for the Kreidler Award for 1970-71 in order to bring it into focus and establish an ideal objective evaluation.

5. The functioning of committees between meetings would be enhanced if the membership lists included phone numbers and better addresses. The National list is lacking in this area -- perhaps the Division could provide a list. The Awards Committee is compiling such a list of its members.

Philip L. Brach

Resolutions

Chairman Steve M. Slaby, honored guests, members of the American Society for Engineering Education, ladies and gentlemen – the Resolutions Committee presents with pleasure the following:

1. We are indebted to President Novice G. Fawcett, Dean Harold A. Bolz, and the staff of Ohio State University for providing this meeting with such adequate facilities. We appreciate the hospitality and services extended to us by all of the members of the staff.

2. We express our appreciation to Professor Paul T. Yarrington and his fine staff of the Department of Engineering Graphics of Ohio State University who have served as gracious hosts for this meeting of the Engineering Design Graphics Division of the American Society for Engineering Education.

3. We wish to thank Professor Borah Kreimer of Northeastern University, Chairman of the Creative Design Display Committee, Professor Robert D. LaRue, local chairman of the Displays Committee, students Miss Susan Duggan of Northeastern University, and Mr. Fred Rodgers of OSU and all of those who worked with them for the fine exhibition of graphic designs. And special thanks are due also to Dr. Phillip L. Brach of Washington Technical Institute and his devoted committee of judges for their tedious work in evaluating the design projects.

4. We appreciate the time and effort spent by our speakers and the able presentation of subject matter in making this a profitable professional meeting.

5. We welcome the ladies of the Engineering Design Graphics Division and thank them for their interest and attendance. A special thanks to Mrs. H. R. Weed and her committee for the excellent women's program.

6. We extend to Professor Steve M. Slaby, our Chairman, and the Executive Committee of the Engineering Design Graphics Division of the American Society for Engineering Education our deepest appreciation for their exemplary planning and challenging leadership.

7. We desire that these expressions be recorded in the minutes of our meeting and that a copy be presented to the Secretary of the Engineering Design Graphics Division and that he send a copy to the appropriate persons.

Chairman Slaby, the Resolutions Committee moves the adoption of these expressions and requests that appropriate action be taken.

Frank Oppenheimer
B. Leighton Wellman
I. L. Hill, Chairman

Engineering Design Education

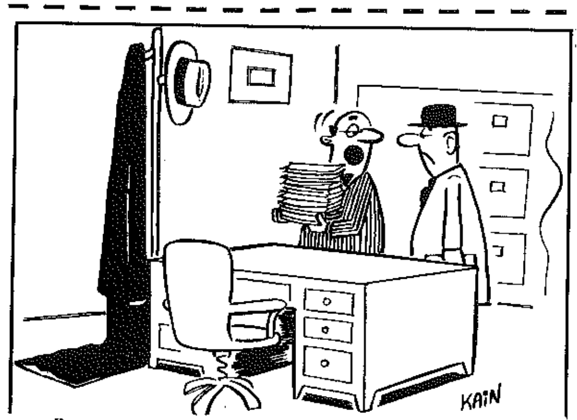
Throughout this past academic year, members of the committee have been actively engaged in consultations with a number of institutions on curriculum reform involving design education at the freshman and sophomore levels. This has included the selection of teaching materials, course outlines, design projects and cases, and teaching techniques.

The committee is responsible for a session at this Annual Meeting entitled RESEARCH AND DESIGN IN ENGINEERING GRAPHICS to be held on Thursday morning, June 25, 1970.

The committee is planning and will conduct a design seminar at the Mid-Winter meeting to be held in November, 1970 at the University of Massachusetts. Participants will be actively involved in the decision making process required to arrive at a design solution to problems centered within the social-economic environment.

The committee will circulate a questionnaire early next year (1971) among members of the division in order to survey the status of engineering design education at the freshman and sophomore levels since the 1967 Summer School. This survey will assist the committee in formulating a position statement regarding design education and will help to direct the committee's activities in the future.

PERCY H. HILL, Chairman
Engineering Design Education Committee
Tufts University



"---Bet you wouldn't say that to his face."

Nominations

The following have been nominated for office in the Engineering Design Graphics Division, ASEE for the year 1971-1972:

Vice Chairman

WILLIAM B. ROGERS
United States Military Academy

C. GORDON SANDERS
Iowa State University

Secretary

MICHAEL P. GUERARD
Texas A&M University

Z. CLAUDE WESTFALL
University of Maine

Circulation Manager & Treasurer, EDGJ

ROBERT J. CHRISTENSON
General Motors Institute

ROBERT J. FOSTER
Pennsylvania State University

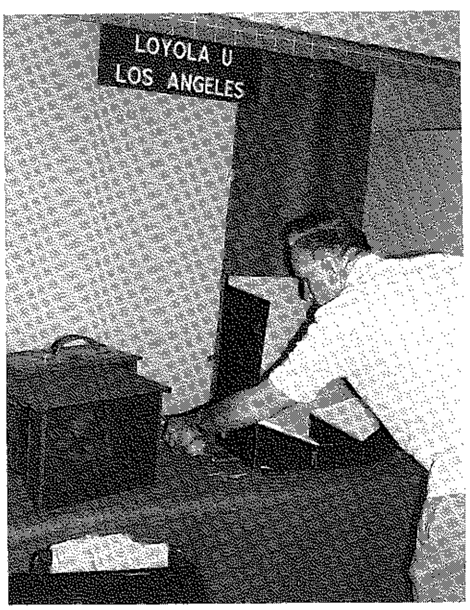
Director

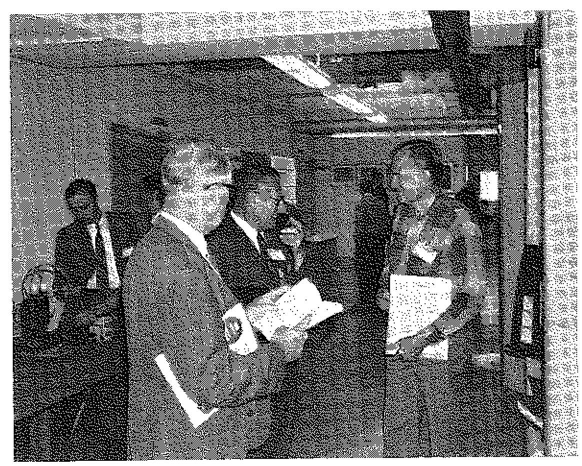
EDWARD V. MOCHEL
University of Virginia

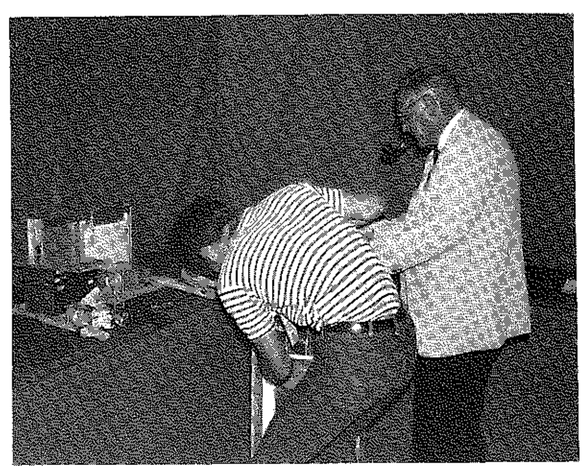
WEBSTER M. CHRISTMAN, JR.
University of Wisconsin/Milwaukee

Respectfully submitted,

Nominating Committee:
Earl D. Black
Ivan L. Hill
Ralph M. Coleman
Steve M. Slaby
Eugene G. Pare', Chairman







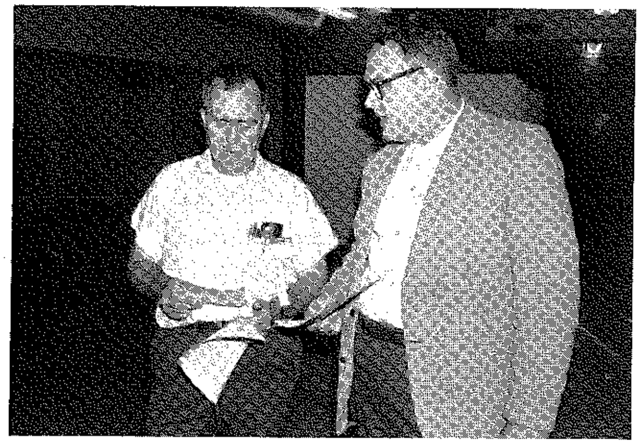
ANNUAL
CREATIVE ENGINEERING DESIGN DISPLAY

June 1970

The highlight of the ASEE Annual Meeting at Ohio State University, the Creative Engineering Design Display, attracted many visitors whose comments and opinions were flattering to our Division and the colleagues who were responsible for organizing the Display. The 1970 Display was a professional show of 75 quality projects representing 32 schools. This year it was opened up to students at all levels from freshmen to graduates. A school was limited to two (2) freshmen, one (1) sophomore, one (1) junior, one (1) senior, and one (1) graduate project resulting in a display of only top level work. There was a definite improvement over previous years in The quality of presentation, reports, and prototypes. From the enthusiastic comments of visiting engineering colleagues, the Display Committee for 1970 is expecting an influx of new schools, next June, at the United States Naval Academy in Annapolis, Maryland.

A very welcome feature at the display area was Miss Susan Duggan, an engineering student at the Burlington Campus of Northeastern University. The pleasing personality of Miss Duggan, plus the availability of Phil Brach, Bob LaRue, and Chairman Borah Kreimer and their staff, gave the visitor a welcome feeling and an opportunity to question and discuss. Due credit must be given to Dean Paul Yarrington, assistant dean of engineering at Ohio State, and his staff for the artistic and effective set-up of the display area. His key man, Professor Bob LaRue, put in many hours of planning and working in the display area before, during, and after the meeting.

A hats-off salute to Dr. Phil Brach, chairman of the Awards Committee and his team of judges. The judges -- 13 in number -- selected from industry and engineering education evaluated each project five (5) times. The responsibility of selecting the winners is a thankless job that requires many hours of application to reading, studying and evaluating. Not only did Phil supervise the judging of the Creative Engineering Design Display, but also the selection of the recipient of the Frank Oppenheimer Award which was given to Professor William J. Crochetiere of Tufts University for the presentation of his paper entitled "Engineering Design in Physical Medicine".



The Engineering Design Display Coordinating Committee Chairman, Borah Kreimer, is again extending an invitation to all Engineering Colleges, Technical Institutes, and Junior Colleges (including Community Colleges) to enter their outstanding creative design projects for competition in the 1971 Display.

All of the students who were involved in the projects that were on display at OSU have been sent certificates of recognition indicating that their work merited national exposure. Plaques were awarded to those who placed first, second, and third in each of the categories. Those schools with first place recognition, will receive duplicate plaques. Opening up the display to upperclassmen and limiting each school to only their very best, brought out a quality that was surprising. Even more surprising was the fact that freshmen rivaled the upperclassmen in creativity. The following list of winners and the projects present an interesting argument as to why an instructor in design should attend an ASEE meeting. One could spend several profitable hours fortifying his design education program in the design display area.

John R. Barylski
Southeastern Massachusetts University

AWARD RECIPIENTS

FRESHMAN

1st Place - THE WEATHER WINDOW

Designers - Klickman, Richard
Hughes, Earl
Jimenez, Jose
McFadden, Donald
Turner, Michael

Instructor - Professor Levosky

School - University of Texas at El Paso

2nd Place - OCEANOGRAPHIC RESEARCH AND EXPLORATION COMPLEX

Designers - Dietenhofer, Paul
Yuse, Richard
Ericson, Lee
Garland, Christopher

Instructor - Professor Kreimer

School - Northeastern University, Suburban Campus

3rd Place - ELECTRIC COMBINATION LOCK

Designers - Chow, Paul
Sewell, Wayne
Frizell, Robert
Harp, George
Spillman, David

Instructor - Professor Levosky

School - University of Texas at El Paso

SOPHOMORE

1st Place - COMPACTION RESEARCH IN URBAN NETWORK AND COMMUNITY HOUSEHOLDS

Designer - Pratt, Thomas

Instructor - Professor Stearns

School - Dartmouth College

2nd Place - A MEASURING DEVICE FOR AUTO EXHAUST PARTICULATES

Designers - Allin, Hugh
Brown, David
Link, Greg

Instructor - Professor Sauter

School - General Motors Institute

3rd Place - MACHINE TOOL FIXTURE

Designers - Mathies, Jim
Overman, Al
Keigley, Gerald

Instructor - Professor Street

School - Louisiana State University

JUNIOR

1st Place - COORDINATE GEOMETRY PLOTTING WITH THE COMPUTER

Designer - Pickens, Patrick

Instructor - Professor Brewer

School - Louisiana State University

SENIOR

1st Place - PERSONALIZED AUTOMATION ON TOMORROW'S HIGHWAYS

Designers - Editors
Francis, Bob
Ferrante, Joe
Others

Instructor - Professor Mott

School - University of Dayton, Technical Institute

2nd Place - AUTOMATIC BICYCLE TRANSMISSION

Designers - Cusimano, G.
Bergman, S.
Kniskern, J.

Instructor - Professor Chilton

School - Arizona State University

3rd Place - WHEEL CHAIR MODIFICATION FOR LEGG PERTHES PATIENT

Designer - Myers, Alan

Instructor - Professor Pare'

School - Washington State University

GRADUATE

1st Place - A MECHANICAL HEART

Designer - Zachary, Richard E.

Instructor - Professor Street

School - Louisiana State University

FINALISTS

"ONE MAN BOAT LOADER-CARRIER"

Designer - Kolek, Douglas S.

Instructor - Professor Kreimer

School - Northeastern University

"EASY MIX"

Designers - Toschik, M.
Burns, M.
Rowe, C.
Estes, J.
Kanovich, J.

Instructor - Unknown

School - Arizona State University

"LIQUID DEPTH INDICATOR"

Designers - Rozek, Teresa
Reynolds, Wayne
Schwartz, Ira
Ufnal, Adam

Instructor - Unknown

School - University of Hartford

"MATHEMATICAL TOY"

Designers - Christie, Daniel
Goodreau, Norbert
Petersen, Kenneth
Shaughnessy, Clark

Instructor - Professor Dottmann

School - University of Wisconsin, Milwaukee

"BACK PACK"

Designers - Bacheldor, Pat
Coles, Cal
Cross, Alan
Cuculic, Mark
Culpepper, Joe
Ealem, Pat

Instructor - Mr. M. B. Atkins

School - Texas A & M University

FINALISTS (Continued)

"FOOT-OPERATED DOOR OPENERS"

Designers - Dembiec, D. A.
Santner, W. B.
Selin, R. K.
Kuenkler, R. K.

Instructor - Professor Christman, Jr.

School - University of Wisconsin, Milwaukee

"POSTAL SCALE"

Designers - Kenik, Frank
Gratz, Wayne
Stanton, Scott

Instructor - Professor Loving

School - Illinois Institute of Technology

"PATTERN GENERATOR"

Designers - Bowe, A. G.
Cheung, J. K.
Gardner, J. B.
Dudzik, P. A.

Instructor - Professor Robert Ritter

School - Loyola University of Los Angeles

"TWO-CYLINDER ENGINE"

Designer - Bennett, Dave

Instructor - Unknown

School - General Motors Institute

HONORABLE MENTIONS

"TEMPORARY STRUCTURES"

Designers - Warley, Deas
Sherman, Dan
Simon, Kenneth
Arriaga, Joseph
Darnell, James

Instructor - Professor Darnell

School - Arizona State University

"JWTZ SOLID STATE TUBE"

Designers - Patterson, Jr., Johnny
Harper, Wallace
Fuselier, Thomas

Instructor - Professor Street

School - Louisiana State University

"COMBINATION SCALE"

Designers - Green, R. V.
Chutz, M. G.
Hazelwood, P. R.

Instructor - Professor Street

School - Louisiana State University

HONORABLE MENTIONS (Continued)

"ADJUSTABLE LOADING DOCK"

Designers - Muccino, Kenneth
Norlin, Richard

Instructor - Professor Maiorano

School - Worcester Polytech

"MODEL-FLI"

Designers - Watkins, John
Melnick, Paul

Instructor - Unknown

School - Worcester Polytech

"ESCAPE SYSTEM DOWNED AIRCRAFT"

Designers - Steinberg, Robert
Nabb, Richard
Leach, Robert

Instructor - Unknown

School - Worcester Polytech

"SIN IN THE SKY"

Designers - Goodrich, Jane
Fey, Stephen
Williamson, J. L.
Hoffmeister, Mark

Instructor - Professor Duncan

School - University of Missouri, Kansas City

"CAST REMOVER"

Designers - Owen, Phil
Post, Mitchel
Judd, Dennis
LaPointe, Rich
Williamson, J. L.

Instructor - Unknown

School - University of Missouri, Kansas City

"MULTIPURPOSE SPORTMAN'S CHAIR"

Designer - Lipiec, A.

Instructor - Unknown

School - McMaster University

"THE DESIGN OF A HIGH SPEED AUTOMATIC BULB MACHINE FOR SWITCHBOARD LAMPS"

Designers - Urion, K. D.
Burasco, T. R.

Instructor - Unknown

School - University of Missouri, Kansas City

"THE HEALD CO. EJECTION MECHANISM FOR A 273 A UNIVERSAL GRINDING MACHINE"

Designers - Lind, John
Nock, Herbert
Peterson, Daniel

Instructor - Unknown

School - Worcester Polytech

"CURETTE CLEANING APPARATUS"

Designers - Miele, Gerald
Gionfriddo, Ray
Cascone, Bob

Instructor - Mr. Stevensen

School - University of Hartford

"OVERHEAD CRANE DESIGN"

Designers - Baerman, R. A.
Beutel, H. F.
Bondou, B.
Brandt, B. J.
Hallen, W. R.
Heritsch, R. R.
Holzman, R. W.
Ludwig, D. A.
Najuock, A. A.
Nemschoff, M. S.
Ormson, J. H.
Rollay, D. T.
Schultz, B. R.
Stachowicz, R. W.

