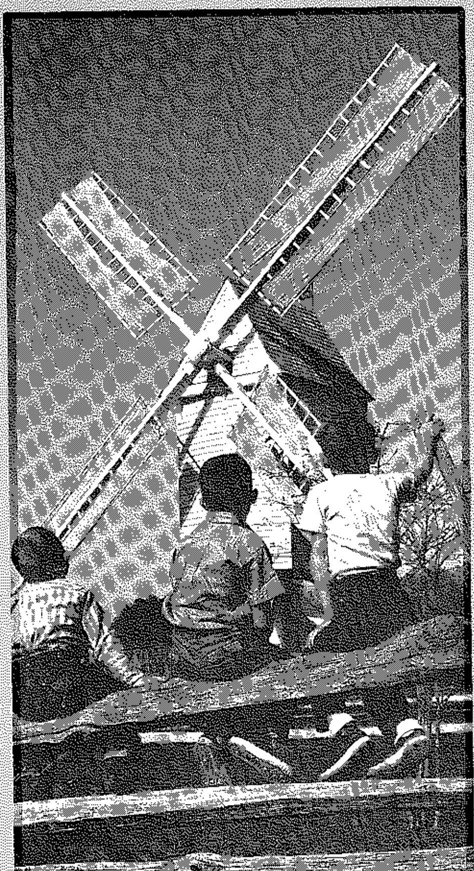
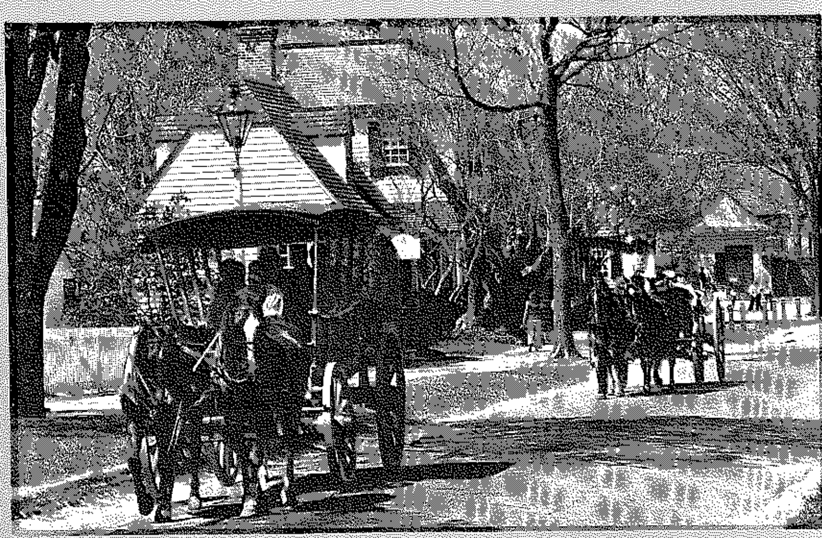
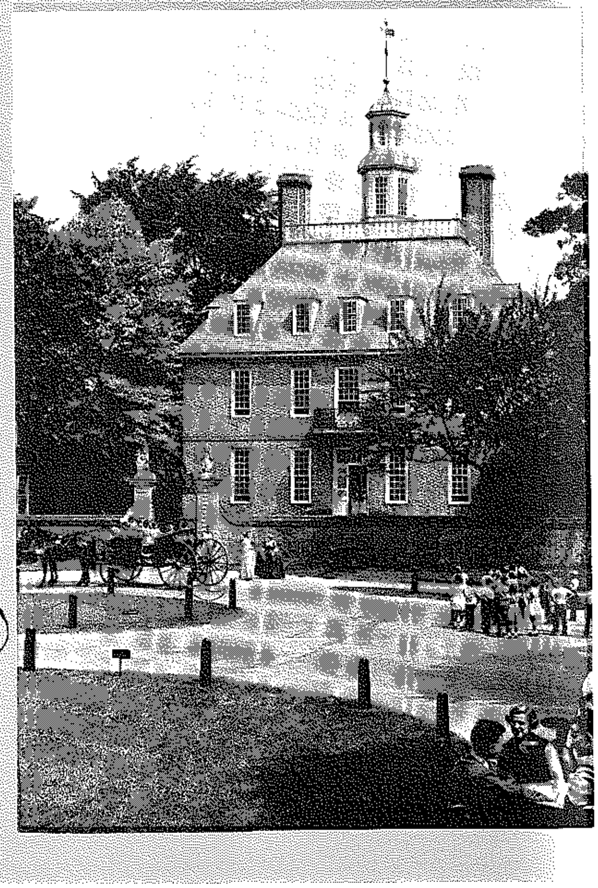
ENGINEERING DESIGN GRAPHICS JOURNAL

FALL 1974 VOL. 38, NO. 3, SERIES 115



WINTER MEETING
December 12-14
1974





Colonial Williamsburg
Foundation
Williamsburg, Virginia 23185

ENGINEERING DESIGN GRAPHICS JOURNAL

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

Yearly subscription rates: U.S., Mexico, Canada

	1 yr	2 yr	5 yr
ASEE members	$ 3.00	$ 5.00	$10.00
Non-members	5.00	10.00	25.00
Other subscribers	10.00	20.00	50.00

Single copy rates:
In U. S., Mexico, and Canada:
ASEE members....................$1.50
Non-members.....................$2.00
All other orders..................$3.50

Back issues are available at single copy rates prepaid and are limited in general to numbers published within the past six years.

Subscription expiration date (last issue) is printed in upper right corner of mailing label, W73 for Winter 1973, S74 for Spring 1974, F75 for Fall 1975, etc.

NOTE
The views and opinions expressed by the individual authors do not necessarily reflect the editorial policy of the ENGINEERING DESIGN GRAPHICS JOURNAL or of the Engineering Design Graphics Division of ASEE. The editors make a reasonable effort to verify the technical content of the material published; however, final responsibility for the opinions and the technical accuracy of each article rests entirely upon the author.

ENGINEERING DESIGN GRAPHICS JOURNAL OBJECTIVES:

The objectives of the JOURNAL are:

1. To publish articles of interest to teachers of Engineering Graphics, Computer Graphics and allied subjects.
2. To stimulate the preparation of articles and papers on the following topics (but not limited to them):
3. To encourage teachers of Graphics to innovate on, experiment with, and test appropriate techniques and topics to further improve quality of and modernize instruction and courses.

CALENDAR OF MID-YEAR MEETINGS

1974-75: Williamsburg, Virginia

1975-76: Arizona State University

STYLE GUIDE FOR JOURNAL AUTHORS

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

1. All copy is to be typed, double-spaced, on one side only, on white paper, using a black ribbon.
2. Each page of the manuscript is to be consecutively numbered.
3. Two copies of each manuscript are required.
4. Refer to all graphs, diagrams, photographs, or illustrations in your text as Figure 1, Figure 2, etc. Be sure to identify all such material accordingly, either on the front or back of each figure. Your own name should also appear on the back of each. Illustrations cannot be redrawn; they are reproduced directly from submitted material and will be reduced to fit the columnar page. Accordingly, be sure all lines are sharply drawn, all notations are legible, reproduction black is used throughout...and that everything is clean and unfolded. Do not submit illustrations larger than 8-1/2 x 11. If necessary, make 8-1/2 x 11 or smaller photo copies for submisssion.
5. Submit a recent photograph(head to chest) showing your natural pose. Make sure your name is on the reverse side.
6. Please make all changes in your manuscript prior to submitting it. Check carefully to avoid ambiguity, to achieve maximum clarity of expression, and to verify correct spelling throughout. Proofreading will be done by the editorial staff. Galley proofs cannot be submitted to authors for review.
7. Enclose all material unfolded in large size envelope. Use heavy cardboard to prevent bending.
8. Send all material, in one mailing, to:

   James H. Earle, Editor
   Engineering Design Graphics
   Texas A&M University
   College Station, Texas 77843

CALENDAR OF ASEE MEETINGS

1975 -- Colorado State University
1976 -- University of Tennessee

THE AMERICAN SOCIETY FOR ENGINEERING EDUCATION

ENGINEERING DESIGN GRAPHICS JOURNAL

FALL 1974 VOLUME 38 NUMBER 3 SERIES 115

TABLE OF CONTENTS

EDITOR'S PAGE

The Journal staff looks forward to producing the Journal for the 1974-75 publication year. The staff is composed of Associate Editors, Garland Hilliard of North Carolina State University, Bob Foster of Pennsylvanis State University, and newly elected Circulation Manager, Clyde Kearns of Ohio State University. Clarence E. Hall of Louisiana State University is the Journal's Advertising Manager. Each of these staff members has had a minimum of one year's experience working on the Journal which indicates that this year's issues will be even better than in the past.

The Division of Engineering Design Graphics has recently undergone a self-study analysis to define its role and to develop a set of new by-laws by which to operate. Many hours of effort have been expended to arrive at the conclusion of this study; those involved are to be commended for their efforts.

Beginning in 1960, the Division began discussing the role of design as related to the freshmen courses in engineering graphics. This discussion grew and finally emerged as the 1967 Design Workshop held at Michigan State University in 1967. This Workshop was devoted to design, its definition, methods of teaching it, and importance of design to engineering design graphics courses. This excellent summer school served as a springboard for the introduction of design into the mainstream of engineering graphics course content.

Since that time, many schools have progressed along these lines, gaining support from their university faculty and administrators. Design was not introduced as a separate part of graphics, but instead, as an integral part and necessary feature of graphics. Design became the motivating vehicle for establishing the necessity of graphics as a fundamental of the design process to develop and communicate original ideas. All areas of engineering education have recognized design as an important aspect of engineering education and one that has been difficult to teach. The Engineering Design Graphics Division has taken the leadership in attempting to introduce design and the fundamentals of engineering in graphics courses. Our Division must be considered the pioneer in this area of engineering education.

Approximately three years ago, this movement culminated with the changing of the name of the Division from the Division of Engineering Graphics to the Division of Engineering Design Graphics, thus incorporating an important word which reflects the mission of the Division. Design must always be one of the stronger aspects of engineering graphics.

Design is sufficiently broad to include graphical mathametics, computer graphics, traditional engineering graphics, and the other fringe areas often taught in engineering graphics. However, the primary focus should always remain on the development of creativity and imagination with graphics as the fundamental medium of expression and tool for developing original designs. Without this flavor, the material taught of a strictly technical nature could be taught by any other program equally as well as in an engineering design graphics program. No other course can offer the introduction to engineering, stimulation of creativity, and the solution of basic engineering problems with graphical principals better than an engineering design graphics program. When modifying a curriculum or adding new material, it should be done with due consideration to its contribution to the design aspect of graphics.

The Journal would certainly welcome articles related to design and methods of construction that are applied in a classroom. Many articles have been published that deal with hypothetical situations and experimental programs. These are excellent and invaluable; however, the bulk of the instruction in engineering design graphics is not in these areas. In order to give a good balance of articles, we are in need of classroom applications that can be adapted immediately to improve existing programs to expand the present offering, and would not be a rejection of the fundamentals essential to any graphics course.

Please let us hear from you if you wish to share your ideas with our readers.

Jim Earle

COMPUTER GRAPHICS AT MISSISSIPPI STATE UNIVERSITY

By Wilbur Pearson

For two semesters now, we at Mississippi State University have given instruction in Computer Graphics. We have only one graphical output device, the Gould 4800 Electrostatic Plotter, connected on-line with the Univac 1106 Computer. The Gould Plotter has a maximum plot size of 10" X 10", with a maximum speed of 4800 lines per minute, so we are limited to hard copy line drawings of that size. Plots are obtained with simplicity and speed, however, which is an advantage where each student is to produce plotter drawings as assigned in class.

Our instruction in computer graphics is being given as a part of a new course now offered by our Department of Engineering Graphics. The name of the course is "Graphic Methods of Engineering Problem Solution". The class meets 6 hours per week, the first ten weeks being devoted to computer graphics - automated drawing and the remainder of the semester to graphical solution of problems and graphic calculus.

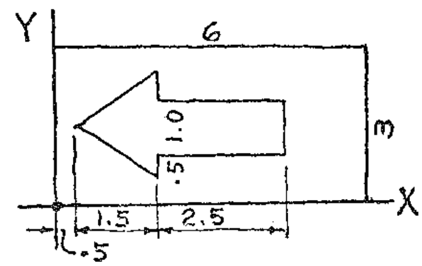
About one third of class room time in computer graphics is spent in slide illustrated lecture and two thirds in workshop, informal instruction and running and de-bugging programs.

The course begins with a slide illustrated lecture giving an overall introduction to computer graphics. About 42 slides are used. This lecture includes definitions, history of development, capabilities and potential, basic hardware involved, and basic methods of data transcription. Hand-out sheets are used to explain control card format. The first class period includes a tour of the Computing Center and brief instruction on the key-punch machine. Students are given "hands-on" practice so that they will be able to correct cards for themselves when de-bugging their programs.

Instruction continues in succeeding class periods with lectures based on prepared notes correlated with slides to illustrate each progressive step in the programming of a drawing. A subroutine of Fortran IV machine language, called the DRAWL language is used mainly in writing our programs for drawing an object. The DRAWL was developed by the Industrial Engineering Department, the University of Michigan. Our Univac 1106 computer at M.S.U. has been programed to receive instructions in the DRAWL subroutine. The DRAWL language provides a simple means of defining the graphical composition of an object to be drawn, and obtaining output in the form of drawings of various desired views, without requiring the user to be a trained programmer. DRAWL statements can in some cases also be combined with other Fortran IV statements.

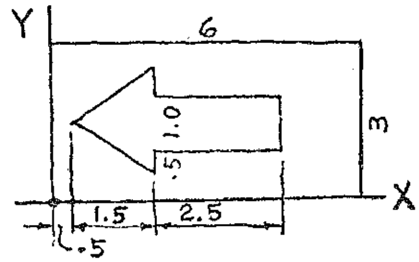
Lecture notes and slides were prepared to explain and illustrate the use of DRAWL statements to program line drawings. A total of 84 slides were used in this part of the course. Step-by-step the instruction moves from simple basic DRAWL "calling" statements to the use of a special DRAWL routine which employs special "built-in" functions and the use of data cards to simplify and speed up the process of plotting for 3-D shapes and producing various views of different orientation of these shapes. Hand-out sheets supplying DRAWL calling statements and other needed reference data were given to the students as the instruction proceeded.

After each step of instruction illustrating a specific drawing problem, the students were assigned a similar drawing problem to program and run. A correct plotter drawing was the final goal in each case. The instructor was available for help in de-bugging programs. Operations in-




```
CALL INIT

CALL NAMOBJ ('TEMP')

CALL POINTS (0,0.,0.,0.,1.)

CALL POINTS (1,6.,0.,0.,1.)

CALL POINTS (1,6.,3.,0.,1.)

CALL POINTS (1,0.,3.,0.,1.)
```

Figure 1: A visual slide used to introduce computer graphics and the drawing of a 2-D template.




```
CALL POINTS (1,0.,0.,0.,1.)

CALL POINTS (0,.5,1.5,0.,1.)

CALL POINTS (1,2.,.5,0.,1.)

Continue until all points described

CALL FINOBJ

CALL DRAW ('TEMP')
```

Figure 2: A visual slide used to introduce computer graphics and the drawing of a 2-D template.

volved in each problem were similar to those used in examples shown on the slides.

The slides for use in this course were prepared as follows. A series of problems were selected to illustrate the use of DRAWL to program and obtain plotter drawings of typical 2-D and 3-D objects. In each case, a freehand pencil sketch was made with the necessary dimensions noted. The object was sketched in position of best orientation for plotting of points to define its graphical composition. The X, Y, and Z axes as required, were located in the optimum position for plotting the points with respect to the machine axes. Programs were written and run on the computer-plotter and the computer printout sheet was used illustrate the proper calling statements and operations. For best visual results on the screen, the art work to be photographed should be no larger than 5 inches by 3-1/2 inches, so we cut the program printouts into short strips and glued them in place below Xeroxed copies of the small freehand sketches, staying within this overall size limit. Our University photographer then made the slide from this art work. We found that best visual results are obtained by using the negative for the slide instead of developing a positive finished slide. This gives light lines on the screen with a black background. By mounting the negative in the slide frame between two sheets of color gel, we obtained colored lines on a black background. The effect is pleasing and very easy to read.

The slides showing the finished plotter were made by photographing the plotter drawings, or Xeroxed copies of them, and reducing to proper size in the process. Again negatives with color gel were used. Figures 1, 2, and 3 are examples of slides used to illustrate the programming of drawings. Slides illustrated by Figures 1 and 2 show a freehand sketch of a flat template for which a simple 2-D drawing is to be programmed. The location of the X-and Y-axes is shown and the actual program listing is given underneath. In this simple example, two slides are sufficient to complete the program, by selective omission of repetitive data. The use of the DRAWL calling statements and the meaning of all data entered in the program format are carefully explained while slides are being shown. The Figure 3 slide is then shown after the call to draw to exhibit the actual plotter drawing. On more complex problems, numerous slides are required to cover all operations involved in programming the drawings, again omitting repetitive data but displaying the freehand sketch on each slide to enable the student to follow the sequence of operations.

Beginning with the program just illustrated, progressive steps of instruction continue in the following order:

1. The combination of the Fortran IV statement for a DO-LOOP operation with DRAWL to program the drawing of circles and circular arcs. Figure 4 illustrates one slide of this series.
2. The transformation matrix and how it is used in the mathematics of point conversion. Handout sheets give all reference data necessary on the format of each of the matrices. Students learn how to manipulate points, lines, and geometric figures by applying the proper matrix.
3. How geometric or other shapes (DRAWL "parts") can be stored in the "DRAWL" library of parts for later retrieval and re-use. Figure 5 illustrates one slide used in the series for items 2 & 3.

