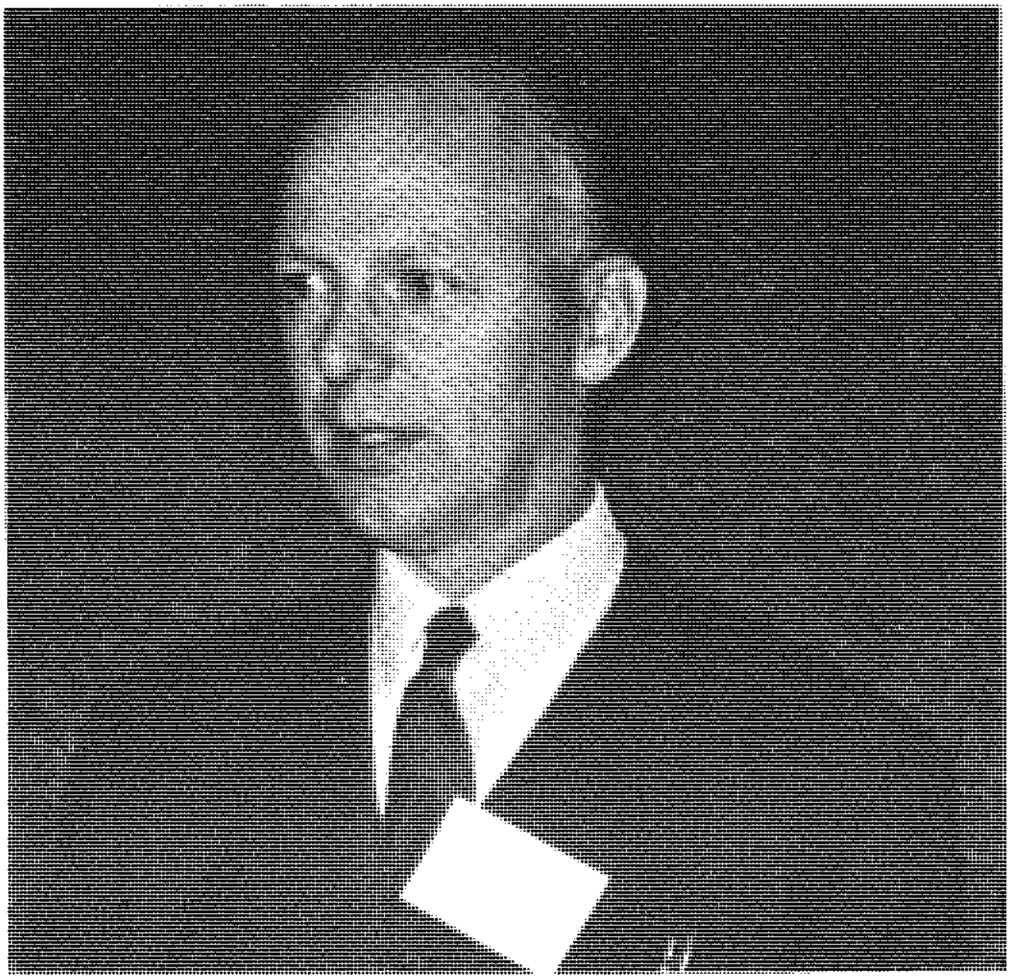
ENGINEERING DESIGN GRAPHICS JOURNAL

WINTER 1971 VOLUME 35 NUMBER 1 SERIES 104



KLAUS KRONER
Host, Mid-Year Meeting
November, 1970

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

ENGINEERING DESIGN GRAPHICS JOURNAL

WINTER 1971 VOLUME 35 NUMBER 1 SERIES 104

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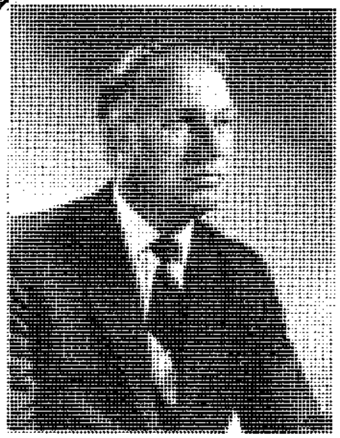


Conventions Revisited!!

PERCY H. HILL

(The following is a guest editorial written by a member of the Engineering Design Graphics Division as an answer to the one which was in the Fall, 1970 issue. Although the editorial staff may not agree with the contents of a guest editorial, it believes that all sides of an issue should be presented to the membership.)

If our esteemed editor of the JOURNAL wished a reaction to his fiery editorial in the Fall 1970 issue, he succeeded as far as this division member is concerned. I had his ear on the telephone before the ink had dried on the cancelled stamp of the mailing envelope. Too bad that I read the editorial first, for it spoiled my appetite for the remainder of the issue. I will give the author credit, however, for he makes no excuses for his opinions and continues to support his point of view.

Granted that there is room for improvement in meetings of our Division, both Mid-Winter and Annual, but I have learned to take the "bitter" with the "sweet", and in recent years there has been an increase on the "sweet" side. The papers presented at the November 1970 meeting held at the University of Massachusetts were among the best I have heard since joining ASEE. Methods of presentation were excellent, the program had variety, speakers presented their cases to the audience with confidence and knowledge of their subject, sessions were well attended, and the presentations contained a lot of "meat". I feel sure that many of those in attendance will begin to investigate techniques of Calcomp plotting, read a bit further into Graph Theory, and feel that there is another dimension to the study and application of Nomography. I know that I will.

Meetings of the Division are no panacea. One should not expect to return home with course outlines, instructors' manuals, or a prescription that will cure an ailing course. Programs should be such that they stimulate thinking among the membership along lines that are beneficial to educators of Engineering Design Graphics. Such a stimulation is the necessary ingredient for innovation that will best assist the educator to cope with problems local to his institution and and student body. I believe that this stimulation has occurred as a result of recent meetings. At least, with me and my close colleagues, it has. I am also pleased to see an increasing number of young faculty in attendance at meetings.

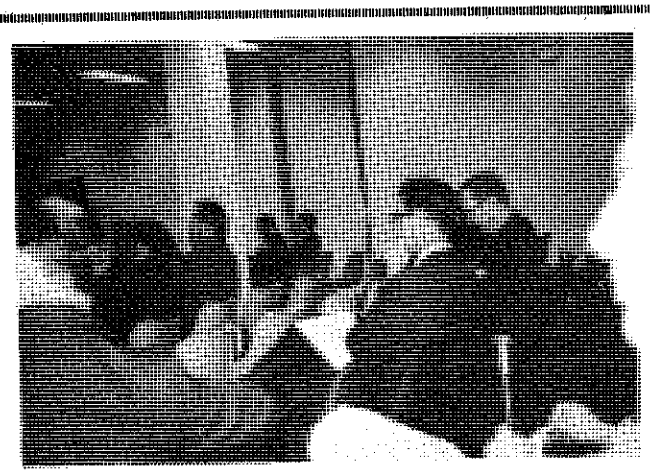
It is difficult for me to believe that the individual who gives a paper at meetings would ". . . . use this as an excuse to receive an allowance from his school" and that "some people have been invited so often that they feel as though they are doing the program a favor by accepting. . . . . " and "others who accept soon realize that they are merely filling time so that the program may be complete". My impression is that papers are given by dedicated people who have something to say. They don't always say it in the best way, but they are sincere in attempting to advance the state-of-the-art in the educational process. I take my hat off in salute to the members of the Division who take the responsibility of planning a program for the membership, for I believe their troubles and frustrations are many and their rewards are few, if any. I also salute the members as well as others who give papers or speak at our meetings. The accepting of the honor to give a paper means that this person spends six months in advance of the meeting in nervous anxiety thinking about his topic, researching the literature, painstakingly writing the paper, finalizing his presentation, maneuvering a small departmental budget to print 250 copies of the paper to be lugged to the meeting, and arriving at the meeting with a quickening pulse, high blood pressure, and uptight until he has completed his presentation. He knows that the audience is made up of experts who know his subject much better than he and, as it should be, can be quite critical regarding the points he emphasizes. In fact, the great majority of people on the program only begin to enjoy the meeting after they have presented their papers, like the next day. It is good that we have among our membership people who are willing to undergo this punishment.

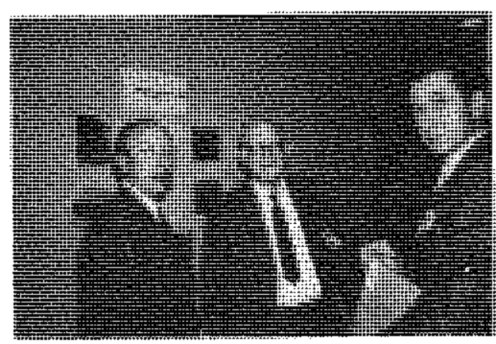
I take exception to two other remarks in this most revealing editorial, namely: "Could it be that schools are under the impression that the ASEE as well as its Divisions and Committees are stictly social organizations with no educational value?" and "Is it any wonder that members are planning to drop their membership in ASEE? These people feel that the organization is not worth the dues nor the time". I sincerely hope that this information is not wholly true, for if it is we as a Division are in serious trouble. I question the source of this information for if it can be documented, it is a serious matter to be brought to the attention of the Division Chairman and the Executive Committee.

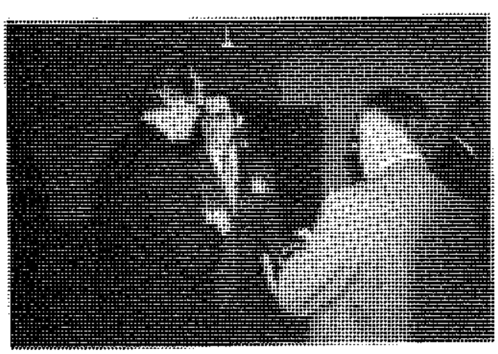
I fully agree with the closing remarks of the editorial that suggests all attendees be in some way connected with the program. That we have more seminars, workshops, and possibly open discussion sessions so that all in attendance will have a chance to state their case and exchange views. This goes on over coffee, at meals, and often in more spirited discussions, but can also be accomplished as an integral part of the program. Let us hope that program planners in the future will take this into consideration.

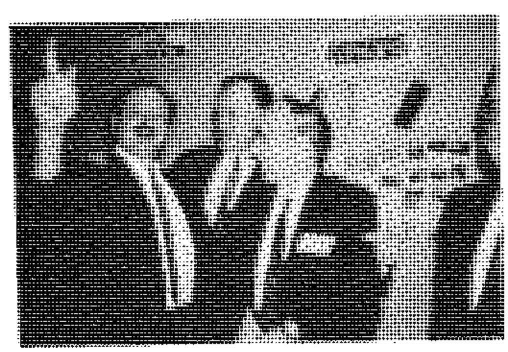
I would like to close on one positive note in the form of a suggestion that we have a CALL FOR PAPERS in advance of meetings. The mechanism for accomplishing this would involve a small (three to four mambers) Program Committee that would chose a meeting theme based on a response from members and announce a call for papers in the form of Synopses submitted four to six months prior to the meeting. Synopses of papers would be screened by the committee and an appropriate number selected to fill out the program. This method would provide the opportunity for all members to participate in competitive paper presentations and to have some voice in meeting themes, as well as to provide a steady input of high quality technical papers to our Journal and other publications.

I would like to thank the Journal editor for the opportunity to write this rebuttal to his editorial of November 1970.









ENGINEERING CLASSICS

A new edition of a leading text

DESCRIPTIVE GEOMETRY

Fourth Edition

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

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

Changes in the Fourth Edition:

- This edition features the inclusion of problems in pictorial form—the form of graphical communication often used by the designing engineer. These pictorial projects will serve both to reinforce the related orthographic principles and, more importantly, to stimulate the development of the studeut's depth perception and visualization ability. This original material has been thoroughly student-tested.

- New problem layouts have been added or substituted throughout, and new self-testing problems have been added.

- Elimination of most of the superscripts associated with the point and line identification has simplified the notation system.

- The decimal system of dimensioning is now used throughout all of the text material, in practically all of the drawings, and on more that 50% of the problem layouts.

- All shaded figures have been airbrushed.

1971 approx. 384 pages prob. $7.95

CONTENTS

A series of worksheets coordinated with the text:

DESCRIPTIVE GEOMETRY WORKSHEETS: Series A, B, and C

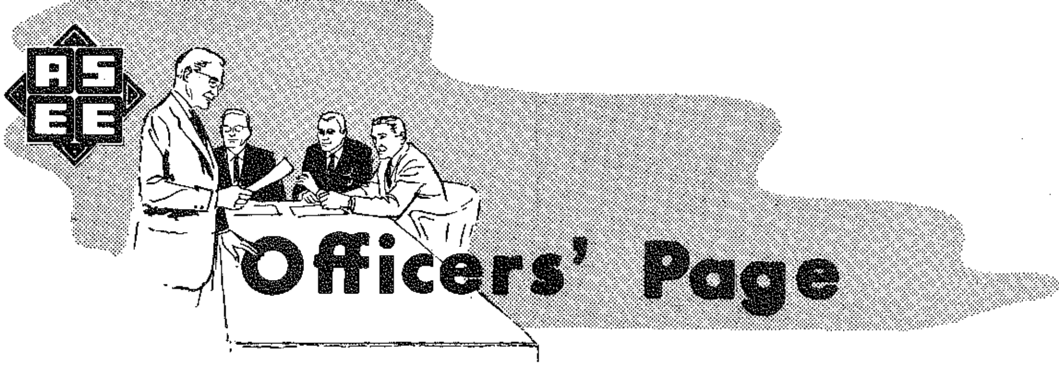
By the above authors

Series A, Third Edition, 1968, 77 sheets, paper, $4.95

Series B, Second Edition, 1966, 76 sheets, paper, $4.95

Series C, Second Edition, 1967, 72 sheets, paper, $4.95

Solutions Manuals are available, *gratis.*



1971-1972
YEAR OF SELF STUDY

PERCY H. HILL
Vice-Cairman

"The immediate problem is that a lot of first-rate engineers (as well as many of lesser caliber) are either out of work or else doing work that doesn't take advantage of their professional training and experience.

An even greater large-range problem may be that present conditions will divert some present engineers from the field permanently and also dissuade larger numbers of pre-college students from choosing an engineering career. Historically our supply of trained people in any profession always seems to be out of phase with the demand by about the length of time required by training."

Editorial by Anderson Ashburn
PRODUCT ENGINEERING, Dec. 21, 1970

The Engineering Design Graphics Division will have more opportunity and influence in the next three years than at any time during the past decade. I say this in light of the government's de-emphasis on space and defence spending which causes specialists to be unemployed; emphasis within companies on consumer products and a diversification from funded programs; emphasis on the problems of society (pollution, urban planning, transportation, etc.); and the rapidly developing program for the Bechelor of Engineering Technology (BET).

In order to meet this challenge and take advantage of the opportunities it presents, I feel that the Division is in need of a thorough Self-Study. Such a Self-Study should reveal how the Division may best represent itself in engineering education and serve its membership during the critical years immediately ahead. The Self Study must result in a published report to the membership with a plan for.

IMPLEMENTATION

The SELF STUDY COMMITTEE should define its own direction but I hope that it would consider the following items in addition to others;

(1) The relationship of the Division to ASEE.

(2) Review of proposals of past chairmen that are filed in our minutes but never acted upon.

(3) Review of the By-Laws -- makeup of the executive committee, directors, officers, etc. (perhaps job descriptions would be beneficial).

(4) Should we have one treasury and one budget?

(5) Review of the JOURNAL OF ENGINEERING DESIGN GRAPHICS

   (a) Editorial policy - Review Board.

   (b) Financial position.

   (c) Distribution.

   (d) Number of issues per year.

   (e) Format.

(6) Review of Division Committees and their membership. (Possibly a restructuring in light

of recent developments in engineering education.)

(7) Review of form, format, and content of future meetings (mid-winter and annual.) (Possibility of a program committee and/or a call for papers.)

(8) Review of Creative Design Displays.

(9) Review of Division Awards.

The work of the committee should begin immediately (the chairman and the executive committee have approved) with an INTERIM REPORT due at the annual meeting at Annapolis and a FINAL REPORT at the mid-winter meeting at Houston. Membership on the committee will be on a volunteer basis but divided into subcommittees representing members East and also members West. In this way committees may find it easier to meet locally in between the two regularly scheduled Division meetings. This will also allow geographic perspective or different points of view to be related to the future functioning of the Division. The committees will be chaired by CO-CHAIRMEN. I have appointed a COORDINATOR who will serve as a member of the committee and will see to it that work of the co-committees results in a single report. The coordinator will also serve as chairman of the IMPLEMENTATION COMMITTEE.

The Implementation Committee will be named at the Houston meeting and will be charged with reviewing the Self Study Report, extablishing priorities, and providing an IMPLEMENTATION PLAN. I hope that the Self Study and the Implementation Plan may be published as a special edition (volume) of the Journal bu a special editor (similar to the 1967 Summer School Proceedings).