Instructor - Professor Pavelic

School - University of Wisconsin, Milwaukee

"ECONOMIC DESIGN OF RACK FLOW SYSTEMS FOR INTEGRATED MACHINE LAYOUT"

Designer - Roedar, William

Instructor - Professor Chang

School - University of Wisconsin, Milwaukee

"LONG HAUL URBAN TRANSPORTATION"

Designers - Bartz, E.
Baumann, R.
Cyra, D.
Eriksen, A.
Farooki, W.
Gonia, M.
Gurschke, H.
Haerter, F.
Kalister, B.
Kaplan, L.
Loeffel, K.
Mackey, J.
McCarthy, F.
Mueller, T.
Rock, G.
Ryan, C.
Seder, R.
Voigt, K.

Instructor - Professor Beimborn

School - University of Wisconsin, Milwaukee

"OSCAR"

Designers - Hutchinson, Roger
Matthews, Ted
Barton, Bill
Mitchell, Roger
Bowman, Joe

Instructor - Dr. Michael Furey

School - Virginia Polytech

HONORABLE MENTIONS (Continued)

"METRO-DENVER TRANSPORTATION PROPOSAL"

Designers - Kirk, John
Neil, Chris
Lebkisher, Vic
Oswald, Glen
Ogle, Gary
Larson, Pamela

Instructor - Professor Hatley

School - Colorado School of Mines

"CRAFT CENTER"

Designers - Phillips, Joe
Pretti, Wayne
Shea, Dave
Sheehan, Darby
Matough, Lynn

Instructor - Professor Hatley

School - Colorado School of Mines

"1970 CHEVROLET BOLT-ON, TRACTION AND ROLL UNIT"

Designer - Gross, B.

Instructor - Unknown

School - University of Missouri, Rolla

"FOUR-WHEEL DRIVE FOUR-WHEEL STEERABLE VEHICLE"

Designer - Allan, Robert

Instructor - Unknown

School - University of Missouri, Rolla

"CAN CRUSHER"

Designers - Fedor, Dave
Gee, Keith
Crawford, Dan
Holliman, Eric
Kabat, Bob

Instructor - Prof. Henderson
Prof. Short

School - General Motors Institute

"VISICOM"

Designers - Blue, Gordon
Ko, Mike
Eyer, Mark
Johnson, Jim
Gonnason, Jeff

Instructor - Unknown

School - University of Washington

"BEST STRUCTURE"

Designers - Schill, Jim
Swert, R.
Parrot, R.
Crain
Dawson, W.
Herdrix
Endress

Instructor - Unknown

School - General Motors Institute

HONORABLE MENTIONS (Continued)

"TRANSLATIONAL FRICTION DRIVE SYSTEM FOR ELECTRIC VEHICLES"

Designers - Potterfield, M. L.
Sherrick, S. F.
Brychta, Jim
Campo, Carl
Grimes, Lee

Instructor - Professor Swancutt

School - University of Missouri, Rolla

"COMBINATION GAUGE - DEPTH, AIR, TIME"

Designers - Erwin, R.
Smith, D.
Marshbanks, D.
Prior, R.

Instructor - Unknown

School - University of Nebraska

"HOME REFUSE COMPACTOR"

Designers - Mr. Burton
Mr. Bazak
Mr. Beach
Mr. Foy
Mr. Spitler

Instructor - Professor Devens

School - Virginia Polytechnic Institute

"COMMUNICATION ANALYSIS DESIGN"

Designer -

Instructor -

School - Kansas City University

"VIBRA-BED"

Designers - Wong, D.
Sherman, I.
Yates, R. W.
Skvarenina, S. G.

Instructor - Unknown

School - Illinois Institute of Technology

"SEPTICO"

Designers - Tsigonis, Robert
Pattee, Allen
Quinn, Michael
Shepard, Randell
Thompson, Rod
Fu, Frank
Tyler, John
Weston, Bill
White, Jim

Instructor - Professor Smith

School - Dartmouth College

"AN AUTOMOBILE HAND-CONTROL FOR THE HANDICAPPED"

Designers - Biskner, Chuck
Parbs, Bob
Begyn, Larry

Instructor - Unknown

School - Iowa State University

HONORABLE MENTIONS (Continued)

"AN EFFICIENT 3-WAY LIGHT SWITCH"

Designers - Murdock, Doug
Savage, Sharon
Ogle, Rick
Johnson, Steve

Instructor - Professor Collins

School - University of Washington

"PROJECTOR ERASER"

Designers - Cunningham, Jack
Dacy, Roy
Davis, Gary
DeFrietas, Stephen
Dorsett, Stephen
Etter, Jr., Frank
Forrester, Ronald
Fory, Daniel

Instructor - R. F. Vogel

School - Texas A & M University

"BURNITALL, LTD"

Designer -

Instructor -

School -

"AUTO-HAMMER ATTACHMENT"

Designer -

Instructor -

School - Southern Tech. Inst.

"COMPUTERIZATION OF 3-D DESCRIPTIVE GEOMETRY PRINCIPLES"

Designer - Gregoire, Timothy

Instructor - Professor Slaby

School - Princeton University

"CHILD'S EDUCATIONAL TOY"

Designer - Skrzyczak, H.

Instructor - Unknown

School - Illinois Institute of Technology

"MOTORCYCLE TRAILER"

Designer - Kaiser, Rodger

Instructor - Unknown

School - Pennsylvania State University

"HOUSE"

Designer - Halloran, Jim

Instructor - Unknown

School - Passaic School of Drafting

"SUBURBAN INSURANCE BUILDING"

Designers - Boardine, Terry
Vasilik, Michael
Tarzia, Ralph

Instructor - Unknown

School - Passaic School of Drafting

"SPACE/TIME INTERACTIONS VERSION I"

Designers - Estes, Mark
Brewer III, John

Instructor - Unknown

School - Louisiana State University

"COMPUTER ANALYSIS OF CLOSED COUPLED VIBRATORY SYSTEMS"

Designer - Antosiewicz, Michael

Instructor - Professor Besel

School - University of Wisconsin, Milwaukee

"AN EXAMINATION OF SYSTEMS FOR EMERGENCY MEDICAL CARE"

Designers - Antosiewicz, Michael
Burgarino, T.
Denz, J.
Dudley, G.
Graber, J.
Jones, S.
Krueger, G.
Schamell, P.
Stackowicz, R.
Widule, T.

Instructor - Professor Beimborn

School - University of Wisconsin, Milwaukee

"PORTABLE POST"

Designers - Solomon, James
Powell, Robert

Instructor - Unknown

School - Mississippi State University

"SHIP TO SHORE CARGO CARRIER"

Designers - Sonnichsen, T.
Jerde
Fallen, D.
Bevins, B.

Instructor - Unknown

School - Washington State University

"ROAD FRICTION TESTER"

Designer - Portelli, John

Instructor - Unknown

School - Pennsylvania State University

"CHURCH"

Designer - Miller, Craig

Instructor - Unknown

School - Passaic School of Drafting

"MULTI PURPOSE CAR WASHING DEVICE"

Designers - Chapman, P. B.
Neely, G. L.
Lyons, R. R.

Instructor - Unknown

School - Mississippi State University

HONORABLE MENTIONS (Continued)

"ROTARY AIR PUMP"

Designer - Cardinalli, Robert

Instructor - Unknown

School - Passaic School of Drafting

"DESCRIPTIVE GEOMETRY"

Designers - Nelson, John
Ehmer, Lee
Hyland, Bruce
Foggan, Charlie

Instructor - Unknown

School - Washington State University

"CEREBRAL PALSY WALKER"

Designers - Hay, Robert Ian
Martinez, Ralph
Stehling, Steve
Porter, Bill
Stuckley, John

Instructor - Professor Levosky

School - University of Texas at El Paso

"PLAYGROUND, SAFE DRIVING PRACTICE RANGE"

Designers - Williams, Tom
Pellar, Jerry

Instructor - Unknown

School - Wayne State University

"PLAYGROUND, SAFE DRIVING PRACTICE"

Designer - Toms, Robert G.

Instructor - Unknown

School - Wayne State University

"VARIABLE SPEED TAKE-OFF"

Designer - Harm, Peter

Instructor - Unknown

School - Passaic School of Drafting

"CARBON DIOXIDE PICNIC COOLER"

Designers - Carlson, Don
Follmer, Frank

Instructor - Mr. Britton

School - University of Missouri, Rolla

"CREATIVE PARK"

Designer -

Instructor - Unknown

School - Southern Methodist University

"INTERIOR ENVIRONMENT CONTROL SYSTEM FOR LOW COST HOUSING"

Designers - Gardner, Paul
Kolb, Paul
Talaga, Robert

Instructor - Unknown

School - University of Illinois at Chicago Circle

HONORABLE MENTIONS (Continued)

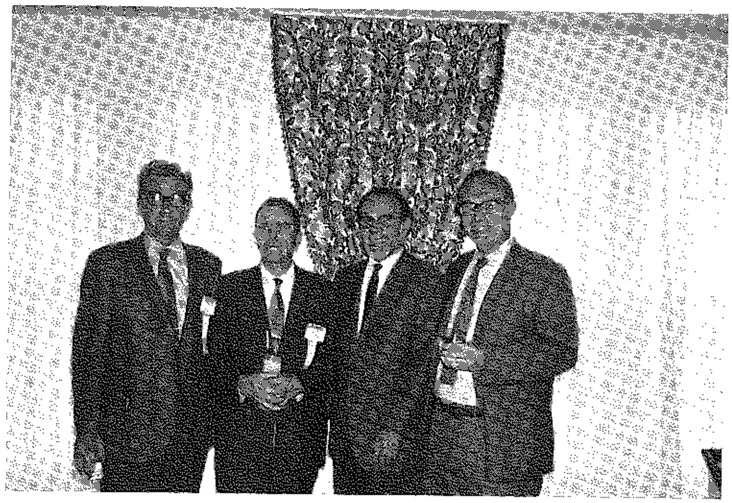
"AUXILIARY DOORBELL SYSTEM"

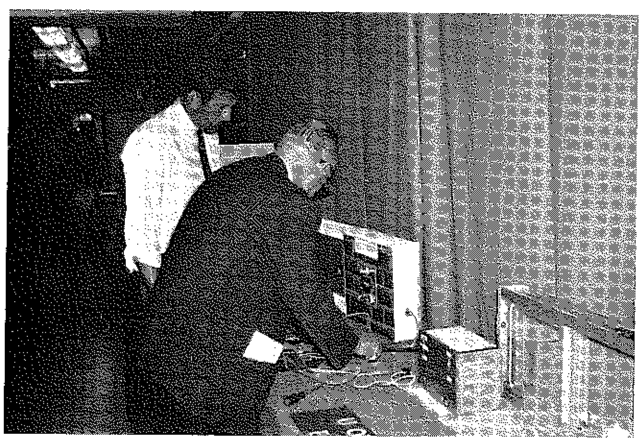
Designers - Schwartz, Barry
Dohlman, Dale
Hughes, Wayne
Mitchell, Dave
Pearson, Dave
Bender, Steve