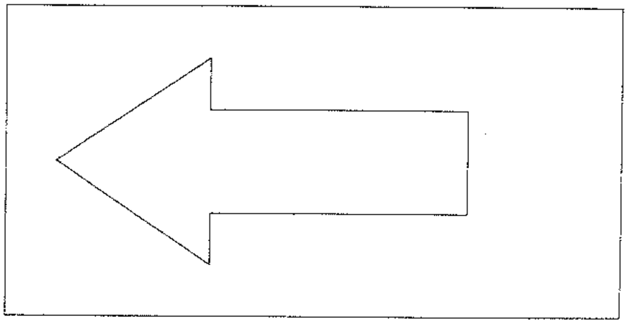
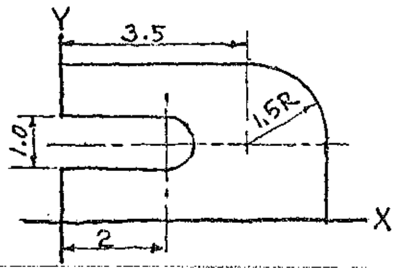
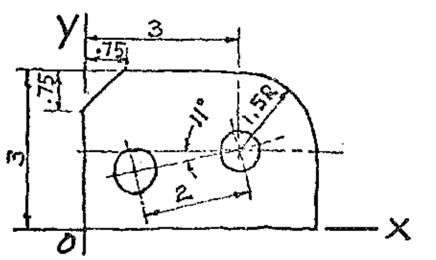


Figure 3: The computer-driven plot of the program.



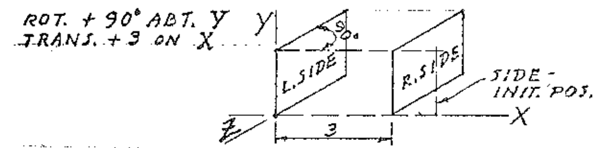

```
      DO11J = 270,450,1
      X = 2.+R*COS(.0174*J)
      Y = 1.5+R*SIN(.0174*J)
      CALL POINTS(1,X,Y,0.,1.)
   11 CONTINUE
      CALL POINTS(1,0.,2.,0.,1.)
      CALL POINTS(1,0.,3.,0.,1.)
      CALL POINTS(1,3.5,3.,0.,1.)
      CALL POINTS(0,0.,0.,0.,1.)
      CALL POINTS(1,5.,0.,0.,1.)
      CALL POINTS(1,5.,1.5,0.,1.)
```

Figure 4: The portion of the program that deals with arcs and circles.




```
C     ADD UNIT CIRC & QUAD FROM PARTS LIB
      CALL ADD('DIA1')
      CALL ADD('QNE')
C     NAME AND DEFINE SCALE TRANSFS TO
C     CHANGE SIZE
C     OF CIRCLE AND QUAD
      CALL NAMTRA('SC75',1.,0.,0.,0.,
     1                        0.,1.,0.,0.,
     2                        0.,0.,1.,0.,
     3                        0.,0.,0.,1./.75)
```

Figure 5: A slide which shows how values can be stored in the program for recall.




```
C     ROTATE SIDE PANEL 90 DEG. ABT. Y Z FOR L SIDE
      CALL CMBMAT ('RY')
      CALL ROTYD (90.)
      CALL ENDCMB
      CALL TRANSF ('LSIDE','SIDE','RY')
C     MOVE L SIDE 3 UNITS ALONG X TO FORM R SIDE
      CALL CMBMAT ('T3X')
      CALL TRLATE (3.,0.,0.)
      CALL ENDCMB
      CALL TRANSF ('RSIDE','LSIDE','T3X')
```

Figure 6: A visual slide showing the programming techniques for preparing 3-D drawings.

4. The use of special DRAWL calling statements for combining transformations and simplifying their use. Practice in manipulation of geometric shapes using combined transformation operations. Methods of programming three-dimensional drawings. Figure 6 illustrates one slide used in this series.

5. The use of data cards, employing special "built-in" DRAWL functions, to simplify and speed up the programming of drawings. The application of data card use in programming 3-D drawings, including envelopes of lines drawings. Figure 7 is an example of student work in preparing an envelope of lines plotter drawing. The drawing shows the top, front, and a perspective view of a 3-D object.

By the end of the course, students with no prior experience with computers are able to make three dimensional plotter drawings containing any desired views including perspective views of objects. A practical problem undertaken at the end of the Fall 1974 semester course was the preparation of line drawings of ship hulls.

The Department of Marine Technology had a number of students in the class; this department was interested in obtaining computer-plotter drawings of various views of ship hull lines. Offset points for the hull lines were obtained and two students assigned to each set of lines to be programmed. The lines, in ship vernacular, are Station Lines, Water Lines, and Buttock Lines. The main deck line and central profile line were also included. These lines define the shape or contours of the hull. After the sets of lines were plotted and corrected as individual sets, they were collected into an assembly of lines and plotter drawings made from numerous viewing angles. (Figure 8 is the plotter drawing of the top and profile views and Figure 9 shows two perspective views.)

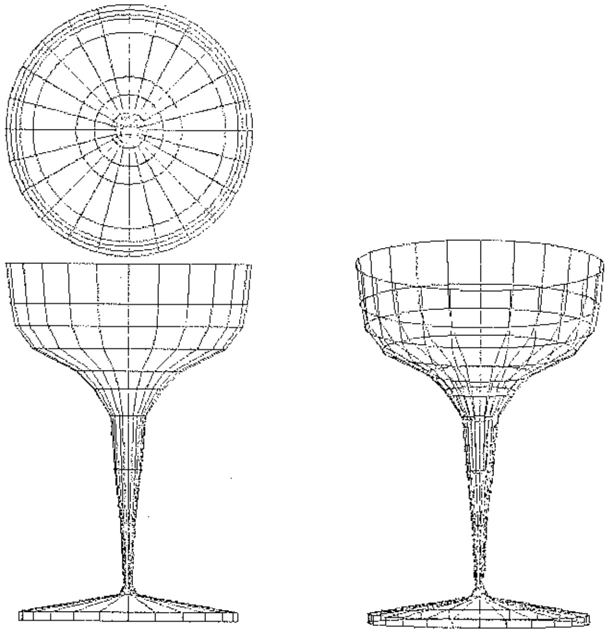


Figure 7: A student plot of an envelope of lines in three views.

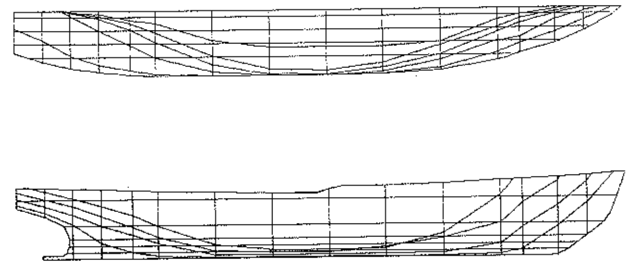


Figure 8: Plotter drawings of two orthographic views of the hull of a ship.

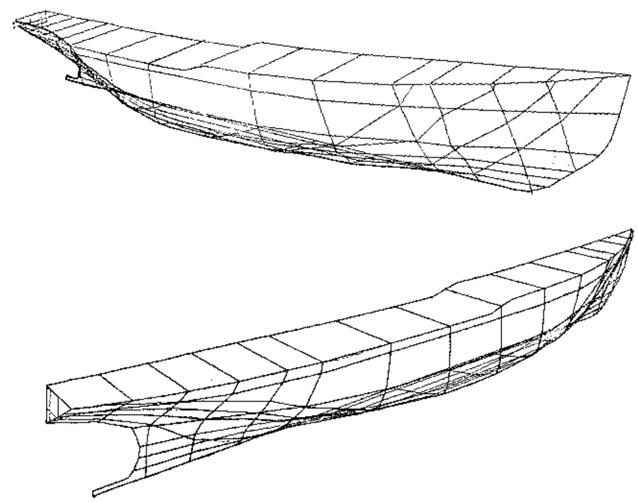
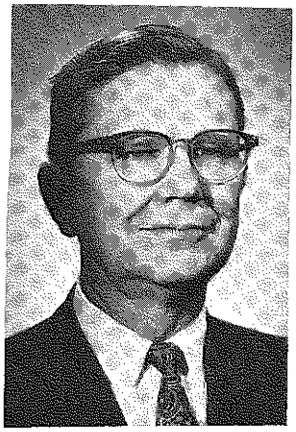


Figure 9: Two computer plotter perspectives of a hull of a ship.

Such drawings are a valuable aid in the study and design of ship hulls as they form a clear picture of the shape of the hull. Once the hull is programmed, the designer can obtain a plotter drawing of any view he may desire. Perspective views taken at any angle or distance from the hull are easily made. With such available information, the designer is enabled to change or modify the flowing lines of the hull, and readily check the suitability of the modified lines by means of machine up-dated drawings.

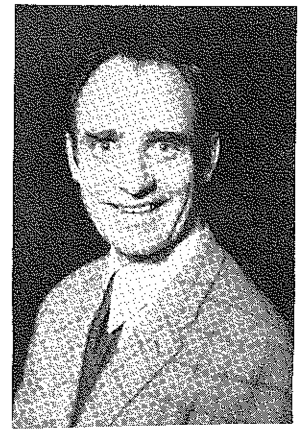
A meaningful course of instruction in computer graphics can be conducted without the aid of the more sophisticated equipment, such as the Cathode Ray Tube and related hardware. It is believed that we here at Mississippi State University have demonstrated this.



Stark

Lawrence E. Stark and
Dale L. Schafer

Texas A&M University



Schafer

PREDETERMINED ELLIPSE GUIDE ANGLES FOR AXONOMETRIC PROJECTION

By Lawrence E. Stark

The purpose of this article is to discuss the results of a computer program that was developed to determine the correct ellipse guide angles for constructing axonometric projections. Using the method described here one can construct an axonometric projection using predetermined ellipse guides for circular features. The sight angle for three planes of an axonometric projection will fit the available ellipse guide angles, with only one angle not being an exact fit. Also computed by this program are the directions of the three axonometric projection axes and scale factors for their projected lengths.

A classic example of an axonometric projection of a cube is shown in Figure 1. Three orthographic views were required to obtain the fourth view which is a trimetric projection. In Table 1, columns 1, 2, and 3 a similar trimetric projection could have been constructed with two planes of the cube foreshortened exactly 25° and 30°. The third plane would have been foreshortened 49°6'. This is much closer to the desired 50° ellipse guide angle than the plane in Figure 1 which has a sight angle of 52 degrees when graphically constructed due to error in construction. In addition, the trimetric projection whose principal planes are foreshortened 25°, 30°, and 49°6' could have been drawn to a larger scale since no additonal views were necessary.

A program and subroutine, named SUBROUTINE ELIPSE, was written to calculate the sight angle (ellipse guide angle) for one visible plane of a right prism given the sight angles for the other two planes. The two sight angles were required to be non-zero and their sum be less than 90° in order that the three planes be visible. The terms used in this program were named to relate the graphical construction shown in Figure 2A and 2B.

A main program was written to print Table 1 using SUBROUTINE ELIPSE as a subprogram to print the results in degrees and minutes, see Table 1, columns 1 through 6. For example, in Table 1, column 1, the height axis was tilted forward 10° which established the top plane ellipse guide, or sight angle, as 10°. With the height axis at 10°, the right axis was rotated about this height axis at 5° increments, starting at 10° and ending at 75°. See Table 1, columns 1, 2, and 3. At each 5° increment the computer calculated and recorded the direction of the axes with respect to the horizontal and the scale factors for their projections. It was decided that the angle for the three axes would best be referenced to the true length line in the top plane or to a horizontal line drawn at the point of intersection of the axes. These axes angles shown in column 4, 5, and 6 in Table 1, are defined in relation to the horizontal. SUBROUTINE ELIPSE also calculates the scale factor for each axis, columns 7, 8, and 9.

The statements used in the SUBROUTINE ELIPSE are described below and the terms used in the statements are shown in Figure 2A and 2B.

Statement
Number

22 Assigns a real name to the variables listed.

23 Assigns the value to data radian.

24 Determines the projected length of LO3 (height line 03), where ELIPS1 is the ellipse guide angle for the top plane and the forward tilt angle of the height axis.

25 Determines the projected distance of line OT, where ELIPS2 is the ellipse guide angle for the left side plane and the angle the right axis makes with the plane of projection.

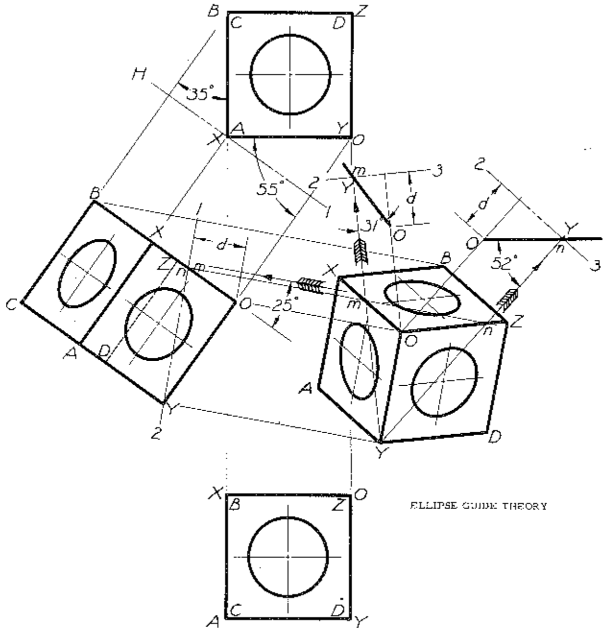


Figure 1: Determination of ellipse guide angles for axonometric projection using the traditional auxiliary-view method.

Table 1: Axonometric projection data as determined by a computer program.

1 TOP-ELLIPSE ANGLE DEG MIN	2 LEFT-ELLIPSE ANGLE DEG.MIN	3 RIGHT-ELLIPSE ANGLE DEG MIN	4 HEIGHT ANGLE DEG MIN	5 DEPTH ANGLE DEG MIN	6 WIDTH ANGLE DEG MIN	7 VERT. AXIS SCALE FACTOR	8 RIGHT AXIS SCALE FACTOR	9 LEFT AXIS SCALE FACTOR
10 0	10 0	75 47	90 0	1 47	44 7	0.985	0.985	0.246
10 0	15 0	71 50	90 0	2 42	32 31	0.985	0.966	0.312
10 0	20 0	67 27	90 0	3 41	25 7	0.985	0.940	0.384
10 0	25 0	62 49	90 0	4 43	20 5	0.985	0.906	0.457
10 0	30 0	58 3	90 0	5 51	16 25	0.985	0.866	0.529
10 0	35 0	53 11	90 0	7 6	13 37	0.985	0.819	0.599
10 0	40 0	48 15	90 0	8 31	11 24	0.985	0.766	0.666
10 0	45 0	43 16	90 0	10 9	9 33	0.985	0.707	0.728
10 0	50 0	38 14	90 0	12 8	7 59	0.985	0.643	0.785
10 0	55 0	33 8	90 0	14 35	6 37	0.985	0.574	0.837
10 0	60 0	27 58	90 0	17 47	5 22	0.985	0.500	0.883
15 0	15 0	68 32	90 0	4 7	42 56	0.966	0.966	0.366
15 0	20 0	64 36	90 0	5 36	34 21	0.966	0.940	0.429
15 0	25 0	60 18	90 0	7 11	28 1	0.966	0.906	0.496
15 0	30 0	55 44	90 0	8 54	23 10	0.966	0.866	0.563
15 0	35 0	51 0	90 0	10 49	19 20	0.966	0.819	0.629
15 0	40 0	46 8	90 0	12 60	16 11	0.966	0.766	0.693
15 0	45 0	41 9	90 0	15 33	13 33	0.966	0.707	0.753
15 0	50 0	36 3	90 0	18 37	11 15	0.966	0.643	0.809
15 0	55 0	30 47	90 0	22 30	9 11	0.966	0.574	0.859
15 0	60 0	25 20	90 0	27 39	7 17	0.966	0.500	0.904
20 0	20 0	61 4	90 0	7 37	41 12	0.940	0.940	0.484
20 0	25 0	57 4	90 0	9 46	34 11	0.940	0.906	0.544
20 0	30 0	52 43	90 0	12 8	28 33	0.940	0.866	0.606
20 0	35 0	48 6	90 0	14 46	23 56	0.940	0.819	0.668
20 0	40 0	43 16	90 0	17 47	20 2	0.940	0.766	0.728
20 0	45 0	38 14	90 0	21 21	16 40	0.940	0.707	0.785
20 0	50 0	32 58	90 0	25 42	13 39	0.940	0.643	0.839
20 0	55 0	27 25	90 0	31 19	10 53	0.940	0.574	0.888
20 0	60 0	21 23	90 0	39 5	8 12	0.940	0.500	0.931
25 0	25 0	53 18	90 0	12 34	38 43	0.906	0.906	0.598
25 0	30 0	49 6	90 0	15 37	32 35	0.906	0.866	0.655
25 0	35 0	44 34	90 0	19 3	27 20	0.906	0.819	0.712
25 0	40 0	39 43	90 0	23 2	22 47	0.906	0.766	0.769
25 0	45 0	34 32	90 0	27 48	18 43	0.906	0.707	0.824
25 0	50 0	28 58	90 0	33 46	14 58	0.906	0.643	0.875
25 0	55 0	22 49	90 0	41 45	11 19	0.906	0.574	0.922
25 0	60 0	15 30	90 0	53 52	7 26	0.906	0.500	0.964
30 0	30 0	44 60	90 0	19 28	35 16	0.866	0.866	0.707
30 0	35 0	40 27	90 0	23 51	29 30	0.866	0.819	0.761
30 0	40 0	35 29	90 0	28 59	24 18	0.866	0.766	0.814
30 0	45 0	29 60	90 0	35 16	19 28	0.866	0.707	0.866
30 0	50 0	23 50	90 0	43 29	14 46	0.866	0.643	0.915
30 0	55 0	16 19	90 0	55 33	9 44	0.866	0.574	0.960
35 0	35 0	35 47	90 0	29 22	30 19	0.819	0.819	0.811
35 0	40 0	30 31	90 0	35 59	24 23	0.819	0.766	0.861
35 0	45 0	24 26	90 0	44 27	18 33	0.819	0.707	0.910
35 0	50 0	16 52	90 0	56 34	12 15	0.819	0.643	0.957
40 0	40 0	24 38	90 0	44 45	22 37	0.766	0.766	0.909
40 0	45 0	17 8	90 0	57 3	14 60	0.766	0.707	0.956