The Self Study Committee at this point in time has been organized as follows:

SELF STUDY COMMITTEE

Philip Brach - coordinator
Washington Technical Institute

Committee East

Mary Blade
Cooper Union

Allan Clemow
Tufts University

Edward Griswold
Cooper Union

Borah Kreimer
Northeastern University

Steve Slaby
Princeton University

William Rogers - co-chairman
U. S. Military Academy

Committee West

John Brewer
Louisiana State University

Robert Christenson
General Motors Institute

James Earle
Texas A & M University

Ivan Hill
Illinois Institute of Technology

William Punkay
Harper College

Rolond Ruhl
University of Illinois

Robert LaRue - co-chairman
Ohio State University

Please write to me at Tufts University, Medford, Massachusetts (02155) if you wish to serve on the Self Study Committee and/or if you have topics that you wish to be studied. The Division's only purpose is to serve the membership and to encourage an understanding of engineering graphics and design (design graphics) in technical education. I sincerely hope that ALL of the membership will participate in one way or another in this SELF STUDY for you are the ultimate benefactors.

PERCY H. HILL
Vice-Chairman

Where Would You Like To Have The Mid-Year Meeting ?

JAMES H. EARLE
Chairman

The Executive Committee of the Engineering Design Graphics Division approved a motion that future mid-year meetings of the division should be carefully selected to afford the greatest convenience and interest to the membership.

The major points of this motion were as follows:

1. All mid-year meetings will be held off-campus in commercial facilities unless exceptional continuing education facilities are available.

2. The cities in which the meetings are to be held should have good transportation from all parts of the country and interesting features that would contribute to the meeting.

3. Meetings need not be held in university towns since it is unnecessary to hold the meeting on a campus.

4. Cities will be selected by the Division first and a host selected secondly in the in the general geographical area to coordinate arrangements.

5. An attempt will be made to take advantage of the industries and speakers from the city in which the meetings are held.

The Executive Committee will be responsible for selecting meeting sites for the next five years at the annual meeting at the U. S. Naval Academy. Consequently, we would like your suggestions for cities that should be considered that fall within the context of the major points of the motion above.

Some possible sites for meetings that offer good industrial relations are:

1. Seattle, Washington
   Boeing Corporation
   beautiful scenery
   good travel connections

2. Huntsville, Alabama
   Redstone Arsenal
   good weather

3. Flint, Michigan
   Automobile Industry
   good travel connections

4. Los Angeles, California
   Many Industries
   good weather
   good travel connections

Sites where meetings can be scheduled without cooperation from industry where content and instructional methods can be discussed are:

1. Disney World - Orkando, Florida
   Home of Disney's 27,000 acre wonderland and convention center.
   Excellent family entertainment and meeting facilities.
   Good weather
   Good entertainment

2. New Orleans, Louisiana
   Warm weather
   Interesting city
   Good travel connections

3. Las Vegas, Nevada
   Excellent facilities
   Good entertainment
   Good travel connections
   Warm weather

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

Where Else?

You are encouraged to complete the form on the following page and give your preferences for locations for future meetings. Your responses will be tabulated and used to plan future meetings. Please give your views so that your officers can represent you.

(tape together)

JIM EARLE
Chairman
Engineering Design Graphics Division
Texas A & M University
College Station, Texas 77840

Place
6¢
Stamp
Here

(fold here)

Please rank the following locations for future mid-year meetings for the Engineering Design Graphics Division; remove this page, fold as shown and mail to Jim Earle.

Rank each location from 1 to 8 (1 for highest and 8 for lowest). Write in other sites that you would prefer.

___ Disney World - Orlando, Florida

___ New Orleans, Louisiana

___ Las, Vegas, Nevada

___ El Paso, Texas

___ Other

___ Seattle, Washington

___ Huntsville, Alabama

___ Flint, Michigan

___ Los Angeles, California

___ Other

____
(name)

____
(address)

____
(city) (state) (zip)

MID-YEAR MEETING

at the

UNIVERSITY of MASSACHUSETTS

November 1970

PROGRAM

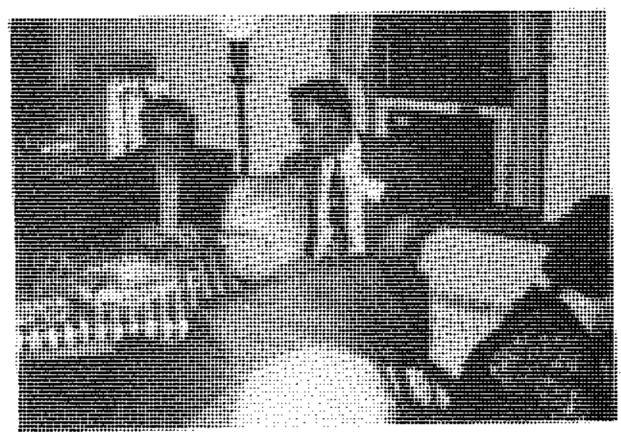
Wednesday, November 11

6:00 PM - 10:00 PM
Registration

7:00 PM - 10:00 PM
Commercial Exhibits

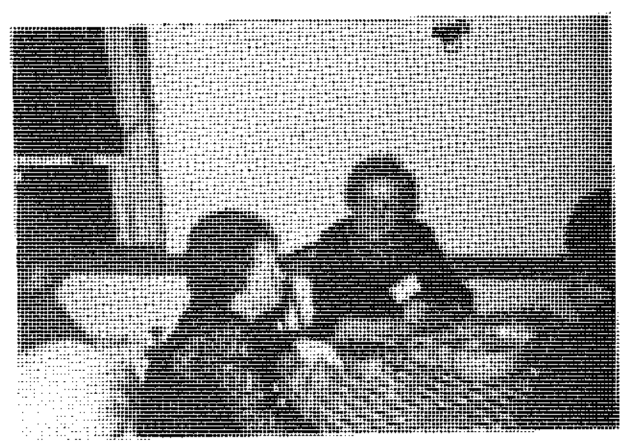
8:00 PM - 9:00 PM
Social Hour

Past Chairmen LEIGHTON WELLMAN and IVAN HILL discuss "problems" of the Division

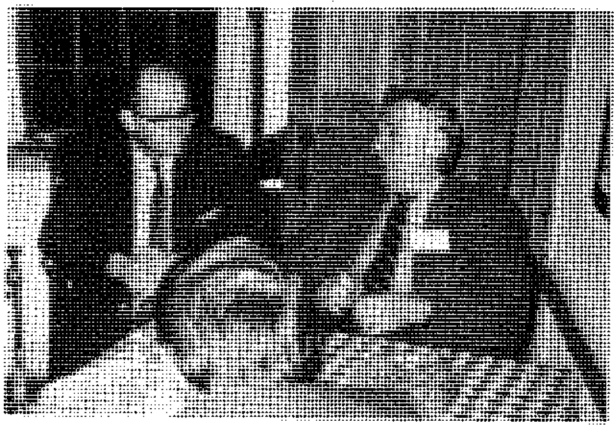


GENE PARE and BILL RULE discuss ideas as IVAN HILL listens

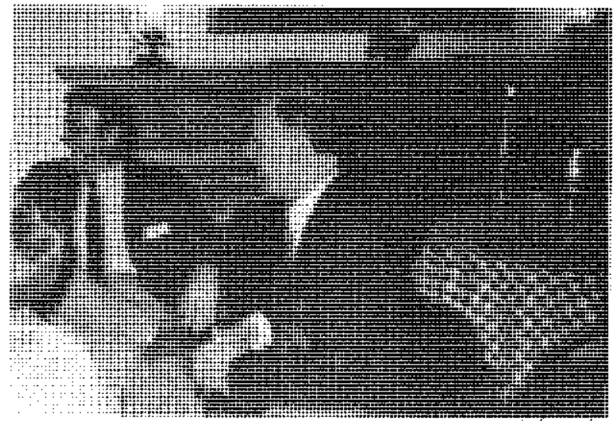
Mr. BORAH KREIMER and Mrs. IVAN HILL



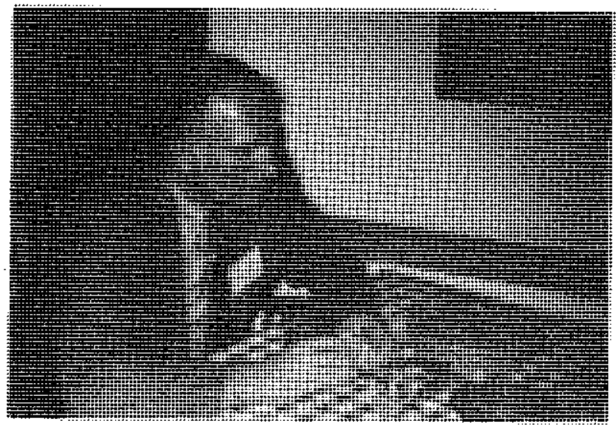
Mrs. KLAUS KRONER and Mrs. LEIGHTON WELLMAN



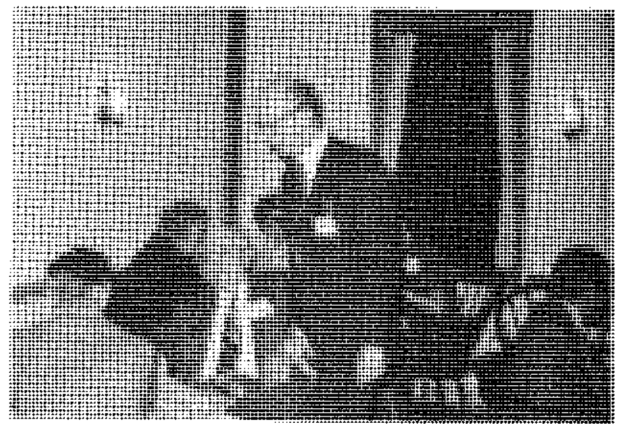
Vice-chairman PERCY HILL discussing the future of the Division with the chairman JIM EARLE



GORDON SANDERS and KLAUS KRONER enjoying an amusing anecdote by a colleague



Serious thought by our Vice-chairman



The host checking on refreshment needs

Thursday, November 12

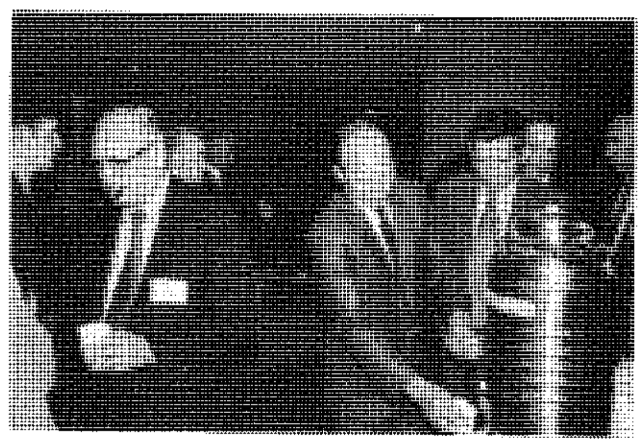
8:00 AM - 6:00 PM
Registration

8:30 AM - 6:00 PM
Commercial Exhibits

9:00 AM - 9:30 AM
Keynote Address
JOSEPH S. MARCUS
Associate Dean of Engineering
University of Massachusetts

9:30 AM - 10:30 AM
"A Mapping Program For Use With Spatially Variable Data"
ALLAN K SCHMIDT
Associate Director
Laboratory for Computer Graphics and Spatial Analysis
Harvard University

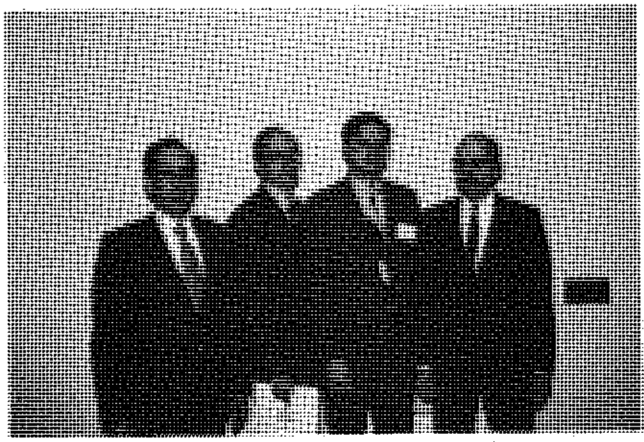
10:30 AM - 10:45 AM
Coffee Break



Between sessions

10:45 AM - 12:15 PM
Computer Graphics
EDWARD V. Mochel, moderator
University of Virginia

"Digital Data Plotting For Freshmen Engineers"
FRANKLYN K. BROWN
Northeastern University



Computer Graphics Panel; Professors FORREST WOODWORTH, ED MOCHEL, JOHN BREWER and FRANKLYN BROWN.

"Elective Courses In Computer Graphics"
JOHN A BREWER, III
Louisiana State University

"Computerized Descriptive Geometry"
FORREST M. WOODWORTH
University of Detroit

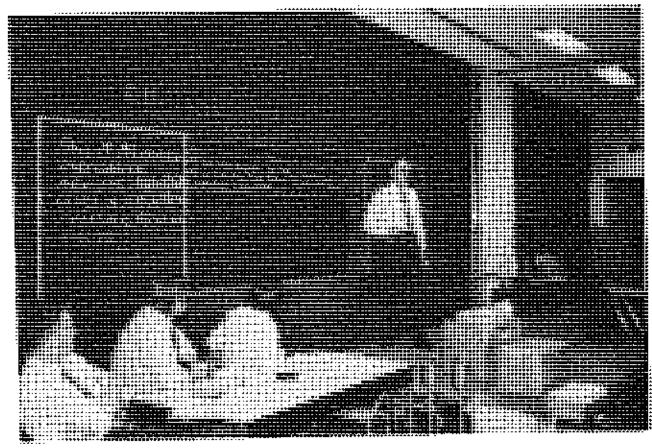
An attentive audience

1:45 PM - 3:15 PM
Seminar in Product Design
PERCY HILL, moderator
Tufts University

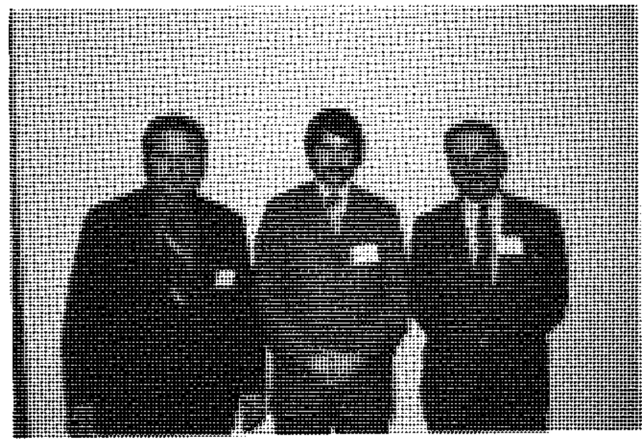
"Introduction, Problem Definition, Goal"
PERCY HILL

"Research, Task Specifications, Ideation"
ALLAN CLEMOW
Tufts University

"Conceptualization, Analysis, Market Potential, Manufacturing"
FRANKLYN UMHOLTZ
University of Massachusetts

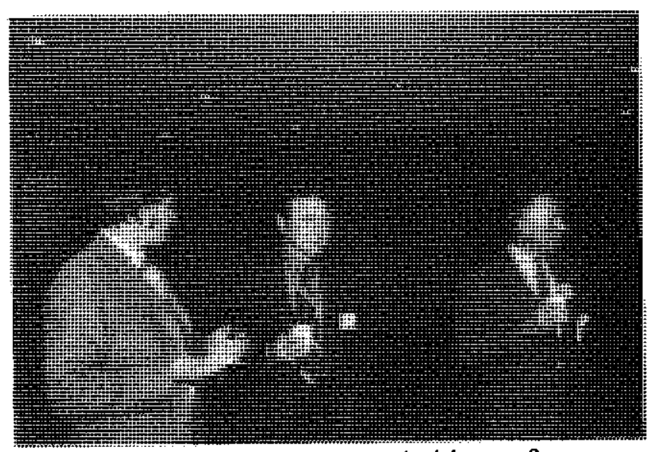


PERCY HILL introducing session on Product Design

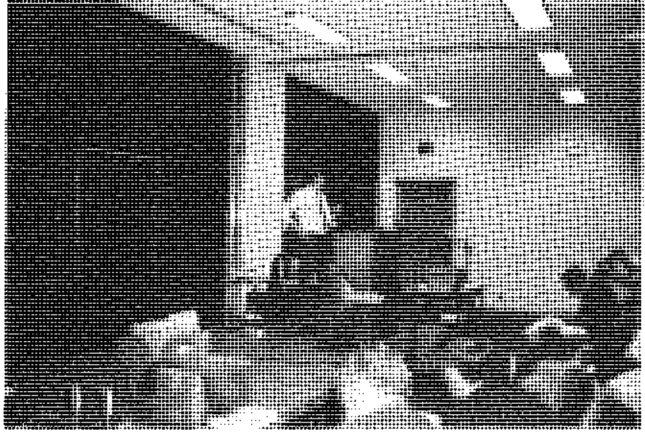


Product Design Panel; Professor FRANK UMHOLTZ, ALLAN CLEMOW, and Professor PERCY HILL. (Professor Wilfred Rule was not available for the picture)

Coffee Break



Discussing presentation of Seminar in Product Design



ALLAN CLEMOW expounding on Creative Design

3:30 PM - 5:00 PM
Seminar in Product Design (continued)

"Solution, Selling the Design Idea, Commercialization"
WILFRED RULE
Northeastern University

"Evaluation and Conclusion"
PERCY HILL

Discussing the last session

5:00 PM - 6:00 PM
Committee Meetings

6:30 PM - 10:00 PM
Executive Committee Dinner

8:00 PM - 9:00 PM
"Going to a Modernized Metric System"
Dr. DOUGLAS V. FROST
Metric Association

Friday, November 13

8:00 AM - 1:30 PM
Registration

8:30 AM - 6:00 PM
Commercial Exhibits

9:00 AM - 10:30 AM
Theoretical Graphics
STEVE M. SLABY, moderator
Princeton University

STEVE SLABY introducing Theoretical Graphics.