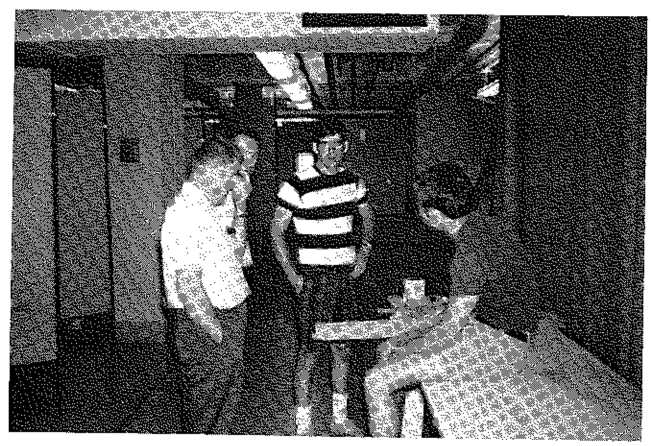
Instructor - Unknown

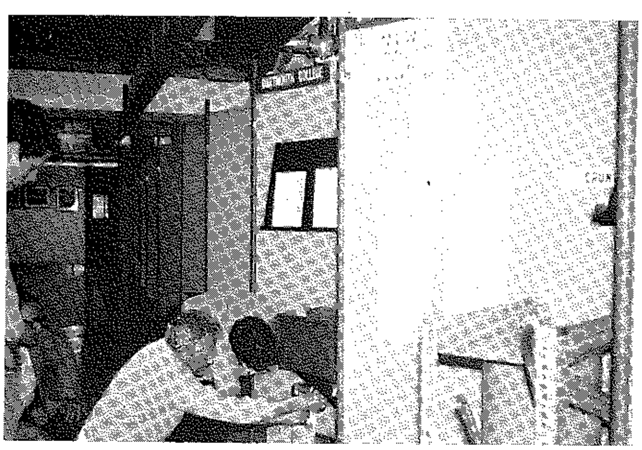
School - Iowa State University

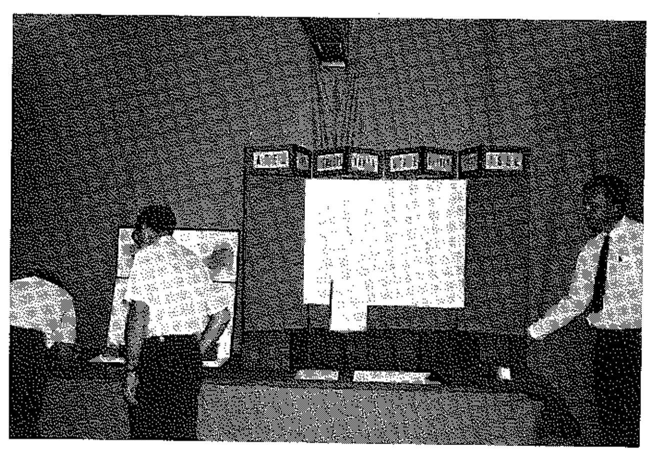
Preparation and Perspiration



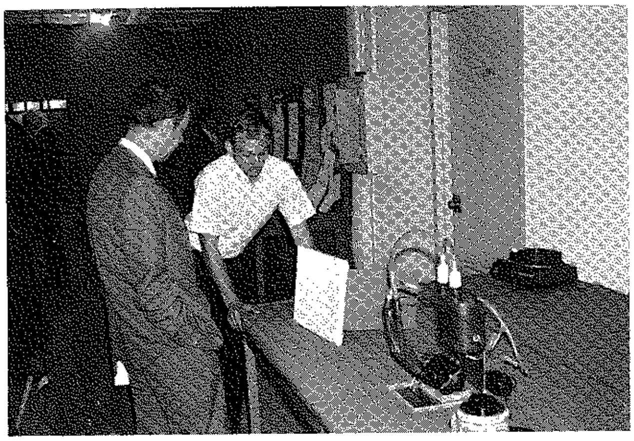


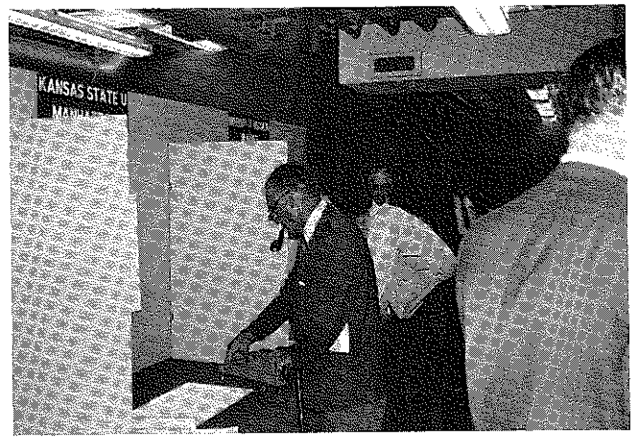


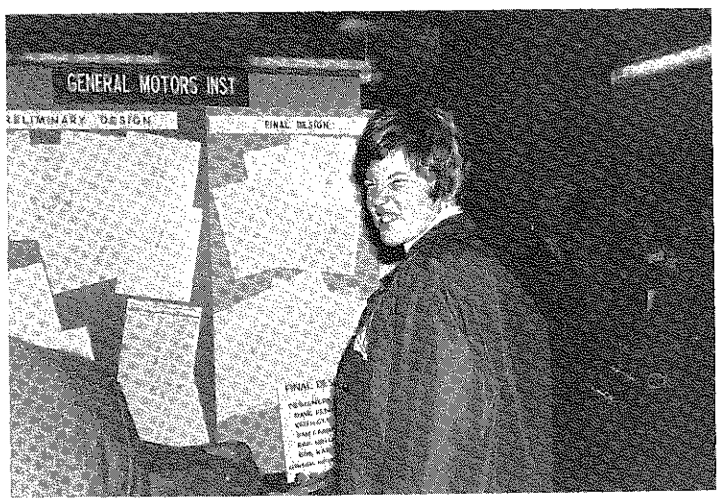


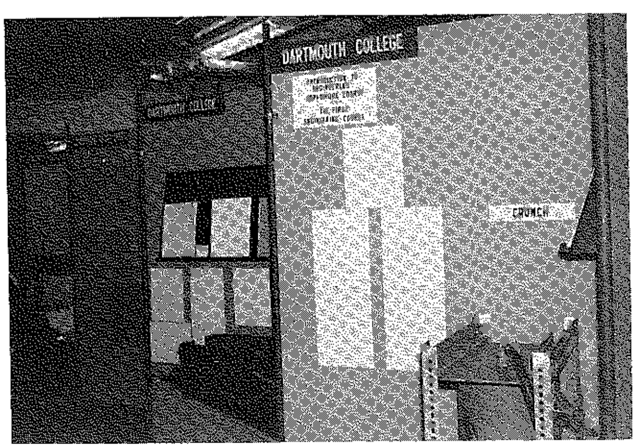


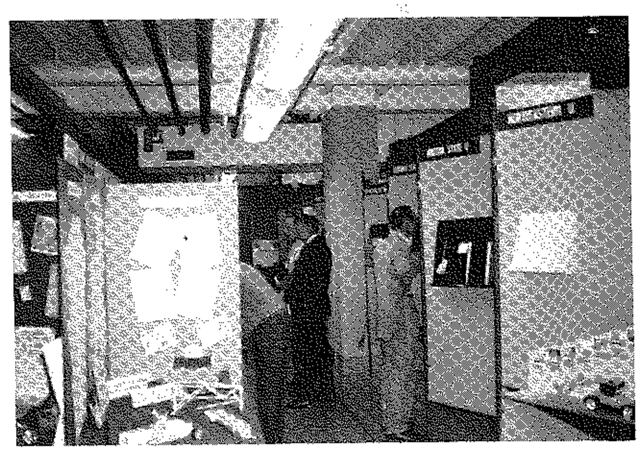
Displays



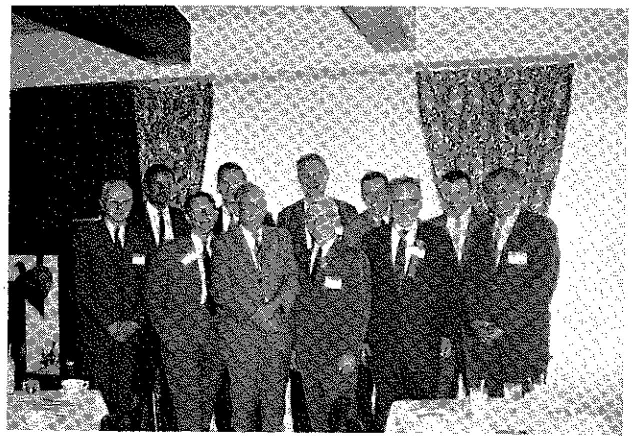

KANSAS STATE U

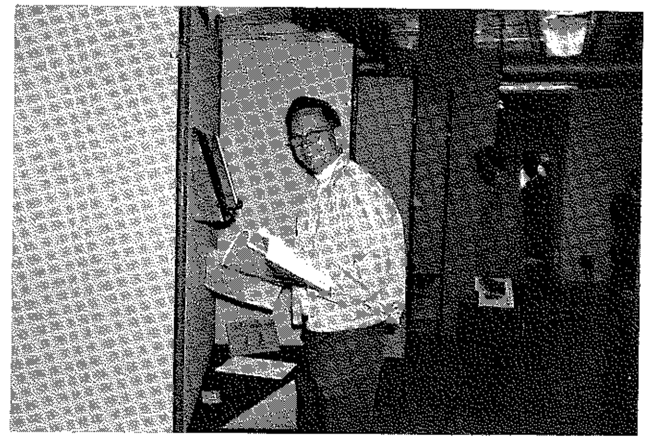

GENERAL MOTORS INST
FINAL DESIGN

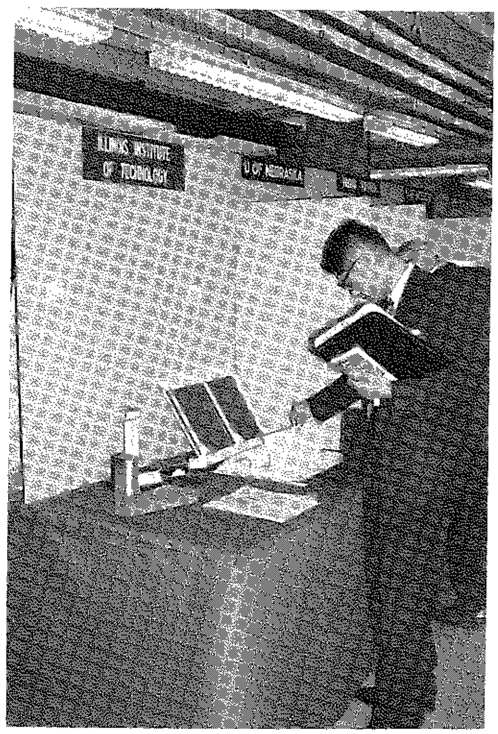

DARTMOUTH COLLEGE
CRUNCH

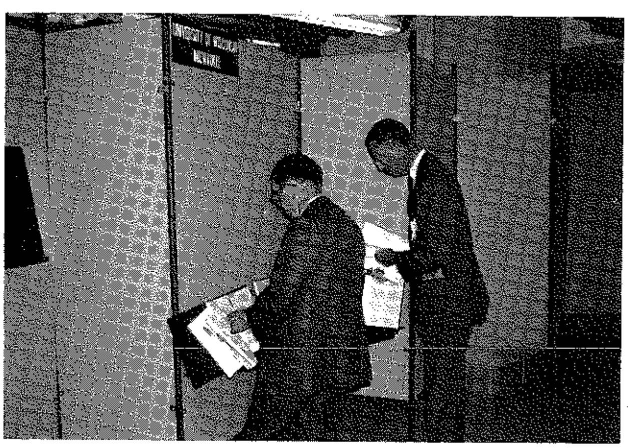


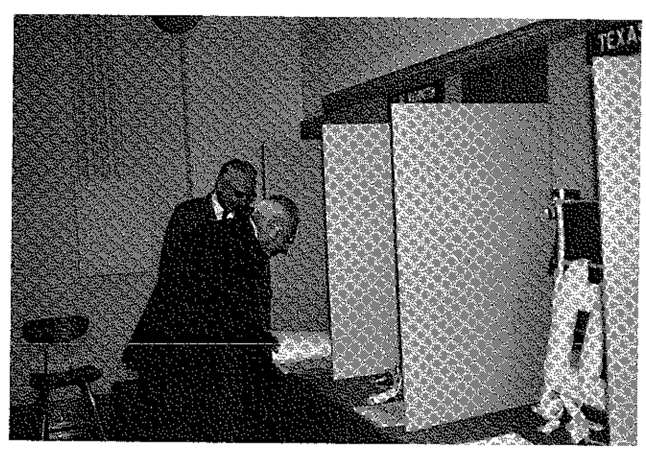
Judging



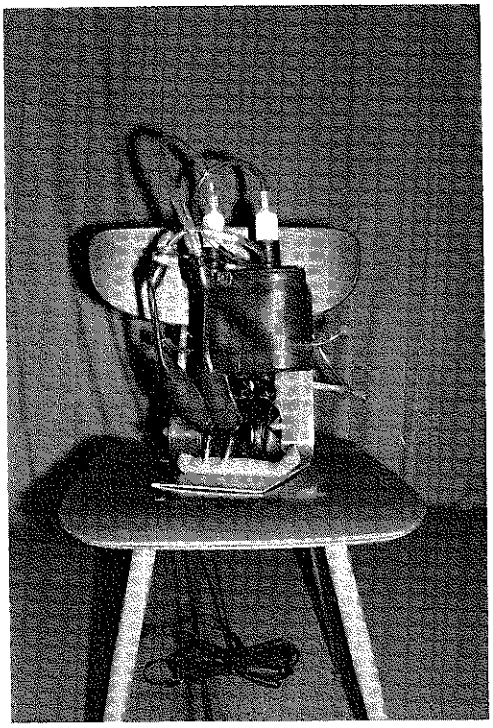


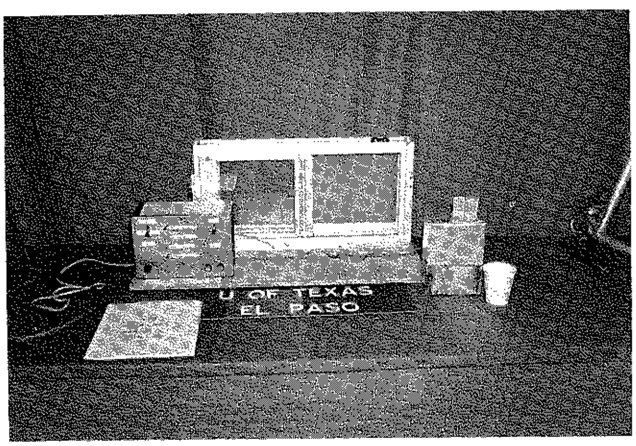


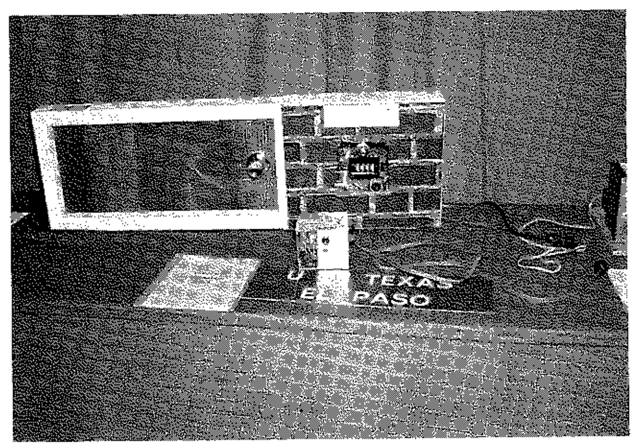


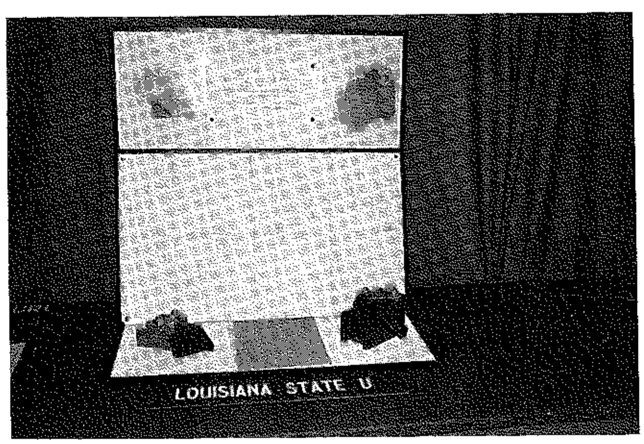


Award Winners









Just Published!

ENGINEERING WRITING

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

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

ENGINEERING DESCRIPTIVE GEOMETRY
Theory and Application

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

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

Notes on Graphical Calculus and Vector Analysis

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

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

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THE ENGINEERING FUNDAMENTALS SERIES

Developed by
Virginia Polytechnic Institute

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

Graphics—Books I, II, III

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

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

An Introduction to Computers and Elementary Fortran—Book IV

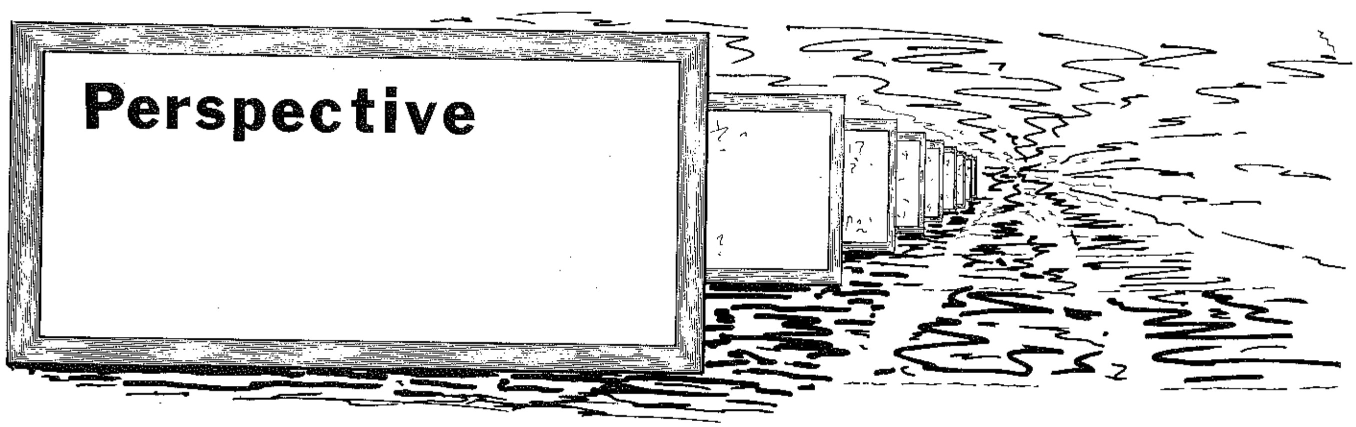
Robert C. Heterick and **James H. Sword**
Virginia Polytechnic Institute

1969—$3.25

PROBLEMS IN ENGINEERING GRAPHICS
Series B

Billy R. Henry, Lamar State College of Technology

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



Dr. Clair V. Mann

Dr. and Mrs. Mann

On March 4, 1970 at Washington, D.C., a special citation for outstanding work in the field of land surveying was presented to Dr. Clair V. Mann, of Rolla, Missouri, a former (1940) Chairman of the Engineering Drawing (Graphics) Division of A.S.E.E. The citation was presented by Dr. Charles M. Andregg, President of the American Congress on Surveying and Mapping.

This "congress" is one of the nation's topmost technical associations. Its membership is composed of those of topmost level in the professions of surveying, engineering, mapping, and world-wide geodesy. The members live both in America and abroad - in Europe and elsewhere.

The citation - an exceptionally high honor, and the fourth ever given by the Congress, is beautifully engraved on a polished brass plate mounted on a handsomely shaped walnut plaque measuring 10 x 14 inches. It reads as follows:

"American Congress on Surveying and Mapping. This Citation, to Dr. Clair V. Mann, in recognition of his long and dedicated service to the land surveying profession, and for his outstanding work in developing the State Land Surveying Authority of Missouri, is presented at this 30th annual meeting, March 4th, 1970."

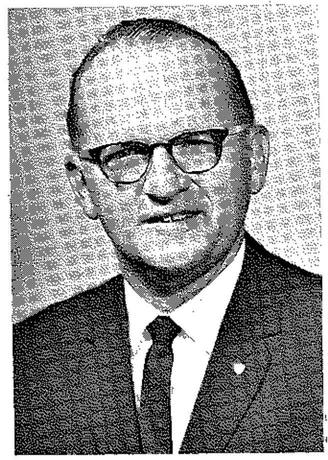
Dr. Mann was one of the two Council Members of the old S.P.E.E. (now A.S.E.E.) (with Dr. Thomas E. French) who, in June, 1928 at the S.P.E.E. annual convention at University of North Carolina, Chapel Hill, took the Drawing Division's proposed "constitution" and plan of organization to the full S.P.E.E. Council, got it approved, and thereby organized the FIRST of the (now several) "divisions" of the S.P.E.E. (A.S.E.E.). In 1944, he was also instrumental in the creation of the Society's division of "tests" (Educational Methods).

Dr. Mann was the first to urge the creation of the Journal of Engineering Drawing (Graphics), and managed to have it established at Madison in June, 1936. He, with Professor Fred Higbee and John Russ, served as the first editorial staff. He was editor-in-chief for 1939-40.

Since then, Dr. Mann has written more than 1,000 technical, educational, and historical documents, among which is the 1040 page History of Missouri School of Mines, published in 1941. He has some 800 pages now written of a 1,000 page history of Rolla, Missouri. His many such books and documents are being collected both by Missouri State Historical Society and by the old School of Mines, Rolla, in separate "Clair V. Mann" collections. Mrs. Mann has, throughout the years, closely collaborated with Dr. Mann in all these endeavors. They have received numbers of other citations - and also a number of honorary life memberships in outstanding societies, state and national.

L. C. Christianson

The Arthur L. Williston Award in Technology Education



Jerry S. Dobrovolny

This award has been presented since 1964 in recognition of the publication of a highly significant article, pamphlet, or book in the field of technical institute education. Awards of $250 and $150 are granted only when publications are adjudged worthy. Funds came from a gift of the late Arthur L. Williston.

Jerry S. Dobrovolny, Professor and head of the Department of General Engineering at the University of Illinois, Urbana, has written numerous papers pertaining to engineering technology education, including such areas as teacher preparation, administrative structure, curriculum structure, and semantic differentiation. More recently, he has become a consulting editor for a new professional journal devoted to technical education.

Since 1957, Professor Dobrovolny has been active in engineering technology developments in the United States. He is considered a leader in significantly changing the curriculum in general engineering and in identifying needed changes in the preparatory programs for teachers of technical education. He has directed eleven summer institutes and five Academic Year Institutes funded by the National Science Foundation. These institutes provided an opportunity for nearly five hundred participants to upgrade their subject matter competence as well as to develop a sound philosophy of technical education.

Professor Dobrovolny has worked closely with the U.S. Office of Education, directing three curriculum projects resulting in published curriculum guides and chairing the committee on technical education aspects of the project on Standard Terminology for Instruction in State and Local School Systems.

In Illinois, he has worked with junior colleges to develop sound programs in engineering technology. He directed four curriculum projects and two studies of engineering manpower needs under grants from the State Board of Vocational and Technical Education.

He is a member of the Technical Institute Division and the Engineering Design Graphics Division of ASEE and is past president of the American Technical Education Association. Recently, he has been chairman of the committee on civil engineering technician and technology education of the American Society of Civil Engineers.

As a Fellow of the American Association for the Advancement of Science, he has worked closely with the Commission on Science Education on several programs on the relation of science education and technical education. He has worked with the Engineers' Council for Professional Development in accrediting programs of engineering technology.

He holds both a bachelor's and master's degree in engineering from the University of Illinois. He is a registered professional engineer, and among his honors has been an appointment by the Governor of Illinois to the Illinois Advisory Council on Vocational Education.

TWO NEW PROGRAMS at the UNIVERSITY of ILLINOIS

New Program in Environmental Quality and Improvement

Why Engineers? In the growing realization that the nation and the world need to deal promptly and drastically with rapidly-cumulating environmental problems, a new and highly-promising field of people-oriented engineering has opened up. These problems include:

* Food supply and land availability;
* Atmospheric and water purity;
* Livable, enjoyable, aesthetically pleasing, well designed structures, effectively distributed;
* Location of production facilities;
* Planning of cities and towns;
* Speeding of transportation;
* Conservation and improvement of natural and artificial resources for recreation and high-quality living.

In preparing engineers to deal with these problems, the Department of General Engineering at the University of Illinois in Urbana-Champaign, through its engineering design courses and student-faculty activities in behalf of environmental advances, has received widespread favorable national recognition in various media.

To support and extend this effort in depth, a Field of Concentration in Environmental Quality has been organized under the "umbrella" of General Engineering. Some eight courses, totaling nearly thirty semester hours of credit, have been identified in various cooperating departments. Of these about half can be substituted directly in the curriculum, and the rest can be added as electives.

With this solid base of interdisciplinary subject matter plus a senior design project devoted to solution of specific problems in environmental improvement, a graduate in General Engineering has both the design experience and the theoretical background for continuing study in any of several advanced fields.

Within engineering itself, studies of pollution sources and emission mechanisms, processes of diffusion, and methods of control are part of atmospheric sciences research. In this field General Engineering has mounted and operates a significant laboratory effort in conjunction with the University-wide Center for Atmospheric Studies.

In applying engineering training to non-technical lines of development, possible fields include architectural urban and regional planning, social theory branches such as sociology-anthropology or psychology, landscape architecture and environmental design, urban and regional planning, recreation and parks facilities, programs, and activities, town and rural community planning or services, and other specific aspects of living-quality and environment.