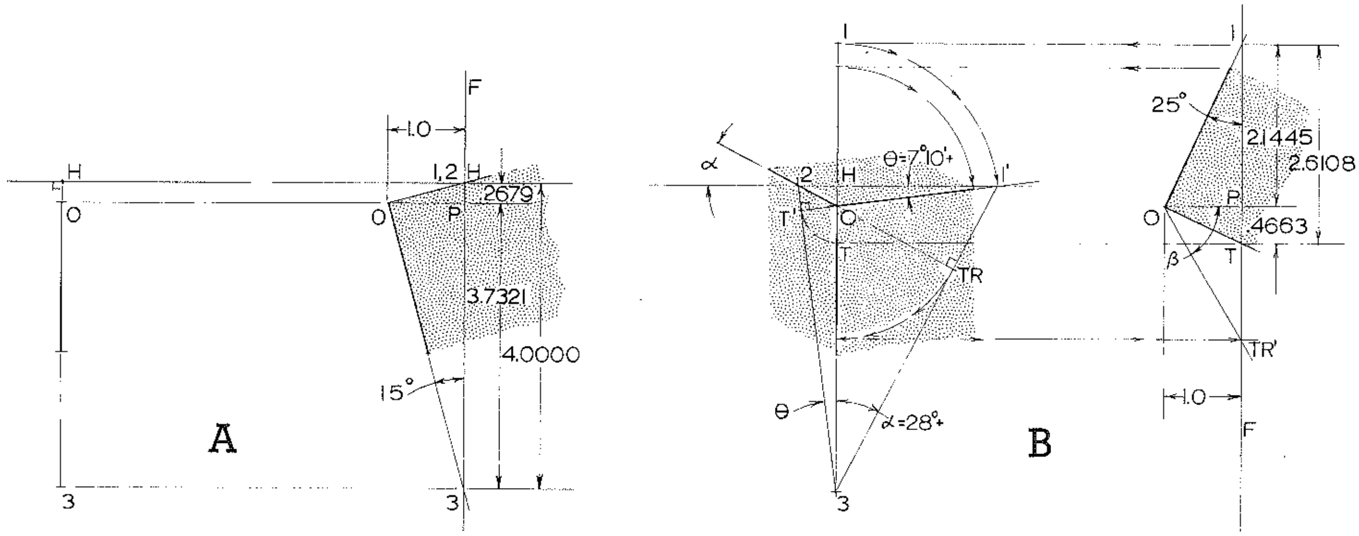


Figure 2: The geometry used for preparing the computer program.

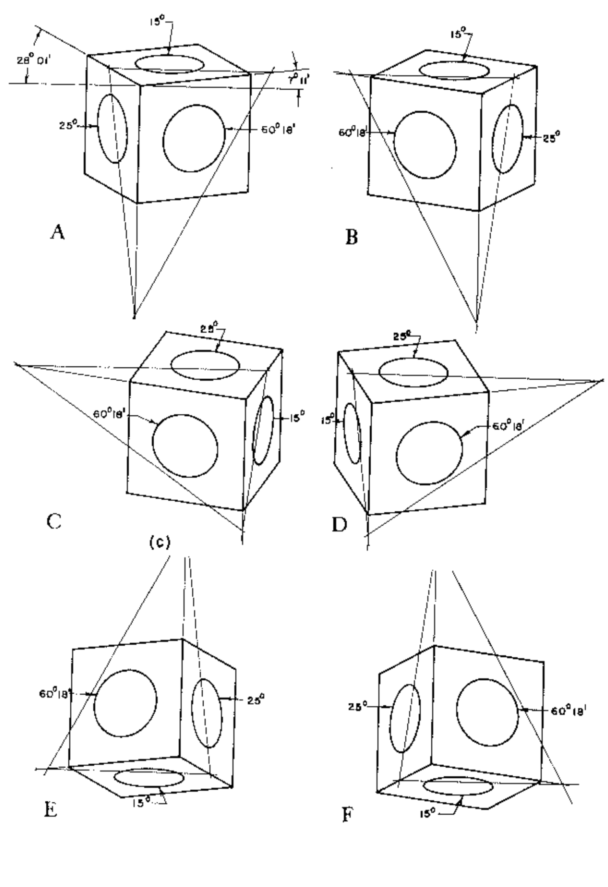


Figure 3: The variations of pictorials that can be drawn using the same axes and ellipse angles.

26 Determines angle Theta in radians.

27 Determines angle Theta as the angle which the right axis (0-2) makes with the horizontal true length line 2-1.

28, 29 Calculates the length of line OH (LOH) and 2H respectively.

30, 31 Calculates the angle Alpha in radians, then converts to degrees which is the angle the left axis (0-1) makes with the horizontal.

32 LOTR determines the length of line OTR.

33 ELIPS3 calculates the tangent line OTR divided by line OP where OP is equal to unity.

34 Assigns the height axis 90° to the horizontal.

35, 36, 37 Determine the scale factors for the height, right and left axes respectively.

The trimetric projection in Figure 3(a) was drawn from the data given in Table 1. This same trimetric projection could have been rotated as shown in Figure 3 (a through g). This is to emphasize the versatility of the data in Table 1. For example, the three sight angles 15°, 25°, and 60°18' appear only once in Table 1 for brevity. The many positions shown in Figure 3 are left to the discretion of the reader. Table 1 would have been much longer had all axonometric projections, incremented at 5°, been recorded.

The true length lines, shown in Figure 3, were drawn to align the major axes of the three ellipses. If it is desirable to omit the true length lines, the minor axes of the ellipses could have been aligned parallel to the axis not bounding the plane of the ellipse.

```
//EGTEST JOB (Y039,52-A,*05,1,01),'SCHAFER TESTING'
//*PASSWORD      *****************************************************
//*WATFIV
C-----MAIN PROGRAM TO PRINT A TABLE USING SUBROUTINE ELIPSE.
      DIMENSION DEG(6), IDEG(6), IMIN(6)
      WRITE(6,600) (ICOL, ICOL=1, 9)
      DO 30 IELIP1 = 10, 40, 5
         WRITE(6,601)
         LIMIT  = 85 - IELIP1
         DO 20 IELIP2 = IELIP1, LIMIT , 5
            DEG(1) = FLOAT( IELIP1 )
            DEG(2) = FLOAT( IELIP2 )
            CALL ELIPSE(  DEG(1),    DEG(2),
                       DEG(3), DEG(4), DEG(5), DEG(6), SF1, SF2, SF3   )
            DO 10 II = 1, 6
               IDEG(II) = INT( DEG(II) )
               IMIN(II) = IFIX( 0.5 + 60.0 * AMOD(DEG(II),1.0) )
   10          CONTINUE
            WRITE(6,601) ( IDEG(II), IMIN(II), II=1,6 ), SF1, SF2, SF3
  20        CONTINUE
 30      CONTINUE
      STOP
 600  FORMAT(1H1, 9(I7,6X),/,118H  TOP-ELLIPSE LEFT-ELLIPSE RIGHT-ELLIPS
     +E    HEIGHT          DEPTH          WIDTH      VERT. AXIS    RIGHT AXIS
     +    LEFT AXIS      , /, 1H , 6(13H     ANGLE      ), 3(13H     SCALE
     +), / 6(13H     DEG MIN   ),   3(13H     FACTOR     ) /)
 601  FORMAT(1H , 6(I6,I3,4X), 3(F9.3,4X) )
      END

      SUBROUTINE ELIPSE( ELIPS1, ELIPS2,
                     ELIPS3, AXIS1, AXIS2, AXIS3, SF1, SF2, SF3)
C-----GIVEN THE SIGHT ANGLE OF ELLIPSES ON TWO FACES OF AN AXONOMETRIC
C-----PROJECTION OF A RIGHT ANGLE PRISM, SUBROUTINE ELIPSE WILL RETURN
C-----THE SIGHT ANGLE OF THE THIRD VISIBLE ELLIPSE.  ELIPSE WILL ALSO
C-----RETURN THE ANGLES OF THE THREE PRIMARY AXIS WITH THE HORIZONTAL,
C-----AND THE SCALE FACTOR FOR EACH AXIS.
      REAL LO3, LOT, LOH, L2H, LOPL13
      DATA RADIAN /57.29578/
      LO3    = COTAN( ELIPS1/RADIAN )
      LOT    = TAN( ELIPS2/RADIAN )
      AXIS2R = ARSIN( LOT/LO3 )
      AXIS2  = AXIS2R * RADIAN
      LOH    = TAN( ELIPS1/RADIAN )
      L2H    = TAN( AXIS2R ) * ( LOH+LO3 )
      AXIS3R = ATAN( LOH/L2H )
      AXIS3  = AXIS3R * RADIAN
      LOPL13 = SIN( AXIS3R ) * LO3
      ELIPS3 = ATAN( LOPL13 ) * RADIAN
      AXIS1  = 90.0
      SF1    = COS( ELIPS1/RADIAN )
      SF2    = COS( ELIPS2/RADIAN )
      SF3    = COS( ELIPS3/RADIAN )
      RETURN
      END

//$DATA
```

Table 2: The computer program for calculating the ellipse guide angles and the axonometric axes.

CONSTRUCTING AXONOMETRIC SCALES

By John Denison

Paris Junior College

In drawing axonometrics, one of the first and most important aspects to consider is the construction of proper scales for the axonometric axis used. In explaining this concept to students, I have found that any axonometric scale can be found by using this simple approach. Not only does it give them a good working knowledge of descriptive and plane geometry, but also affords them the knowledge they will need when they enter the world of work.

Examine the axonometric axes, OA, OB, and OC shown in space A of Figure 1, and consider the required problem of determining the scales for these axes. Note that the angles given can be any angle, and because of this, it is possible to find scales for any of the three types of axononetric drawings: isometric, dimetric, or trimetric.

The true length line is of primary consideration: any line perpendicular to a receeding axis is a true length line. Examine line C_FB_F in space B of Figure 1 and note that it is perpendicular to line O_FA_F. This is also true of line A_FC_F which is perpendicular to O_FB_F and line A_FB_F which is perpendicular to O_FC_F.

Recall in basic assumption that any object will fit into a sphere if the sphere is big enough. Now, put the theory to test by bisecting line A_TB_T, which represents line A_FB_F, and scribe a semi-circle. When point O_F projects through the semi-circle in the top view, this will be point O_T in the top view. Because there is a line formed from A_FO_F this same line will also be

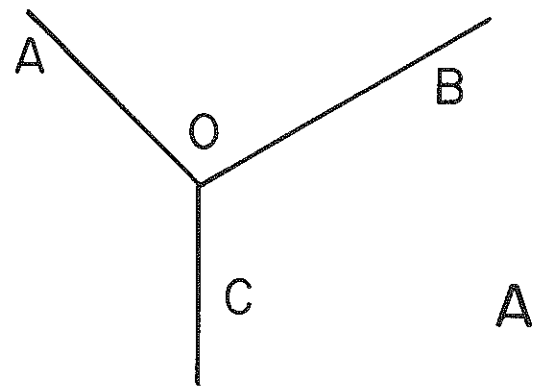


Figure 1-A: Any three axonometric axes are drawn.

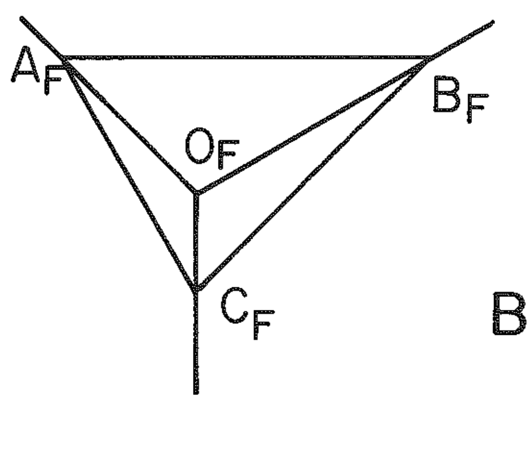


Figure 1-B: A line is drawn to intersect two axes and to be perpendicular to the third axis. This is repeated on each plane.

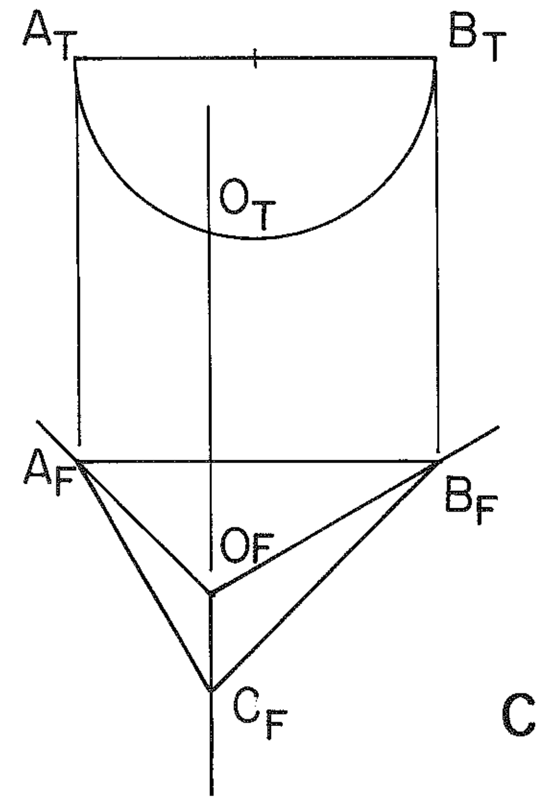


Figure 1-C: A semi-circle is constructed as a top view using AB as the diameter.

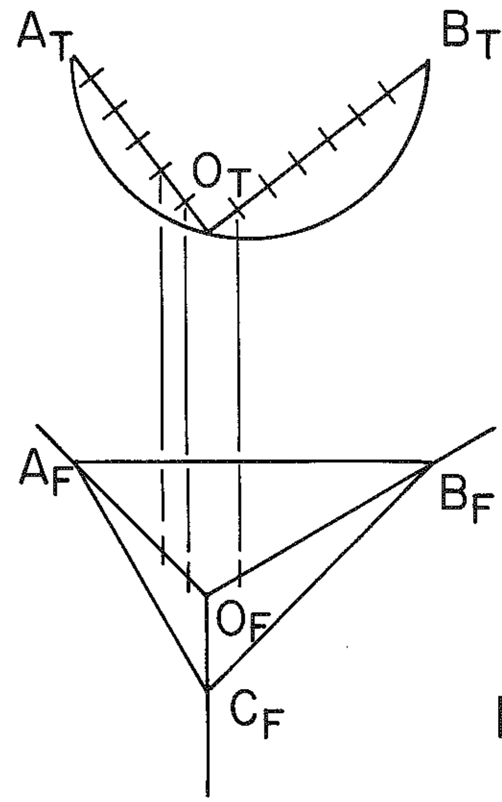


Figure 1-D: Point O is found on the arc for establishing AOB. These true lengths axes are divided into equal divisions.

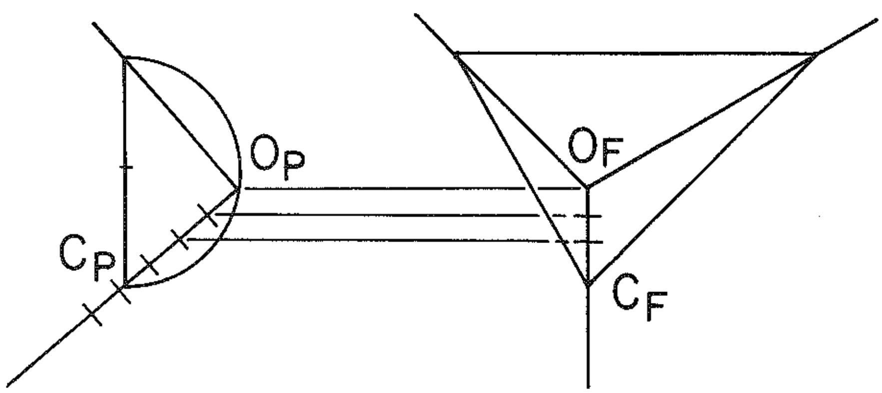


Figure 2: The left side view is constructed to locate divisions on the vertical axis.

shown in the top view as line A_TO_T. The same is true of line O_FB_F. If the opposite of A_TO_T and B_T are drawn and the other half of its circle is drawn, the cube will fit into the sphere.

In space D, consider that lines O_TA_T and O_TB_T are the true length edge views of any surface no matter how big it may be. Because of this, any unit of measurement laid off will be true length on this line. However, if the points are projected to the front view, this will have automatically established the scales used in drawing any object using this particular axis. To find the scale on line O_FC_F, merely draw the right or left side views as is shown in Figure 2.

To be able to think constructively is one of the primary qualifications that American business and engineering firms are looking for in graduates of higher education. Not only does this problem afford a good review of basic principles of graphics, but the end result is a usable set of scales that can be used as helpful aids in the construction of axonometric pictorials.