"Application of Graph Theory to Dome Construction"
MARY F BLADE
Cooper Union

" Intuitive Nomography"
WALTER MESSCHER

More interested colleagues

10:30 AM - 10:45 AM
Coffee Break

10:45 AM - 12:15 PM
Theoretical Graphics (continued)

"Avant Garde Descriptive Geometry in Film Animation"
Miss JANE SPEISER
Animator Consultant

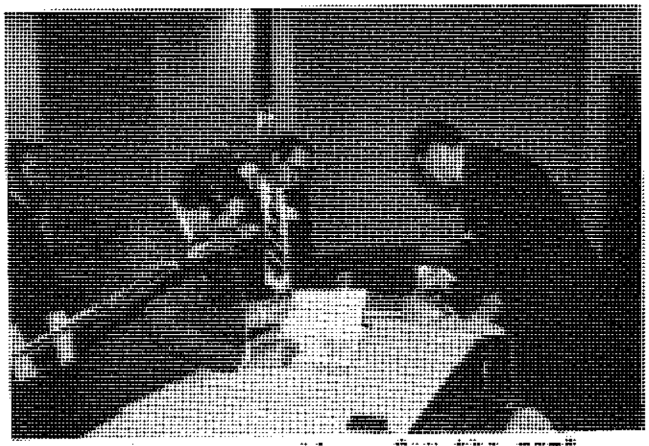
12:30 PM - 1:30 PM
Division Business Luncheon
JAMES H. EARLE, chairman
Texas A & M University

1:45 PM - 3:15 PM
Community Colleges

DAVID C. BARTLETT, presiding
Greenfield Community College

"What Subject Matter Should be Included in Engineering Graphics at Two-Year Community Colleges?"
WALTER HOPKINS
Ulster County Community College

3:15 PM - 3:30 PM
Coffee Break



Making preparations for the next session

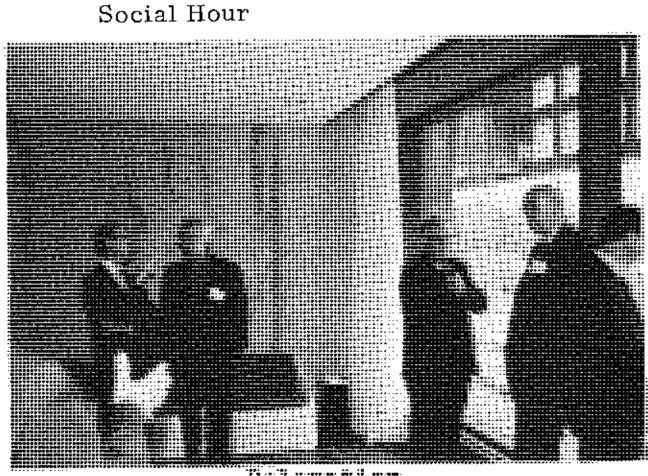
3:30 PM - 5:30 PM
Discussion Sessions

Computer Graphics
JAMES R. BURNETT, leader
Michigan State University

Design
Z. CLAUDE WESTFALL, leader
University of Maine

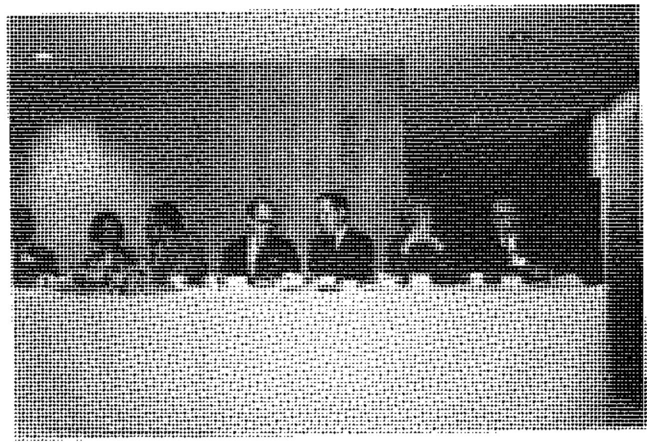
Theoretical Graphics
STEVE M. SLABY, leader
Princeton University

6:30 PM - 7:30 PM
Social Hour



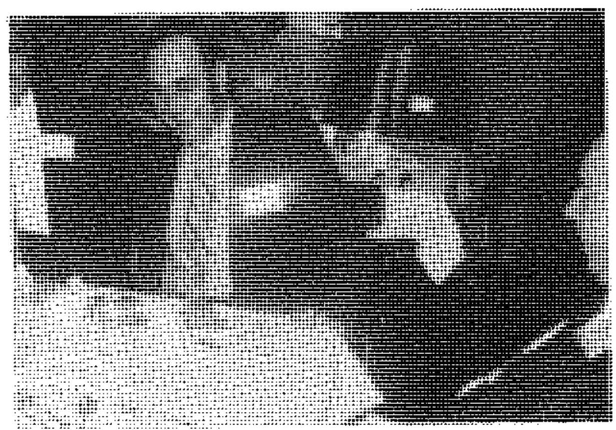
Relaxation

7:30 PM - 9:30 PM
Banquet
JAMES H. EARLE, presiding



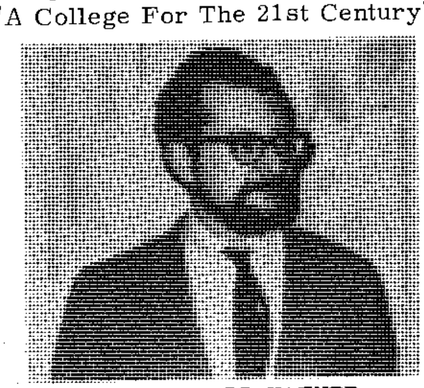
Head table

Entertainment
Choral Group
University of Massachusetts
Women's Club



Obviously enjoyable

Speaker
Dr. EVERETT HAFNER, Dean
School of Natural Sciences & Mathematics
Hampshire College
"A College For The 21st Century"



Dr. EVERETT HAFNER

Mid-Year Meeting

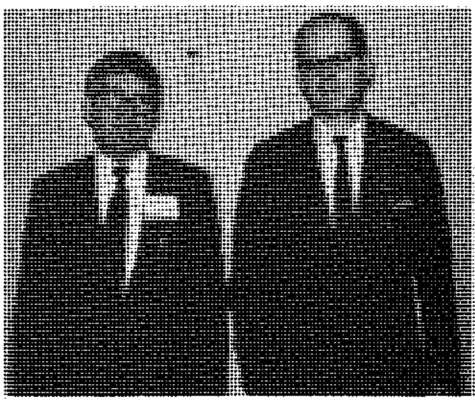
Houston, Texas

November 3, 4 & 5, 1971

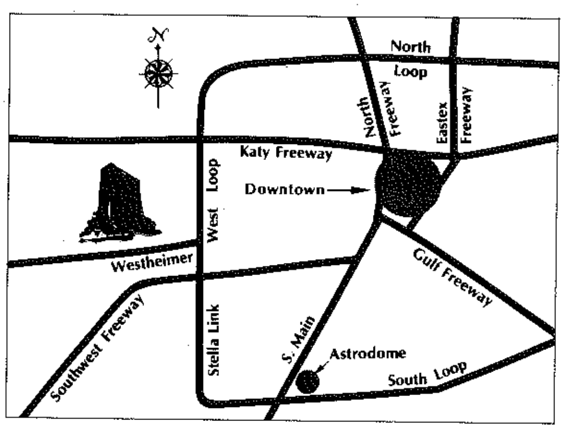
The next mid-year meeting of the Engineering Design Graphics Division will be held in Houston's all-new Houston Oaks complex. The meeting will be jointly hosted by Texas A & M University, The University of Houston and Rice University.

The facilities of the complex are outstanding and offer numerous commercial outlets and recreational centers for your entire family. The Galleria mall houses one hundred stores, restaurants, theatres, art galleries and other facilities estimated at a cost of $10 million. The famous Nieman-Marcus Store, the Post Oak Tower (offices), the Houston Oaks Hotel, the 600,000 square foot mall and the University Club are contained in this new development.

An indoor ice skating rink is open daily. There are ten indoor tennis courts, courts for squash, handball, paddle tennis and exercise rooms.



Burt Frazer (U. of Houston) and Jim Earle (Texas A&M) co-hosts of the next mid-year meeting of the Division.



Houston Oaks is minutes from three major freeways; seven minutes from the Astrodome; 10 minutes from downtown Houston; readily accessible to airport by freeway or helicopter.

Transportation to Houston will be easy to schedule from any part of the nation. Houston Oaks is easily accessible to the airport by freeway or helicopter. Parking is available for five thousand (5,000) cars.

This meeting is planned to be self-contained with the entire program held in the Hotel accommodations. The need for daily travel or contact with traffic will be reduced to the minimum.

Your family will enjoy the warm autum weather of Texas and the interesting attractions of Houston -- home of NASA, Hughes Tool, the Astrodome, Astroworld, and the headquarters of many of Texas' industries. Plan, now, to attend.

Inquiries may be directed to

Burt Fraser
Engineering Graphics
University of Houston
Houston, Texas 77004

Jim Earle
Engineering Design Graphics
Texas A & M University
College Station, Texas 77843

A. P. McDonald
Engineering Graphics
Rice University
Houston, Texas 77004

Announcement

of a

New Committee

in the

Engineering Design Graphics Division

Human Factors in Systems Design

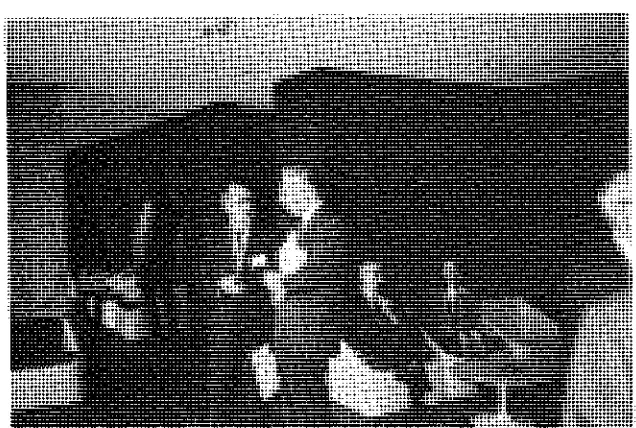
Since the early 1940's, the human element, alone or in groupd, has become recognized as an essential component which cannot be overlooked or minimized in Engineering Design. Professional Engineers are increasingly involved in man-oriented systems and design problems. So too are engineering graduates who commendably recognize the need for and demand human relevance early in their course material and projects.

Basic data, theoretical/practical studies, research techniques are growing rapidly in hu-factors. Much of this information can and should be integrated into Engineering Design in order to produce an engineer better prepared to deal with society's technical needs and problems.

The Committee on Human Factors is to be formed to deal with the various issues related to this subject area in Engineering Design. The first committee meeting will be held sometime between June 21 and June 24, 1971 at the United States Naval Academy in Annapolis. Anyone interested in serving on this committee is asked to please contact me. Those who are interested in Hunam Factors are urged to attend the meeting.

John G. Kreifeldt
Committee Chairman
Department of Engineering Graphics & Design
Tufts University
Medford, Massachusetts
02155

MID-YEAR MEETING

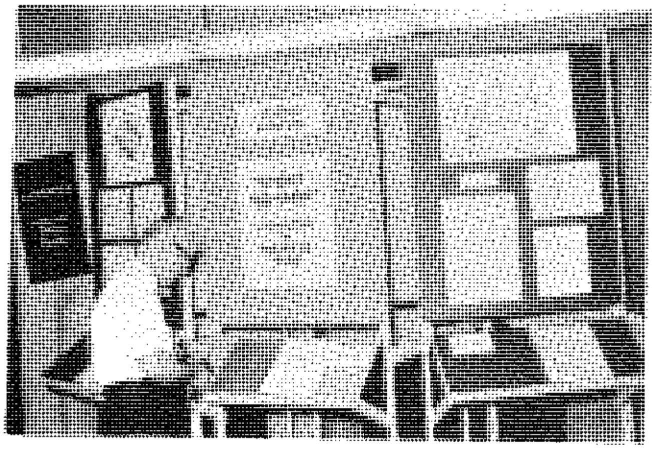


Relaxation

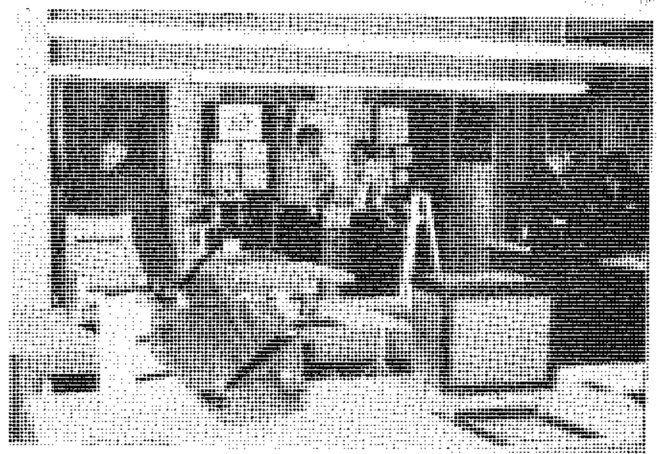
A reminder, "Do not forget the next meeting in Houston!"

design display

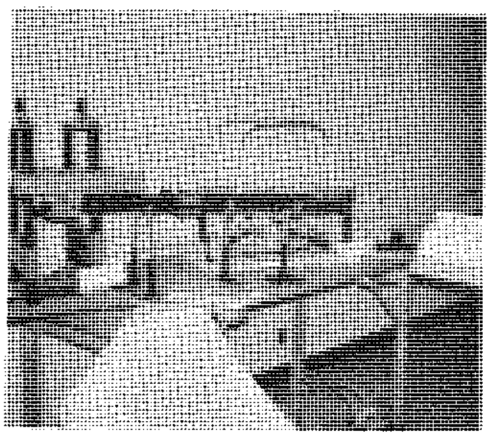
1968



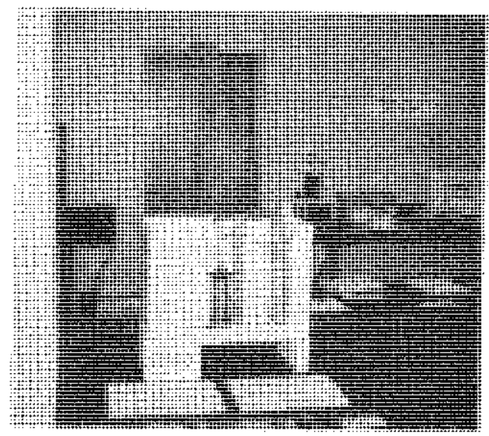
Preparing the show



Interested spectators

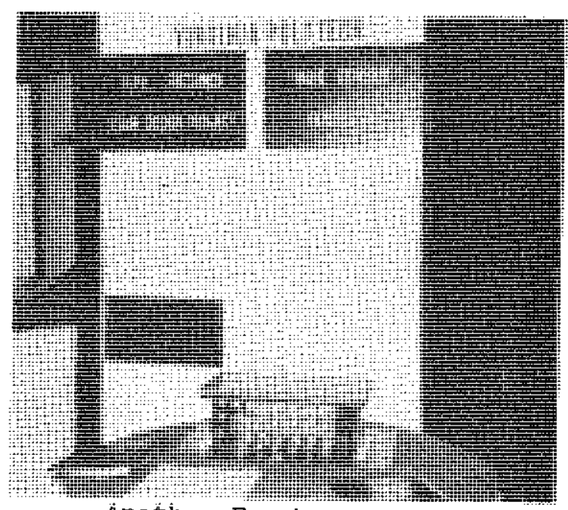


A Junior display



A Freshman Display

Judging

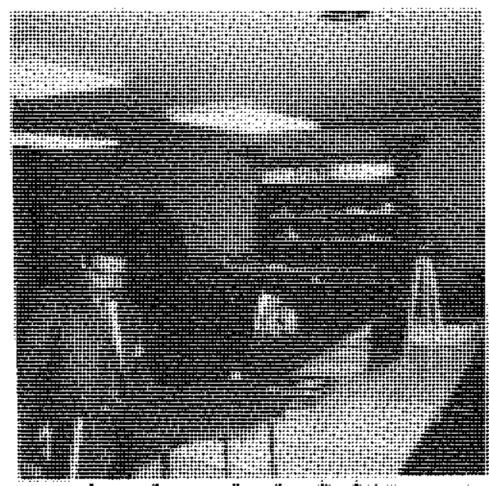


Another Freshman display

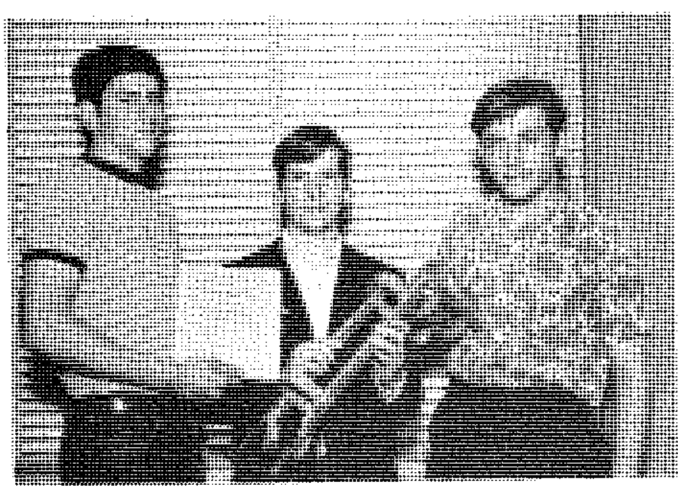
Instructor congratulating student on award winning project.