Student Contributions: A student-staff team from General Engineering, with cooperation of students from Landscape Architecture and the College of Law, has made important moves within reach of the University. Most significant of these, perhaps, has been a small-scale example of upgrading natural resources within a densely-populated area. This project has involved reclamation and recreational planning for Boneyard Creek, an open, highly-polluted sewer, once a beautiful, lazy, tree-bordered stream running through the University precincts and the cities of Champaign and Urbana. With faculty backing, and with help from the local sanitary district, student groups sparked by engineers have conducted outstandingly successful cleanup and publicity campaigns. These groups are now engaging in pollution-identification, reduction, and control studies, in conjunction with the cities and other agencies involved.

In redesigning this neglected but potentially valuable green-belt resource, the engineering students are demonstrating the runoff capacity, aesthetic, and economic advantages of landscaping. This contrasts with the horrors of sheet-piling and box-culverting at great expense what otherwise can be a delightful human refuge. When completed, the stream-area improvement promises a highly-pleasing contrast in an otherwise stark horizon of brick and concrete. This project alone will add greatly to the livability and attractiveness of the engineering quadrangle. Environmental improvement begins at home!

Engineers for the Future: For many such problems and solutions, engineers are essential as leaders or decision-shaping members of administrative and technical teams. Engineers have the potential breadth and capacity to make realistic yet tasteful plans and then to carry them into effective action. The education and training of engineers provide them the ability at once to visualize solutions and to communicate their importance and promise in persuasive terms for other professional disciplines as well as for the public at large.

Thus either for present or potential engineering students with interests in and concern for people, the environment, and a satisfying, rich quality of life for humans as a part of nature, an environmental degree program in General Engineering at Illinois-Urbana is a logical, challenging, and exciting prospect.

Graduate Study: For those who already hold engineering degrees and who are looking for professional identity and purpose, or for graduates in other fields who are interested in engineering, the Department of General Engineering is evolving a project-design-oriented master's degree program involving other cooperating engineering departments. Background in these areas, with a thesis and design effort in environmental studies as a focus of specialization, represents a confident step toward engineering careers for improvement of human living.

A.S.E.E. in 1971; The U.S. Naval Academy

The 79th annual meeting of the American Society for Engineering Education will be held from June 21 through 24, 1971, at the United States Naval Academy, Annapolis, Maryland. The scene of this meeting, and the 9th Annual Exhibit of Educational Resources, is the recently completed Science Building, Michelson Hall, named in honor of Albert A. Michelson, a Naval Academy graduate in the Class of 1873. He was destined to become the first American Nobel Laureate in the physical sciences.

The Naval Academy is ideally suited as a scene for a meeting of the ASEE. Historic Bancroft Hall will provide residence facilities for attendees and their families. Thus attendance at the annual meeting can be combined with an interesting, and informative, visit to the United States Naval Academy.

Annapolis, the capitol of Maryland, is one of the most picturesque and historically interesting cities in America. The grounds and buildings of the U. S. Naval

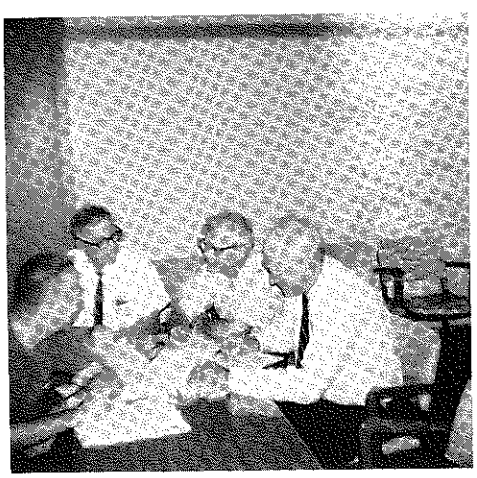
Academy occupy a beautiful 302 acre site on the south bank of the Severn River.

Annapolis is known not only for the U. S. Naval Academy and St. John's College but for its many colonial structures, both public and private, which transcend the years to show the life, architecture and culture which extends from pre-Revolutionary times. The only 18th Century waterfront on the Atlantic Coast is here. The historic sector of the city is a Registered National Historic Landmark.

Maryland, and surrounding territory, abounds in historical landmarks significant in the heritage of our country. Many Revolutionary and Civil War sites dot the countryside. Fort McHenry, located in nearby Baltimore, is the scene of the historic battle in the War of 1812 which inspired Francis Scott Key to write our national anthem. The Battle of Antietam, sometimes called the Battle of Sharpsburg, took place in nearby Virginia.

The newly developed 39,500 acre Assateage Island National Seashore includes Assateague Island and adjacent small islands. This facility is located on the Atlantic Ocean a little over 100 miles from Annapolis. Included is interesting Chincoteague Island, the home of the famous pygmy ponies whose ancestry legend attributes to horses stranded on the island as a result of a shipwreck.

All of this, and more, awaits you at the 79th Annual Meeting. We cordially invite you to discover America - to begin with Maryland - so much of America did.



GEOMETRY OF ENGINEERING DRAWING, Fifth Edition

George J. Hood, deceased, **Albert S. Palmerlee,** Professor of Engineering Graphics, and **Charles J. Baer,** Professor of Engineering Graphics, both of the University of Kansas. 469 pages, $10.95 | This book, continuing to emphasize descriptive geometry, has been expanded to include other graphic materials required in most contemporary curricula.

Special Features | Eliminates the use of projection planes and fold lines by a direct approach to the multi-view presentation and solution of problems in descriptive geometry. Changes its coverage from that of a descriptive geometry text (without eliminating descriptive coverage) to that of an engineering graphics text through the addition of chapters on section views, dimensioning, use of instruments, drawing techniques, photodrawing, and vectors. Places the hundreds of problems closer to their respective topics. Includes such other new items as freehand sketching, oblique pictorial views and problems, the Golden Rectangle and Fibonacci numbers, and the USASI engineering lettering alphabet and the alphabet of lines.

ENGINEERING AS A CAREER

Ralph J. Smith, Stanford University. 488 pages, $8.95 cloth; $6.95 soft | Through technical discussions, illustrative examples, and actual case studies, this text acquaints the reader with engineering as a career; outlines the qualifications, duties, and responsibilities of engineers; describes the engineering profession in terms of functions and branches; provides career guidance as well as motivation for the study of pre-engineering courses; and offers training in the philosophy and techniques of problem-solving. Two new chapters are devoted to creativity and decision-making.

ENGINEERING DRAWING WITH CREATIVE DESIGN, Second Edition

Hiram E. Grant, Emeritus, Washington University, St. Louis. 334 pages, $7.95 | This revised textbook can now be used independently of a workbook, for problems have been added. An extensive chapter on creative design has also been added, and a wide selection of creative design problems is included in the problem section.

PROGRAMMED GRAPHICS

William F. Schneerer, Case Western Reserve University, 608 pages, $10.95 | A programmed text designed for use as an aid in the teaching of engineering drawing. The text is developed on the premise that all students of technical drawing should be given a fundamental approach to the subject—the engineering-science oriented approach. Emphasizing communication by graphic means rather than the details and conventions of mechanical drafting, it covers: orthographic projection, pictorial drawing, drafting standards, descriptive geometry, and graphic mathematics.

ANOTHER GEOMETRIC SOLUTION FOR PROBLEMS INVOLVING SPECIFIED ANGLES

PROFESSOR AL ROMEO
The Ohio State University
Department of Engineering Graphics
Columbus, Ohio

In an article entitled "Solution to a Class of Problems Involving Dihedral Angles" (1), the author utilized an ingenious and unique modification of rotation in the graphical solution of a problem of dihedral angles. This solution suggests a number of possibilities that warrent further exploration, study, and perhaps other applications.

There is an alternate approach to the solution to this problem utilizing a cone to define the dihedral angle (2). This method consists of constructing a right circular cone whose vertex, axis, base plane and limiting element (slant height) bear a unique and significant relationship to the problem statement. The problem cited in the earlier article, is as follows (Fig. 1): Given: Line AB and the H plane. Required: Through AB, construct a plane that makes an angle of 30° with the H plane, and is tilting downward in a southeasterly direction.

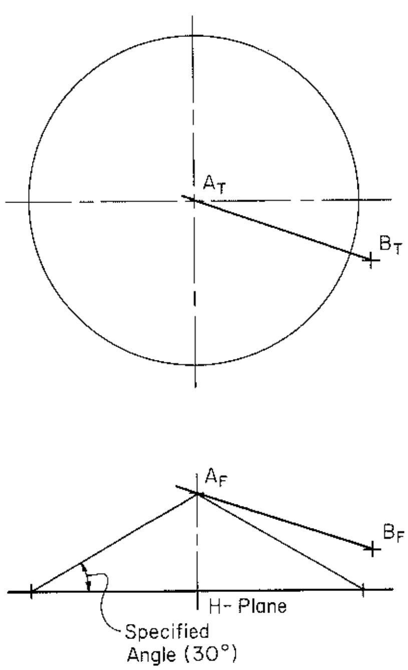


Fig. I

THE CONE METHOD

The cone used as the mechanism leading to the solution must have the element-base angle equal to the dihedral angle specified and its base must lie on or be parallel to the specified plane. Figure 1 demonstrates the basic problem layout with the specified cone superimposed.

The analysis at this point is as follows (Fig. 2): The dihedral angle of the two planes (WXY and XYZ) can be constructed or measured by identifying one line in each plane (RT and ST) that is perpendicular to and intersect on the line of intersection (XY) of the planes. The dihedral angle formed by WXY and XYZ is measured by the true size of the angle formed by the intersecting lines RT and ST.

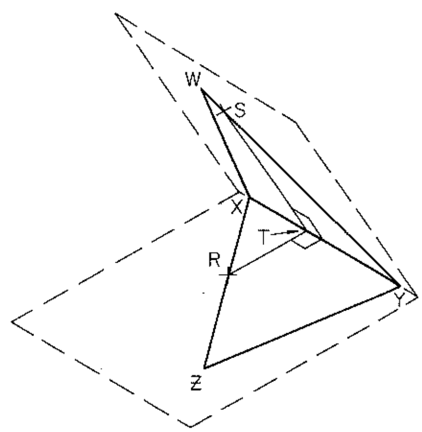


Fig. 2

Therefore, to complete the analysis of the original problem, one needs to identify the line of intersection of the planes forming the dihedral angle, and the two lines perpendicular to the line of intersection. The cone automatically provides all of these elements. For instance, if we extend line AB (Fig. 3) to intersect the base plane of the cone at point Z, we can construct a line, SZ, tangent to the base circle of the cone. This tangent line (SZ) will prove subsequently to be the line of intersection needed. The plane (AZS) formed by this line is tangent to the cone, since it passes through the vertex and contains a line tangent to the base circle. Since AZS is tangent to the cone, a plane-cone tangency relation requires that there be a common line that lies on the cone, and also lies on the plane. This common line (AS) is an element of the cone. This element, (AS) intersects the tangent line at right angles, therefore, the angle formed by AS with the base radius (or the base plane) is a measure of the angle formed by the plane AZS with the horizontal plane. However, since the cone was constructed so that all of the elements were at the specified angle, than the plane AZS is the required plane which makes a specified angle with the horizontal plane. Obviously, the line SZ lies in both the horizontal plane and plane AZS and, therefore, SZ is the line of intersection between the two planes.

2. There is only one solution, if the given line (AB) makes the same angle with the specified plane as the specified angle, because the line (AB) will be an element of the cone and only one tangent can be constructed through one point on a circle.

3. There are two solutions to the problem if the line (AB) makes an angle with the specified plane smaller than the specified angle. In this case, it is necessary to specify which of the two solutions is desired. This specification can be suggested in several ways:

(A) Construct a plane which makes a thirty-degree angle with the H-plane and slopes down to the right and to the front.

(B) Construct a plane which makes a thirty-degree angle with the H-plane and whose strike line (Fig. 4) has a bearing less than 90° and whose dip is toward the south.

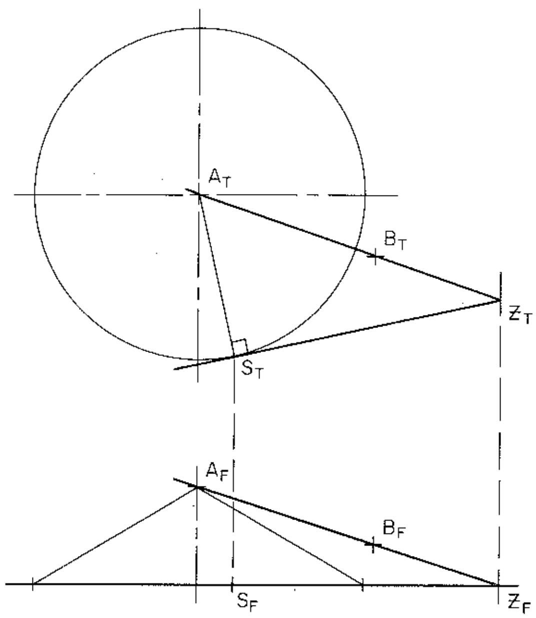


Fig. 3

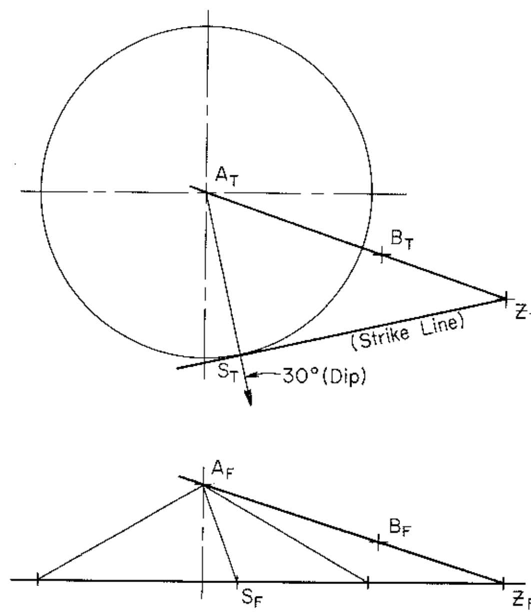


Fig. 4

SOME RESTRICTIONS

There are three observations to be made about this solution:

1. There is no solution to the problem if the given line (AB) makes a larger angle with the specified plane than the specified angle, because in that case the line (AB) will intersect the base of cone within the base circle. Therefore, since it is impossible to construct a tangent to a circle from a point within the circle, there is no solution.

OTHER APPLICATIONS

The cone method of solution to many problems involving specified angles is a very simple technique to use and deserves a much more widespread use than it currently enjoys. Some of the problems for which the cone method is appropriate and simple to use include the following:

1. Given two skew lines, construct a third line that makes specified angles with the given skew lines. A specific application involves two skew pipes for which only standard elbows or tees are available (for instance, a 45° elbow). Therefore, it

is necessary to specify the angle based on the availability of the elbow or tee. The two angles specified may be the same or may be different.

2. Given any two oblique planes, construct a third plane that makes specified angles with the two given planes. The specified angles may be different in magnitude, but the sum of the two specified angles must be between 90° and 180°. There are many specific applications for this problem in aircraft design involving rectangular duct work.

3. Lines making specified angles with a principal or oblique plane. An application of this problem most frequently occurs in drainage pipe lines, sanitary sewers, etc.

4. The most obvious application of the cone method is in determining the true angle between the oblique line and an oblique plane. Applications of this problem include struts of fixed wing aircraft, or a tripod (radio or TV tower) setting on a sloping plane. The typical solution to this problem requires three views in addition to the two given views. Using the cone method requires only two additional views.

5. The most elementary use of the cone method is in constructing the true length of a line (2, 4).

An alternate class of problems is determining the true size of an angle between lines and/or planes. The cone method (4) is applicable to these problems simply by using a reverse procedure to that given above.

SUMMARY

One additional advantage to using the cone method, is that it is easily integrated with the typical problem in representational drawing in which an object is rotated in space to provide an orthographic view in its new position. In fact, this approach is desirable when one wants to introduce the concept of isometric projection.

Lest one mistakenly assume that the cone method cannot be applied in the folding line system of orthographic projection, bury the thought. It is simply a function of recognizing in which two views the appropriate cone should be constructed. In most, if not all, conventional problems, the particular views of the cone which are required are: (1) the normal view of the base of the cone (point view of the axis); and (2), a normal view of the axis (true slant angle of the cone elements).

Hopefully, these comments will encourage a more widespread use of the cone method in the solution of problems involving specified angles of lines and/or planes (see ref. 2, 3, and 4).

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(1) Thorsen, Thomas, "Solution to a Class of Problems Involving Dihedral Angles", Engineering Design Graphics Journal, Winter 1970, Vol. 34, No. 1, Series 101.

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ADVERTISERS' INDEX

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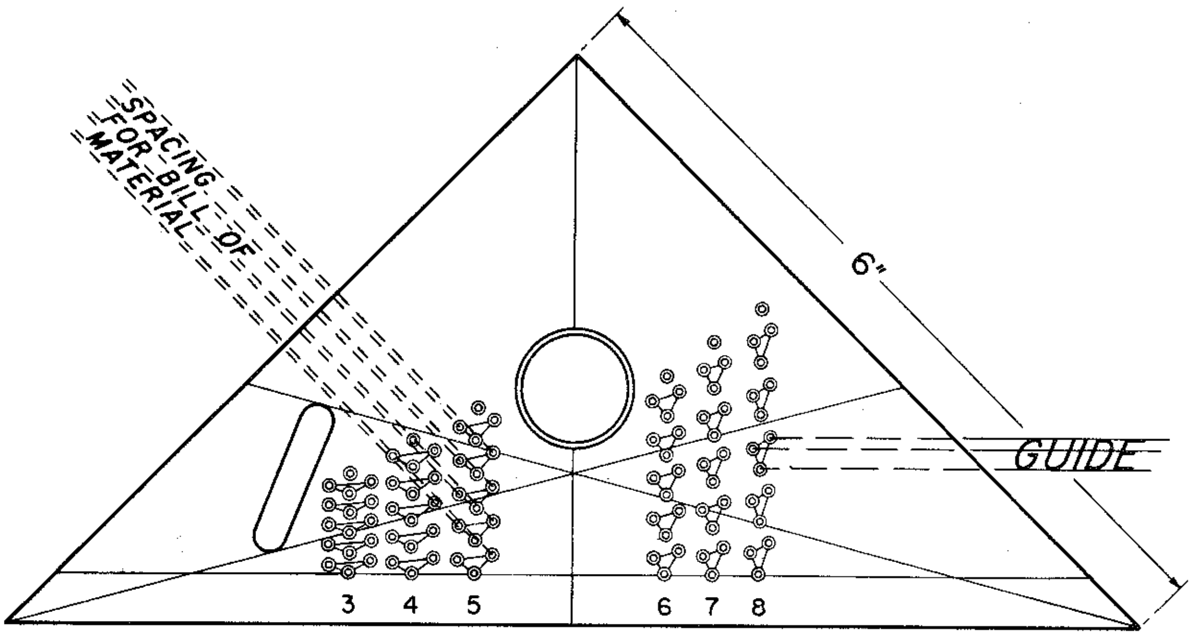

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INTRODUCTION TO ENGINEERING AND DESIGN

PROFESSOR F. A. MOSILLO
Engineering Graphics and Design
Systems Engineering Department
University of Illinois at Chicago Circle

The Chicago Circle Campus of the University of Illinois has a three quarter freshmen engineering conceptual design sequence (4 credit hours each) that is taken by all engineering students. Its purpose is to introduce the students to engineering as well as to integrate the basic sciences and forms of communication that are used by the engineer. The realization that we were producing young engineers who did not know what engineering was all about, or what it could be, prompted us to respond to the strong demand for the element of relevance in the student's education. The ultimate goal is to kindle an insight toward creative engineering analysis and design, as well as to obtain a professional attitude that will be beneficial to society as well as to the student.