Clair M. Hulley
University of Cincinnati

SCALES AND ALIGNMENT CHARTS USING A DIGITAL PLOTTER

PART 2

The nomograph involving the elliptical trigonometric scale (Figure 1) is a solution for the equation:

X= (SIN(Z)*COS(Y))/(COS(Y)-COS(Z))

In the design determinant this becomes:

$$\begin{vmatrix} X & 0 & 1 \\ 0 & COS(Y) & 1 \\ SIN(Z) & COS(Z) & 1 \end{vmatrix} = 0$$

These six functions are then defined and stored (Table 1). The scale factors of 0.5 and 0.25 in the CALL CRVSC statements for X and Y scales allow the chart to be magnified unequally in the X and Y directions and equivalent to dividing the first and second columns of the design matrix by these factors.

If oblique coordinates are desired the necessary trigonometry is entered in the definitions of the functions.

As a thorough test of the program logic a chart involving the folium of Descartes was constructed.

The form of the standard matrix for one curved scale and allowing for the introduction of various modulii for the X scale (MX) and Y scale (MY) is:

$$\begin{vmatrix} 0 & A & 1 \\ 1 & B & 1 \\ C & D & 1 \end{vmatrix} = 0$$

where: A=MX* f(X), B=MY* f(Y),
C=(MX*Z1)/(MY-MY*Z1)+MX*Z1,
D=(Z2*MX*MY)/(MY-MY*Z1+MX*Z1)

The functions were left in this form in the program to prevent confusion and also to avoid an indeterminant form which results in the simplification if applied to this problem.

The ratio of the moduli MX to MY in the example was 0.5.

The equation for this chart Figure 2 is:

Y= (XZ** 3- Z**2- X*Z+X)/(-Z)

The values of C and D in the matrix for the curved scale then are: C=Z/(1.+Z**3) and D=Z*Z/(1.+Z**3).

When these values are substituted in the matrix (Table 2) and the modulus ratio of 0.5 is used the functions are:
A=Z, B=Z, C=(Z/(1.+Z**3))/(.5+.5*(Z/(1.+Z**3)))
and D=((.5*Z*Z)/(1.+Z**3))/(.5+.5*(Z/(1.+Z**3)))

To utilize an 8-1/2 X 11 paper efficiently the call to CRVSC was made with the scale factors of 0.25 except for the Y scale which had a factor of 0.5 because of the larger modulus.

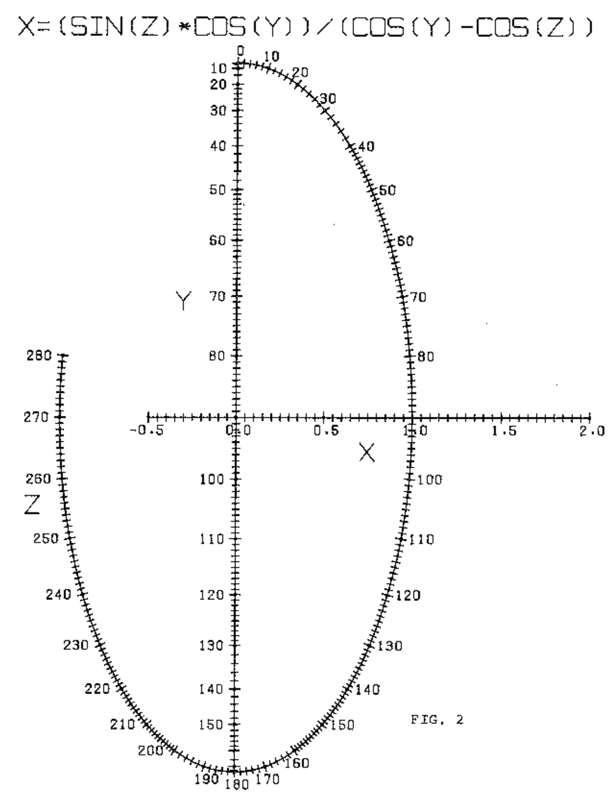


Figure 1: An elliptical nomograph.

```
C THE FUNCTIONS STORED ON DISK WERE AS FOLLOWS...
      FUNCTION FXFZ1(Z)
      FXFZ1=Z
      FUNCTION FYFZ1(Z)
      FYFZ1=0.
      FUNCTION FXFZ2(Z)
      FXFZ2=0.
      FUNCTION FYFZ2(Z)
      FYFZ2=COS(Z*3.14159/180.)
      FUNCTION FXFZ3(Z)
      FXFZ3=SIN(Z*3.14159/180.)
      FUNCTION FYFZ3(Z)
      FYFZ3=COS(Z*3.14159/180.)
// JOB
// FOR
*ONEWORDINTEGERS
*IOCS(1132PRINTER,CARD)
      EXTERNAL FXFZ1,FXFZ2,FXFZ3,FYFZ1,FYFZ2,FYFZ3
C  SAMPLE PROGRAM WITH INPUT FOR ELLIPSE NOMOGRAM..
      CALL CRVSC(0.,280.,.5,.25,FXFZ3,FYFZ3)
      CALL CRVSC(0.,180.,.5,.25,FXFZ2,FYFZ2)
      CALL CRVSC(-.5,2.,.5,.25,FXFZ1,FYFZ1)
      CALL CRVSC(-.5,2.,.5,.25,FXFZ1,FYFZ1)
      CALL NUPEN(1)
       CALL PLOT(0.,0.,-3)
      CALL EXIT
      END
// XEQ
        6
     40.          2.          4          U          -1
     90.          1.          9          R          -1
    100.          1.          9          N          -1
    160.          1.          9          R          -1
    200.          2.          4          D          -1
    280.          1.          9          L          -1
        8
     10.          5.          1          N          -1
     20.          5.          1          L          -1
     50.          2.          4          L          -1
     90.          1.          9          L          -1
    100.          1.          9          N          -1
    130.          1.          9          L          -1
    160.          2.          4          L          -1
    180.          5.          1          N          -1
        1
      2.          .1          4          D           1
        1
      2.          .05         9          N
```

Table 1: The program used for plotting the nomograph shown in Figure 1.

```
THE EXTERNAL FUNCTIONS STORED ON DISK WERE.....
      FUNCTION FXFZ4(Z)
      FXFZ4=0.
      FUNCTION FYFZ4(Z)
      FYFZ4=Z
      FUNCTION FXFZ5(Z)
      FXFZ5=1.
      FUNCTION FYFZ5(Z)
      FYFZ5=Z
      FUNCTION FXFZ6(Z)
      FXFZ6=(Z/(1.+Z**3))/(.5+.5*(Z/(1.+Z**3)))
      FUNCTION FYFZ6(Z)
      FYFZ6=(.5*Z*Z/(1.+Z**3))/(.5+.5*(Z/(1.+Z**3)))
// JOB
*EQUAT(PLOT,PHALT),(GO,PLOT)
// FOR
*ONEWORDINTEGERS
*LISTALL
*IOCS(1132PRINTER,CARD,PLOTTER)
      EXTERNAL FXFZ4,FYFZ4,FXFZ5,FYFZ5,FXFZ6,FYFZ6
      CALLFCHAR(-.8,-2.,  .25,.25,0.)
      WRITE(7,1)
1     FORMAT('X')
      CALLFCHAR(4.5,-2.,.25,.25,0.)
      WRITE(7,2)
2     FORMAT('Y')
      CALLFCHAR(1.5,.5,.25,.25,0.)
3     FORMAT('Z')
      WRITE(7,3)
      CALL CRVSC(-1.,1.,.25,.25,  FXFZ4,FYFZ4)
      CALL CRVSC(-2.,2.,.25,.500,FXFZ5,FYFZ5)
      CALL CRVSC(-2.,2.,.25,.500,FXFZ5,FYFZ5)
      CALL CRVSC(-6.,-1.5,.25,.25,FXFZ6,FYFZ6)
       CALL CRVSC(-2.,-1.5,.25,.25,FXFZ6,FYFZ6)
      CALL CRVSC(-.2,7.,.25,.25,FXFZ6,FYFZ6)
      CALLEXIT
      END
// XEQ
        3
0.       .02          4     L     1
.1        .02         4     N     1
.1         .02        4     L     1
        1
2.        .05         1     N     1
        1
2.        .1          4     R     1
        4
-4.        .5         1     R     0       .8
-3.         .2        4     R     0        .8
-2.       .1          9     R     0      .8
-1.5      .05         1     N     1  .8
        1
-1.5       .1         4     U     1       .8
        5
.1        .01         9     D     1
.5         .02        4     D     1
1.        .05         1     R     1
3.         .1         9     U     0       .8
7.         .5         1     R     0         .8
```

Table 2: The program used for plotting the nomograph shown in Figure 2.

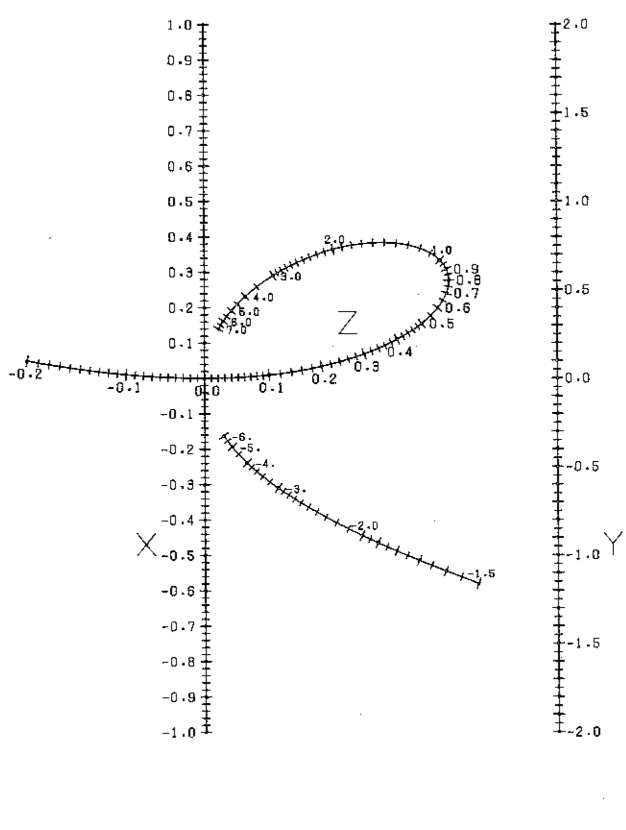


Figure 2: A curved-line nomograph.

Because of the unusual nature of the curved scale a large intermix of smaller labels, no label, left, right, up and down label commands were used to demonstrate the flexible nature of these subroutines.

The Z scale has the Z=0 value at the origin as well as Z= +infinity and Z= -infinity there also.

It is interesting to note that unequal moduli tend to rotate the positive loop clockwise and the asymptote of the negative values counterclockwise.

If you wish to check the chart: let X=0.4 and Y=0.6 then the three Z roots are -0.5 (off the chart to the left) and Z=1. and Z=2. You will note major tick marks have a little ink circle at the center to make them easier to identify.

If the chart involves two curved scales and it is difficult to transform to standard form I frequently calculate the chart in three dimensional matric form and send it to a subroutine to plot out a pictorial in two dimensions for the plotter.

The listings for the subroutines were written and statements placed in sequence using the DATA PRESENTATION package of I.B.M. modified to run on a Calcomp 718.

The listings for the programs were also plotted on the plotter since a lineprinter listing frequently is impossible to reproduce.

Design for the donor

A design team from the Rhode Island School of Design proposes simplification of the process of mobile blood collecting to make it more efficient, more comfortable and more understandable for both donor and staff.

Marc Harrison
Chairman, Industrial Design Program
Rhode Island School of Design

During the 1970 annual meeting of the Massachusetts Red Cross Blood Program, Mr. Jack Henry of the American National Red Cross Blood Program, Washington, DC, outlined the future planning and policy directions the blood program would inevitably take in order to meet the growing and changing needs for blood. His thesis required a major revision of our layman's view of blood programming. Until that time, it had appeared to us that the blood program's needs were in the area of large volume growth. Quantity, we had thought, was the key word. The designer's role would be finding improved techniques and equipment that would facilitate both speed and volume collection.

Henry's concept, however, suggested a more subtle view. Although not ignoring natural growth of demand, he envisioned that the blood program's problems would have to be solved through comprehensive and effective blood management techniques other than those in effect. The program now has the capability to cope with the total volume requirement over any given year; whereas, the real crisis appears to be the inability in stabilizing and maintaining a steady flow of blood, of specified and required types, upon demand.

While blood program administrators dream of dependable and controlled supply of donor blood with just the right amount and type for fluctuating needs, most blood programs face serious and crisis level "peaks-and-valleys and feasts-and-famines." These crises are due to local and seasonal factors as well as other unforeseeable events.

It is assumed that specialized administrative techniques and programs could help resolve the supply and demand problem. Computer donor and blood type classification and retrieval, and comprehensive donor mobilization programs to insure blood donations when needed, are two avenues of approach. Yet, in response to the latter, the evidence that one in four donors returns is a disturbing statistic unacceptable if comprehensive blood management is to take place. The logical extension of this would mean that blood programs would progressively have to expend more and more time and resources for the purpose of recruiting one-time donors.

During the same meeting in Washington, four Rhode Island School of Design industrial designers presented a critical thesis in the form of a slide show on mobile blood collecting techniques. The general view of the study was that the low donor return problem is intimately tied to the quality of the donor experience as presently practiced. The study pointed out that in many small but significant ways, the last person to be considered in the planning, procedures, choice of equipment, and general day-to-day operation of blood collecting is the donor and his special needs. In fact, it would almost appear that the blood program conspires against the donors' sensibilities and, therefore, tends to self-defeat its own goals.

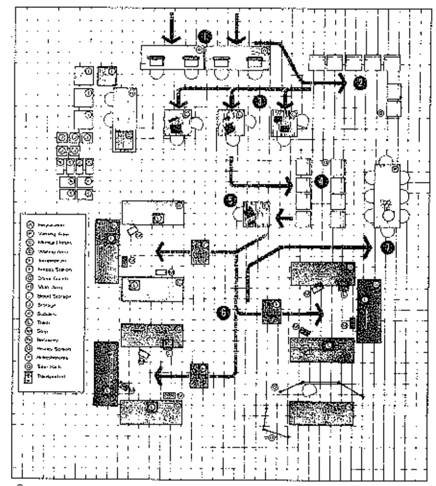
The study stated that while members of the blood collecting staff accomplish their difficult job with dedication, professionalism, and proper medical and legal procedures, they do so against extremely heavy odds and in spite of the conditions and equipment required for use. During its study, the design team became progressively impressed by the spirit and ingenuity of the collecting staff who managed to do excellent work in spite of imposed limitations in the situation.

Donor advocacy

The design team felt that the outmoded and cumbersome equipment, procedures, and general "style" of the blood program in the public's view appeared to be somewhat accidental. The equipment was uncomfortable, old-fashioned, sterile and fragmented in spite of the good-intentioned attempts by the blood program. The team considered that its contribution might be in the area of donor advocacy, concentrating systematic efforts in identifying ways to improve the donor's total experience while in the hands of the Red Cross Blood Program.

The study also showed that the first-time donor, under present methods, is more often than not left alone with his anxiety; he is physically uncomfortable and he walks out with little more understanding of what the blood program is all about than when he walked in. In spite of the best efforts to improve the situation, the existing equipment and procedures in themselves prevent the desired effect of donor comfort.

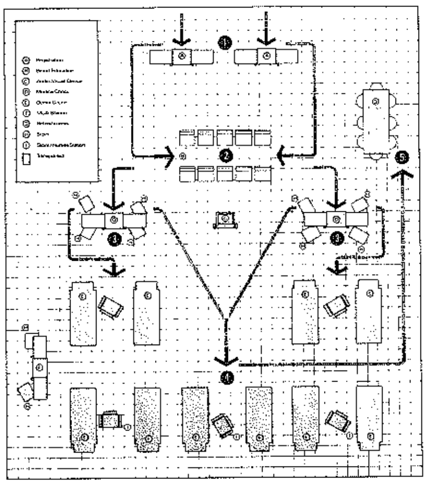
Following this early study group which had made some temporary design suggestions, another and larger design team was formed to examine these precepts and, in addition, evaluate in greater detail the oper-



2

Opposite
The existing central supply system and the handling techniques leave much to be desired. The present equipment is a conglomeration of odd sized, cumbersome boxes. The boxes, due to their size and weight, take inordinate battering. The large storage boxes tend to be inefficient; they are rarely completely filled. The supplies are packaged to facilitate quick use, but in actual operation the staff has to spend additional time to unpack, sort and organize all supplies, and move them to the site. The items are often not packed according to which stay on the truck and which have to be replaced.

2
Taken as a whole, the present arrangement is characterized by a "start–stop" type of activity. While fulfilling a present need, this arrangement constitutes physical and psychological barriers to the desired flow of the donor and adds to the visual disorder.



3

3
The revised plan which shows the new system concept developed by the design team noticeably reduces the number and type of objects required in a collection setup. Several major changes in procedure have been indicated. These include: self-registration by the donor, a continuous audiovisual (blood use, history, etc.) presentation which the donor sees before he actually donates and a medical check which includes taking the temperature with the use of an electronic thermometer. Careful examination of this plan shows the proposed system operates as two complete collection setups, thus hopefully providing a smoother and faster experience for donor and staff.

ation of mobile blood collecting, identifying the contribution design might make. Considering the goals described by Henry and other blood program people, the new team visited several regional blood programs and worked at mobile blood collecting for several months. Extensive slide, stop-action movies, and other documentation were devised to trace and track supplies and every item and piece of equipment and to identify the actual work operations of the staff. The purpose was to determine where double, triple and often quadruple handling of items occurs and to spell out in what areas streamlining and more efficient techniques could be instituted.

One dominant goal
The total flow from home base, central supply, loading and unloading, setting up at the site, overall procedures, packing up and returning were also documented. The data culled from this was put into perspective by juxtaposing against one dominant goal and question. How does operation individually and collectively affect the first-time donor during his visit to the collecting site? The design team, with more time, was able to identify the disquieting effects of the fragmatic techniques and equipment in use in greater detail.