Award Projects

Instructor consulting with students on award winning project

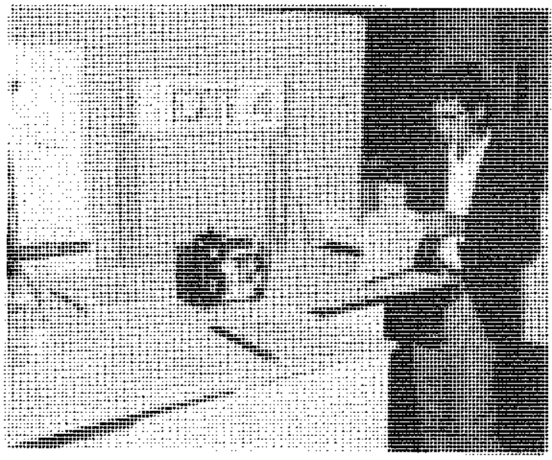


Award projects being exhibited at following mid-year meeting

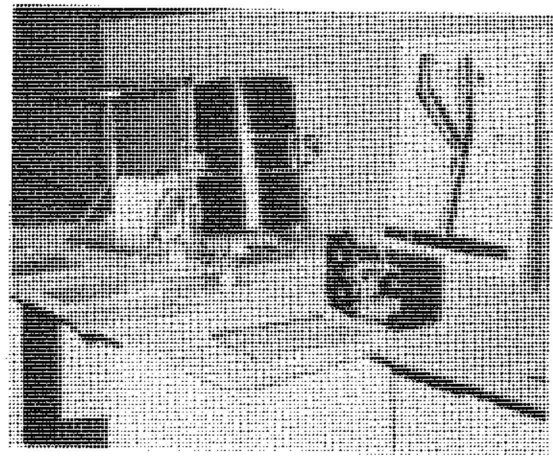


Award winners from the east.

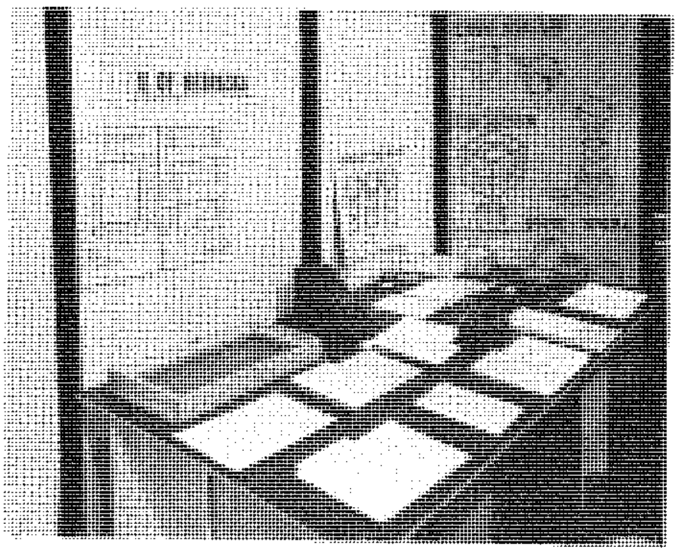
DISPLAY
1969

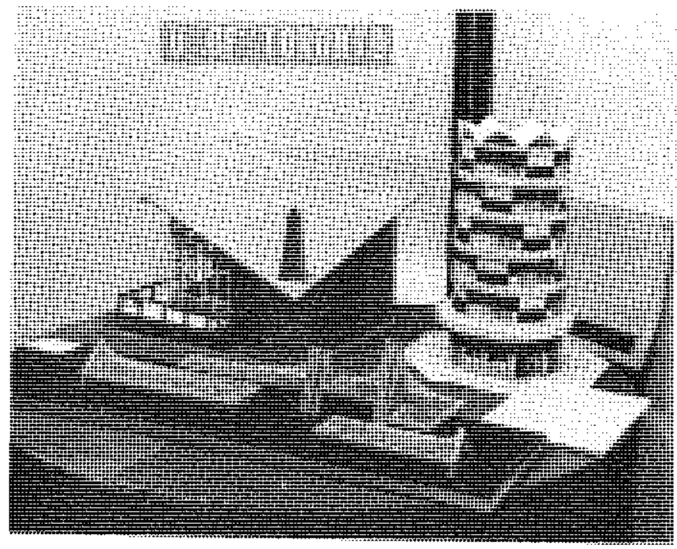


Preparation



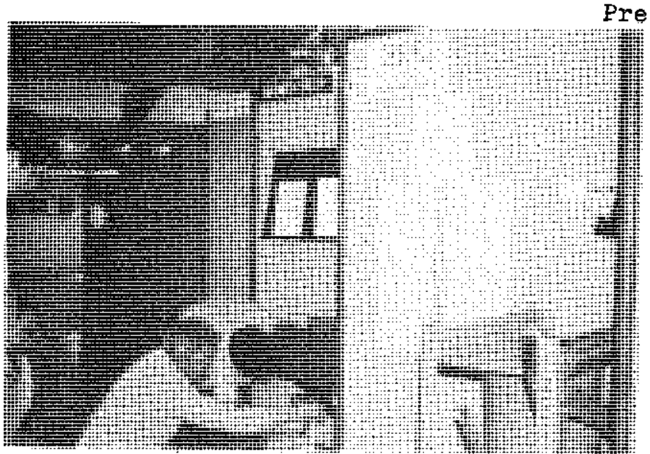
Typical Display

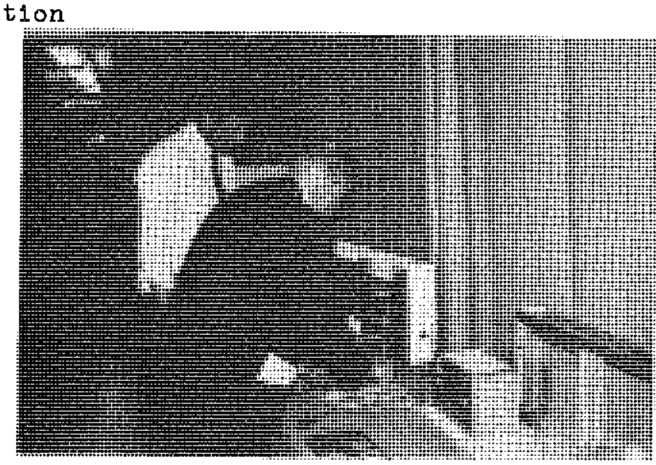


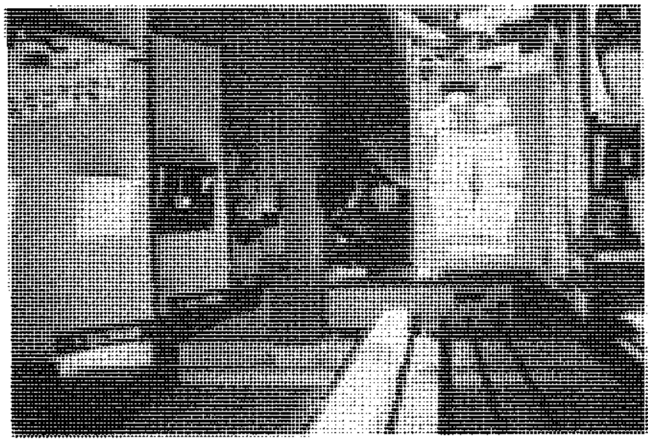


1970

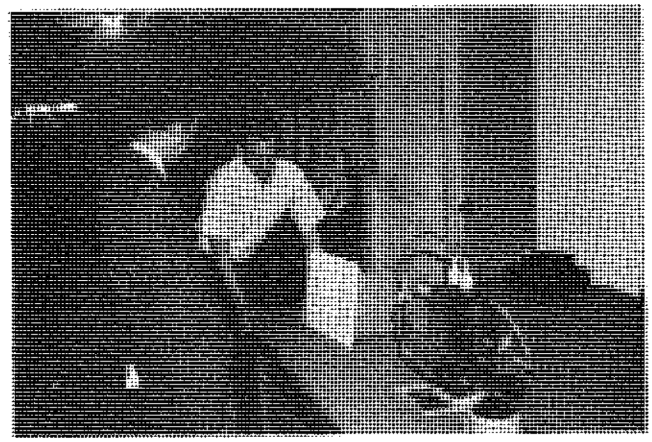
Preparation



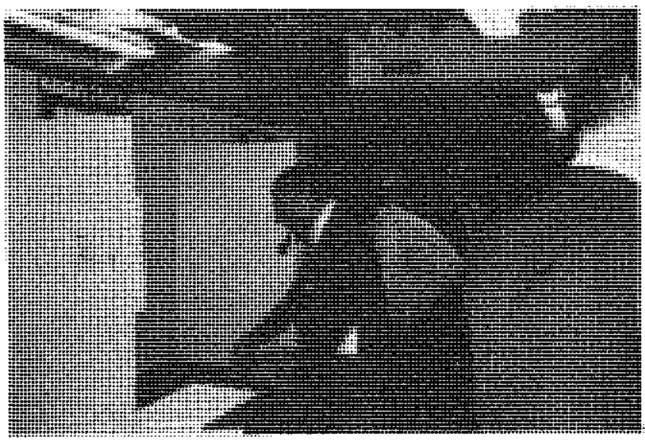




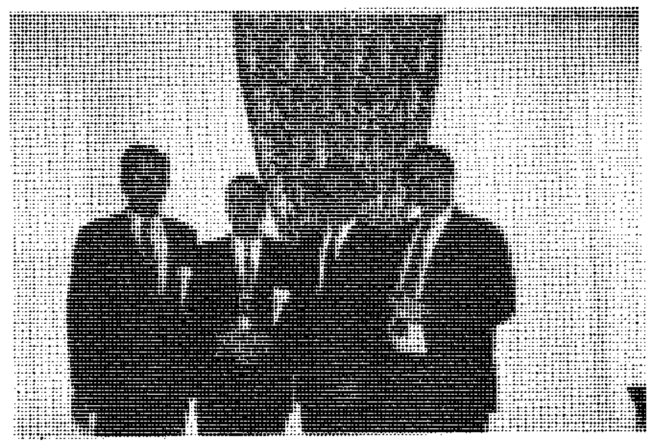
Interested engineering educators



Demonstration by student



Judging



Hosts

1971

The Creative Engineering Design Display for 1971 will be held at the United States Naval Academy during the ASEE Annual Meeting. Did you make reservations to show the outstanding work being done by your students?

Each school is allowed to enter six projects as follows;

Two (2) Freshmen projects
One (1) Sophomore project
One (1) Junior project
One (1) Senior project
One (1) Graduate project

Since the committee feels that it would be unfair for a school to submit more than other schools in a given category, no substitutes will be permitted.

For further information concerning rules for entering projects contact

Professor Robert D. LaRue
Engineering Graphics Department
The Ohio State University
2070 Neil Avenue
Columbus, Ohio 43210

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3

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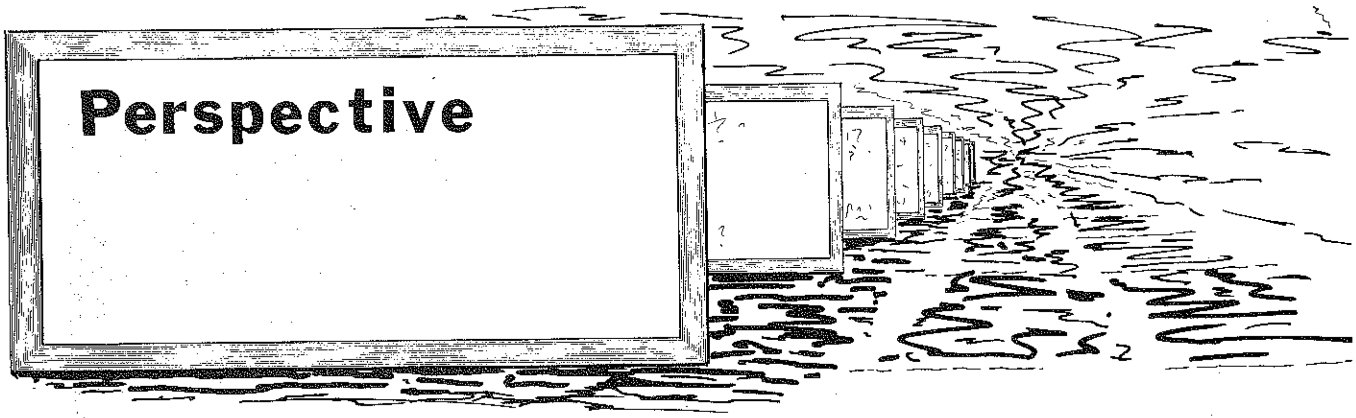
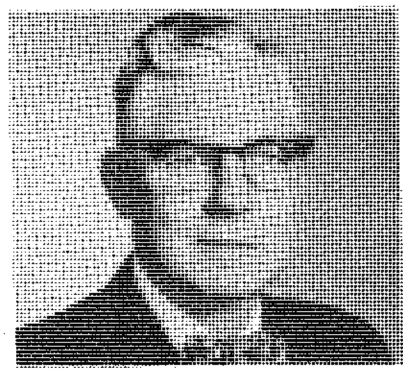


Mr. Graphics at GMI Retires



On Monday, August 31, 1970, a retirement reception was held for Professor Earl D. Black in the Heritage Room of the Campus Center at General Motors Institute. He has spent the last 28 years at this same school, starting as an instructor and rising to Senior Instructor and Associate Professor.

It is doubtful that retirement for Earl means sitting in a rocker for most of the day. He has developed a habit of being active which will probably remain with him during his present "leisure" time. After receiving his B. S. degree at Southeast Missouri State College he struggled along until being appointed a teacher at the Bendel High School in Flint, Michigan. General Motors students began to know him as a teacher in August of 1942. Since that time he has been active in his academic interest. Could anyone who is acquainted with him expect him to sit home and do nothing.

Earl Black has written several books and many articles on Engineering Graphics or related subject matter. His activities have led him to membership on several committees of the Engineering Graphics Division of ASEE, such as the Industrial Relations Committee (chairman from 1959 to 1963), Future Developments Committee (1960 to 1964), and the Long Range Planning Committee (1965 to 1967). In 1964 he became the editor of the Journal of Engineering Graphics as well as chairman of the Publications Committee following a year as secretary of the division. After completing a successful three years in this office, he was elected vice-chairman of the Division which led to his chairmanship in 1968-1969. In 1961 he was appointed to the ASA Standards Committee as the ASEE representative.

During his administration as chairman of the Division, there were two significant developments. First, the request for the change of name for the Division was submitted to ASEE. The request was to have the Division known as the Engineering Graphics and Design Division, which was eventually rejected an the present name accepted. The second development was the organization of the Engineering Design Education Committee to whom teachers may look for assistance, upon request, to develop a Creative Design sequence in the curriculum.

Earl has many non-academic interests to occupy much of his "liesure" time. Professional activities, which may be included in this category, would be designing homes and designing business places. Extra-curricular activities would include sessions at the golf course or bowling alley. He has also been known to enjoy himself while tinkering around the house.

Professor and Mrs. Black ---------the former Cora Reisenbichler --------- have been married since 1932. They have two sons; Dr. Earl D. Black III who is a pediatrician at Cross Point Woods, Michigan and Dr. Larry L. Black who is a dentist in Flint. The Earl Blacks also have six more interests --- six grandchildren.

As was mentioned earlier, it is difficult to imagine Earl sitting in a rocker most of the day. Most of his "sitting" will be done at a desk or table where he can do some writing since he plans to undertake Creative as well as Technical writing. Of course, he believes in the old saying "All work and no play makes Earl a dull boy" and axpects to put the writing tools down for extensive travel.

Earl, all of your professional friends -- -- of which, we know, there are many ---- wish you and Cora the best of everything. I'm sure that the Engineering Design Graphics Division of ASEE not only wishes you well, but also extends a hearty "thanks" for your time and deeds. The staff of the ENGINEERING DESIGN GRAPHICS JOURNAL wants you to know that we appreciate what you have done to permit continued improvement for the present and especially for the future. We hope that you will not forget us.

Good luck in whatever you do!