ENGINEERING AND DESIGN I

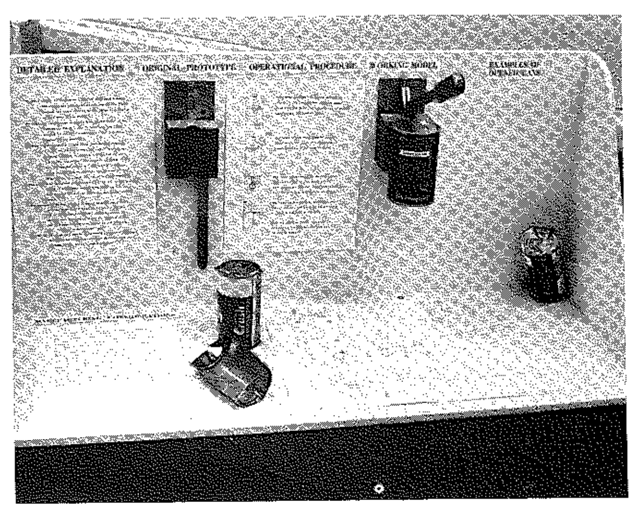
The first course introduces the students to the design process by a series of short design assignments and one major project continued throughout the quarter. The problems are chosen to stimulate the students' imagination, give practice in writing, and to show the need for the graphical forms of communication. With the needs of communication exposed, the students are less reluctant to learn the traditional engineering graphics material.

The course begins with the standard introduction to Design, Engineering, and the means of Engineering Communication (Graphics, Writing, and Mathematics). An important factor here is that the quarter design project is also assigned at this time and is to be carried on concurrently with the academic material of the course. More than one-third of the lectures are on the design process and about half of the lectures cover the standard engineering drawing and descriptive geometry material. However, two important factors must be noted. One is that the design project is continuing concurrently, and secondly, that the design experiences are contained in as many of the graphics problems as possible. Time is also spent on report writing, graphs, vector geometry, and other topics needed for the design of the quarter and/or topics to point out what engineering is all about.

ENGINEERING AND DESIGN II

The second course attempts to fulfill similar objectives as the first course, except it uses statics as its basic academic area. Design problems are chosen to stimulate the learning of statics, and since pure statics design problems are not always "pure", similar topics (such as strength of materials) are also learned by the students. An additional stimulus in the course is to have visiting industrial representatives speak to the students on the procedures and problems of design in the real world.

The means of introducing the design element into this course is the most difficult and varied of the three courses. This is due to several reasons, one of which is that 75% of the course is earmarked for statics. This could produce a 3-hour credit course in statics and a one-hour credit course in design, rather than a 4-hour credit course that is integrated. This is the problem of most texts that attempt to integrate graphics and design, and more than likely reflects the lack of effective integration at other schools. Another problem which was stated above, is the absence of "pure statics" in any design problem. The problems, however, are not a detriment to the course, but actually an asset in allowing more flexability and teacher stimulation.



Can opener that forms a spout.

Variations take the form of quarter long problems, a series of short problems, case studies, and others still under consideration including combinations of those mentioned. The case study is one way of getting the students involved in an experience of some engineer solving a problem. Guest speakers do somewhat the same, except the student involvement isn't as extensive. The several short-problem method (one of which could be a case study) seems to be quite successful in that it can be used to incorporate the different areas of the statics parts of the course. Regardless of what method is used, integration of the engineering sciences is the key to a successful course.

Door that stops at any position.

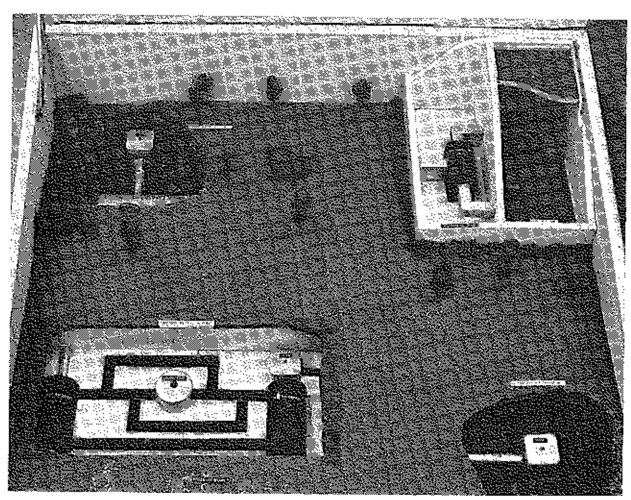
ENGINEERING AND DESIGN III

The third course consists of one complete design project for the entire ten weeks. Here we attempt to get away from the pure hardware problems, and expose the students to large scale many faceted problems. The students (in teams of 6 or so) choose a project that they wish to study from a general theme chosen for that particular quarter. Examples of themes used in the past are "Low Income Housing", "Air Transportation", and "Human use of Biotechnology". The students are expected to study not only the engineering problems of their project, but also the social interaction. The systems approach is used to make this massive undertaking possible.

The course begins by inviting experts on the theme from all over the country to lecture to the students. In the meantime the students are modeling their projects to be sure they are not overlooking anything. The students turn in three written reports (proposal, progress and final)

Display at Ohio State.

at relatively equally spaced intervals, and also present them orally. Throughout the course, lectures are given by visiting experts on the areas of design and techniques that the students need to examine their project. Project Management (with emphasis on PERT), Economics, Project Evaluation, Optimization, Simulation, are examples of some of the topics presented. A few lectures are also reserved for topics on professionalism as well as patents by visiting lecturers experienced in these areas to make the course as completely fulfilling as possible in ten weeks.



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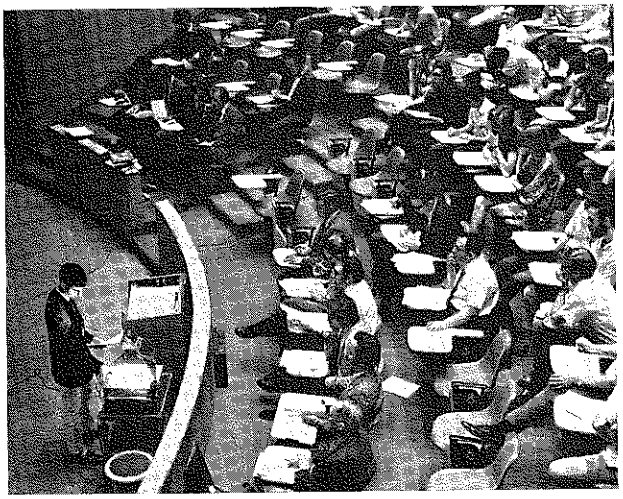
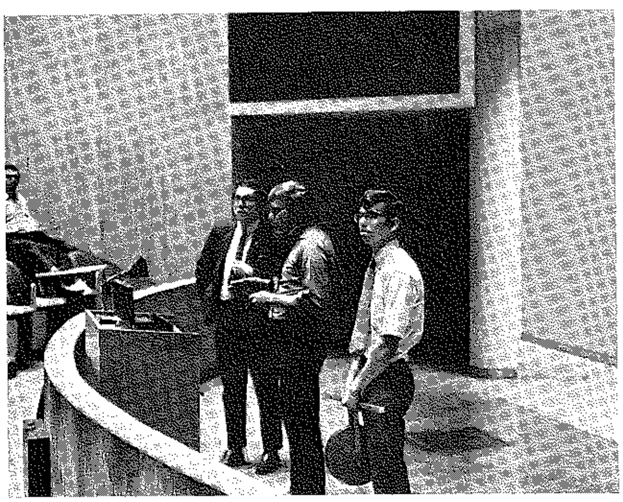
The final course in the sequence is expected to show the students the role of the engineer in a real life experience. Not only does he get exposed to the different academic disciplines, but also to industry. The students make numerous trips to libraries, speak with politicians, and visit industrial and/or business concerns during the progress of their projects. The students at first are filled with apprehension, but as they finish the year, they have an understanding and a feeling of accomplishment beyond what they thought they could ever reach. The community also has been exposed to the students and both have learned from the encounter.



Presentation of final project to group of judges and students.



Winning team (Theme: Environmental Control) Spring 1970. Giving their presentation. Project was cleaning up oil spills from off shore oil wells.

CONCLUSION

Before these courses, far too many students dropped out of "engineering" in their first year without ever being exposed to engineering. In completing this series of

Group picture of winning team alone.

freshmen courses, students will have been exposed to engineering and hopefully recognize whether or not their interests lie there. This approach gives students a realistic outlook at engineering while teaching them the fundamentals, as well as allowing them some freedom of exploration in their fields of interest. The variations as well as the pitfalls are many, but dare we retain the status quo in the face of declining enrollments in engineering while technology and social problems are on the increase?

- - - - - - - - - - - - - - - - - -

COURSE OUTLINES

Engineering and Design I

Contact Hours Lecture	Lab	
3		Fundamentals of the Design Process
7		Basic Principles of Orthogonal Theory and Conventions
4		Spatial Geometry
3		Fundamentals of Data Presentation
1		Short Creative Problems
2		Fundamentals of Modeling
	40	Laboratories covering above subjects
20	40	Totals

Engineering and Design II

Lecture	Lab	
8		Applicable Engineering Design Case Studies and Creative Design Projects
1		Introduction to Statics
7		Force System
7		Equilibrium
2		Friction
2		Centroids
3		Hour Exams
	20	Laboratory - Discussion covering above subjects
30	20	Totals

Engineering and Design III

Lecture	Lab	
3		Engineering Design Processes
3		Modeling, Analysis, and Evaluation
5		Substantive Discussion of Design Theme
5		Introduction to Analytic Methods (Optimization, Probability, and Statistics, etc.)
3		Role of the Professional Engineer in Society
1		Tests
	40	Laboratories - Preparation of Design Projects
20	40	Totals

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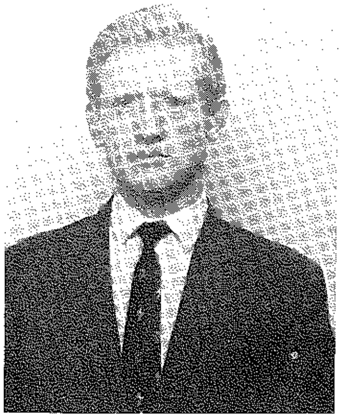
AUXILIARY PROJECTION



K. A. POCOCK
Senior Lecturer in Mechanical Engineering
The St. Helens College of Technology, St. Helens, Lancashire

When producing a scaled pictorial projection of a three-dimensional object, it is easy to draw an isometric. For an isometric the scales on all three principal axes are the same as are the angles between the axes. But such views are not always convenient, e.g. the isometric view of a cube is confusing.

The following tables give the scales along the principal axes and also the angles between those axes for a complete range of second auxiliary views. Thus such views can be produced without the necessity of drawing the first auxiliary.

The tabular values given are related to the orthographic views as follows:

The scale of the axes is given by the ratio of the length of each axis in the second auxiliary view to its length in the orthographic view (its true length) i.e. Scale of x-axis $= \frac{O_2X_2}{OX}$ and similarly for y and z.

Although it may appear that a full range of values of θ and ϕ is not given, any other angles may be obtained by suitable transposition, e.g. if $\theta = 80^\circ$ and $\phi = 120^\circ$ is required it can be obtained by making x = Y and y = X, $\theta = 10^\circ$ and $\phi = 60^\circ$. Using the tables the following is then obtained:

X scale	Y scale	Z scale	ZY	YZ	θ	ϕ
0.99622	0.87037	0.50000	$11^\circ.51$	$87^\circ.17$	10°	60°

$(\therefore\ ZX = 98^\circ.68)$

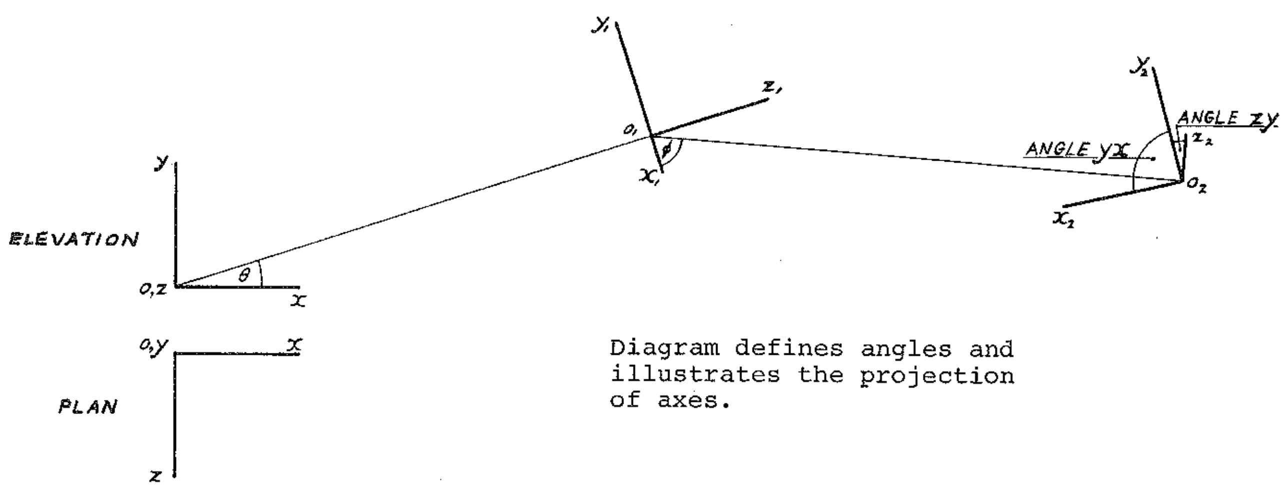


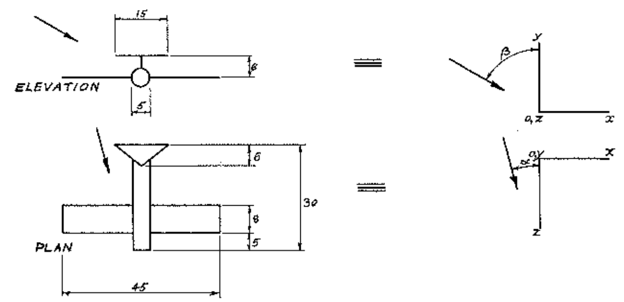
Diagram defines angles and illustrates the projection of axes.

Projection of Axes

Hence:

x scale	y scale	z scale	zy	yx	θ	φ
0.87307	0.99622	0.50000	98°.68	87°.17	80°	120°

An example of the use of the tables for producing a second auxiliary projection of a very simple object is given below:



It is assumed in this case that θ and φ are not known directly but that a view is required in the approximate direction of the arrow, i.e. slightly to starboard and above from the rear. Taking the orthographic axes x, y, z as shown it is seen that θ = 60° and φ = 70° will give a suitable view. (If more accurate determination of the view is required, some simple graphical geometry will give θ and φ. Theoretically θ = 90° − β and

$$\phi = \cos^{-1} \frac{\sin \alpha}{\sqrt{(\sin^2 \alpha + \sin \beta \cos^2 \alpha)}} .$$

This is the same view as θ = 30° and φ = 70° if the x and y axes are transposed. Thus from the tables:

Scale of x	Scale of y	Scale of z	ZY	YX
0.95513	0.98527	0.34202	61°.52	86°.91

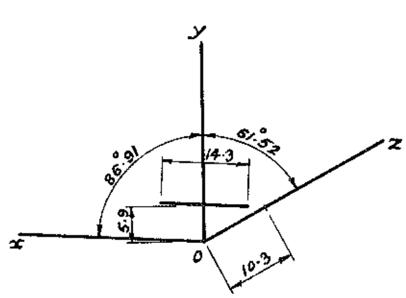
The scaled dimensions therefore become (to the nearest 0.1):

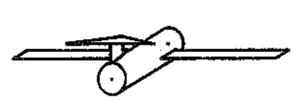
5) 15) 45) x0.95513 (4.8 (14.3 (43.0

5) 6) x0.98527 (4.9 (5.9

5) 6) 8) 30) x0.34202 (1.7 (2.1 (2.7 (10.3

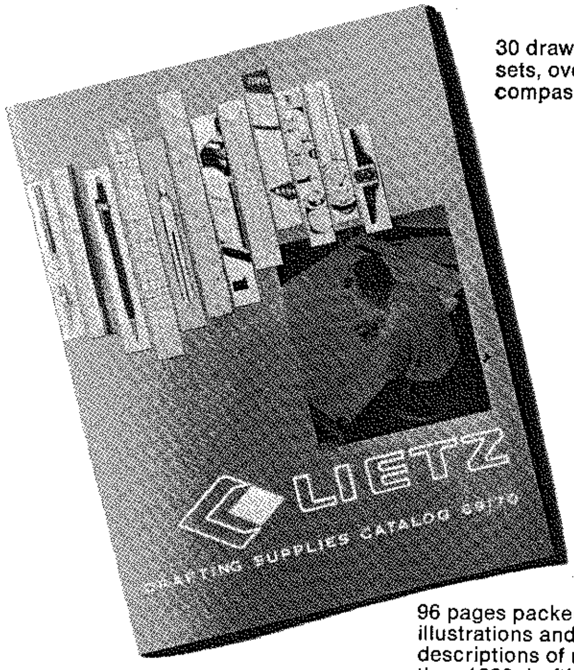
and hence the required drawing is produced thus:





The table gives scales of orthogonal axes and the angle between them, enabling a complete range of second auxiliary views to be obtained without constructing a first auxiliary.