Existing methods can be characterized as having no clearly understandable system or form. The elements that make up the mobile collecting unit emerged from World War II as historical curiosities, each with its own peculiar logic and self-serving needs. Items do not match in size or quality and are not weighed in terms of their respecitve importance or priority.

In operation, the collecting unit provides the donor with few clues to what is really going on and why. He is ushered through multiple steps with vague waiting periods in between. He meets several interviewers, nurses or volunteers, each handling a fragment of the total operation. These fragments, while understandable to the staff member, are often another confusing element for the donor. The registration interview, temperature and medical checkup stations are rarely clearly identified, requiring the donor to ask directions. Signage for the donor is often makeshift—on backs of posters or cardboard—leaving the donor in a confusing environment indiscriminately composed of beds and people.

Furthermore, the donor beds are basically uncomfortable, requiring the donor to stare at the ceiling and to use his arm behind his neck as a pillow to allow him to see what is going on around him. The beds, due to the usual damage caused by loading and unloading, become ragged and often tear donors' clothes. The beds are high and require the addition of a step stool for each, thus adding more items to be handled. Upholstery materials are drab, uncomfortable in hot weather and costly and time consuming to repair. Finally, the large variety of sizes and shapes of cartons, boxes and other items manhandled into the collecting site usually ends up as an unsightly mountain of clutter in a corner.

Reportedly, the height of the bed facilitates operations the nurse must accomplish while standing; however, the combination of the bed design, the blood scale design and the location of nursing station supplies requires inordinate bending, reaching, walking, focusing, etc. None of the items has been designed in terms of the others for actual all-day use. In order to handle the growing waste products generated by more disposable items, each three-bed unit requires waste bins, further adding to floor clutter—not to mention handling and inventory.

Constant handling
Although every blood center maintains extensive central supply operations designed to package supplies for ready use in the field, in almost every instance the staff in the field has the additional burden of double and triple handling of supplies and equipment in order to do the job, expending energies which could easily be handled by central supply. Thus the accumulated confusion and fatiguing effects upon the collection team and the lack of cohesive and streamlined procedures throughout the day, inevitably take their toll on members. They, in turn, less effectively cater to the donor's need for reinforcement, education and the alleviation of his fears. Enthusiasm and care, which the dedicated nurse would like to put forth, run thin after a day of standing. Backache from excessive bending to manipulate the scale and blood bag and many other superfluous manipulative operations further accentuates the nurse's physical fatigue.

Perhaps the process one could take as

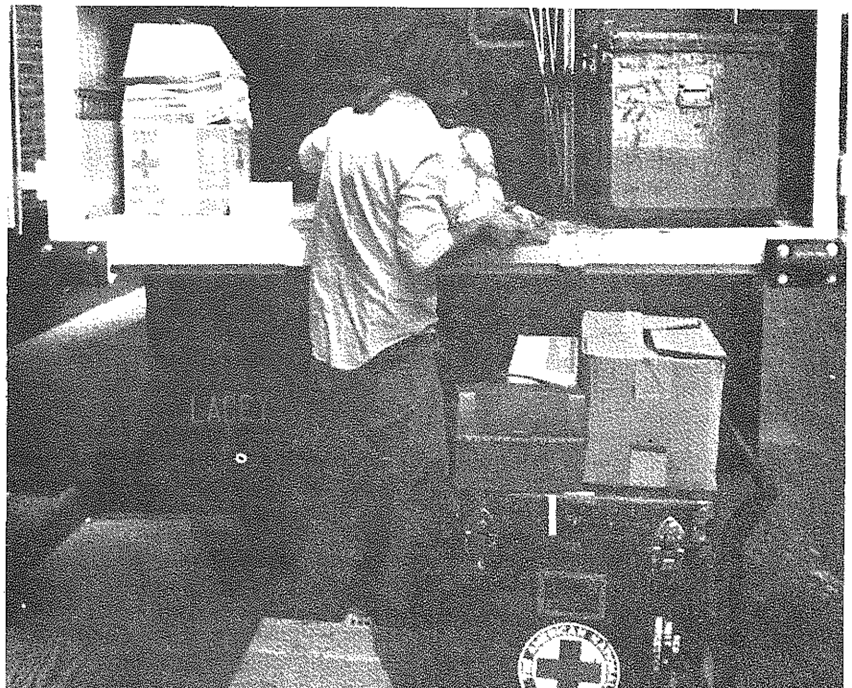
4
Under the current system, no standard ways have been instituted to lift, load and unload these many items in the least possible trips. The items are bulk loaded in the trucks and require excessive double and triple handling.

5, 6
The design team selected the Herman Miller Co / Struc System as a comprehensive central supply and delivery system. Storage lockers can be readily moved by a wheeled dolly. All of the drawers, trays, and details are modular and interchangeable with the experimental supply carts.

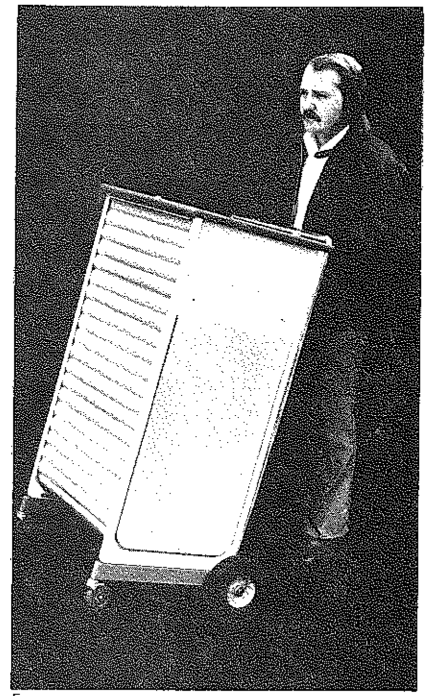
The carts, if filled with rationally established types and amounts of supplies, can reduce shifting of items from one place to the other. The carts have tambour doors to protect the contents from weather and can be locked for security. By using these carts and drawers and establishing a specific place and sized drawer for each item, the volumes would be better utilized.

All of the materials of the system can be sanitized and can withstand heavy usage. The drawers of the system are significantly more durable than metal ones, and the color is integral.

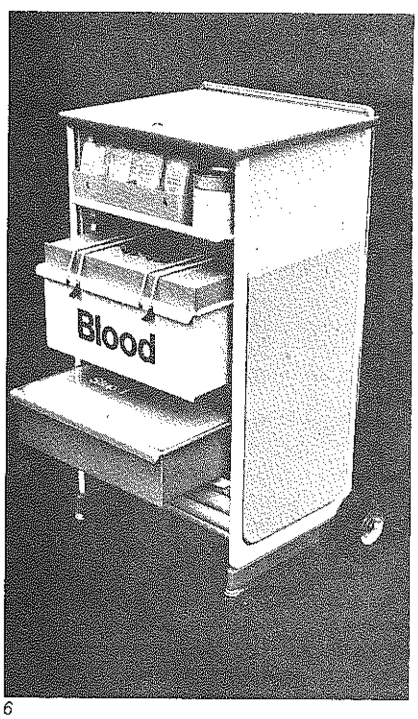
7, 8
Application of the Red Cross Blood Program symbol, 8, would also help to identify the staff member. Standard placement of nameplates and RN badges should be adopted.



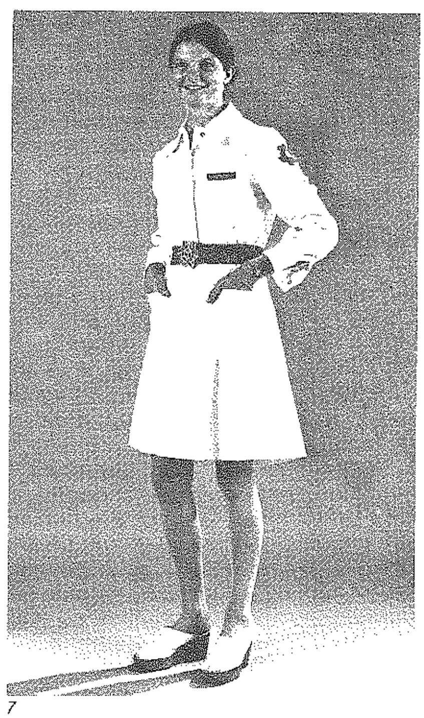
4



5

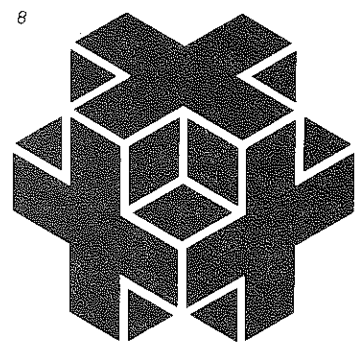


6



7

8



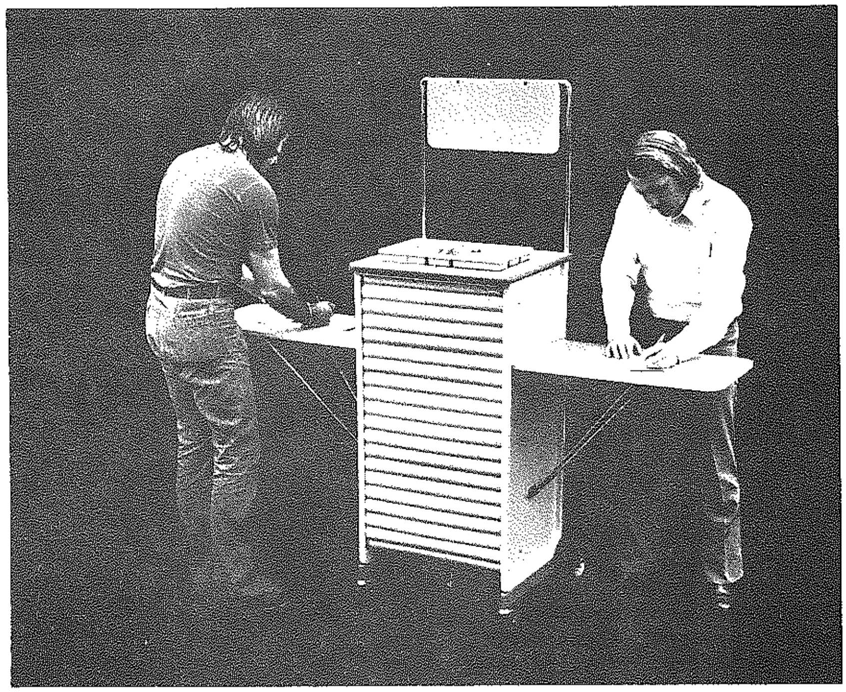
Design for the donor

11–13
In the experimental registration station the Co / Struc supply carts become multifunctional at the site. Donors, fully capable of filling out the forms themselves, do so on graphically revised, easy-to-read forms. A Red Cross staff member stands by to clarify questions and to do screening.

With the Co / Struc supply cart, supplies come systematically packed for immediate use, eliminating unnecessary setup manipulation. Also, the supply and work areas are clearly separated. The work area is small enough to eliminate ambiguity about the donor positioning to the nurse; a position perpendicular to the nurse has been deemed best, yet positions can be easily altered on the special stools.

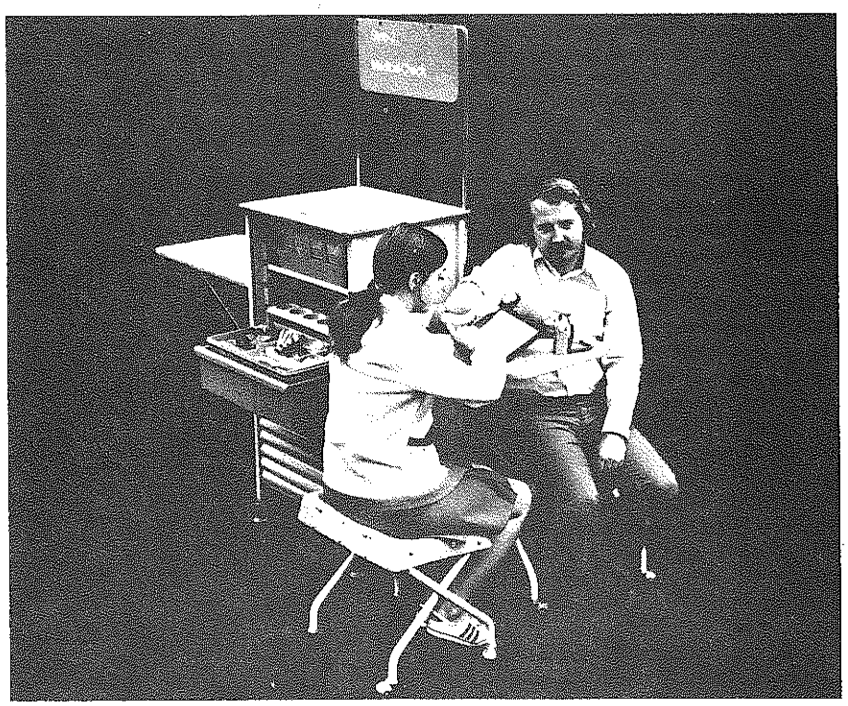
9

10



11

9, 10
The present registration system is dependent upon the furniture supplied by the sponsoring site. At each site, the medical history setup must be adapted to new table and chair conditions. The usual tables and chairs impose seating relationships of the donor facing the nurse and slightly off to one side. This requires awkward movement to accomplish the hemoglobin test and other operations.



12

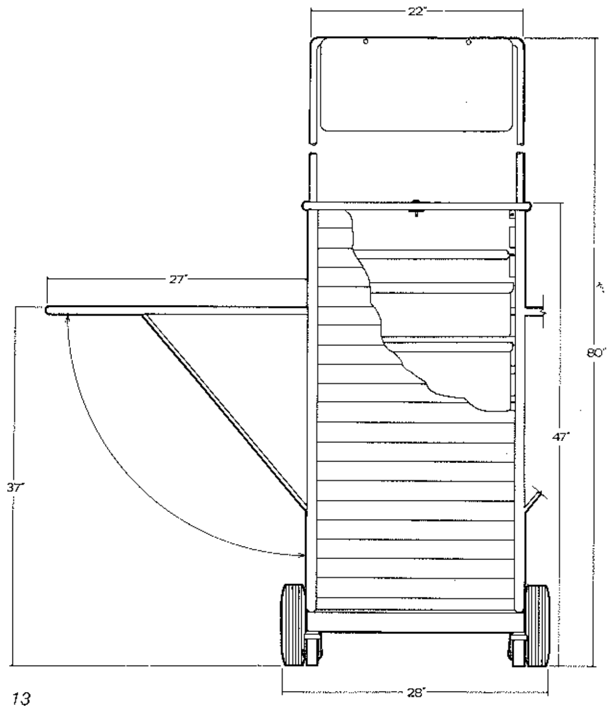
model for mobile blood collecting would be air travel. The passenger in his seat is the focus of all activities—travel and safety education, comfortable furniture, limited variety of forms, uncluttered environment, music, color and texture, are all planned to make the traveler physically, visually, tactfully and mentally comfortable in a highly charged and dynamic activity. Everything, including the style and appearance of the staff, is planned to reassure the traveler, to alleviate anxiety and to express competence and professionalism. Above all, the traveler feels as if he is being catered to and that the staff knows what it is doing and is using the latest technology. Could not the blood program adopt some aspects in kind, that is, develop a total approach to answering donor needs?

Design priorities

To do this the design team set themselves the following priorities as a guide for accomplishing the preliminary design work:

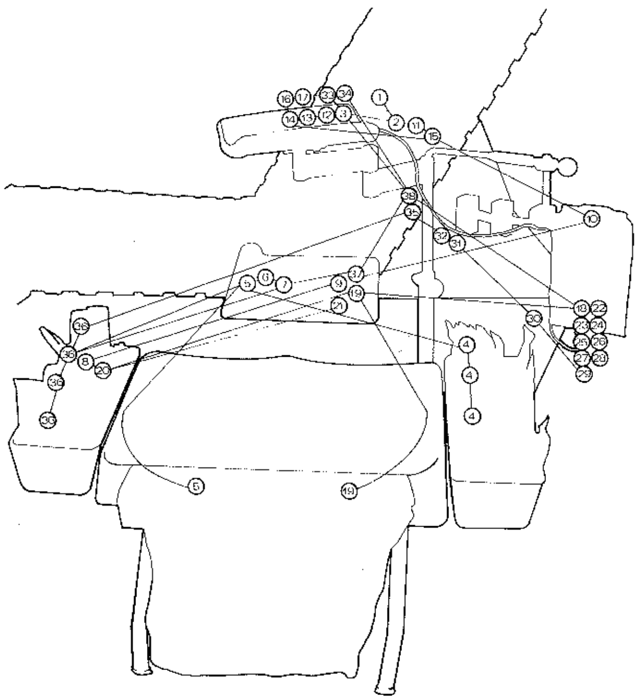
- That all of the items and procedures of mobile blood collecting be organized into visually understandable and simple looking and acting systems. That color, forms, shape, and details all relate to each other whenever possible. That there be a concentration and consolidation of functions to reduce steps and to reduce numbers and kinds of equipment, striving for multiple use whenever possible.
- That the entire system contribute to permit closer and extended personal contact between nurse and donor for the goal of improved donor education.
- That the donor meet not a loosely knit group of nurses, volunteers and aides during interviews, but several clearly defined professional staff members at advertised posts. (At some donor sites, we noticed more volunteer workers than donors, contributing to the donors' confusion.) Volunteer workers can have important impact in areas other than amidst the donor beds, such as in central supply, canteen, etc.
- That the staff in the public view adopt related clothing standards of color, texture and detailing. (Career apparel of airline personnel permits wide style selection, while unmistakable clues identify the relationship to the whole.)
- That the overkill of supplies and equipment brought to the donation site, which must be unpacked, sorted and repacked,

14
The range of types of clothes are related by the use of standardized red, blue, and white, and the selection of certain weaves and textures. In addition a limited range of detailing, piping, buttons, pocket application and location, and golf pleat back to permit full arm swing, etc., could also tie varied outfits together as parts of an overall style. The apparel should be human engineered and work well in conjunction with the nursing station stool and the tools required in everyday operations.