December 16, 1970

Mr. Borah L. Kreimer
Editor
Engineering Design Graphics Journal
Northeastern University
Suburban Campus
South Bedford Road
Burlington, Massachusetts 01803

Dear Mr. Kreimer;

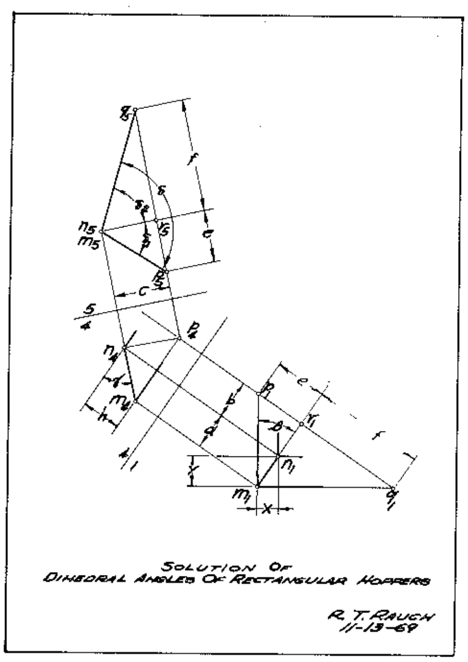
Your attention is called to page 18 of the Spring, 1970, issue of the Engineering Design Graphics Journal, Volume 34, No. 2, and Series 102.

I have been unable to find the derivation of the trigonometric formula for the hopper dihedral angle. I can well imagine that the oversight was caused by the fact that the alternate solution was submitted in two parts and the one part became lost in the "shuffle"

In case you may be interested in publishing the trigonometric solution in a future issue, I am enclosing the complete solution.

Yours very truly,
CUMMINS ENGINE COMPANY, INC.

R. T. Rauch
Technical Specialist
Test Engineering



Dear Mr. Rauch;

Thank you for the complete solution concerning the hopper dihedral angle. I am very happy to print it here.

Sincerely

Borah L. Kreimer
Editor

$\tan \beta = \frac{x}{y}$; $\tan \gamma = \frac{h \sin \beta}{x}$

$\tan \delta_1 = \frac{e}{c}$; $e = (a+b) \tan \beta$

$c = (a+b) \sin \gamma$

(1) $\therefore \tan \delta_1 = \frac{\tan \beta}{\sin \gamma}$

$\tan \delta_2 = \frac{f}{c}$; $f = (a+b) \cot \beta$

(2) $\therefore \tan \delta_2 = \frac{\cot \beta}{\sin \gamma}$

(3) $\delta = \delta_1 + \delta_2$

SUBSTITUTE IN:

$\tan \delta = \tan(\delta_1 + \delta_2) = \frac{\tan \delta_1 + \tan \delta_2}{1 - \tan \delta_1 \tan \delta_2}$

WE ARRIVE AT:

(4) $\tan \delta = \frac{\tan \gamma}{\sin \beta \cos \beta \cos \gamma}$

OR

(5) $\tan \delta = \frac{2 \tan \gamma}{\sin 2\beta \cos \gamma}$

NOTE THAT USE OF EQUATIONS (1), (2), & (3) IS SIMPLEST.

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by Warren J. Luzadder, Purdue University

COMPLETELY REVISED AND EXPANDED - the 6th Edition fulfills the requirements of technicians who need training in engineering drawing and practical design. It provides students with a working knowledge of production and construction processes, aids them in the interpretation and alteration of working drawings, and prepares them for creative design.

FEATURES the most complete coverage of descriptive geometry in the field in a new chapter on spatial graphics, and introduces new chapters on creative design, computer-aided design and automated drafting, and numerically controlled machine tools. Other new sections describe models for design and construction of chemical processing plants and material concerning technical illustrations. It also analyzes empirical equations and the construction of alignment charts for designers and draftsmen requiring a knowledge of graphic methods.

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

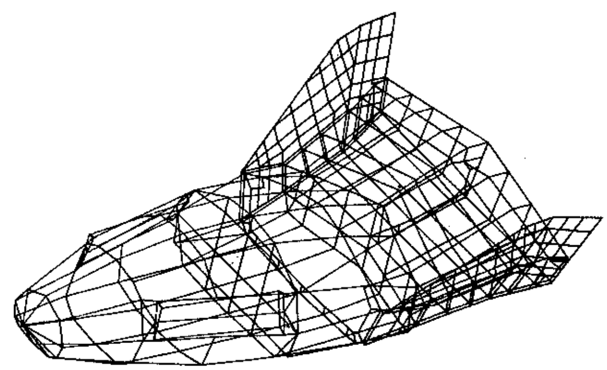
TEACHING AIDS

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.

PURDUE UNIVERSITY ENGINEERING DRAWING FILMS are available from the Audio-Visual Center, Purdue University, West Lafayette, Indiana 47907

And by the same author ...



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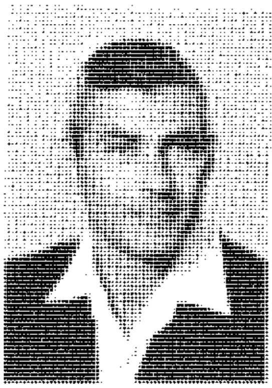
1968 656 pp. 6" x 9" illus. (06232-3) $11.50

Illustration from the text

For more information, write Box 903 **Prentice-Hall** Englewood Cliffs, N.J. 07632



On Conic Sections

Dr. MORDECHAI LEWIN
Technion - Israel Institute of Technology

Abstract

Some very elementary considerations of Descriptive Geometry lead to a considerable simplification of Dandelin's proof of the fact that a right circular cone, or cylinder, is intersected by a plane along a conic section.

The Problem

In the process of teaching three-dimensional synthetic geometry, one often encounters difficulties in proving that "a conic section is a conic section". Dandelin's proof, by means of his spheres, is elegant but apt to become quite tedious if one is going to treat the cases of the ellipse, the parabola and the hyperbola separately after first having settled the problem of the intersection of a plane and a right circular cylinder.

By using the definition which is common to all three lines and some elementary concepts from Descriptive Geometry, it is possible to simplify the entire treatment without having to distinguish between a cone and a cylinder.

The Proof

Regarding the cylindrical surface as a special case of the conical surface, we may now state the classical theorem on conical surfaces;

The line of intersection of a plane with a circular conical surface is a conic section.

We shall, knowingly, disregard the special case where the plane is perpendicular to the axis of the cone as well as the degenerate case where the plane passes through the vertex of the cone.

Let $\overline{AB}$ denote the true length of the segment AB. Let the axis of the conical surface be vertical. Denote the angle of inclination of the generating lines as α. A plane π with the angle of slope $\beta > 0$ (the angle being measured with the horizontal) intersects the given cone. Let the line of intersection be denoted by s. Without the loss of generalization, we may assume

(1) $\quad 0 < \alpha \leq 90^{\circ}$

(2) $\quad 0 < \beta < 180^{\circ} - \alpha$

For $\alpha = 90^{\circ}$ the cone becomes a right circular cylinder. Let S be the Dandelin Sphere inscribed in the cone, touching the plane π at the point F. Let σ denote the horizontal plane passing through the circle of contact of S with the cone. Let d be the line of intersection of π and σ; d is clearly horizontal.

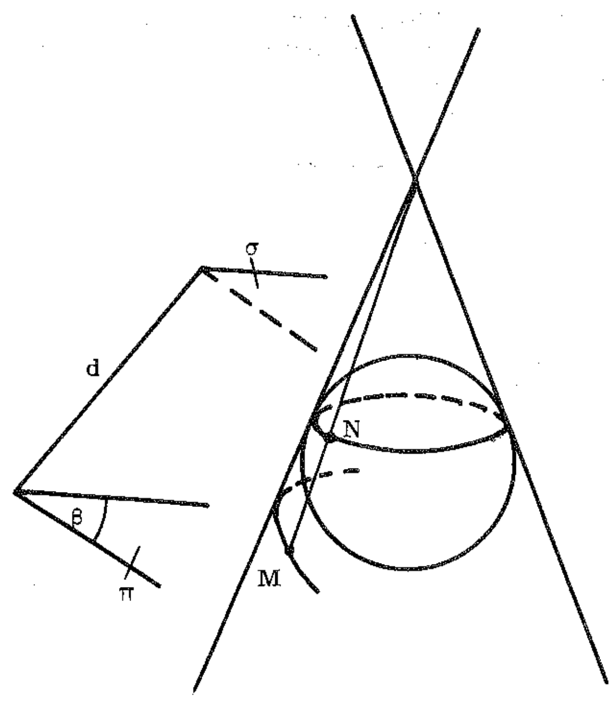


Figure 1

Let M be an arbitrary point on s. Denote the distance of M and d as δ_M. The generating line through M touches S at N. Figure 2 is an exact elevation of the system; the projection plane having been so chosen as to let both π and σ appear in an edge view. The d appears in a point view. Let M', N' and d' be the frontal projections of M, N and d respectively. (M) and (N) are the positions of M and N respectively after MN has been revolved about the axis of the cone until it comes to be parallel to the projection plane. An obvious fact used frequently in Descriptive Geometry is that (M)(N) = $\overline{MN}$. Since MF and MN are both tangent to S, they are equal. We now have

$$\frac{\overline{MF}}{\delta_M} = \frac{\overline{MN}}{\delta_M} = \frac{\overline{(M)(N)}}{\overline{M'd'}} = \frac{\sin\beta}{\sin\alpha} = \theta$$

θ is thus a constant depending on the system. By (1) and (2) it is clear that

$$\theta \lesseqgtr 1 \text{ accordingly as } \beta \lesseqgtr \alpha$$

so that s is an ellipse, a parabola or an hyperbola, depending on whether β is less than, equal to or greater than α, thus proving the theorem.

When $\alpha = 90^o$, (2) implies $\beta < \alpha$ so that $\theta < 1$ and s is invariably an ellipse, which willl settle the case of the cylinder.

It should be noted that regardless of the character of s, F turns out to be a focus of the conic section and d the directrix associated with with the focus F.

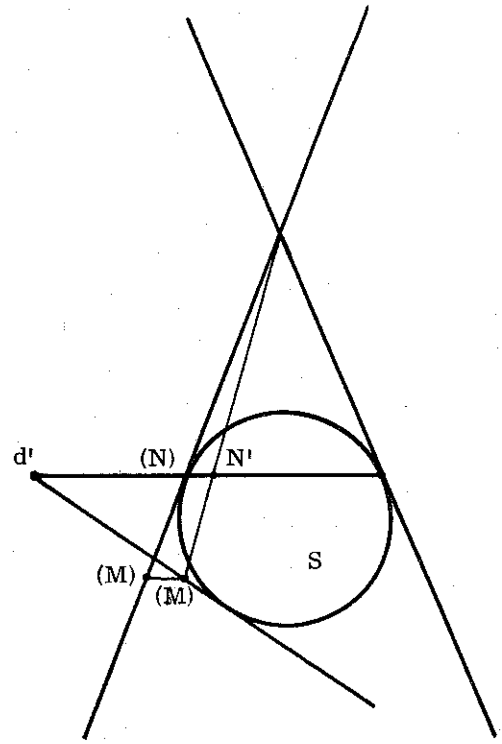
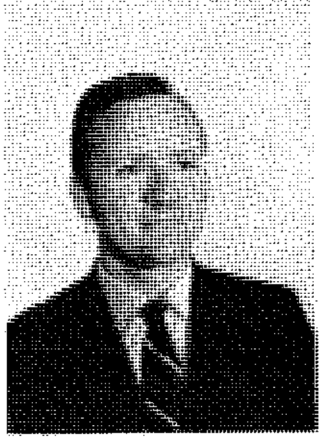


Figure 2

θ is clearly the eccentricity of the conic section.



Evaluation Of A Program In Engineering Design Graphics

PROFESSOR CHARLES H. STORY
East Tennessee State University

Charles H. Story received his Doctor of Education degree in August of 1970 at Texas A&M University. This article is a summary of his dissertation.

NATURE OF THE PROGRAM

Background

The Visiting Engineer Program at Texas A&M University was formulated to provide students of freshman graphics with a more realistic exposure to the profession of engineering. Since the initiation of the program during the fall of 1966, 258 engineers have served as consultants and evaluators to over 6400 students.

The program is an important part of two freshman courses in Engineering Design Graphics required of all engineering majors. Engineering design and the design process are introduced to the students in order to develop creative solutions to team design problems.

This article will present a summary of the programs' effectiveness as evaluated by the student and engineer participants. In addition to the narrative, selected portions of the survey data will be presented in graphical form.

Goals

The immediate goals of the program are shown in Figure 1. It is desired that freshmen students will (1) learn to develop an original design, (2) learn the principles of solving an engineering problem, (3) learn more about the profession of engineering, and (4) learn the importance of presenting engineering solutions in oral, graphical and written forms. The central circle in Figure 1 represents the two courses in graphics offered for engineering majors -- E. G. 105 and 106. The Visiting Engineer Program has provided realism and a unique approach to teaching the two courses in Engineering Design Graphics.

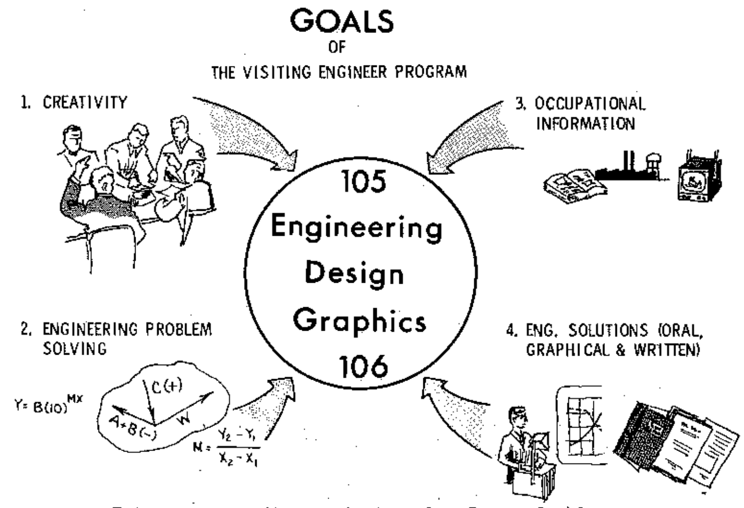


Figure 1. Immediate Goals of the Visiting Engineer Program

The long-range goals have included emphasis on (1) generalizing engineering education to include more humanities and liberal offerings dealing with social needs, (2) the involvement of the student in projects which require creativity and innovations rather than problems with the single solutions, and (3) improvement of the engineer's communication process.

Team Design Problems

Two types of design problems have been utilized -- one for each course in graphics. The rather broad systems problems were assigned during the fall semester and gave particular emphasis to (long - range) objective number one. The product design problems of the second semester emphasized the second objective which dealt with creativity and innovations. Both were projects to emphasize the third objective. Typical problems were as follows:

1st Semester -- E. G. 105

Systems Design

- Campus Information Center
- Trailer Facility
- Functional Service Station
- Hobby Center
- Rifle and Skeet Range
- Nuclear Fallout Plan
- Campus Access Planning
- Recreational Facility

2nd Semester -- E G. 106

Product Design

- Overhead Projector Eraser
- Portable Cement Mixer
- Home Exerciser
- Automobile Controls
- Offshore Elevator
- Panel Applicator
- Bathing Apparatus
- Adjustable TV Base

Activities

Each class of Engineering Design Graphics 105 and 106 was divided into design teams of six to eight members. Teams were able to select or propose a problem concerned with product or systems design. Instruction about the design process was used to assist groups in approaching the problem in a systematic manner. The six basic steps used throughout the semester are shown in Figure 2.

Practicing engineers from major industries in the United States were invited to make two visits to Texas A & M to participate in the program. The first visit (Figure 2) concerned consultation with the student teams about refinement of design projects and to assist in relating information about the nature of engineering occupations. The second visit involved evaluation of the teams' presentations to the class and panel of engineers. The critiques enabled the students to recognize their team's strengths and weaknesses as well as to learn more about evaluation methods used by engineers in industry.