Scale of x-axis	Scale of y-axis	Scale of z-axis	Angle ZY	Angle YX	θ	φ
1.00000	0.17365	0.98481	0.00	90.00	0	10
1.00000	0.34202	0.93969	0.00	90.00	0	20
1.00000	0.50000	0.86603	0.00	90.00	0	30
1.00000	0.64279	0.76604	0.00	90.00	0	40
0.98527	0.24372	0.98481	45.44	46.32	10	10
0.98660	0.37895	0.93969	27.27	66.18	10	20
0.98863	0.52213	0.86603	19.43	75.61	10	30
0.99111	0.65641	0.76604	15.34	81.13	10	40
0.99375	0.77413	0.64279	12.96	84.73	10	50
0.99622	0.87037	0.50000	11.51	87.17	10	60
0.99823	0.94157	0.34202	10.63	88.78	10	70
0.99955	0.98527	0.17365	10.15	89.70	10	80
0.94157	0.37895	0.98481	64.49	29.12	20	10
0.94695	0.46933	0.93969	46.78	50.32	20	20
0.95513	0.58115	0.86603	36.05	64.26	20	30
0.96507	0.69413	0.76604	29.52	73.65	20	40
0.97553	0.79697	0.64279	25.41	80.17	20	50
0.98527	0.88275	0.50000	22.80	84.70	20	60
0.99313	0.94695	0.34202	21.17	87.71	20	70
0.99823	0.98660	0.17365	20.28	89.44	20	80
0.87037	0.52213	0.98481	73.26	22.46	30	10
0.88275	0.58115	0.93969	59.36	41.81	30	20
0.90139	0.66144	0.86603	49.11	57.00	30	30
0.92374	0.74825	0.76604	41.93	68.43	30	40
0.94695	0.83073	0.64279	37.00	76.85	30	50
0.96825	0.90139	0.50000	33.69	82.87	30	60
0.98527	0.95513	0.34202	31.57	86.91	30	70
0.99622	0.98863	0.17365	30.38	89.24	30	80
0.77413	0.65641	0.98481	78.31	19.98	40	10
0.79697	0.69413	0.93969	67.82	38.19	40	20
0.83073	0.74825	0.86603	59.21	53.55	40	30
0.87037	0.80971	0.76604	52.55	65.79	40	40
0.91065	0.87037	0.64279	47.61	75.13	40	50
0.94695	0.92374	0.50000	44.10	81.91	40	60
0.97553	0.96507	0.34202	41.76	86.49	40	70
0.99375	0.99111	0.17365	40.43	89.14	40	80



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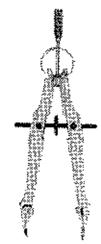

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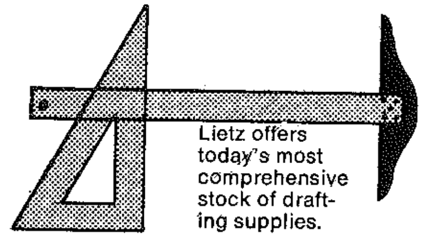

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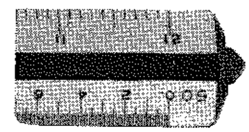

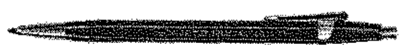

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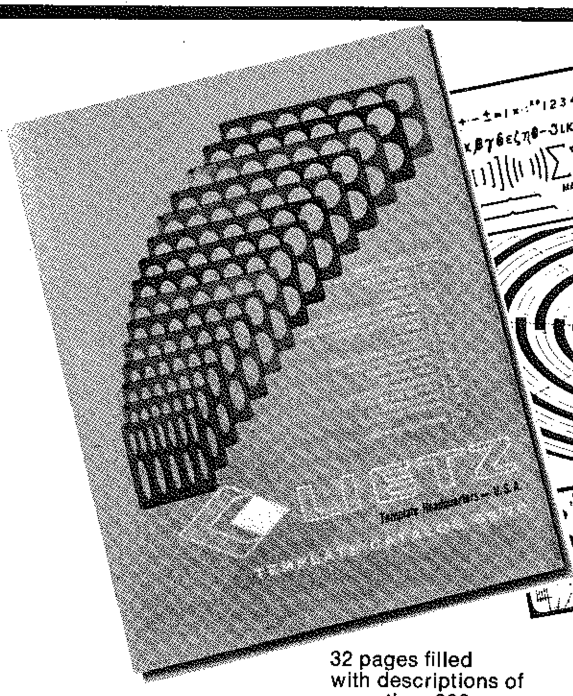

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ENGINEERING DESIGN IN PHYSICAL MEDICINE

PROFESSOR WILLIAM J. CROCHETIERE
Assistant Professor
Engineering Graphics & Design Department
Tufts University

Abstract

There are some 3 million handicapped persons living in the United States. This paper is concerned with the augmentation of impaired human function due to paralysis. The similarity between the design of "Man Amplifiers" and "Orthotic Devices" is drawn to illustrate the role that the design engineer can play in Physical Medicine. The problem of total rehabilitation is discussed with particular emphasis on environmental modifications to enable a severely disabled person to pursue a chosen vocation.

I. INTRODUCTION

Consider for the moment the many individuals among us who, because of a traumatic accident, a quirk of nature, or simply the result of old age are physically handicapped. In the United States alone there are estimated to be some 3 million such persons.[1] Because of their impaired function, they rely in many cases on other people, or on artificial aids to perform even the simplest of everyday activities. In the U. S. these individuals are treated and rehabilitated by that branch of medicine called Physical Medicine. Treatment of these paralyzing afflictions is generally prescribed by a team made up of the physiatrist, a social worker, psychologist, physical therapist, occupational therapist, orthotist/prosthetist (brace maker) and in some cases recently, an engineer. The function of the team is to decide on a program of therapy which will treat the condition and help the patient to lead a more productive and rewarding life despite his handicap. Each member of the team is then responsible for carrying out his role in the total rehabilitation of the individual.

Of course there have been several contributions to the area of Physical Medicine made by the engineer even before his appearance on the Physical Medicine Team. In the areas of therapeutic and diagnostic instrumentation alone he has made many significant strides. The purpose of this paper, however, is not to encompass all such activities for this would be indeed a mammoth undertaking. Rather this paper is concerned with the particular problems associated with impaired human function due to paralysis and some of the engineering solutions which have been implemented in recent years. Before proceeding with this discussion, however, I should like to digress for a moment with a cursory review of some developments in a particular area of technology which I believe has some relevance to the problem.

II. ASSISTING HUMAN FUNCTION

Closely associated with the problem of augmenting impaired human function, is the problem of magnifying the physical power of man (Man Amplifiers). These systems consist of a mobile structure within which the human directs the anthropomorphous motion of the machine. Properly coupled, the machine can be made to follow the operator's every motion at several times his output power level. The Peditulator is one such machine developed by the General Electric Company.[2] This robot-like device stands some 20 feet tall on two legs. Within the cab the operator stands with his legs coupled to the legs of the Peditulator. As he "walks" then so does the machine but at a more rapid rate. Expanding on this concept, the engineers at G. E. have also developed a "Walking Truck" in which the operator's arms and legs are coupled to the legs of the mechanical quadruped. The stability of the vehicle is thus improved and it is also capable of carrying a payload over previously impassable terrain.

The above mentioned units are, of course, quite large. The concept of a powered anthropometric system for the human has also been under investigation. A wearable exoskeleton has been developed at the Cornell Aeronautical Laboratory. The purpose of the structure was primarily to investigate the required degrees of freedom for mobility. Although external power has not yet been incorporated, the unit has shed some light on the subject of human locomotion in that it indicated that man can function satisfactorily even when certain of his degrees of freedom have been constrained.

During the same period that these industrial projects were underway, research groups made up of physiatrists and engineers were developing orthotic systems (systems to improve disabled function). In many ways they resemble the powered exoskeletons of industry. The main differences, of course, are the power levels involved and the mode of control. Notable among these is the Case Research Arm Aid.[3] Developed by a collaborative effort between engineers at the Case Institute of Technology and medical doctors at Highland View Hospital in Cleveland this system consists of a pneumatically powered, digitally controlled exoskeleton for the arm. Several modes of control for the five degree of freedom arm have been implemented ranging from the playback of preprogrammed motions to realtime computer control of the arm. At this time, it seems that one of the biggest problems in this development is the operator's inability to control all degrees of freedom simultaneously. As a solution to this problem, intensive research is currently being directed to the utilization of the electromyographic activity (EMG) from functioning muscles of the body as a possible control signal. The EMG signal because of its wide frequency range and its analogous function in the body appears to be well suited for this application.

A clinically applicable orthotic arm has been developed at the Rancho Los Amigos Hospital in Downey, California.[4] The "Rancho Arm" has 7 electrically powered degrees of freedom, each discretely controlled by a tongue switch. The operator displaces the tongue switch in either direction to actuate each electric motor. The hand in this way is brought to terminal end positions by a sequence of discrete joint rotations. Cumbersome as it may seem the Rancho Arm has been well accepted and is currently available commercially.

Both of the above described orthotic systems are powered by external actuators. Is it not possible to electrically stimulate the otherwise useless muscles within the limb to produce controlled motion? It has long been known that even paralyzed muscle can be made to contract by the application of stimulating electrodes on the skin overlying the muscle. The concept of a lightweight exoskeleton containing joint fixators and stimulating electrodes has been under investigation in recent years. Initial results include the evaluation of several feedback control schemes for elbow flexion.[5] Although some clinically applicable devices of this nature have been produced the concept of an orthosis totally powered by stimulated muscle is still in the research stages.

III. DESIGN PHILOSOPHY

The above mentioned orthotic aids for the paralytic have been directed toward what I term the VALET approach

Vital
Assistance for
Limited
Everyday
Tasks

That is, the design philosophy has been one of attempting to provide the means to enable the afflicted to feed himself, brush his teeth, comb his hair, etc. Many of these severely involved individuals, however, in addition to these desires, have aspirations of earning a living, for instance, as a writer, computer programmer, etc. Although their bodies are handicapped, their minds are still quite viable. In fact, it is even conceivable that because of the curtailment of some of their physical activities they may be able to develop their mental faculties more fully than they would otherwise. A comprehensive approach to assistive devices should not only include powered appendages but should also include the environmental facility for mental activity.[6] This approach might be called SEED for

Systems for the
Environmental
Enrichment of the
Disabled

His working environment should be modified in such a way as to provide him with every opportunity to develop in his chosen vocation.

IV. CUTANEOUS CONTROL OF APPLIANCES

At Tufts we have been concerned with the particular problem of providing remote control of electrical appliances within the individual's environment. A "Cutaneous Transducer" has been developed, which when mounted on an innervated part of the body monitors slight deflections of the skin accompanying skeletal motion. It consists of semi-conductor strain gages mounted on a flexible beam in a bridge arrangement. A voltage is produced which is proportional to the deflection of the beam. To evaluate the controllability of the transducer a tracking study was performed at the Tufts Rehabilitation Institute on three quadriplegic patients.[7] With the transducer mounted on the shoulder they were each able to track a 10 level staircase wave after only 10 minutes of practice. This success led to the development of a control circuit which allows the operator to control the power to any of 15 different appliances by merely shrugging his shoulder in a specific manner.

The logic is such that each appliance is assigned a four bit word designation (i.e. 1010). The output voltage of the transducer bridge is fed into a level sensing circuit which has the characteristic shown in Figure 1.

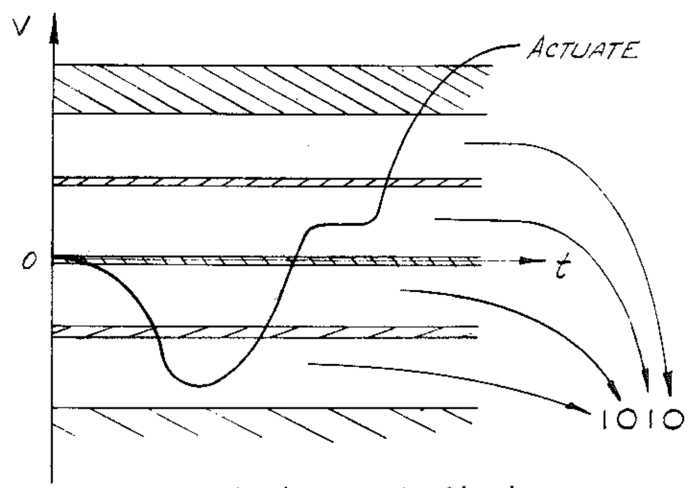

Fig. 1. Transfer characteristic of level sensor

If the output voltage is held within the lowest voltage band for a sufficient period of time (about 1/2 second) the first digit is a "1", otherwise it is a "0". The figure shows a typical voltage trace to turn on appliance 1010. Once the word is read in, the operator may actuate the command circuit by causing the voltage to exceed a large positive value. To turn the appliance off the procedure is repeated. The system has been evaluated by one quadriplegic who found it quite satisfactory. Work is currently proceeding to telemeter the transducer voltage to give the operator more mobility. Upon completion of this phase the operator will be able to move about his room in an electric wheelchair, for instance, and control his appliances without trailing wires behind him.

V. SUMMARY AND CONCLUSIONS

The problem of augmenting human function is currently being investigated in industry as well as the hospital. Although the goals of both groups are quite different, the systems which have evolved are strikingly similar and it will be interesting to see if the future developments in both fields remain on a parallel course. Concerning the problem of assisting the paralyzed, it would seem that orthotic devices, at least at this stage, can only partially solve the problem. Direct control of the environment as opposed to control through the manipulation of an orthosis has been presented as an alternate solution. Any complete solution to the problem, however, will require a great deal more research in areas that have scarcely been touched. Dr. Heinz Wolff [8] of the British Research Council has labelled research in these areas

Unglamorous
Research
Into
Necessary
Equipment

The problems associated with hygiene in the bathroom, the problems of dressing oneself, the problem of climbing stairs while in a wheelchair for instance are all very real and in need of solutions. Because they might be considered unglamorous should not detract one from working in the area for it is entirely possible that many of us here may at some time be in need of these very solutions.

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DESIGN IDEAS

Leg Brace

While recuperating from polio, the patient must learn to walk again. Although he (or she) is capable of bending the knee, the leg braces do not permit it. With the present brace designs the knee must remain rigid in order to properly support the leg. Hence it is difficult for a post polio victim to learn to walk again.

It is desirable to have a leg brace which will afford the necessary support to the leg and, at the same time, cause the individual to bend the knee in a normal manner.

Space Saver Garage

It is often necessary for a family to need two cars. One of these will probably be used by the man of the house to go to work while the other will be used by the lady of the house for such tasks as driving the children to school, shopping, etc. It is also very possible that a one-car garage is all that ground space permits.

Design a garage that would accomodate two cars and would require the ground space for only one.

Blackboard Cleaner

We are all familiar with our present dirty chalkboards. Even when they appear to beclean they are streaked, dusty, and discolored. The chalk rails are dust catchers causing chalk dust to cling to handkerchiefs as well as clothing. In spite of "new erasers", "dustproof chalk", and "eraser cleaning machines" the blackboard conditions remain with us

Design a blackboard cleaning system that will eliminate the streaks, dust, etc.

It's

getting around.

ENGINEERING DESIGN GRAPHICS

by James H. Earle, *Texas A & M University*

University of Minnesota . . . University of Houston . . . San Jose State College . . . Arizona State University . . . University of Illinois at Chicago Circle . . . and over 60 other colleges and universities have adopted ENGINEERING DESIGN GRAPHICS.

It's the only text with a design approach to teaching graphics. The content is structured to guide the student through the design process from problem identification to the design and analysis of his solution, including: team dynamics, gathering data, human engineering, patents, technical reports, oral presentation, and final implementation.

This text introduces engineering design through the applications of descriptive geometry and graphical principles at the freshman level.

757 pp., 1167 illus. $12.95 (1969)

Extra Dimension to Earle: Series of Problems Books

DESIGN AND DESCRIPTIVE GEOMETRY: PROBLEMS 1, 2, 3, 4,
by J. H. Earle, S. M. Cleland, J. Oliver, L. E. Stark, P. M.

Mason, N. Bardell, R. F. Vogel, J. T. Coppinger, and M. P. Guerard, *Texas A & M University*

1: 106 problems, paperbound, $5.25 (1967)

2: 123 problems, paperbound, $5.25 (1968)

3: 151 problems, paperbound, $5.25 (1969)

4: 111 problems, paperbound $5.25 (1970)

Teacher's Guides and Solutions Manuals, $1.50 each
These problems books are designed to introduce the student to the engineering design process through a series of engineering problems that are solved with descriptive geometry.

ENGINEERING GRAPHICS AND DESIGN: PROBLEMS 1, 2, 3, 4,
by Earle et al.
1: 179 poblems, paperbound, $5.25 (1967)
2: 201 problems, paperbound, $5.25 (1968)
3: 151 problems, paperbound, $5.25 (1969)
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ENGINEERING DESIGN GRAPHICS: PROBLEMS C, D,
by Earle et al.
C: paperbound, $7.95 (1969)
D: In press, paperbound (1970)
Designed for a one-semester program in engineering graphics, Problems C is a selection from the two Problems 3 books and Problems D is a selection from the two Problems 4 books.