13

14



15
After extensive research and observation through a variety of media such as time lapse and still photography, the nurse's activities during venipuncture were found to consist of an average of eighty distinct movements. Of these eighty movements, 50 percent involved full bending at the waist. Of equal importance, it was found that the movements took place over the entire length of the bed and nursing station. Because the blood collection operation required such an unorthodox amount of movement on the part of the nurse, she would often set up what we called "nursing substations" taped to the end of each bed. Through the use of these "substations," the nurse was able to cut down her distance of travel considerably.

The operational and manipulative activities of the nurse during venipuncture have been reduced 50 percent by the use of the experimental system. Bending has been eliminated. The nurse is able to establish her own reach limits by adjusting the armrests and scales. Tool and supply containers on the sides of the stool further reduce the need for long-range movement, resulting in an activity carried out in a small, controlled sphere of space.

be reduced whenever possible. That central supply's responsibilities be heavily increased to produce truly ready-to-use kits. That the supplies required for each station and job be organized into a standard materials handling system which is directly related to the central supply design.
• That the entire mobile blood collecting unit become a clear evolutionary "system" in which every item, procedure and attitude would become a rational link of a chain whose purpose is to provide for a better donor experience. That as the system undergoes change, the donor experience remains the dominant concept.
• That the inordinate accumulated physical demands placed upon the assistants and nurses be compressed and simplified.
• Whenever possible, install for testing the latest applicable technological innovations which could enhance the goals set forth here. (Electronic thermometers, vital signs monitors, one-solution preparation of the venipuncture site, alternate methods for cooling blood in storage containers and portable audiovisual devices have been examined and included in the experimental system for testing. Some of these if adopted would have significant impact upon the procedures and would reduce timing and handling problems.)

Systematic approach to problems

The experimental system we proposed is an attempt to answer the above conditions. More important, however, we hope this effort reveals the need for comprehensive and systematic examination of the problems and how to go about solving them as revisions become necessary.

Individually, the members of the design team acknowledge that this has been the most perplexing, frustrating, and difficult assignment each has faced; yet, at the same time, it has also been challenging and rewarding. The complex relationships of people, equipment, facilities, staff, supplies, inventory, etc., do not easily reveal themselves and line themselves up in accurate order of priority.

Credits
Experimental Mobile Blood Collecting System, American National Red Cross Blood Program.
Design: Marc Harrison, M. Edward Lawing, Per Hoel, Michael Kreski, Peter Petrilli, David Rejeski, Charles Schreiner for industrial design, with the assistance of Pam Brackett, Laura Every and Pat Ubaldi for apparel design, and Scott Miller and Veronica Miller for graphic design.

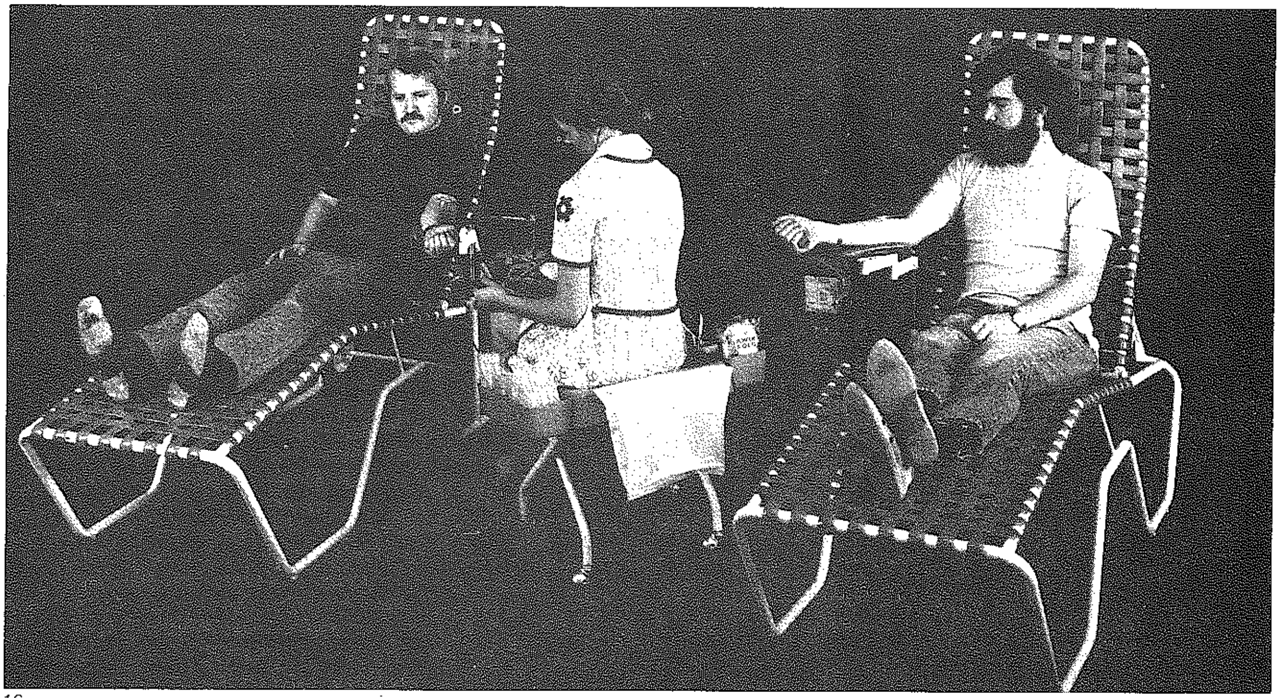
16–18
The new two-lounge setup is an attempt to make the donor comfortable during venipuncture and to economize on the efforts of the nurse. Of aluminum tubular construction, the lounges have replaceable high tensile strength vinyl webs. Each lounge weighs approximately 22 lbs. and has the ability to stack for ease of storage and carrying.

The design of the experimental donor lounge was greatly influenced by the donors' statements that they were rendered "helpless" by the prone position that they must assume. The design team felt that the donor requires comfort, visual and verbal contact with the nurse and fellow donors, and the ability to keep in touch with what is going on.

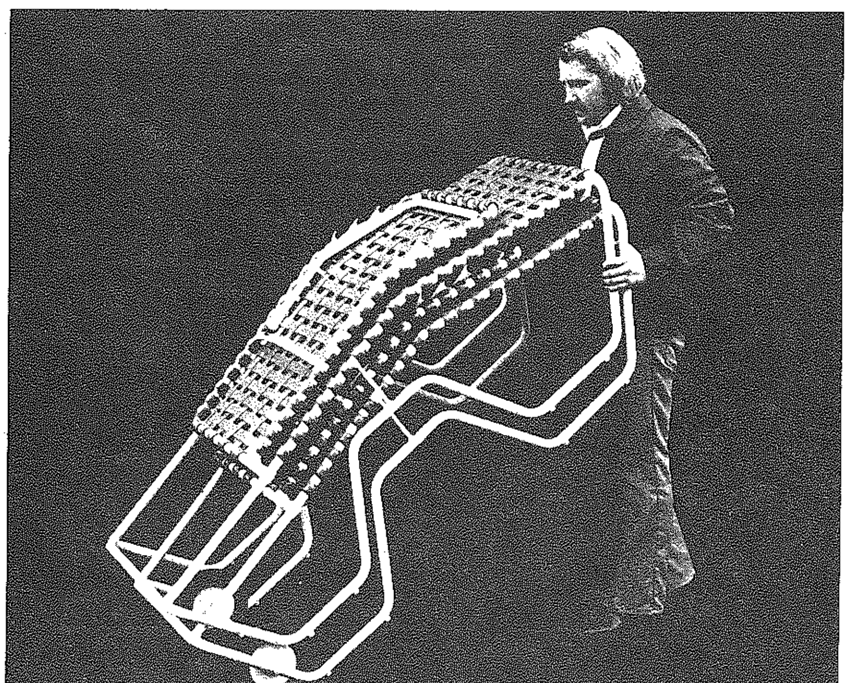
Other design factors were incorporated to allow for easy lowering of the lounge back for countering donor reactions. The lounge in the low position puts the head lower than the feet. The lounges stack for easy transport, and one lounge for each five or six stacked would have built-in wheels enabling one mobile assistant to move the lot.

The double weave strapping provides excellent support and is probably stiff enough for cardiac massage; it is easily cleaned, and the open web provides air circulation, particularly during warm and humid conditions.

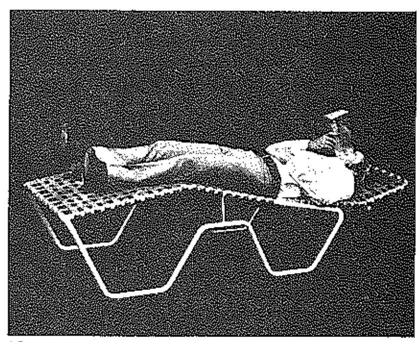
The nurse's position has been lowered to a seated one in near proximity to the level and position of the donor, permitting greater control of her activities.



16



17

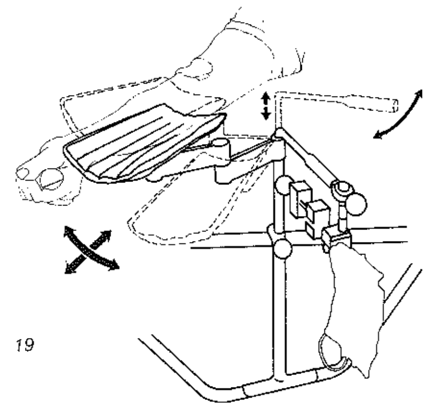


18

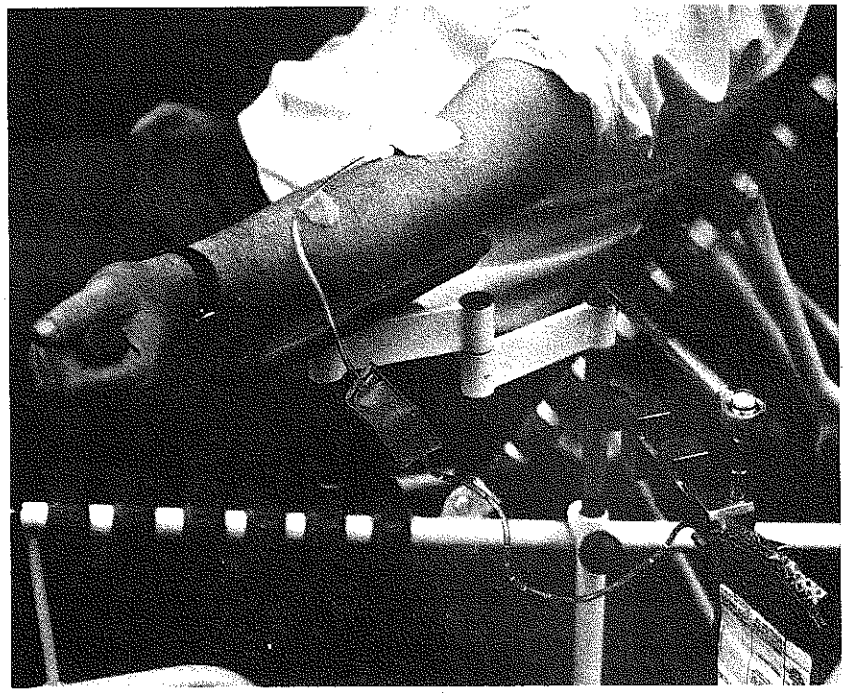
Design for the donor

19, 20
The new armrest is an attempt to position the donor's arm in a comfortable, but technically accurate, position for venipuncture. It has two double bar extensions which are capable of moving in a plane to coincide with the arm's natural mobility. In addition, it adjusts to height by moving up and down within the center post; the new blood scale is capable of similar movements at the nurse's convenience.

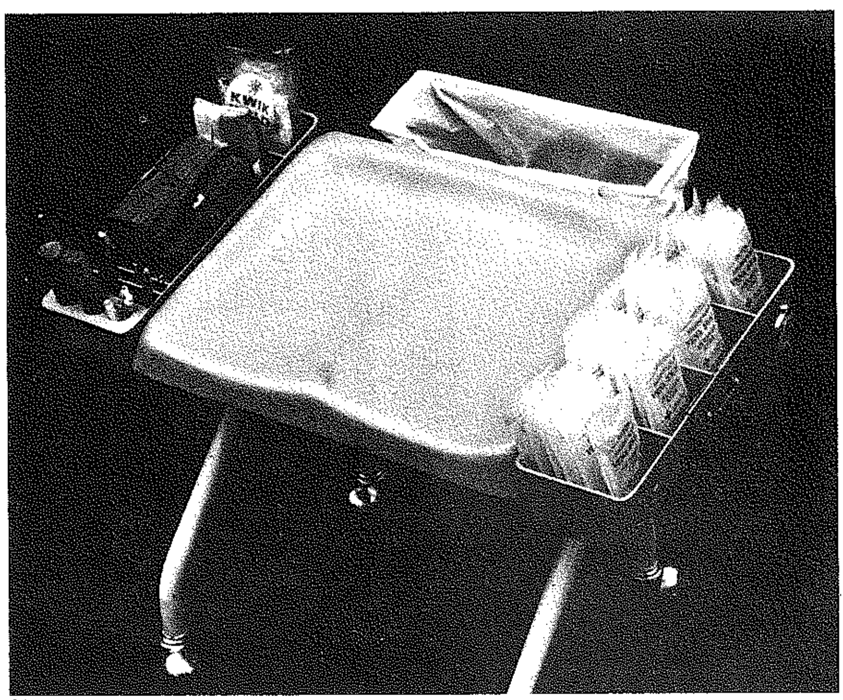
21, 22, 26
The combined functions of a stool on wheels, clip-on nursing station supply pods and waste container, in a single form, constitutes the most significant element of the experimental system. The major change of allowing the nurse to sit during the hours of venipuncture activities, with carefully planned supplies and waste disposal placed at her fingertips, significantly reduces the walking, standing, reaching, bending, and focus change associated with the existing methods. However, this device required innovation in the area of the supplies for one day's activities.



19



20



21

The concept of the "donor pack," a completely prepackaged, disposable item containing all of the expendable items required for a single venipuncture had to be developed. Stored in one of the "saddle bags" would be an adequate supply of these donor packs for a full day. The other saddle bag would contain all of the tools, recovery items, etc. which must remain and are not replenished.

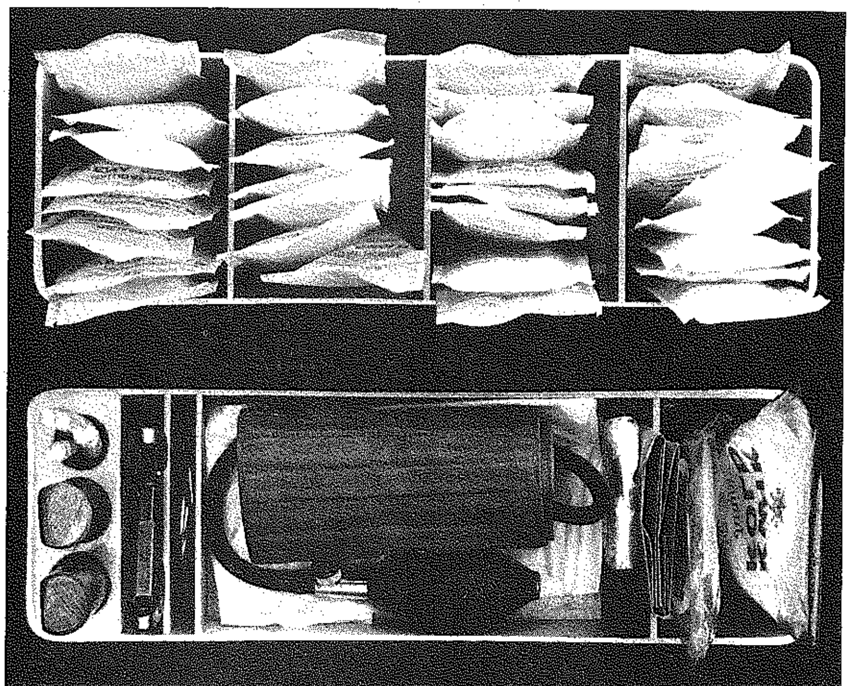
The donor pack in use is taken from the saddle bag and clipped on the clipboard which contains a stopwatch, holds the registration forms and acts as a lap work-surface. As the donor pack is used up, the blood bag is timed and information is recorded on the form. All of these activities are functions of the clipboard. The stool, engineered with an eleven-degree frontal slope, supports the nurse's natural angle of work.

23–25

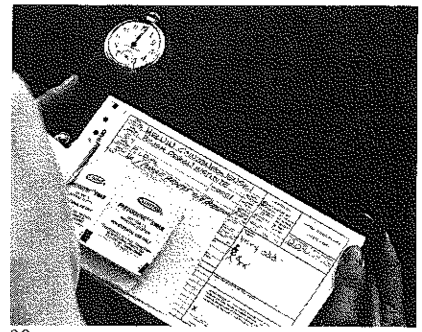
The new blood chest was constructed from two Co/Struc drawers, making it compatible with all parts of the system and giving it the strength, appearance, and durability inherent in the system components. Mechanical fasteners have been eliminated and the integral color of the containers cannot peel, chip, or discolor, keeping maintenance to a minimum.

The removable lid contains two snap-in gel packs positioned equidistantly above the blood. This arrangement produces an equal cooling of all blood packs and greater thermal efficiency of the chest. At the end of the day, the lids from all chests can be slid into a Co/Struc locker, rolled into a freezer, and then removed frozen the following morning to be snapped back on.