STRUCTURE OF THE STUDY

The problem was concerned with an evaluation to determine the degree of accomplishment of both immediate and long-range goals of the Visiting Engineer Program. The research involved a survey of three respondent groups: 89 visiting engineers, 819 students of the Engineering Design Graphics 105 and 234 former students who were participants in the program. Two juries consisting of visiting engineers and faculty from the College of Engineering assisted in the preparation of questionnaire instruments. Five-

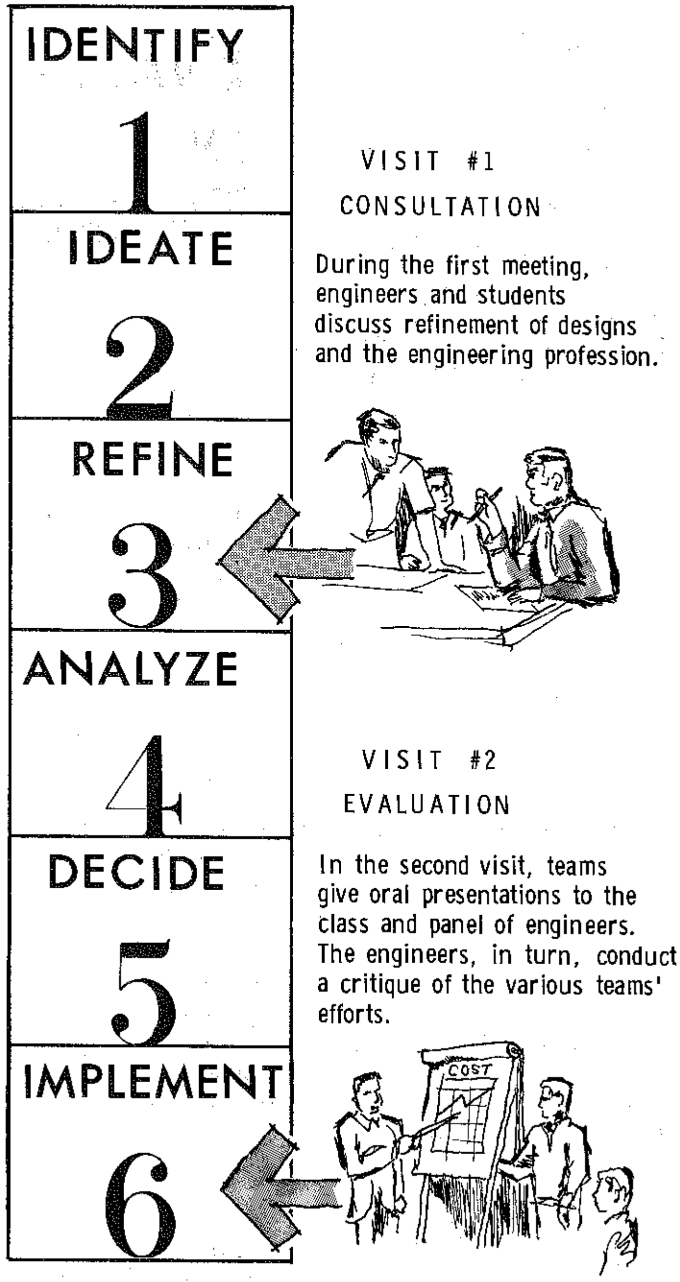


Figure 2. Visiting Engineers' Assistance in the Design Process

point rating scales were used to determine specific reactions about the various aspects of the program -- content, organization and experiences. Open-ended questionnaire items were included in all instruments to obtain overall reactions.

A pilot study was conducted to test the validity of the proposed instruments. Since the questions were composed to relate to the established goals, a statistical test (Friedman Two-Way Analysis of Variance by Ranks) was applied to the pilot data. Questions receiving the highest ratings were those concerning the fourth goal --the importance of presenting solutions in oral, graphical and written forms.

FINDINGS

Value of Visiting Engineers

Figure 3 shows the positive, negative and neutral responses from the students concerning their reactions to both visits. Seventy-four per cent of the students expressed a positive reaction to the first visit by the engineers. A slight increase was noted for the second visit, where over eighty-six per cent expressed a positive reaction.

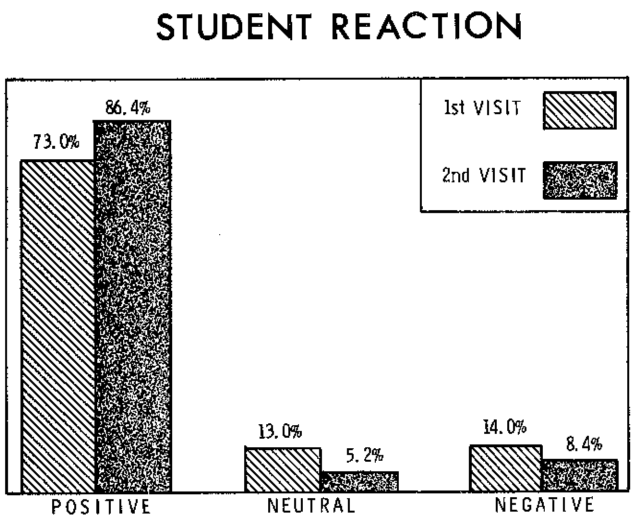


Figure 3. Student Reactions to Both Visits by the Engineers

By surveying students in Engineering Design Graphics 105, changes in attitudes toward engineering were determined. Although over forty per cent expressed no basic change in attitude as a direct result of the program, over thirty per cent expressed renewed interest in their present majors. In addition, over twenty-four per cent said the program confirmed earlier expectations about engineering.

Evaluation of Aspects of the Program

A three - way comparison was used to show the similarity of responses among students, former students and engineers. Mean ratings of items found in all three instruments were compared graphically. Figure 4 represents six of the thirteen items used in the comparison. Responses to the items were tabulated and arranged in descending order according to the mean scores. Items receiving the highest ratings were: (1) value of technical writing, (2) importance of graphical methods, and (3) gathering data for design problems.

A two-way comparison was used to show the similarities of ten program experiences. Six of the items included in the two-way comparison for former students and engineers are shown in Figure 5. Two experiences tied for the highest combined ranking -- report writing and visual aids for presentations. Oral presentation techniques and the design process received the next highest ratings.

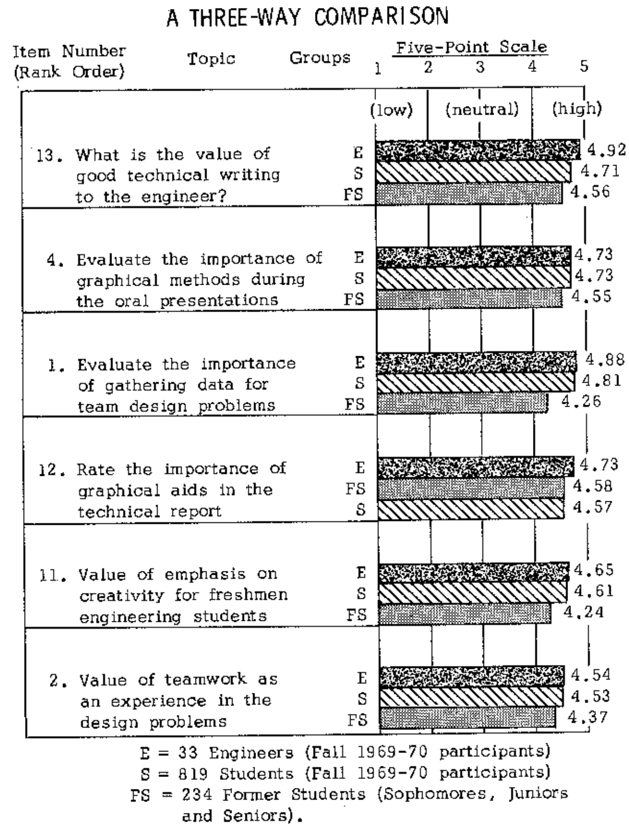


Figure 4. A Three-Way Comparison to Six Questionnaire Items

Visiting engineers from five successive programs returned questionnaires soon after the last visit. Figure 6 presents eight of the twelve items evaluated by the engineers. A five-point rating scale was used to evaluate each item. Eleven of the twelve items received mean scores over four points (4 = good; 5 = excellent).

CONCLUSIONS

Based on the major findings of the survey, certain conclusions were reached. First, a review of literature revealed that college engineering students should be exposed to realistic design experiences as early as possible.

It was noted that the visiting engineers had a positive effect on student attitudes on matters regarding the established goals. Based on the three-way comparison, participants were in general agreement as to the high degree of accomplishment of the various goals. In short, the program was found to be an effective method for introducing students to engineering.

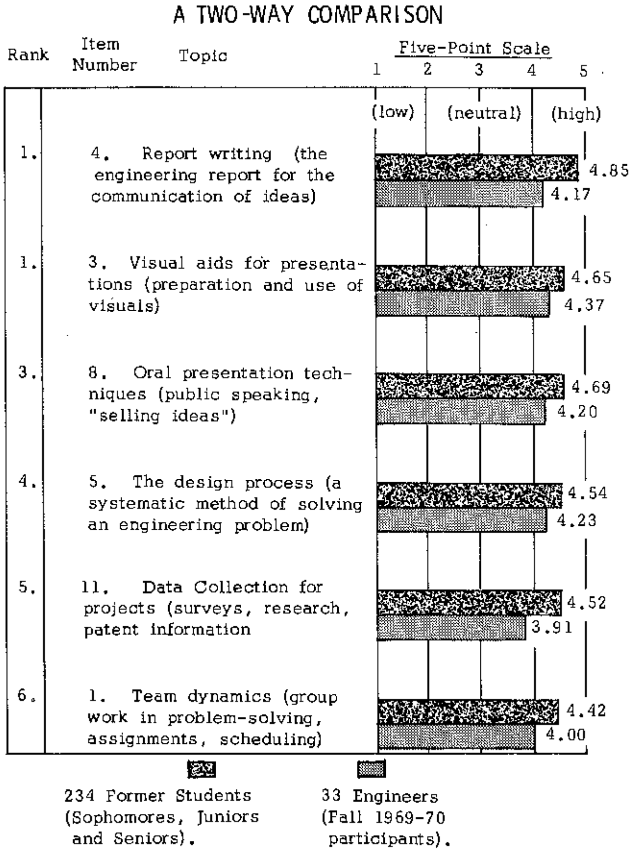


Figure 5. A Two-Way Comparison of Mean Responses to Six Items in the Follow-Up Study

Ten experiences offered by the Visiting Engineer Program were recognized to possess high degrees of importance for the engineering students. To mention a few, the groups concurred that teamwork, graphical techniques in reports and presentations, and creative design were highly valuable experiences.

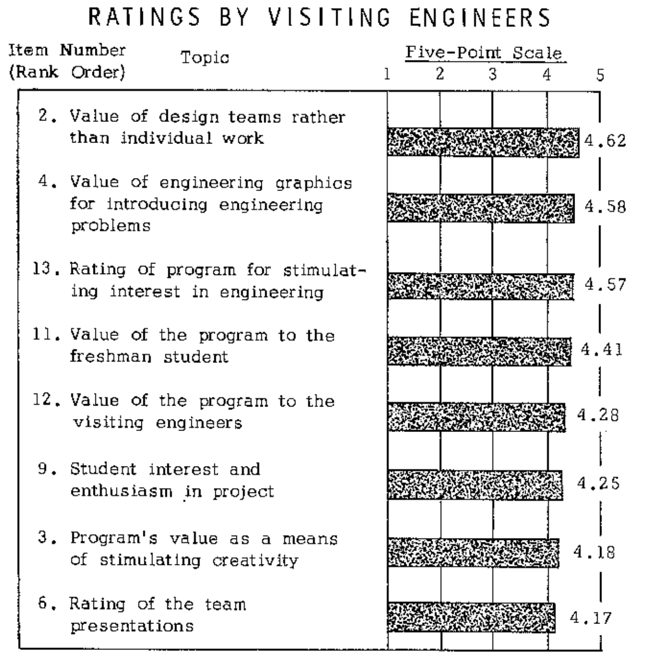
Although no major difficulties were found regarding student performances in the program, some students reported some difficulty in organizing team efforts during the earlier "free" class periods. Other difficulties concerned the organization of the team and individual efforts in writing the technical report.

RECOMMENDATIONS

Future programs should include a continuation of periodic evaluations from the participants. In addition, follow-up studies could include graduates or past participants who have received work experience in industry.

Increased emphasis and instruction could be given to the early stages of the team design process and technical report. Also, the engineers' critiques could receive more emphasis regarding specific assignments of engineers and time requirements.

Based on the success of the Visiting Engineer Program as determined by this study, this approach is recommended for use at other institutions. Other colleges should consider adaptation of similar plans for making engineering design graphics a meaningful part of the engineering curriculum. The interest of the students and the visiting engineers coupled with the results of their efforts support this comprehensive approach as a logical method of introducing students to the engineering profession.



(Respondents were 89 Visiting Engineers who returned the brochure questionnaire).

Figure 6. Overall Mean Ratings by Visiting Engineers of Five Successive Programs (1967-1970)

Evaluation should be conducted to determine the degree of success of the various stages of the design process. Rating scales should be used more extensively in other fields of study to allow the students to evaluate methods of instruction.

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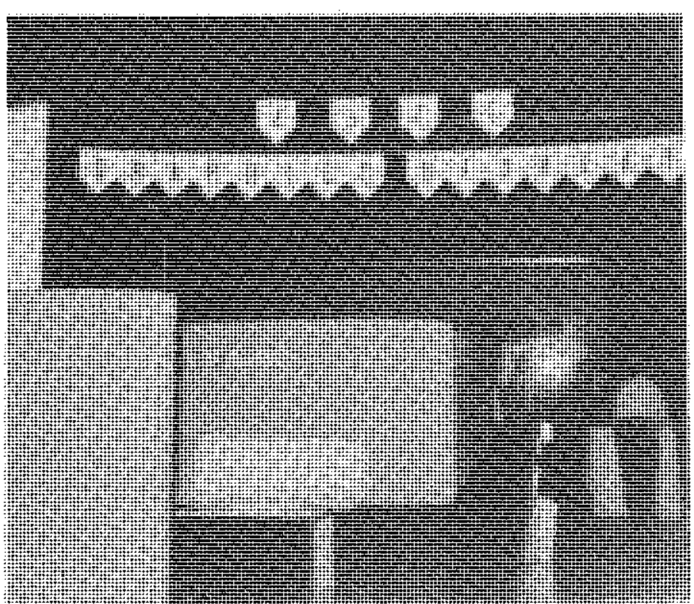
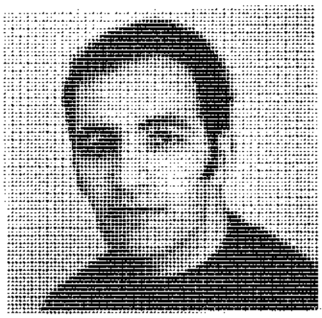




AN APPLICATION OF COMPUTER AIDED DESIGN TO ELECTROCARDIOGRAPHY

JAMES C. OTIS
Ph. D. Candidate
Case-Western Reserve University

ABSTRACT

The feasibility of displaying vectorcardiogram loops in a manner such that their orientation in a three-dimensional space is readily perceptible by physicians has been explored. A system was developed which incorporated a computer and plotter to draw sterioscopic pairs of vector loops for viewing by individuals or by an audience. It was found that properly augmenting the vector loops, along with viewing them stereoscopically, resulted in a very successful display technique.

INTRODUCTION

Electrocardiography and vectorcardiography have been widely used by physicians as an aid in the analysis of heart conditions. An electrocardiogram is a record of electrical potentials in volts and generally consists of a series of two-dimensional curves (one space dimension and one time dimension) each reflecting the cardiac potential in one direction as a function of time, such as that shown in Figure 1. A vectorcardiogram differs from an electrocardiogram by the manner in which the record is displayed. Instead of plotting one component of the potential vector and time, two components of the potential vector are plotted with only timing marks along the resulting curve to show temporal dependence of the potential (Figure 2) [1, 2].

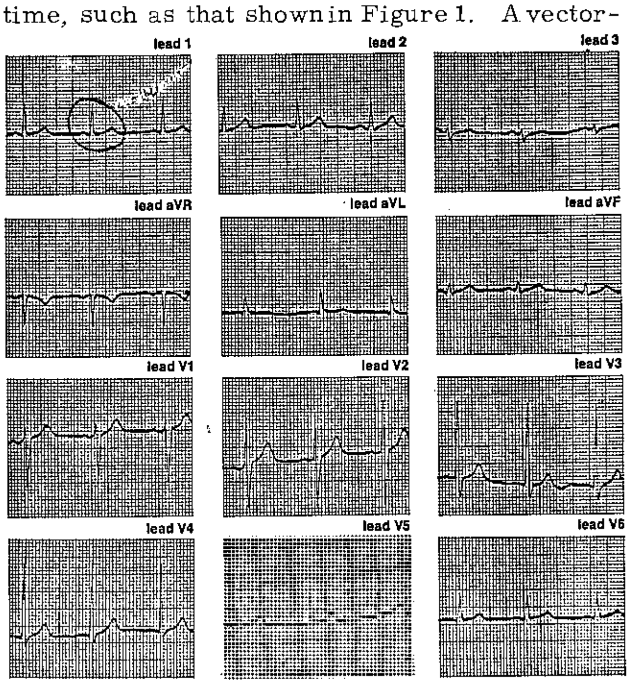


Figure 1
Electrocardiogram Curves

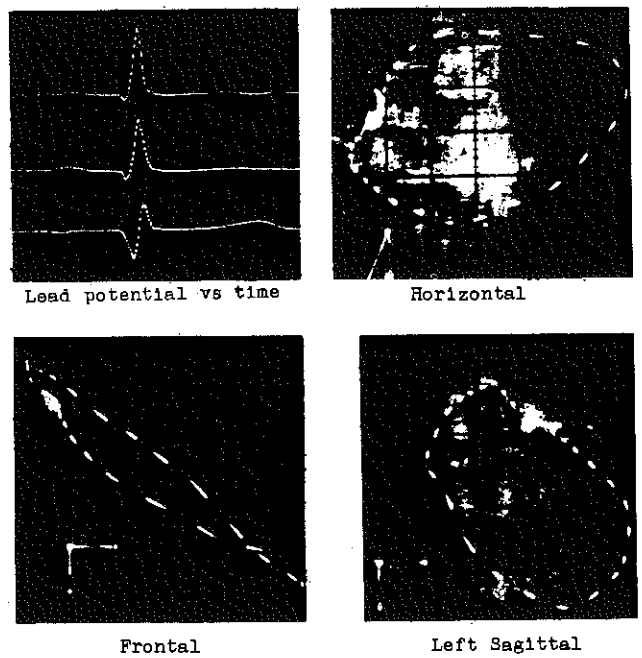


Figure 2
Vectorcardiogram Curves

The cardiac potential at any instant of time is inherently three-dimensional in nature. It is therefore definable by a minimum of three orthogonal components in space, all of which vary with time. This potential must be visualized three-dimensionally by the physician in order to achieve a complete understanding of the heart's behavior. He must visualize a loop being traced out in space with its velocity changing from point to point (Figure 3). When working with an electrocardiogram, this requires vector addition of selected component curves. The process required of adding these components, all functions of time, is an extremely difficult mental task.