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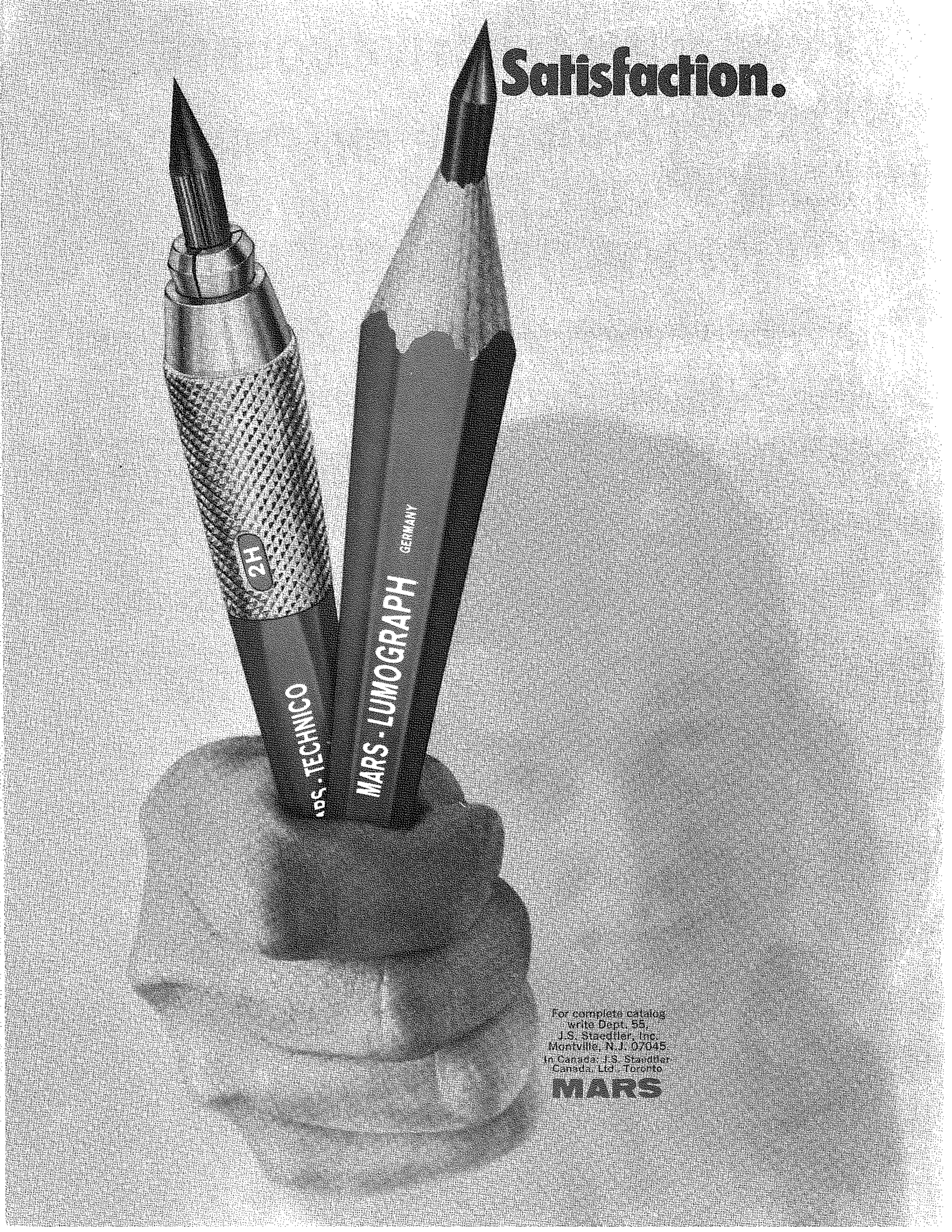
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AN ELECTIVE COURSE IN COMPUTER GRAPHICS

PROFESSOR EDWARD V. MOCHEL
School of Engineering & Applied Science
University of Virginia, Charlottesville, Virginia

Abstract

The purpose of the course is to acquaint the student with the types of graphical computer input/output devices and their many applications to engineering. The student primarily uses prepared programs available in computer memory which utilized an x - y plotter. The relationships between projection systems and matrix transformations are examined. In addition, data presentation and nomography are included. Some examples of student work are shown and conclusions drawn as to the success of the course.

I. Introduction

A. This course was taught for the first time during the spring 1970 semester. It was listed as a junior level course, 3 semester hours credit, with a prerequisite of an elementary knowledge of ALGOL. Seventeen students completed the course, several with a background of only six lectures on ALGOL as their computer background. The course attracted a very diverse group of students as follows:

4 aerospace	engineering	students
1 chemical	"	"
2 civil	"	"
3 electrical	"	"
2 mechanical	"	"
2 nuclear	"	"
2 engineering science		"
1 architecture		"
17	total	students

This list includes at least one student from every department granting undergraduate degrees at my institution.

B. Purpose. The purpose of the course was to provide an interesting and useful course which would (a) acquaint the student with the variety of graphical computer output devices and (b) their application to engineering and related fields. (c) To have the student use the x - y plotter for weekly assignments, and (d) to study common systems of projections and their relationship to matrix transformations. (e) Not to teach programming as an end in itself.

C. Text. No textbook was used for the course as I knew of no suitable text. Fortunately most of the students were familiar with matrices and had a textbook on matrix transformations which was used in the required second-year mathematics course. All the students also had taken a course in engineering graphics. Two footnotes on the schedule refer to articles distributed to the class during the semester.

D. Equipment. The only graphical output device available was a 10" Calcomp drum x - y plotter. However, 16 teletype units were also available throughout the engineering school for undergraduate use, and output of a graphical nature can be obtained using this type of device. The Calcomp plotter was run off line using a Burroughs 5500 computer with the plotting software written in ALGOL.

Auxiliary items which were very useful were permanent library magnetic tape and disk files. At the beginning of the course, 15 programs were put on the permanent library at the computer center. All a student needed to use these programs was a write-up describing the appropriate parameters, and in most instances, the programs could be run with less than a dozen additional cards to be punched.

The disk files stored 14 procedures which could be called in at any time to become a part of the student's program by inserting a single card into his program at the appropriate point.

E. Funds. The table below shows a breakdown of the computer expenses incurred for the course.

Computer processor	$32.50
Input/Output	32.50
Plotter	50.00

Thus, each student had consumed an average of approximately $125 for the entire course. This total could be lowered in the future to below $100 by more efficient planning and programming.

F. Syllabus. The material covered in the course lectures was as follows:

Week		Related Library Program
1	a. Introduction, explain procedures, discuss coordinate systems, assign 3D object, data formats.	TOANGL
	b. Rotation about 1, 2, and 3 axes, order of rotation, translation, projection systems.	
2.	Discuss isometric, dimetric, trimetric, perspective images, derive equations from geometry[1], 1, 2, and 3 point perspective.	TRIMET A2PERSP

3.	Compare regular perspective to spherical, cylindrical and other system, drawing curved lines on plotter.	SFEP DCFEP
4.	a. Matrix transformation, multiplication and inversion, assign a 2D object, rotate, magnify, shrink, shear, reflect 2D data with matrices.	TR22 MI22
	b. General case of reflection about a line thru origin, translation using matrices. Reflection about any line, rotation about any point.	TR23
5.	Three dimension matrix transformations for rotation about 3 axes, magnification, shear double shear, and combinations. Compare to 2D and to programs of weeks 1 and 2.	TR33A TR33B MI33
6.	a. Applications: rotation about line thru origin, reflection about a plane thru origin; general equations for line, plane; direction cosines.	
	b. Translation of 3D data, general case of reflection about any plane, rotation about any line in space.	TR34
7.	Perspective by matrix transformation, relationship between axes, object and image plane; homogeneous and non-homogeneous coordinates; discuss 4 elements of bottom row in TR44, possibilities and limitations of types of systems.	TR44 MI44
8.	Plot package's 10 procedures, linear graphs, procedure for using paydisk.	PAYDISK/ PLOTTER
9.	3 logarithmic procedures LOGAXIS, LOGSCALE and LOGSCALES, semilog and log-log graphs.	PAYDISK/ LOGAXIS
10.	Functional scales, conversion charts, parallel - scale nomographs[2].	PAYDISK/ FNSCALE
11.	Other types of nomographs, multiple scales, N charts, curved scale. Discuss individual project for last assignment, suggest possible areas.	
12.	a. Graphic output on teletype using BASIC, library programs and general procedure, other types of teletype output: lines, areas and shading.	PLOT PLOT9
	b. Discuss "building" concept using levels of generalization (parts=object, objects = assembly).	MOVE

---

[1] See "Computer Projections of 3D Objects," J. of Engr. Education, January 1969.

[2] See "Computer Produced Nomographs", J. of Engr. Graphics, Winter 1969

G. General Comments on Course Syllabus and on Student Work.

1. As you can see, the course consisted of approximately 3 main parts: geometry of projection, matrix transformations and data presentations.

In addition to the 12 weeks of lecture topics, the equivalent of one week was spent on each of 3 additional items:

1 week - quizzes
1 week - movies related to computer graphics
1 week - two guest lectures on computer graphics

This gives a total of 15 weeks for the semester.

The general organization of the course material involved a program with plotter output for each week in the course. The course began with programs formulated on the space geometry involved in projecting a set of points onto a plane using orthographic projection. The first assignment was to have the student "construct" a 3-dimensional object by punching a set of x, y and z coordinates on some data cards. Once this set of data was made up, it could be used interchangably in 9 different programs throughout the course. This saved the student from tediously preparing new data each week.

2. This is a copy of the sheet describing general procedure to be followed to in submitting a program at the computer science center. (See Appendix)

3. This is a typical program write-up in this case the program for drawing in perspective. The student has 9 parameters he may select for drawing each view. (See Appendix.)

4. This is an example of orthographic projection. This could be the product of a special program to draw trimetric views, or it could be the result of using matrices to operate on data. You may wonder why two different techniques were used to obtain essentially the same result. Each approach has its own advantages and disadvantages over the other. The advantage of a special program with a specific set of parameters is that unusual types of projection may be programmed such as spherical fisheye projection. This cannot be done using linear algebra. The disadvantage of a special program is that once written it has no flexibility. When matrices are used, an infinite variety of sequences of rotation, etc., can be performed. A special program just does a specified series of steps over and over again.

5. This output is from a program which automatically draws a top, front and side view after each manipulation of the object. The programs unfortunately do not eliminate hidden lines, and some visualization is necessary

to interpret the views.

6, 7. The next two examples show a gridded cube drawn in spherical fisheye perspective (SFEP), and straight lines generally turn out curved in this type of projection. Points in space are projected in perspective onto a sphere, then this image is transferred orthographically to a plane tangent to the sphere.

8. This 2D image is an example of a 2D object which a student could use to test the effect of matrix transformations.

9. This illustration shows the same data after 2 transformations have been performed on it. This is typical of the initial assignment in using matrices using a program named TR22. Using this program 2D data may be rotated, magnified, sheared or reflected by multiplying the x-y matrix by a 2 x 2 matrix.

If a 2 x 3 matrix is used, the view may also be translated, allowing rotation about any point in the plane and reflection about any line.

If the initial and final positions of the image are known, the computer will determine what overall matrix was used to effect the change in the image. This program which involves a matrix inversion is titled MI22.

Examples of 3D matrix multiplication yield results similar to orthographic and perspective programs. 3D objects may be rotated about all 3 principal axes, or about any line in space. They may be magnified, sheared, double sheared, reflected about any plane, and distorted in unusual ways.

10. This is an example of a log-log graph. In this assignment, many of the students in the class prepared graphs for inclusion in reports for other courses.

11. This is a simple conversion chart, in this case linear in both scales.

12. This is a non-linear nomograph.

13. This is an example of teletype output of a graphical form.

The different zones represent a contour map of the surface of an ellipsoid.

14. This is a student project. It represents a program which takes data, attempts to fit polynomials to it using a variety of degrees. It then computes the standard error for each try and plots all the results as shown. The equations were written on this plot by hand.

The size of the class was ideal for teaching this type of course, and the course ran along relatively smoothly. The students seemed very interested in the material and the majority of them worked hard. The projects at the end were particularly gratifying to me as they included some useful original results which will be helpful to others in this course in the future.

During the semester I made several changes in my programs and plan to make additional changes this summer, primarily to make them easier to use.

The programs I used were written during the past several summers as sort of a part-time hobby while I was teaching summer school. The Computer Science Center at UVa was helpful both with advice and by making grants of computer time.

A master book containing samples of all the programs used in the course was available at all times for student inspection.

In conclusion, I feel the course was generally successful in achieving its goals, and in addition, was an interesting and enjoyable course to teach.

APPENDIX

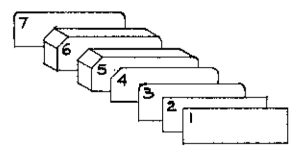
GR 302 COMPUTER GRAPHICS - Spring, 1970

School of Engineering & Applied Science
University of Virginia
Charlottesville, Va. 22901

DESCRIPTION OF PROGRAMS AVAILABLE ON LIBRARY TAPE AT THE COMPUTER SCIENCE CENTER

The following information pertains to the library programs using 3 D data: TOANGL, TRIMET, A2PERSP, DCFEP, SFEP, TR33A, TR33B, TR34B, and TR44.

The order in which a program is submitted.



1. White "Operator Request Card" with a PLOT sticker on it, and a check in the plotter box X. The number of blocks are specified for each program in its write-up.

2. Yellow "Header" card with LIBRARY in the right corner. Use program name as given in the write-up; use 001 and 002 minutes; account # is F1064WH; your name.

3. Orange CR DATA card, available prepunched.

4. First data card, format (13), giving the number of data cards in the deck which describes the object's coordinates. Example: 023 in columns 1, 2 and 3.

5. Deck of cards with the x, y, z coordinates (for example, 23 cards). The format is (13, X1, 3 (f6.2, X1), 12). Example: 004 +06.25 -03.75 +07.80 +2. The first 3 columns are not used in the program, but allow you to number your points. The next series of 3 numbers are the x, y, z coordinates in inches. The last number is a pen instruction.

+3 pen up	when going to this
+2 pen down	point (columns 1 thru
+1 no change from previous	27)

6. These cards are the parameters which determine what view will be drawn. See the program write-ups for specific details. All these data are given in free-field format. Example: 10, 5, 0.572, 0.360, 5,

7. Blue END card, available prepunched.

The following information pertains to the library programs using 2D data:

TR22 and TR23.

1, 2, 3, 4, 6 and 7. Same as above.

5. Deck of cards with the x, and y coordinates. The format is (x3, 2(F5.2, X1), 12) The first 3 columns are not used in the program, but allow you to number your points. The series of 2 numbers are the x and y coordinates in inches. The last number is the same pen instruction described in 5. for the 3D data.

A2PERSP

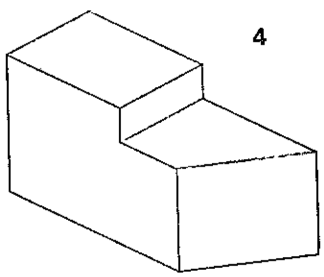
XO, YO, PSI, THETA, B, S, L, M, N,

9 parameters, all real

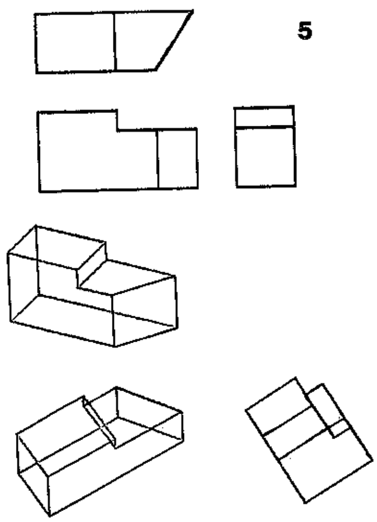
XO, YO	Coordinates in inches to locate the origin for each view. Each successive origin is located from the previous origin.
PSI, THETA	Angles of rotation about the Z and Y axes in that order, in degrees. The object rotates CW about each axis when the axis points toward the viewer. If both are zero, a top view results.
B	The distance in inches from the observer to the origin (located in the picture plane), measured along the Z axis.
S	A scaling factor. When S = 2, a half-size view is drawn.
L, M, N	Translation distances in inches in a positive direction along the X, Y and Z axes respectively. For example, N = -4 will drop each point 4" in the (new, final) direction.

Maximum points/view = 200
Number of views = no. files = no. blocks

4

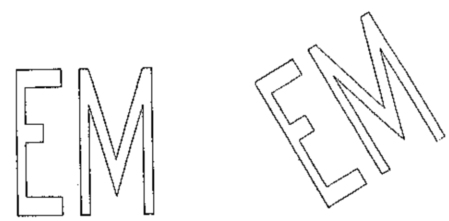


5



8

9



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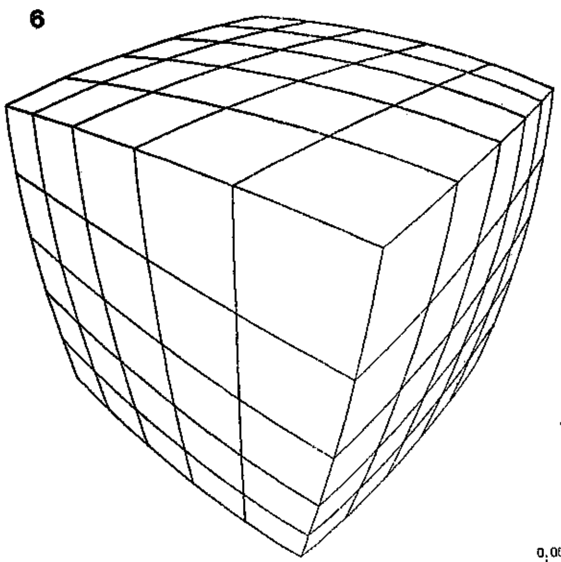

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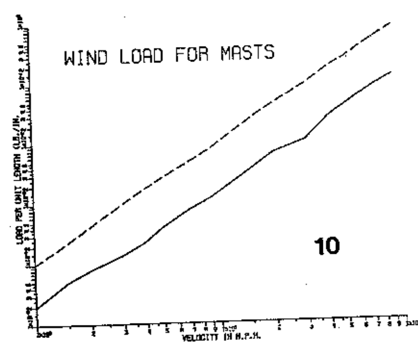

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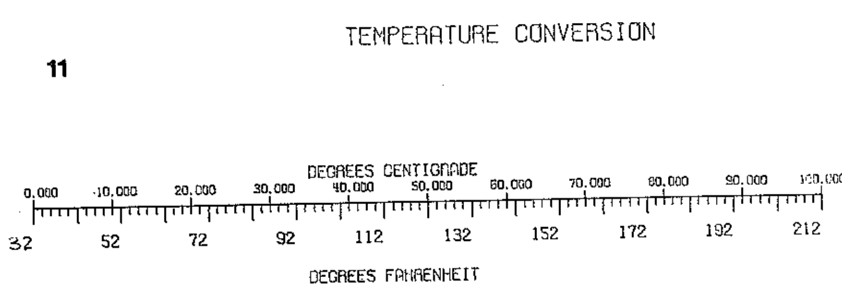

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March 1971 768 pp. Illus. $11.95 (33837-6)

TEACHING AIDS

Provides a wide assortment of exercises following each chapter including drawings required from pictorial representations, drawings required from assembly drawing of complete mechanisms, and completion type drawings.