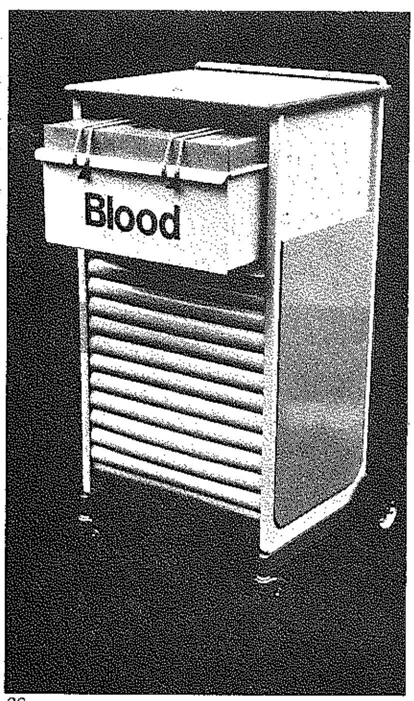
The Co/Struc locker will accept three assembled blood chests, allowing one man to move forty-five pints of blood at once. The chest's small size (approximately 40 percent of the volume and weight of the old chest) makes it ideally suited for shuttles as well as on-the-site storage of blood.



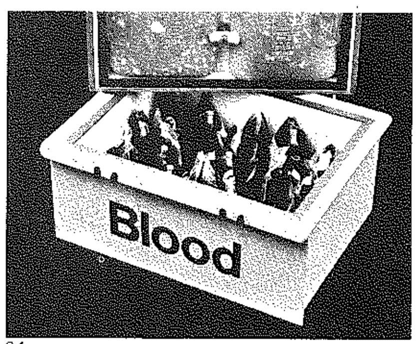
22



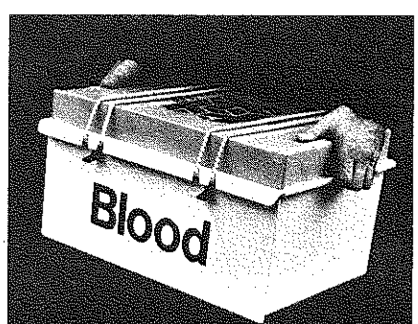
26



23



24



25

The preceeding article, "Design For The Donor"' by Marc Harrison has been reproduced with permission of the Managing Editor of Industrial Design, George T. Finley. This article appeared in the November 1973 issue of Industrial Design.

We are grateful for the assistance and cooperation that we have received from this excellent publication in making these reprints available to our readers. Industrial Design carries articles on numerous areas of design, many of which would be applicable to classroom uses. Such is the case with this article.

We feel certain that you will notice many design problems that would be worthy of a class assignment; and could only be solved with the application of engineering design graphics and an engineering instinct. Adequate information in the article is provided as a background to help your students understand the problems, needs, and limitations.

In addition to the mechanics of designing the various components; there is an extensive application of human factors to be considered. These are factors with which the student can relate and obtain measurements to assist them in formulating one of several design problems included here.

We encourage authors to submit articles that would present realistic design problems that lend themselves to graphical solutions, and are within the scope and goals of the engineering design graphics courses commonly taught in our engineering universities. These articles would enable us to broaden the content of our publication in forthcoming issues of the Journal.

NEW OFFICERS

VICE-CHAIRMAN

Robert D. LaRue, Ohio State University

Professor LaRue received his B.S. and M.S. in Mechanical Engineering at University of Idaho and is a registered professional engineer.

Bob has been an active member of the Engineering Graphics Division since 1957. He was Circulation Manager and Treasurer of the Engineering Design Graphics Journal and has served on numerous committees within the Division. He has played major roles as co-chairman of the Design Display and also has served as co-chairman of the Self Study Committee. He is a past Secretary of the Division and an active member of the Computer Graphics Committee for several years.

He is presently professor of Engineering Graphics at the Ohio State University.

CIRCULATION MANAGER AND TREASURER

Clyde Kearns, Ohio State University

Professor Kearns received his Bachelor of Chemical Engineering from the Ohio State University in 1942. He joined the staff of the Engineering Graphics Department at Ohio State in 1946 and has progressed through all ranks and was recently named Head of the Department of Engineering Graphics. He has had teaching assignments in the Department of Computer Science and Chemical Engineering as well as Engineering Graphics.

His industrial experience includes several positions as project engineer and design engineer with companies such as Pennwalt Corporation, Union Carbide, and North American Rockwell Corporation.

He is the present Circulation Manager and Treasurer of the Engineering Design Graphics Journal.

He has been active in research developing programs for computer graphics. He has been active as an author publishing a number of articles for professional journals.

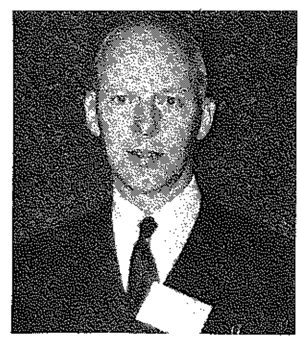
SECRETARY-TREASURER

Paul DeJong, Iowa State University

Professor DeJong received his Bachelor's Degree in Mechanical Engineering from Iowa State University in 1960. He is a registered professional engineer in Iowa and South Dakota.

He has had industrial experience as a private consultant, design engineer, draftsman and designer, and a cartographic draftsman.

Paul joined the Iowa State University Engineering Graphics Department in 1966. He is a co-author of Engineering Graphics and has make many contributions to the Engineering Design Graphics Journal.



DIRECTOR-LIASON

Klaus Kroner, University of Massachusetts

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

Professor Kroner has been a member of ASEE since 1953 and has held several positions in the Engineering Design Graphics Division, such as membership on Committee on Aims, Scope and Status(1960-1963), Teaching Techniques Committee (1960-1970), Educational Relations Journal Advertising.

NOMINEES FOR 1975-76

The following names have been submitted by the Nominations Committee and approved by the Executive Committee. These nominees will be voted on in the spring and will take office immediately following the annual ASEE meeting. Ballots will be mailed in early spring to all members of the Engineering Design Graphics Division.

Additional information on each of these nominees will be given in the Winter Issue of the JOURNAL.

VICE CHAIRMAN

Clarence Hall, Louisiana State University
Borah Kreimer, Northeastern University

JOURNAL ADVERTISING MANAGER

Leon Billow, U. S. Naval Academy
Garland Hilliard, North Carolina State U.

DIRECTOR --ZONES

George Devens, Virginia Polytechnic Inst.
Al Romeo, Ohio State University

12

13

14

DEC. 1974

DECEMBER						
S	M	T	W	T	F	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

MID-YEAR MEETING

The annual midyear meeting of the Engineering Design Graphics Division will be held December 11-14 in Colonial Williamsburg, Virginia. Our host committee from Virginia Polytechnic Institute and State University and the University of Virginia have planned what promises to be one of the most fascinating and informative conferences of all time. Conferees will have the opportunity to again relive the eighteenth century by touring the nearly 100 acres of gardens and landscaped greens which provide a harmonious surrounding for the architectural beauty and simplicity of Colonial Williamsburg's houses, shops, public buildings, and dependencies, 88 of which are original. George Washington, Thomas Jefferson, Patrick Henry and other great Americans walked the same streets and the tempo of that day lives again in the printer, wigmaker, the miller, the militia and others who actively and realistically re-create the life and times.

Registration fees for both conferees ($25.00) and wives ($15.00) include general admission to Colonial Williamsburg, unlimited use of area bus transportation, social hour, and lunch on Thursday and Friday.

Weather in the area is usually mild at this time of year, but our hosts caution us to bring an overcoat. Snow is rare but not unprecedented.

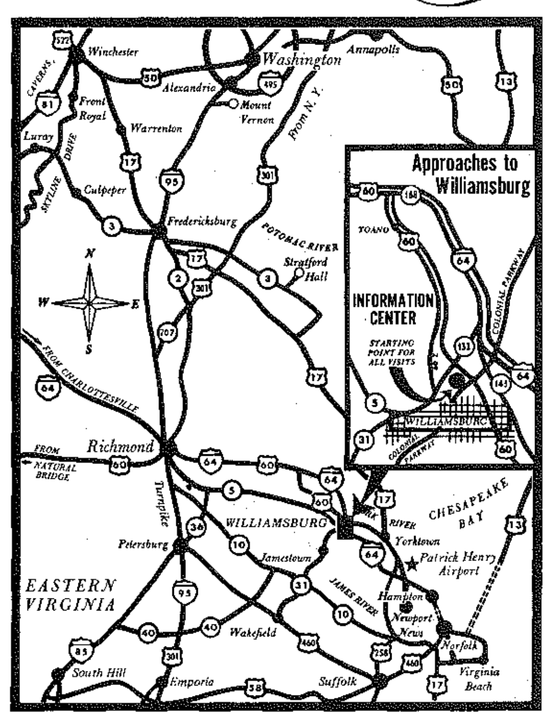
All meetings will be held in the Williamsburg Lodge which adjoins Colonial Williamsburg. Lodging has been reserved just across the street at the Williamsburg Inn and Colonial Houses and will be held until 20 November. Reservations may be made by writing or calling the Visitor Services Division, Williamsburg, Virginia 23185.

The Mid-Year Conference Co-chairman, W. G. Devens, E. V. Mochel, and W. B. Rogers look forward to seeing you all and hope you enjoy your visit in the Commonwealth of Virginia.

COME TO HISTORIC

Williamsburg

VIRGINIA



HOW TO REACH WILLIAMSBURG

WEDNESDAY AFTERNOON, DECEMBER 11

3:00 - 5:00 REGISTRATION - East Gallery
Members' Fees: $25.00
Wives' Fees: 15.00

7:00 EXECUTIVE COMMITTEE DINNER
Room A, Lodge
(For Executive Committee Members, Wives, and Invited Guests

8:00 SOCIAL TIME
Market Square Tavern
(All Members, Wives and Guests)

THURSDAY MORNING, DECEMBER 12

8:00 - 9:30 REGISTRATION - East Gallery

9:30 -11:45 GENERAL SESSION
Tidewater Room

Presiding: William H. Eubanks, Jr
Mississippi State Univ.

GREETINGS AND WELCOME

E. V. Mochel, Univ. of Va.
W. G. Devens, VPI & SU

9:45 "History of Engineering Graphics at the United States Military Academy"
Gilbert W. Kirby, Jr.
Colonel, Professor, USMA

10:30 COFFEE BREAK

11:00 "History of Engineering Graphics and Its Significance in Computer Graphics"
Clarence Hall,
Louisiana State University

12:15 BUSINESS LUNCHEON
North Ballroom

Presiding: Claude Z. Westfall
Chairman, EDGD
Univ. of Maine at Orono

THURSDAY AFTERNOON, DECEMBER 13

2:00 - 4:00 GENERAL SESSION
Tidewater Room

Presiding: Wendell Deen
Univ. of Houston

2:00 "History of Drawing Instruments"
Frank Oppenheimer
Gramercy Guild Group, INC.

2:45 "Philosophical Instrumentation in the History of Graphicsl Communication"
Morgan Thomas
Keuffel and Esser, Co.

3:30 COMMITTEE MEETINGS (To Be Announced)

FRIDAY, DECEMBER 13

9:00 -11:45 GENERAL SESSION
Tidewater Room

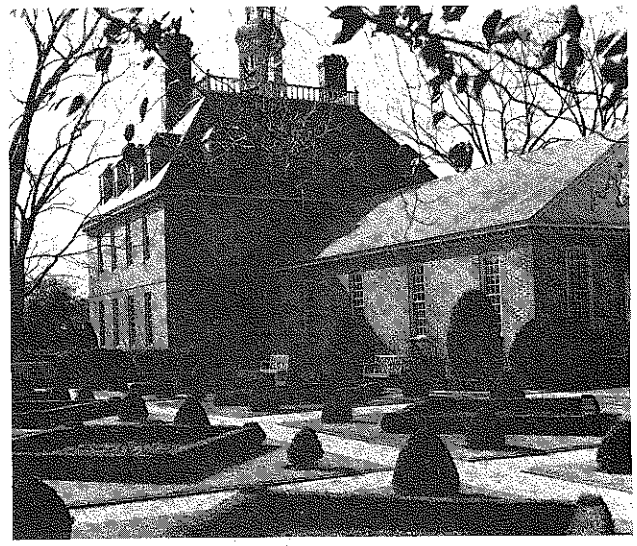
Presiding: Frank F. Marvin, VPI & SU

9:00 "Human Factors Research in Consumer Products Design"

Percy Hill, Tufts University

9:45 "Relating Engineering Design to Social Implications"

Edward W. Knoblock
Univ. of Wisconsin-Milwaukee



10:30 COFFEE BREAK

11:00 "LET'S TALK IT OVER"

Presiding: Claude Z. Westfall
Panel: Executive Committee

12:30 LUNCHEON (Wives Invited)
Virginia Room

Group Photo

1:30 "The Williamsburg Town Plan"
Paul Buchanan

2:15 Walking Tour of Williamsburg

6:00 SOCIAL HOUR (Cash Bar)
Virginia Room

7:00 ANNUAL BANQUET
Virginia Room

Presiding: C. Z. Westfall, Chairman
Engineering Design Graphics Division

Speaker: Gordon Sanders
Iowa State University

SATURDAY, DECEMBER 14

Continue Tour of Colonial Williamsburg

****

LADIES' PROGRAM

WEDNESDAY, DECEMBER 11

8:00 p.m. SOCIAL TIME, Market Square Tavern

THURSDAY, DECEMBER 12

9:00 Guided Tour - Meet at North Gallery

11:45 Luncheon - King's Arms Tavern

FRIDAY, DECEMBER 14

12:30 Luncheon, Virginia Room

1:30 "The Williamsburg Town PLan"

2:15 Tour Colonial Williamsburg

6:00 SOCIAL HOUR & ANNUAL BANQUET
Virginia Room

CLAUDE Z. WESTFALL
University of Maine
1974-75 Chairman
Engineering Design Graphic Division
American Society for Engineering Education

A MESSAGE FROM YOUR CHAIRMAN

It is a priviledge for me to serve as Chairman of the Division of Engineering Design Graphics for the year 1974-75. Your support for the next year is solicited and I will do my best to carry out the responsibilities that go with this office.

I would like to talk briefly about some of our problems and how we might go about trying to meet them. Every year, of course, has its own problems, its particular needs, and its special compensations. Higher education has changed and with it engineering graphics has changed. In some instances institutions have cut programs either partially or completely. At other schools, engineering educators have moved in many new and innovative directions, e.g., computer graphics, metric integration, teaching techniques, creative design, human engineering, etc. The Division, as it has done so well in the past, must continue to be resourceful in meeting the needs of our engineering students. While falling birth and immigration rates have slowed enrollment growth, it appears that for the first time in several years that engineering enrollments will again increase. Many schools are getting back to some of the basics of engineering applications and engineering graphics can certainly fill much of the gap in our engineering curricula. Here then is a real challenge to those of you involved in teaching some aspect of graphics. My hope is that all of you will continue to be resourceful in order to keep our graphics programs strong.

1. A list of officers and committees appears in this issue of the Journal. To those people I would like to extend my appreciation for their willingness to work on behalf of the Division for 1974-75. The Division like many organizations meets only twice a year and therefore must rely upon good communications between its officers and committees. Since individuals are from all parts of the country, this can be a real problem if the Division officers are not advised on what is taking place. Copies of all correspondence should be sent to the Chairman, Vice Chairman, and any others that may be appropriate.

2. All committees are urged to communicate their plans and results to the Journal for publication. The Journal is the official publication of the Division and it is the best way to inform the membership of what is going on. The editors have a difficult job and need our help in preparing all kinds of material that should be known to our members, e.g., Annual and Mid-Year Conference plans, displays, summary of meetings, etc.

3. It seems reasonable to assume that our financial stringency is likely to prevail for some time. It is difficult to obtain additional funds from ASEE for new directions and improvements in our programs due to limited resources. If we are to get more monies a good budget is not only helpful but necessary. For accounting and auditing purposes this will also help to insure that we make the most effective use possible of the resources available to us. A start has been made; this year's budget appears in this issue.

   The Division for the first time now has a Secretary-Treasurer who will have the added responsibility of working with the Chairman in the preparation of a budget. We have had Treasurer's reports in the past, but I believe this is the first time an operating budget has been presented to the membership.

4. Several By-Law changes will be considered by the Executive Committee this year. These are:

   (a) A statement to define the responsibilities of the Directors. This is a real need since some of our Directors have indicated that they did not know what was expected from them and the operating committees for which they have responsibility.

   (b) Consideration of a two-year term for the office of Chairman. Many points for and against this proposal can be made. It will be discussed fully with a recommendation to be made at the 1975 Annual Conference.

5. The Committee on Public Relations will be asked to place some emphasis on obtaining new members for the Division. One vehicle for disseminating information about the Division is our brochure. Membership is open to any member of the American Society for Engineering Education who has indicated Engineering Design Graphics as an area of interest. Individuals who are, or who have been, actively engaged in any phase of the education of the engineer or technician are invited to join ASEE and to affiliate with the Division.

   Copies of the Division's brochures can be obtained from the Secretary-Treasurer, Paul S. DeJong of Iowa State. Individual members are encouraged to use these brochures and to contact those that they may know of who are not now members of the Division.

6. The area of programming has and will continue to be the major activity of the Division. An early start has been made in planning for this year's conferences. Our Director, Gordon Sanders, who is responsible for coordinating all programs is doing an excellent job in this area. This Year's Mid-Year Conference will be held at Colonial Williamsburg and I believe you will find that an outstanding program has been planned for. The Annual Conference will be held at Colorado State and your input for this event is solicited.

   In the Spring 1974 issue of the Journal I posed three questions and invited the membership to respond. These were:

   (a) Areas of interest that you would like to see developed.