This situation may be avoided by using the vectorcardiogram. With two vectorcardiogram displays, e. g. frontal and horizontal, the process becomes one of mentally transforming from a two-dimensional space into a three-dimensional space, which is less difficult than the previous transformation. However, it is still a complex task because of the nonuniformity in loop shapes. The transition from electrocardiography to vectorcardiography improves the man-machine interface by eliminating one space dimension from the transformation. Thus, it is reasonable to assume that the removal of another space dimension from the transformation would result in an even greater simplification of the process, since it will obviously eliminate the mental transformation completely. Therefore, the problem is that of finding a display of the cardiac potential which will eliminate the need for a mental transformation.

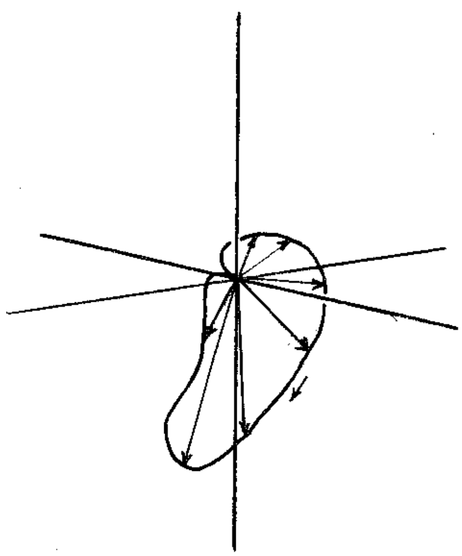


Figure 3
Vector Trajectory

METHODS

The data was obtained by photographing and digitizing the three components used to plot the vectorcardiogram loops (Figure 2). The data was extracted only for the QRS complex which represents depolarization of the ventricles and is of primary interest.

The computing was done on an IBM 1130 computer with an online calcomp drum plotter. A Fortran IV program was written to do perspective drawings of the vector loops given the X, Y, and Z coordinates of points along the loop [3]. The necessary inputs to the program are the coordinates to plot the configuration and the parameters which determine the observer's position. The program consists of two major subroutines. In order to obtain any view desired, one subroutine is incorporated which rotates the coordinates of the configuration in its three-dimensional space. Another subroutine uses the rotated coordinates and maps them from three-dimensional space, or more specifically, onto a plane of projection. The mapping is done in a manner such that the projected points are in perspective. The points in perspective are then drawn by the plotter.

Stereoscopic pairs are obtained by drawing a perspective view from one location, and then rotating the observation point four degrees about the configuration to draw a slightly different perspective. These are then viewed with a mirror stereoscope, such as are used to view aerial photographs for mapping purposes, and with red and green glasses, for black line and red and green line drawings, respectively.

RESULTS

The loops were displayed in stereo but additional techniques were necessary to augment the display. First, a set of axes was included as a reference in which the origin of the axes corresponds to the initial and final point of the loop. The second technique was to project the loop onto a horizontal plane and connect the loop and its projection with vertical lines at 5 millisecond intervals (Figure 4). This is advantageous for two reasons: (1) the uncertainty with respect to the orientation of the loop is eliminated and (2) the velocity changes along the loop are made apparent. Also added to the configuration were the 40 millisecond vector and the maximum vector in the QRS loop because of their particular interest to cardiologists.

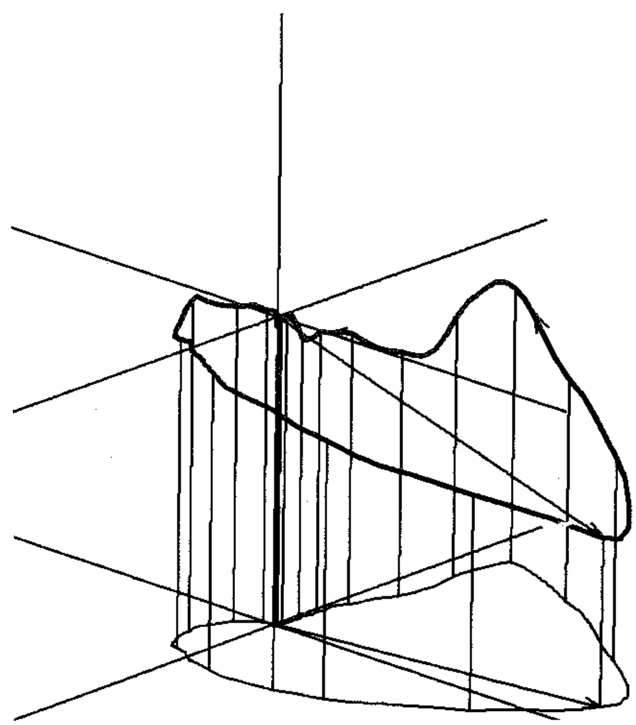


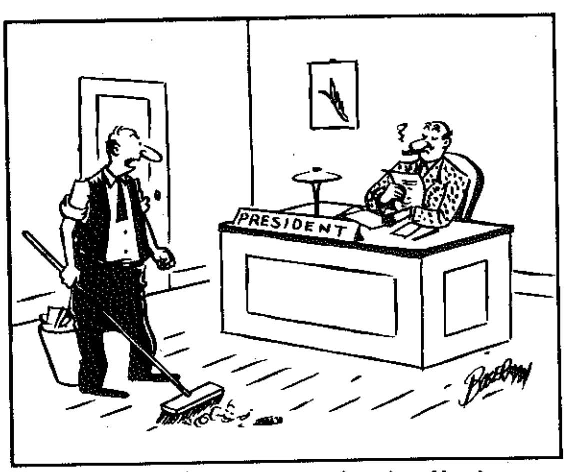
Figure 4
Augmented Loop

The stereoscopic pairs have been displayed in several ways. Originally the left and right views were done apart from each other so that no overlap would occur. These could only be viewed with a mirror stereoscope by one person at a time. In order to show the stereo pairs to an audience, each of the views was put on a color transparency so that the left and right views projected red and green, respectively. By superimposing the two views and using glasses with green and red filters, an audience may view them stereoscopically. Superimposing was also done directly on the plotter using red and green inks. These drawings can be used for individual viewing with red and green glasses without need for a stereoscope or projection equipment. Also the drawing size is not limited when the stereoscope is not used. Several attempts were made to make slides by photographing the superimposed drawings. However, no consistency could be obtained between the color in the slides and the color of the glasses, making this method unsatisfactory.

CONCLUSION

A combination of the techniques of augmented perspective drawing and stereoscopy has resulted in a feasible method of displaying vectorcardiogram loops. The observer is no longer required to make a transformation in order to form a mental image of the vector loop as it would appear in a three-dimensional space. The final result also affords the observer immediacy in perception of the loop through the incorporation of stereoscopy.

Future work will be to determine whether improved diagnosis could result from this display and whether it could be useful as an aid in the teaching of electrocardiography and vectorcardiography.



"Don't act so important. We have computers here."

ACKNOWLEDGEMENT

I want to thank Peter W. Neurath, D. Sc., New England Medical Center Hospitals, for advising me and making this work possible.

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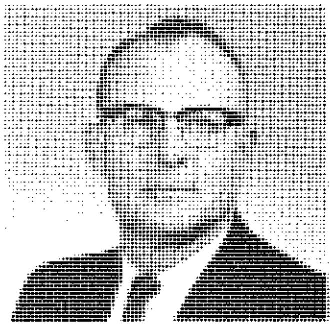

MORE ENGINEERING GRADUATES

W. GEORGE DEVENS
Virginia Polytechnic Institute

According to data recently released by the Engineering Manpower Commission of the Engineers Joint Council, full time student enrollment, in engineering schools, last year dropped 9,500 below the previous year. While the elimination of draft deferments for graduate students has strongly influenced total enrollement, a significant decrease in undergraduate enrollment was noted, particularly at the freshman and sophomore levels. Demand for engineers continues to exceed the supply and we cannot meet the demand at current levels of enrollment. Engineers pride themselves on being "problem solvers". Well, here is a very basic problem crying for solution.

Attempts to increase the attractiveness of an engineering career, to provide better motivation, and to reduce student attrition are in progress in many schools today. Perhaps the common theme in all of them is simply "involvement" ---- a popular term in this day and age. Students want to become involved with engineering at the beginning of their higher education. They are not interested in waiting until their Junior year to start chewing on engineering subjects. We can no longer afford the luxury of taking two year "survivors" of an initial input as being the only ones warranting further attention.

Since engineering is design, the creative aspects of the profession have been largely seized upon as the vehicle to attract and hold student interest. More and more, we see the word "design" appear in course titles. The Engineering Graphics Division of ASEE has recently changed its name to Engineering Design Graphics. Emphasis on design and creativity at an early stage has been successful at several Colleges in improving retention rates. Professor George C. Beakley of Arizona State University has reported, in a paper given at the 1970 Annual Meeting of the American Society for Engineering Education, entitled "Rescuing Freshmen from Engineering Alienation" that retention of engineering freshmen increased by 40% to 60% through "personal involvement in a realistic design experience." I believe this is a major step in the right direction, but I also believe there must be more than this if we are to produce the engineering graduates this nation sorely needs.

At Virginia Polytechnic Institute and State University, we are about to begin the fourth year of a Freshman Engineering Program which we feel is unique in engineering education today. Acting under the assumption that you cannot have upperclassmen in engineering if you lose them as freshmen, major emphasis has been placed on this program. Since the inception of the program, retention of Freshmen has been 70% or better of the original output.

The total V. P. I. freshman engineering involves a number of areas. It begins with the Summer Orientation and Registration Program, required for all entering freshmen. In addition to a general university orientation, the College of Engineering provides its own special orientation. The key element here is a scheduled private conference of the student (and parents) with a seasoned member of the engineering faculty. The student is welcomed to our profession and senses a very personal interest in him even before he has formally enrolled.

In previous years, counseling of freshmen was provided on a general, if needed, basis by a few faculty. Today, each student is assigned an advisor for the entire year. His advisor is one of his instructors during the Fall Quarter, making it easier to establish a true personal relationship.

All one thousand of our freshmen are enrolled in General Engineering. They do not select a specific departmental area until the end of the year - at which time they are in a much better position to make this decision. To assist them, each of our eleven departments provides detailed orientations, on a scheduled basis, throughout the year. Consequently, "department jumping" has shown a considerable decrease.

In addition tp Mathematics, Chemistry and English, each of our freshmen takes a twelve quarter - credit - hour sequence of courses from the Division of Engineering Fundamentals. Six hours, over three quarters, are devoted to Engineering Graphics. We continue to emphasize graphic skills as a prime means of communication for all engineers. However, intricate detailed and assembly drawings are a thing of the past. The course stresses graphical approaches to problem solving and design through training in three dimensional visualization and pictorial representation.

The other six credit hours, also over three quarters, is devoted to a new area labeled "Intro" or "Fundamentals" by the students. The Fall course, "Introduction to Engineering", G E 101, deals with the history and functions of engineering, the role of the engineer in society, and takes in slide rule proficiency. The course is designed to provide high initial motivation. The Winter Quarter course, "Introduction to Engineering Methods", G E 102, deals primarily with resolution of empirical data, graphical mathematics, and basic computer programming. Daily "turn around" service for student programs is provided through centrally controlled batching.

The Spring Quarter features a course entitled "Conceptual Design and Analysis", GE 103. That is a pretty fancy title for a freshman level course. Three years ago, there were many who questioned the sanity of introducing a group of young students with little scientific or technical background into such a program. The students have answered the question through performance. It is a delight to work with these intelligent, creative and open minds. At this point they know no limits or false constraints. New ideas or new adaptations of old ideas come easily. Their work and their reports have caused those, involved with upperclass design courses, to sit up and take notice. However, the biggest gain from this course comes in the student's realization of what he doesn't know - and the further realization of the value of the courses to follow in the total curriculum.

Throughout the year, guest speakers are invited to address the class. Opportunity to visit local industries is provided, and students are encouraged to participate in the functions of the various engineering societies.

To teach the freshman courses, we utilize the diverse talents of the entire College of Engineering faculty. This approach, we feel, is unique to Virginia Tech and offers the obvious advantages of

1. exposing students to a broader spectrum of engineering background.
2. actively involving the entire college with freshmen
3. precluding the need for a substantial increase in faculty

To date, approximately two thirds of the faculty have been involved in the program, including several department heads. Most instructors teach one, and sometimes two, freshman sections in addition to instructing in their parent department. Coordination in effected by the Division of Engineering Fundamentals. Since the majority of the instructors are heavily engaged with their own courses, every effort is made by "The Freshman Office" to plan ahead and to provide detailed instructional material.

The Commonwealth of Virginia is currently engaged in a rapid expansion of its Community College system to a total of twenty-two colleges. Since many of their engineering students transfer to V. P. I. we have established a close liason with many of them to ease student transition. We provide our course material to their faculty to use as they see fit. As a result, transfer students, from these schools, now arrive with more transferrable credit.

We will continue to lose some of our initial input. Failure to cope with mathematics and chemistry contributes a significant percentage of the loss. This loss we can afford. Hopefully, we are retaining the great majority of students who are capable of graduating as engineers.

We have been fortunate to enjoy the complete cooperation of the entire College of Engineering and an enthusiastic group of instructors. Many have discovered that teaching curious and questioning freshmen is a refreshing experience. All the faculty is acutely aware of the presence of our freshmen. Here is where the process begins. If we can motivate, challenge, and stimulate the freshmen; if we can retain the top talent in our profession; we are on the way to providing our nation with more engineering graduates. The new freshman program at V. P. I. launched amidst some skepticism and with some trepidation, has definitely proven to be a step in the right direction.

FRESHMEN ENGINEERING CURRICULUM

Virginia Polytechnic Institute

Chem. 113, 123, 134	General Chemistry	3(3)	3(3)	3(3)
Chem. 114, 124, 134	General Chemistry Laboratory	3(1)	3(1)	3(1)
Math. 111, 121, 131	Calculus	5(5)	5(5)	5(5)
Engl. 112, 122, 133	Types of Discourse & Literature	3(3)	3(3)	3(3)
G.E. 114, 124, 134	Engineering Graphics	3(2)	3(2)	3(2)
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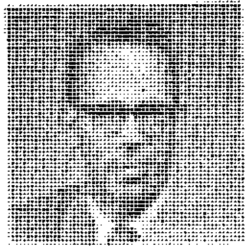

DETERMINATION OF GOLF SWING GEOMETRY BY ORTHOGRAPHIC PHOTOGRAPHY --- DESCRIPTIVE GEOMETRY METHOD

ED WILKS
Georgia Institute of Technology

ABSTRACT

The orthographic photography - descriptive geometry method introduced by Professor Levens in his work on the design of orthopedic devices* is extended to the golf swing. The golf swing application (not yet tested) would determine the motion geometry of the golf club and the golfer's body during a full swing. Three mutually perpendicular synchronized movie cameras photograph the swing using the clubhead and key body joints as moving targets. The perspective camera data is converted to orthographic data through reference scale grids at the golfer. The output of the system is a set of space coordinates for each camera target at each observation time. This data converts directly into descriptive geometry layouts showing relative lacations of the different body joints at particular times. By treating these layouts as ordinary line and plane problems three new golf parameters are developed and illustrated.

RECENT BRITISH RESEARCH ON GOLF

1. "The Searcg For The Perfect Swing" by Cochran and Stobbs; Lippincott, 1968.
This is a report on a comprehensive four year golf research project sponsored by the Golf Society of Great Britain. Dr. Cochran, a physist, was full time director, They treated clubhead geometry from photographs made by a simple camaimed normal to the presumed plane of the clubhead path. They didn't mention any attempt to solve the geometry of the golfer's body.

2. "The Science Of The Golf Swing" by Dr. David Williams; Pelham Books, 1969.
This is a report of Dr. Williams' personal research on golf; his work is also coplanar and he doesn't mention body geometry.

3. "X-Ray Way To Better Golf" by Adwick; Pelham Books, 1970.
Mr. Adwick introduces a new technique in golf swing photography. He makes time exposures showing the complete motion paths of the golfer's hands and the clubhead. Small battery operated lights serve as camera targets.

PHOTOGRAPHY

Figure 1 shows the general setup of the cameras and targets. The principal axes are shown at the origin (O). The three cameras are aimed parallel to these axes and are lined up with the golfer's body. The clubhead, and the golfer's shoulders, hips, and hands are the camera targets. The synchronized cameras would operate at 100 frames per second. Each frame would be needed for the high speed portion of the clubhead arc; something like every fifth frame would be sufficient for the slower moving body parts.