A Teacher's Manual, **PROBLEMS IN ENGINEERING DRAWING**, 6th Edition (available in 1971), provides partially drawn layouts for completion and solution sheets for the instructor.

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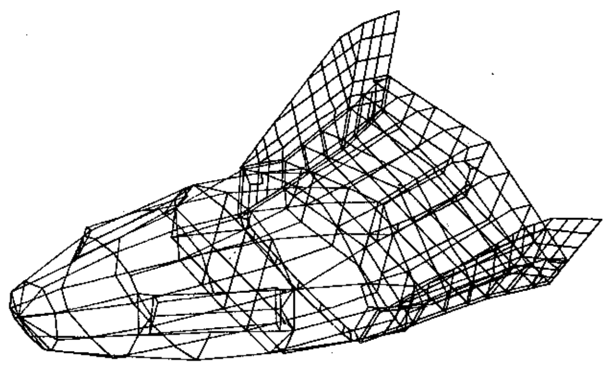

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for design analysis, communication and the computer, 2nd. Ed.

BASIC GRAPHICS for design analysis, communication and the computer, 2nd Edition meets the design requirements of engineers, designers, technical aids and draftsmen who work with computers and numerically controlled machines. The author supplies the essential fundamentals for creative design, communication, and graphic solutions. He emphasizes the use of graphics as a language for creative design and communication as well as a tool for problem solving.

1968 656 pp. 6" x 9" illus. (06232-3) $11.50

Illustration from the text

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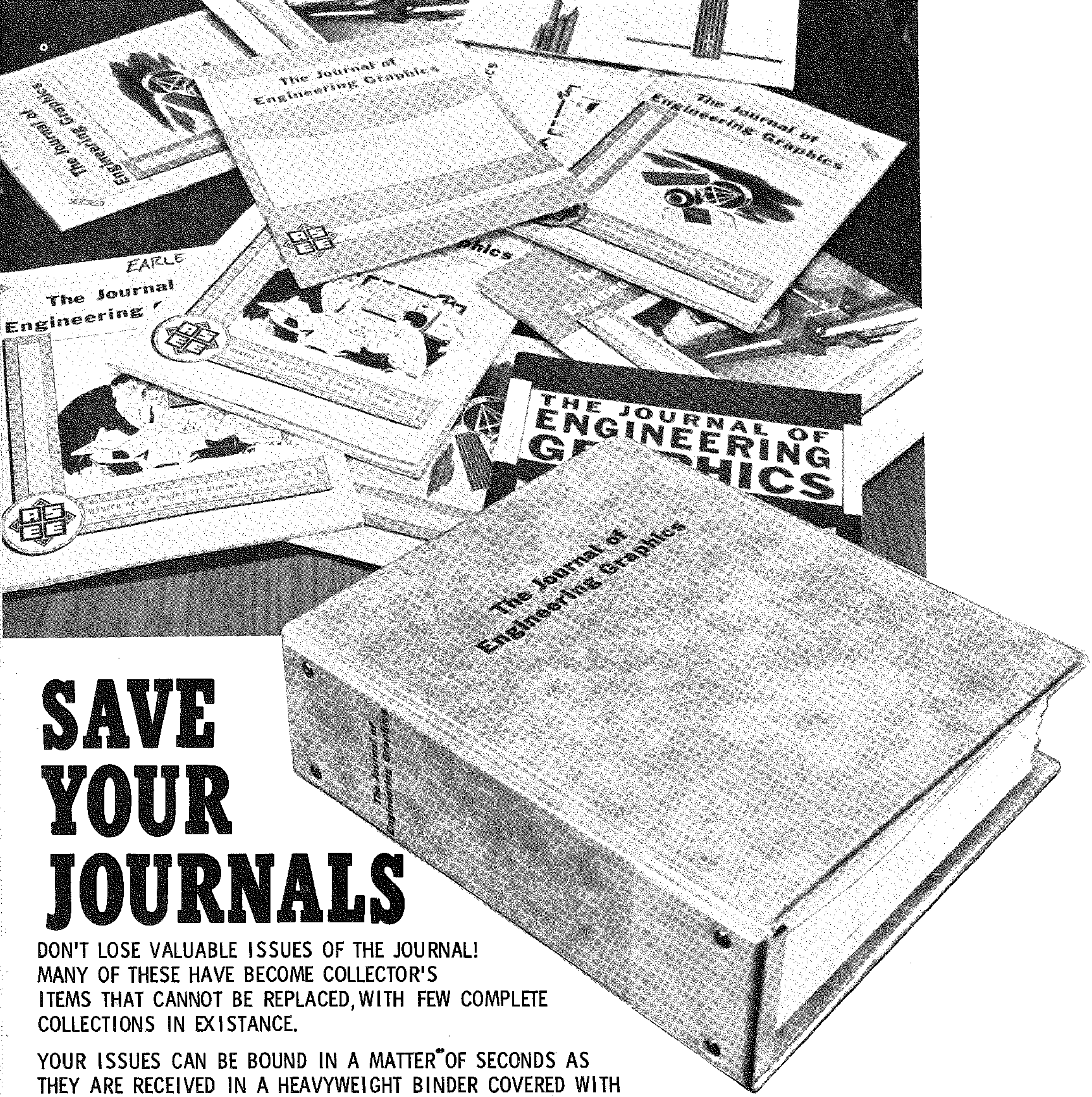

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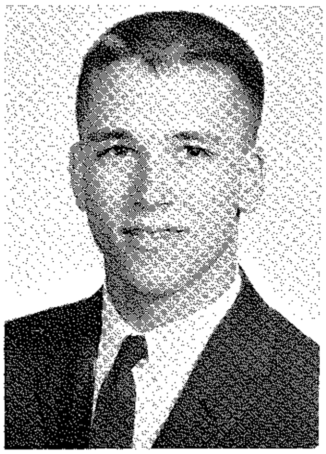

New Books

ALLAN CLEMOW

ENGINEERING GRAPHICS, 4th Ed., J. S. Rising, M. W. Almfeldt, P. S. DeJong, William C. Brown Publishers, 1970, 382 pp.

The fourth edition of Engineering Graphics has included several new chapters and combined some of the existing chapters to provide a slightly different look. Most of the material concerning graphical procedures and practices is basically the same with updated illustrations and terminology.

The new sections include a chapter on Creative Design, Computer-Aided Design and a major revision of the section on Electrical and Electronic Diagrams. The Creative Design chapter takes a prominent position in the beginning of the book so that the student understands the application of what is to follow. The two other new chapters are included in an applications section to give an accurate view of the scope of graphics in industry.

The sequencing of chapters has been altered somewhat from the previous edition for what the authors consider greater continuity in presentation. Also three chapters on pictorial representations have been condensed into one chapter.

ENGINEERING GRAPHICS, PROBLEM BOOK I, C. G. Sanders, C. A. Arnbal, J. V. Crawford, William C. Brown Publishers, 1970, 125 pp. (Workbook)

ENGINEERING GRAPHICS, PROBLEM BOOK II, C. G. Sanders, C. A. Arnbal, J. V. Crawford, William C. Brown Publishers, 1970, 99 pp. (Workbook)

These two workbooks were prepared to be used with the text listed above. Problem Book I covers the first 15 chapters or sections of the parent text and the second Problem Book covers the remaining 14 chapters. Some of the material contained in the two workbooks is the same as that presented in the earlier edition of these problem books.

THE SCIENCE OF ENGINEERING DESIGN, P. H. Hill, Holt, Rinehart, and Winston, 1970, 372 pp.

This is the latest addition to the field of Engineering Design texts. The uniqueness of this book is pointed out by the author in the preface as a book which introduces engineers to management problems and managers to engineering design procedures. The material in this book is presented clearly with illustrative examples in all areas. It lends itself to student use from the freshman through the senior year. The concepts and practices presented here are topics which are vital to an engineer's understanding of the profession he is entering.

The subject matter begins with the definitions of creativity, ideation, the design process, and the reasons why such procedures are needed in the engineering world. Following this are three case histories to point out the nature of the design process and the use of open-ended problems. The next six chapters present subjects intended to aid the design engineer in optimization of his design such as Material Selection, Human Factors, Value Engineering, and other topics to help the engineer function such as PERT/CPM, Patents and Protection, and the Design Critique. Following the last chapter is an annotated bibliography.

There are three appendices containing 20 Design Problems (A1), 15 Design Projects (A2), and 10 Design Cases (A3). The Design Problems are two or three paragraph presentations with interesting and open-ended problems ready for class assignment. The Design Projects are intended as requiring the use of the entire design process in solution. The situations presented realistically to encourage the student to produce finished designs. The third group, the Design Cases, are more lengthy in form being either correspondence or memoranda designed to induce this feeling of reality. Several of these projects are shown in the form of a competition between student companies.

PROGRAM DESIGN IN FORTRAN IV, R. A. Kliphardt, Allyn and Bacon, 1970, 224 pp.

This book contains an interesting approach to the study of Fortran. It begins with discussions of input and output statements for the first two chapters rather than the more conventional descriptive information on digital computers as a lot, flow charts, algorithms, or even arithmetic statements. In fact, flow charts and algorithms do not appear until the fourth chapter in a discussion on transfer statements. Also the author refers some of the basic control statements to the last chapter of the book. He states at the beginning of the book that different systems require different programming features and therefore he tries to present only those features which would be constant in most all systems.

There are several novel features contained in this book. At the beginning there is a checklist for the reader to fill in those things that are particular to his machine. This is to specify the legal rules for any program to be subsequently written. A typical chapter is set up such that there is an amount of source material presented then a series of questions and answers are used to bring out examples and fine points of the original material. It gives the image of there being a second author assisting the reader by asking the questions on behalf of the reader. There are exercises at the end of each chapter and if the author deems it, supplementary material to cover an ancillary point.

ADDITIONS TO THE BIBLIOGRAPHY

PROBLEMS IN ENGINEERING GRAPHICS AND DESIGN 2nd Ed., L. N. Blair, F. A. Mosillo, H. A. Setton, Stipes Publishers, 1969, 110 pp. $4.50.

DIGITAL COMPUTER PLOTTING, F. K. Brown, F. K. Brown Publishers, 1969, 64 pp. $2.50.

GEOMETRY OF ENGINEERING GRAPHICS, R.O. Byers, R. L. Turner, Pruitt Publishers, 1965.

ENGINEERING GRAPHICS PROBLEMS, R. O. Byers, R. L. Turner, News Review, 1967. (Workbook)

ANALYTICAL GRAPHICS, G. A. Dinsmore, Van Nostrand Publishers, 1968, 409 pp. $6.95.

WORKBOOK FOR ANALYTIC GRAPHICS, G. A. Dinsmore, Van Nostrand Publishers, 1968, 159 pp. $4.75.

COMPUTER SCIENCE, A FIRST COURSE, A. I. Forsyth, T. A. Organick, W. Stenburg, John Wiley Publishers, 1969, 553 pp.

ENGINEERING GRAPHICS, F. E. Giesecke, A. Mitchell, H. C. Spencer, I. L. Hill, R. O. Loving, Macmillan Publishers, 1969, 928 pp. $9.95.

ENGINEERING GRAPHICS PROBLEMS, F. E. Giesecke, A. Mitchell, H. C. Spencer, I. L. Hill, R. O. Loving, Macmillan Publishers, 1969, 114 pp. $5.95.

COMPUTER STANDARD FORTRAN PROGRAMMING, J. N. Haag, Hayden Publishers, 1969, 312 pp.

ENGINEERING DESIGN WORKSHOP PROCEEDINGS, B. L. Jenks (Editor), A.S.E.E., 1969, 134 pp. $6.00.

PROBLEMS IN ENGINEERING GRAPHICS, A. S. Levens, A. E. Edstrom, McGraw-Hill Publishers, 1969, 158 pp. (Workbook)

ENGINEERING DESIGN, W. H. Middendorf, Allyn & Bacon Publishers, 1969, 286 pp.

A GUIDE TO PL/1, S. V. Pollack, T. D. Sterling, Holt, Rinehart and Winston Publishers, 1969, 556 pp.

FUNDAMENTALS TO THREE-DIMENSIONAL DESCRIPTIVE GEOMETRY, S. M. Slaby, Harcourt, Brace and World, 1966, 383 pp.

WORKBOOK FOR FUNDAMENTALS OF THREE-DIMENSIONAL DESCRIPTIVE GEOMETRY, S. M. Slaby, H. S. Gum, Harcourt, Brace and World, 1966, 68 pp.

FOUR-DIMENSIONAL DESCRIPTIVE GEOMETRY, S.M. Slaby, E. S. Lindgren, McGraw-Hill, 1968, 129 pp.

ENGINEERING AS A CAREER, 3rd Ed., R. J. Smith, McGraw-Hill, 1969, 418 pp.

ENGINEERING GRAPHICS PROBLEMS, SERIES I, H. C. Spencer, J. L. Hill, R. O. Loving, Macmillan Publishers, 1969, 114 pp. $5.95.

ELEMENTS OF DESIGN ENGINEERING, J. P. Vidosic, Ronald Press, 1969, 330 pp.

PROBLEMS AND PROJECTS FOR ENGINEERING GRAPHICS, F. Woodworth, International Textbook, 1968, 142 pp. $5.50.

PUBLICATIONS IN ENGINEERING EDUCATION AVAILABLE FROM A.S.E.E.

CURRICULUM

Final Report: Goals of Engineering Education, report of ASEE Goals Committee's 5-year curriculum study, supported by the National Science Foundation, 1968, 74 pp., $2. Bound volume of all goals documents, $100. List of separate available documents on request.

The Goals Report suggests that the increasing complications and demands of society will be better served if engineering students extend their academic studies to the graduate level before entering industrial employment. Some of the report's recommendations include: more financial support for research from government and industry; expansion of engineering education facilities; establishment of more high quality part-time advanced degree programs as well as non-degree continuing studies; and a reduction of hours required for the B.S. degree to make engineering competitive with other B.S. programs.

Liberal Learning for the Engineer, report of the ASEE Humanistic-Social Research Project, sponsored by the Carnegie Corporation of New York, 1968, 40 pp., $2.

This report emphasizes that the humanities and social sciences should be treated not as a separate stem, but as an integral part of a liberal engineering education. A major recommendation is: "The increasing social involvement of engineering demands increasing emphasis on the humanities and social sciences. Twenty percent of the total curriculum should be considered a minimum in these areas."

Application of Technology to Education, report of a national symposium sponsored by ASEE Programmed Learning Project and the Educational Research and Methods Division of ASEE, 1969, 39 pp., $2.

The report focuses on three major topics: The Role of Computers in Education, Systems Analysis in Education, and Managing Change. Each section is followed by the discussion of the topic by symposium participants.

Interdisciplinary Research Topics in Urban Engineering, report of an ASEE-NSF study; 1969, 320 pp., $5.

The main purpose of this book is to assist universities in developing inter-disciplinary systems engineering research in urban engineering. Most useful are the extensive annotated bibliographies and annotated listing of government agencies involved in urban engineering. The report emphasizes urban problems in transportation, housing, and environment. Suitable as a college text.

Continuing Engineering Studies: Meeting the Challenge through Industry, Academic Institutions, Engineering Societies, and Government. Report of Joint Advisory Committee of ASEE, ECPD, EJC, NSPE, 1965, 112 pp., $1.

Characteristics of Excellence in Engineering Technology Education, final report of ASEE-NSF study on evaluation of Technical Institute Education, 1962, 46 pp., $1.

Education in Industry, survey on needs of engineers in industry for continuing education, by subject, 1965, 338 pp., $1.

Curriculum in Industrial Engineering, report of ASEE-NSF study, 1967, 34 pp., $1.

REPORTS

Workshop on Bioengineering (EE Div.), 1966, 71 pp., $2.50.

Digital Computer Workshop Manual, 1968, 90 pp., $2.50.

Quantum Electronics Workshop Report, (EE Div.), 1969, 181 pp., $6.50.

Fast Reactors and the University, ed. Martin Becker, Proceedings of an ASEE-AEC Short Topical Conference, 1968, 450 pp., $1.50.

World Congress on Engineering Education, June, 1965, ASEE-NSF report, 1966, 45 pp., $1.

Ethical Problems in Engineering, sponsored by the ASEE Ethics Committee, ECPD, and NSPE; by Alger, Christensen, and Olmsted, 1965, 299 pp., cloth, $6.50.

GRADUATE STUDY AND RESEARCH

Annual Directory of Engineering College Research and Graduate Study. A compilation of data furnished by over 180 engineering colleges on graduate degree programs, requirements, tuition, faculty appointments available to graduate students, engineering college research personnel, research projects, and dollar volume of research. Current Directory, $7; when prepaid, to students, $3.50 ($2 each to ASEE member educational institutions in lots of 10 or more).

Proceedings of the Second Engineering College Research Council (ECRC) Research Administration Workshop, Feb. 10 - 11, 1969. 184 pp., 1969, $8.

Proceedings of the Third ECRC Research Administration Workshop, June 9 - 11, 1969, 170 pp., $7.

TEACHINGS METHODS AND GUIDANCE

Engineering Technician, popular career booklet with back page blank for imprinting by school, 4th ed., 1968, 24 pp., 50¢ (25¢ each in lots of 100).

Nuclear Engineering in Your Future, career booklet, 21 pp., 50¢ (35¢ each in lots of 100 or more).

You and Your Students, guide for effective teaching prepared by the Massachusetts Institute of Technology, with updated references on teaching methods in engineering, 1968, 46 pp., 50¢ (25¢ each in lots of 10 or more to ASEE member educational institutions).

Effective Teaching (annual issue planned by Educational Research and Methods Division), March issue of ENGINEERING EDUCATION: Current issue, $1.25.

Road to Graduate School in Engineering, career booklet, 1967, 24 pp., 50¢ (25¢ each in lots of 50 or more).

SERIES PUBLICATIONS

Continuing Engineering Studies: Reports of annual national conferences on continuing education of the CES Division of ASEE.

No. 1, 1967, 61 pp., $2.
No. 2, 1968, 78 pp., $2.
No. 3, 1969, 90 pp., $2.
No. 4, 1970, 95 pp., $2.

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