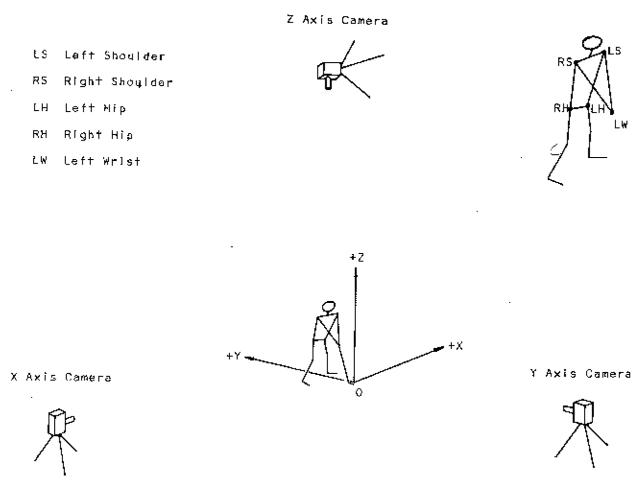

Figure 1
General setup of cameras and targets

CONVERSION OF CAMERA DATA TO SPACE COORDINATES

Figure 2 shows the method of building a scale at the golfer into the film images. The X

* GRAPHICAL METHODS IN RESEARCH by A. S. Levens: Wiley, 1965

axis camera setup is used for illustration. After the camera has been focussed on the golfer, the location of the golfer's feet is marked on the floor, the golfer moves out, and a set of layout wires are installed. These wires form a reference square normal to the camera and midway between the foot markings. Corner O' of the reference square O'ABC is a translated origin whose location is known with respect to the origin O. After the reference square is photographed the layout wires are removed. Then the golfer moves back into position and his swing is photographed. The first step in film analysis is to adjust the distance from the projector to the screen, making the film image of O'ABC coincide with an identical square premarked on the screen. The projector is locked into that location and screen axes Z' and Y' become base lines for measuring coordinate distances Y and Z for the different camera targets.

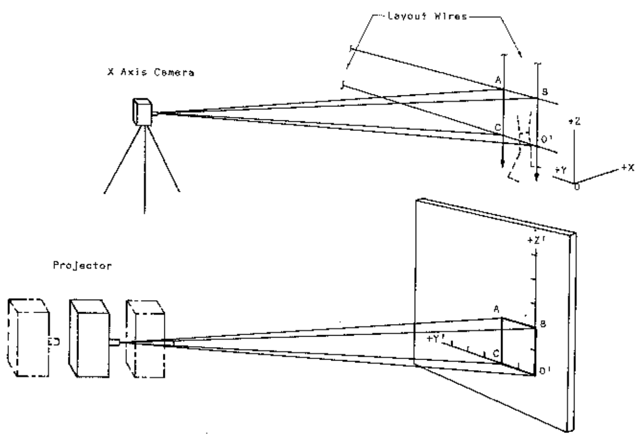

Figure 2
Method of relating scale at Golfer to scale on the Projection Board.

Figure 3 shows how corrections can be made for targets in front of or behind the reference square. The X axis camera and a target (T) behind the reference square are used for illustration. The "similar triangles" method uses the known distance from the camera to the reference square.

When a particular target is visible from all the cameras each coordinate for that target (at that time) would be measured twice, furnishing a check. The X axis camera would read X and Z; and the vertical camera would read X and Y.

MOTION PATHS

The motion path of a target can be traced by sticking pins directly into the projection screen while the projector is stopped at successive frames. Figure 4 illustrates this feature; it shows part of a backswing clubhead path with four points on the arc as seen in four different

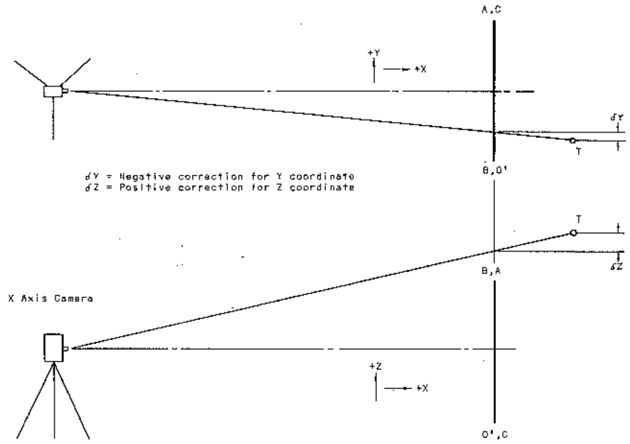

Figure 3
Corrections for targets not in the plane of the scale grid.

film frames. The starting point O, intermediate points D and E, and the end point F represent four target locations for the four frame times. The four points in each of the orthographic views locate four pins stuck in each of the three projection screens. Point F is at (ΔY, ΔZ) in the X axis view; at (-ΔX, ΔZ) in the Y view; at (-ΔX, ΔY) in the Z view; and at (-ΔZ, ΔY, ΔZ) in space.

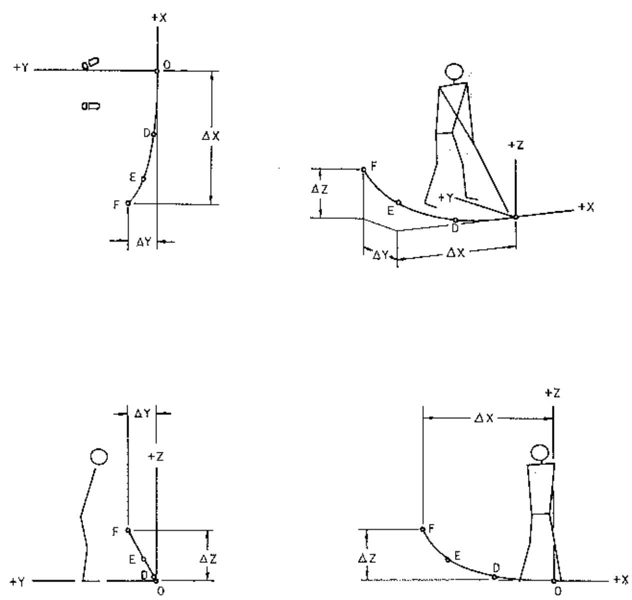

Figure 4
Orthographic projections of a partial arc of the clubhead motion path.

Figure 5 shows an arrangement of shoulder and hip targets* permitting visibility from all three cameras. The camera targets illustrated could be small spheres of lightweight material. The pinsticker would put temporary pins in the images of these targets; later he would locate actual target pins on lines connecting left and right pairs of temporary pins

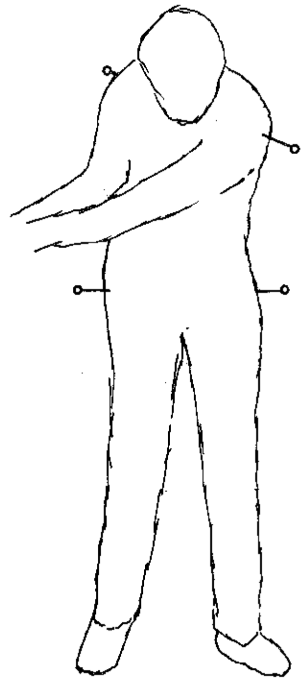

Figure 5
Camera targets for hips and shoulders

NEW GEOMETRIC PARAMETERS AND THEIR MEASUREMENT BY DESCRIPTIVE GEOMETRY

The first parameter ("A") relates to the sequence of motions leading to the desired "late hit"; it is a measure of how much the hips lead the shoulders in the downswing. The given views in Figure 6 are simultaneous projections of a golfer's torso in skeleton form. The projection planes are normal to the X and Y axes. The assumed posture is that of a golfer late in his downswing but before impact. Point MS is the midpoint of the shoulders; MH is the midpoint of the hips. Line MS-MH approximates the golfer's spine. Parameter "A" is defined as the angle the hips lead the shoulders in the downswing as seen by an observer looking down the axis of the golfers' spine. The first auxiliary shows the spine in true length. The second auxiliary shows the spine as a point and indicates the measurement of angle "A" for the instantaneous posture.

The second parameter ("B") also relates to the "late hit"; it measures a relationship between the arms and shoulders during the downswing. The given views in Figure 7 are YZ and XZ projections of the shoulders, hands and hips for a golfer at the start of his downswing. The hips are included only as an aid to visualizing the golfers' posture; they aren't used in the solution. Parameter "B" is the angle between the golfers' left arm and a line connecting his shoulders; it is the interior angle at LS in the plane RS-LS-LW. The usual "true size of a plane" solution is shown with a true length line in the XZ view, plane as an edge in the first auxiliary view, and true size of the plane in the second auxiliary. Parameter "B" is a function of the bend in the right elbow; it introduces the concept of maintaining the "top of the backswing" value of Angle "B" during the first move of the downswing.

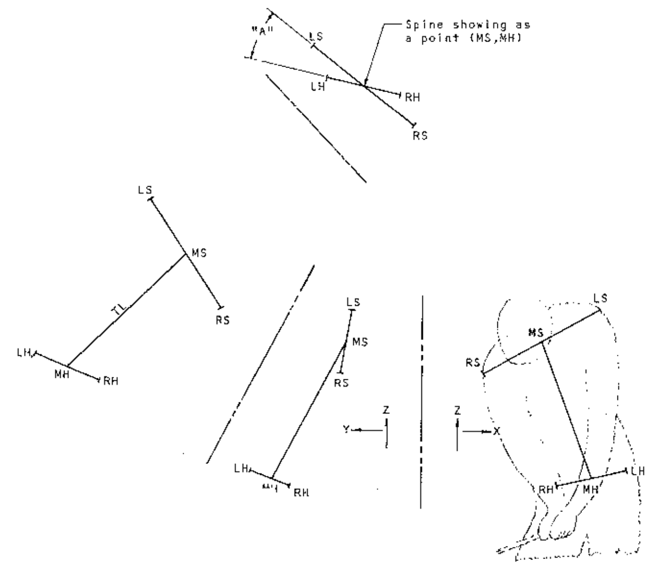

Figure 6
Parameter "A" - The angle hips lead shoulders in the downswing.

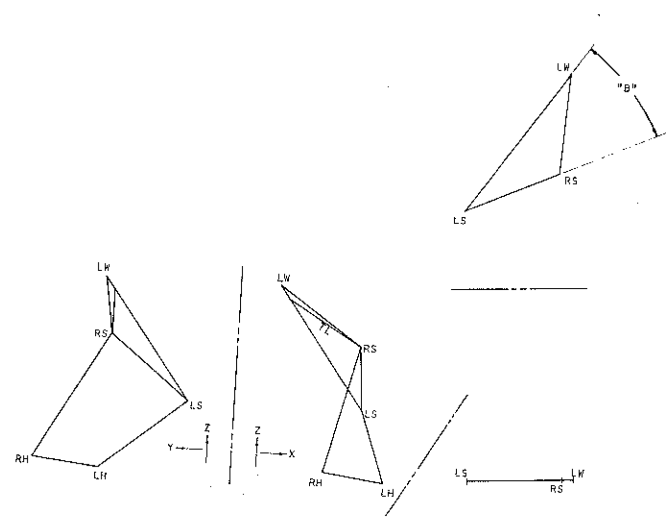

Figure 7
Parameter "B" - The angle between the golfer's left arm and his shoulder line.

The third parameter ("C") relates to backswing geometry. "C" is the dihedral angle between the shoulders-hands plane (the plane in which Parameter "B" is measured) and a plane defined by the shoulders and the spine. Figure 8 shows the two planes for a golfer near the top of his backswing. The planes intersect in the

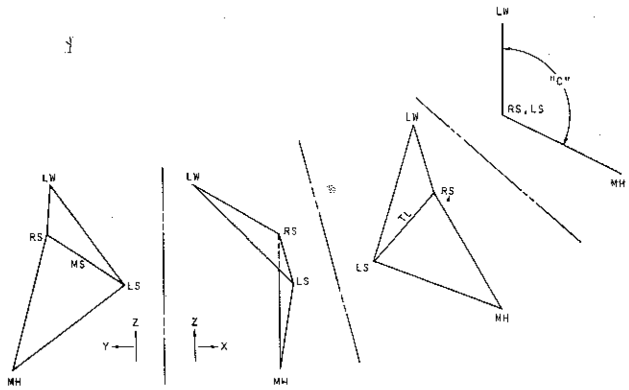

Figure 8
Parameter "C" - The dihedral angle between the shoulders-hands plane and the shoulders-spine plane.

in the shoulder line RS - LS. The usual dihedral angle solution is shown with the shoulder line appearing in true length in the first auxiliary and as a point in the second. Parameter "C" is a function of the shoulder turn and height of hands; its variation pattern could be useful in describing and teaching the backswing.

OTHER USES OF GEOMETRIC DATA

The coordinate form of the output geometric data is ideal for building physical models of the different motion paths. Bent wire motion path models with time markings could be useful devices for golf instruction.

The system could also be used to help a golfer who is off his swing to regain his earlier form. If the geometry of his normal swing has been recorded he could come back to the laboratory when he is having trouble and have the differences between his normal and his trouble swings determined.

The system could further be used as the geometric base for a research project studying the dynamic forces acting on the different parts of the golfer's body during the swing. The output space - time data could be converted to velocity-time and acceleration-time data by graphical calculus.

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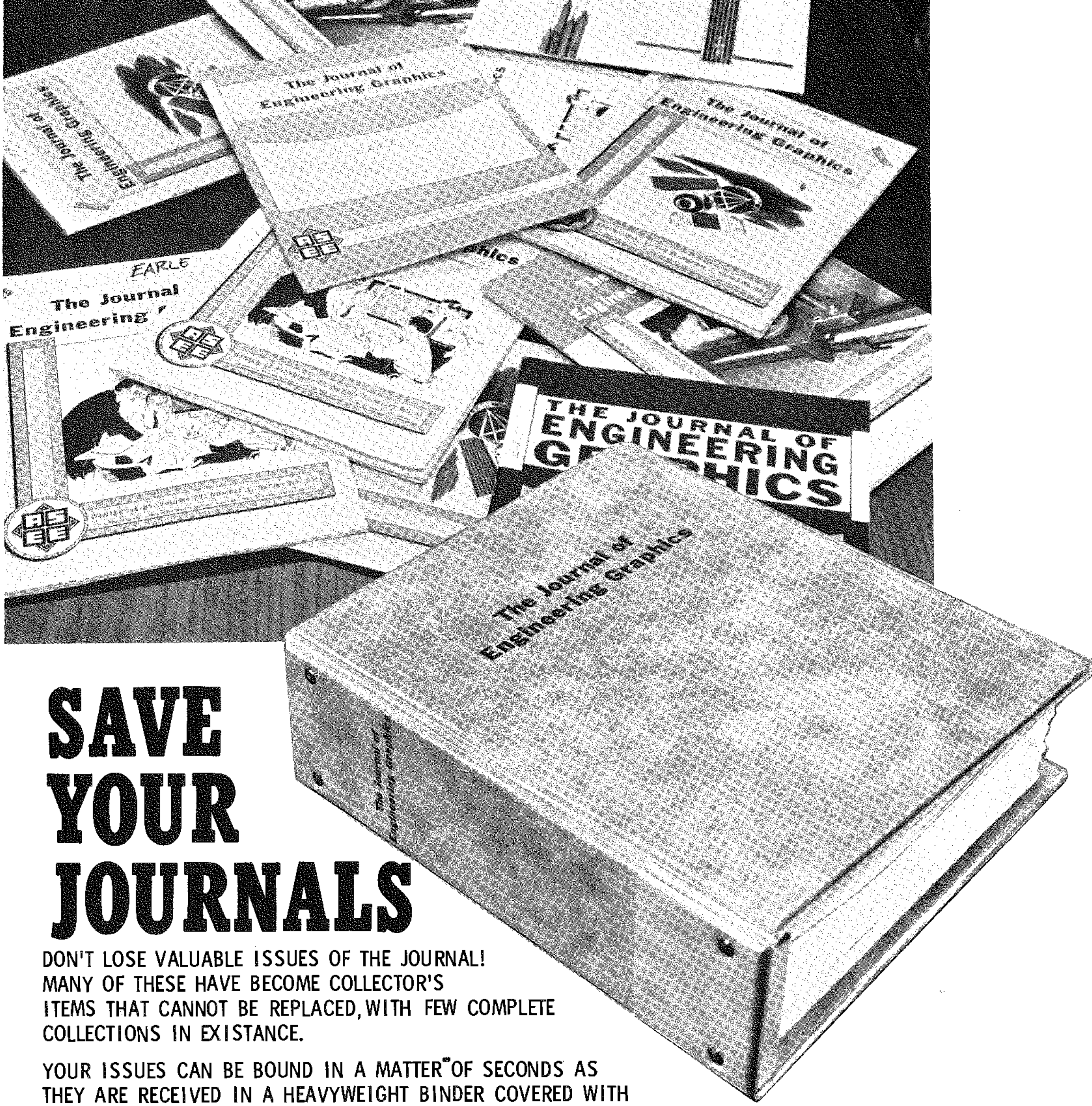

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