   (b) Committees that you have an interest in or would be willing to work on.

   (c) Program suggestions for future Mid-Year and Annual Conferences.

You are again asked to respond to these questions. Possible themes that have already been suggested include "Common Courses for Freshman Engineers" and "Where Are We Heading and Who's Going Along". Some of our members feel that there are too few young people from Junior and Community Colleges in attendance at our meetings. Others have said that we need more membership participation. And, we should promote the Division goals, much more rigidly and more in depth. One member writes that. . . "it is time we launch a campaign to recruit those involved with Freshman Engineering courses. We should also change the name of the Division once more to properly reflect this broadened scope". What are your thoughts concerning the Division? An opportunity will be provided at one of the sessions at the Mid-Year Meeting this year in Williamsburg for members to sound-off concerning the Division.

It is with great pleasure that I assume the Chairmanship of the Division for 1974-75. With that pleasure comes responsibility and I look forward to working with all of you as we strive together to meet our responsibilities to the Division.

ENGINEERING DESIGN GRAPHICS DIVISION - ASEE

ENGINEERING DESIGN GRAPHICS DIVISION
American Society for Engineering Education
Proposed Budget for Period
July 1, 1974 to June 30, 1975

REVENUE	1974-75 Proposed
**ASEE	$ 745.00
*Engineering Design Graphics Journal	
Subscriptions	2500.00
Advertising	1500.00
Creative Design Display Industrial Support	1500.00
Conferences	
Summer Schools	
Mildred Rising Award	100.00
Miscellaneous	80.00
TOTALS	$6425.00

EXPENDITURES	
*Engineering Design Graphics Journal	
Editorial	$ 900.00
Advertising	100.00
Circulation	300.00
Printing & Mailing	2000.00
Reserve in Account	700.00
Creative Design Display	1500.00
Publicity	
Printing & Mailing	
Judges Luncheon	
Awards	
Annual Conference	150.00
Mid-Year Conference	100.00
Printing (stationery, conference programs, committee reports, election ballots, awards, etc).	250.00
Mildred Rising Award	100.00
Postage	150.00
Telephone	125.00
Miscellaneous	50.00
TOTALS	$6425.00

*See Circulation Manager-Treasurer report of finances. Journal funds are under the control of the Publications Committee.
**Amount to be requested from ASEE.

Respectfully submitted,

Claude Z. Westfall
Vice Chairman

ENGINEERING DESIGN GRAPHICS DIVISION
American Society for Engineering Education

Executive Committee

Chairman
Claude Z. Westfall
202 East Annex, UMO
Orono, Maine 04473
Ph. (207)581-7837

Past Chairman
Kenneth E. Botkin
MBL 103, Purdue University
W. Lafayette, Indiana 47906
Ph. (317)749-2926

Vice Chairman
Robert D. LaRue
Ohio State University
2070 Neil Avenue
Columbus, Ohio 43210
Ph. (614)422-2493

Secretary-Treasurer
Paul S. DeJong
Iowa State University
403 Marston Hall
Ames, Iowa 50010
Ph. (515)294-6524

Director, Liaison
Klaus Droner
Dept. of Ind. Engr. & Oper. Res.
University of Massachusetts
Amherst, Massachusetts 01002
Ph. (413)545-2851

Director, Technical & Professional
Charles H. McNeese
Tarrant County Junior College
828 Harwood Road
Hurst, Texas 76053
Ph. (817)281-7860

Director, Programs
C. Gordon Sanders
403 Marston Hall
Iowa State University
Ames, Iowa 50010
Ph. (515)294-3117

Director, Zones Activities
Edward V. Mochel
School of Engr. & Applied Science
University of Virginia
Charlottesville, Virginia 22901
Ph. (804)924-3425

Director, Publications
James H. Earle
Engineering Design Graphics
Texas A&M University
College Station, Texas 77843
Ph. (713)845-1633

ENGINEERING DESIGN GRAPHICS DIVISION OFFICERS AND COMMITTEES - 1974-75

ASEE Council for Professional & Technical Educ.
C.Z. Westfall, U. of M. (Senior Member)
R.D. LaRue, Ohio State (Junior Member)

CHAIRMAN*
C.Z. Westfall, U. of M.

Past Chairman*
K.E. Botkin, Purdue

Chaplain
C.E. Hall, L.S.U.

Secretary - Treasurer*
P.S. DeJong, Iowa State ('77)

Vice Chairman*
R.D. LaRue, Ohio State

BY-LAW COMMITTEES

Nominating
- P.H. Hill, Tufts (Chm.)
- W.B. Rogers, V.P.I.
- K.E. Botkin, Purdue
- A. DeVaney, Amarillo College
- R.J. Foster, Penn State

Elections
- R.D. LaRue, Ohio State (Chm.)
- O.J. Baldwin, Ohio State
- A. Romeo, Ohio State

Policy
- R.H. Hammond N.C. State (Chm.)
- W.B. Rogers, V.P.I.
- K.E. Botkin, Purdue
- A. Romeo, Ohio State

Distinguished Service Award
- P.H. Hill, Tufts (Chm.)
- W.B. Rogers, V.P.I.
- K.E. Botkin, Purdue

Operations Committees (Under the responsibility of an elected DIRECTOR)

Liaison*
K. Kroner ('77)
U. of Mass.
- Public Relations
  R.J. Christenson, G.M.I.
- Educ. Relations
  R.W. Dalrymple, Metropolitan St. Coll.
- Industrial Relations
  M.G. Thomas, K & E
- Affirmative Action
  E.G. Parē, Wash. St. U.

Technical & Prof.*
C.H. McNeese ('78)
Tarrant Co. Junior Coll.
- Graphics Technology
  F.F. Marvin, V.P.I.
- Computer Graphics
  J.C. Brown, U. of Ala.
- Engrg. Design Educ.
- Human Factors in Design
  J.C. Kreifeldt, Tufts
- Teaching Techniques
  C.R. Mercier, Iowa St.
- Theoretical Graphics
  M.F. Blade, Cooper Union

Programs*
C.G. Sanders ('77)
Iowa State
- Annual Conf., Col. State
  B. Houck, N.C. State
- Mid-yr. Conf., Williamsburg
  W.G. Devens, V.P.I.
  E.V. Mochel, U. of Va.
  W.B. Rogers, V.P.I.
- Exhibits (Mid-yr. Conf.)
  L.M. Billow, U.S.N. Acad.
- Creative Design Displays
  J.T. Coppinger, Tex. A. & M.

Zones Activities*
E. Mochel ('75)
U. of Virginia
- Zone I H.B. Metcalf, U. of M.
- Zone II F.A. Mosillo, U. of Ill, Chicago
- Zone III
- Zone IV W.R. Reynolds, Cal. St. Poly. Coll.

Publications*
J.H. Earle, Editor ('76)
Texas A & M
- Assoc. Editors
  R.J. Foster, Penn State
  G.K. Hilliard, N.C. State
- Circ. Mgr. - Treasurer
  C.H. Kearns, Ohio State ('77)
- Advertising Mgr.
  C.E. Hall, L.S.U. ('75)

Non By-law Committees

Ad Hoc

Resolutions
- I.L. Hill, I.I.T.

Awards
- R.C. Parē, Cogswell Poly. Coll.

* Member Executive Committee

Note: Committee Chairman responsible for appointing additional Operations Committee Members

ENGINEERING DESIGN GRAPHICS DIVISION

(See organizational chart for committee assignment)

Committee Chairman

Clarence E. Hall
142 Atkinson Hall
Louisiana State University
Baton Rouge, Louisiana 70808
Ph. (504)388-2022

Percy H. Hill
Department of Engineering Design
Tufts University
Medford, Massachusetts 02155

Robert H. Hammond
Director, Freshman Engr. Division
North Carolina State University
Raleigh, North Carolina 27607
Ph. (919)787-8777 or (919)737-3263

Robert J. Christenson
General Motors Institute
Mechanical Engineering Dept.
Flint, Michigan 48502
Ph. (313)766-9070

Robert W. Dalrymple
Civil Technology Dept.
Metropolitan State College
Denver, Colorado 80210

M. G. Thomas
Educational Marketing Manager
Keuffel & Esser Company
Morristown, New Jersey 07960

Eugene G. Pare'
Mechanical Engineering Dept.
Washington State University
Pullman, Washington 99163

Frank F. Marvin
Division of Engineering Fund
VPI and State University
Blacksburg, Virginia 24061
Ph. (703)951-6555

Jack C. Brown
University of Alabama
College of Engineering
Engineering Technology Programs
Box 1941
University, Alabama 35486

John G. Kreifeldt
Department of Engineering Design
Tufts University
Medford, Massachusetts 02155

Cletus R. Mercier
Iowa State University
Department of Engineering Graphics
403 Marston Hall
Ames, Iowa 50010
Ph. (515)294-3117

W. George Devens
Division of Engineering Fundamentals
VPI and State University
Blacksburgh, Virginia 24061
Ph. (703)951-6555

William B. Rogers
Division of Engineering Fundamentals
VPI and State University
Blacksburg, Virginia 24061
Ph. (703)951-6555

Leon M. Billow
Naval Systems Engineering Dept.
U. S. Naval Academy
Annapolis, Maryland 21402
Ph. (301)267-3881

J. Tim Coppinger
Engineering Graphics Dept.
Texas A&M University
College Station, Texas 77843
Ph. (713)845-4451

Henry B. Metcalf
General Engineering Dept.
201 East Annex, UMO
Orono, Maine 04473
Ph. (207)581-7837

Frank A. Mosillo
Department of Systems Engineering
University of Illinois at Chicago Circle
P.O. Box 4348
Chicago, Illinois 60680
Ph. (312)996-3444

R. Wallace Reynolds
Engineering Technology Dept.
California Polytechnic State University
San Luis Obispo, California 93407
Ph. (805)546-2930 or (805)543-8773

Robert J. Foster
Department of Engineering Graphics
328 Hammond Building
Penn State University
University Park, Pennsylvania 16801

Garland K. Hilliard, Jr.
239 Riddick Hall
North Carolina State University
Raleigh, North Carolina 27607
Ph. (919)737-3263

Clyde H. Kearns
2070 Neil Avenue
Ohio State University
Columbus, Ohio 43210
Ph. (614)422-2634

Ivan L. Hill
Engineering Graphics Dept.
Illinois Institute of Technology
Chicago, Illinois 60616
Ph. (312)Ca5,9600X795

Ronald C. Pare'
Cogswell College
Mechanical Technology Dept.
San Francisco, California 94110
Ph. (415)647-1473

Mary F. Blade
Mechanical Engineering Dept.
Cooper Union
Cooper Square, New York 10003
Ph. (212)Algonquin4-6300

Byard Houck
School of Engineering
North Carolina State University
Raleigh, North Carolina 27607
Ph. (919)787-8282

Wendell M. Deen
Department of Civil Engineering Technology
University of Houston
3801 Cullen Blvd.
Houston, Texas 77004
Ph. (713)749-1349

Thomas R. Long
College of Engineering
West Virginia University
Morgantown, West Virginia 26506

Limerick Laureates

Launching the Latterday Limerick Laureates Laboratory may be like launching a lead balloon it may not get off the ground - and if it does, it may not go over very well or have a very long flight. At any rate hang on to your gondola and ballast away -- because we are not fueling around while all our hot air goes for naught!

What is a limerick?

Webster defines a limerick as: "A nonsense poem of five anapestic lines, usually with the rhyme scheme: a-a-b-b-a. The first, second and fifth lines have three stresses; the third and fourth have two. Example:

A flea and a fly in a flue
Were imprisoned, so what could they do?
Said the flea, "Let us fly!"
Said the fly, "Let us flee!"
So they flew through a flaw in the flue.

What good are they?

Limericks lure laughter, you see,
Though everyone wouldn't agree --
You may read them and weep
Or they may lead you to leap
Off a cliff, or go hang from a tree!

What is the problem?

To keep a limerick column going is a grind
For the Editor caught in the bind
But if you'll send in the stuff,
We will publish enough
To help Garland K. Hilliard unwind.

What is in it for me?

To show that you are a scholar
And to win the first prize of a dollar,
Make the last sentence rhyme
Then mail it in time
______________________________.

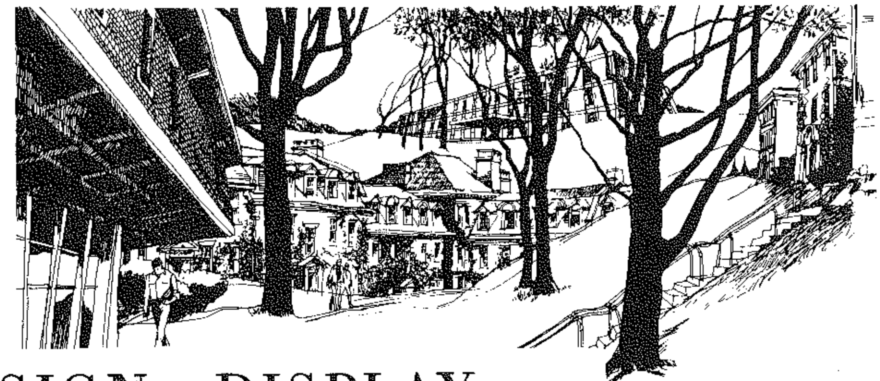
Is that all?

If you're bright and money's your wine
And can write better verses than mine,
We will let you do more,
Say the first and best four -
And pay you a buck for each line.

Either write the winning last line or the first four lines selected to be printed each issue and the Journal will make you a Limerick Laureate and send you a dollar a line for your efforts.

Editor's Note:

Gordon Sanders deserves much credit.
All the above he did write and edit,
And all he has said was true
The cash is waiting for you!
Send your line in and we may print it.



1974 DESIGN DISPLAY — ANOTHER SUCCESS

ASEE
Annual Conference
June 17-20, 1974

The Engineering Design Graphics Division in general and the Creative Design Committee in particular should once again pat itself on the back for continuing to excell itself in providing one of the featured attractions at the ASEE Annual Conference. Student designs have shown a tremendous improvement each year and the 7th Annual Display at RPI seems to have been by far the best yet. Several of the judges agreed that the over 70 entries represented excellent work and were indeed competitive.

The James S. Rising Memorial Award of $100 established last year by Mrs. Rising and her two sons was awarded for the first time to the First Place Freshman Design. In addition, the first place winner in the freshman category will receive a trip to the 1975 ASEE Conference in Fort Collins, Colorado. Hopefully, the student will participate in the program.

First place awards of $100 were also given to the winners in the sophomore, junior, senior and graduate categories. The winners' respective schools will receive plaques. Except for the Rising Award, the other awards are made possible through the generosity of industry who seem to want more of this practical side of engineering.

The increase from over 30 entries last year to over 70 entries this year must have presented quite a task for the judges representing both industry and education. Winners were narrowed to the following:

FRESHMAN DIVISION

1ST PRIZE: Virginia Polytechnic Institute and State University - Design and Construction of an Educational Toy

2ND PRIZE: University of Wisconsin-Milwaukee A System for the Blind to Identify the Contents of a Can

3RD PRIZE: Arizona State University - Book Page Turner for the Physically Handicapped

SOPHOMORE DIVISION

1ST PRIZE: Milwaukee School of Engineering A Cardiac Tachometer

2ND PRIZE: Tarrant County Junior College Northeast Campus - The Professional Medical and Dental Building

3RD PRIZE: General Motors Institute - Energy Miser (A Rubber Band Powered Truck)

JUNIOR DIVISION

1ST PRIZE: University of Wisconsin-Milwaukee Small Robot Development

2ND PRIZE: (Tie) Polytechnic Institute of New York An EMG Controlled Knee-Locking Prosthesis

2ND PRIZE: Union College - PRUX-200 Computer

SENIOR DIVISION

1ST PRIZE: The Cooper Union - Design of an Implanted Artificial Tooth Foundation

2ND PRIZE: United States Naval Academy Proposed Plan for Raising "Tecumseh"

3RD PRIZE: Southeastern Massachusetts University - New Beach House at Round Hill (Town of Dartmouth, Massachusetts)

GRADUATE DIVISION

1ST PRIZE: University of South Carolina A Desk-Top Microcomputer

PRELIMINARY EDG ANNUAL CONFERENCE GUIDELINES

by
Byard Houck, Chairman, Program Committee

ASEE Conference Theme: Engineering Education for World Development

EDGD Theme: Where Are We Going and Who's Going Along?

Our new Division Chairman, Claude Z. Westfall, is providing strong leadership overall and he expects that our 1975 Annual Program Committee will: (1) define the topical themes early; (2) solicit papers widely; (3) sharpen and refine the topical areas as suggestions and papers are received; and (4) maintain a steady publicity effort through the Public Relations Committee and Journal. Claude Westfall insists that new people be given divisional responsibilities and that they be accorded a place on the program to the maximum practical extent.

At the 1974 ASEE Annual Conference, the EDGD had 75 persons attending the two major events which they sponsored. This means that our Division is healthy and that we are finding meaningful dialogue at our Annual Conference. There was, however, a broad agreement among the participants that co-sponsored sessions were less desirable than Division-sponsored sessions. The current plan is to possibly co-sponsor the Computer Graphics session (with the COED Division) and not to co-sponsor any other sessions. The events currently envisioned are:

I. "EDGD - How Are We Involved in the Emerging Trends in Education?

Rationale: Self-paced instruction, mini-courses, curriculum and tract electives and variations -- all of these are upon us now!

Objective: This event will show how Design Graphics people are responding to these major innovations in education. "Where are we going and who's going along?"

Who Should Contribute Papers: (1) anyone who has facts and statistics on these trends; (2) any EDG people using the emerging techniques to teach design and/or graphics; and (3) any EDG people who want to make a general assessment as to how these trends will effect the goals and identity of the Division.

II. "EDGD - How Will We Contribute to the Care and Feeding of Freshmen?"

Rationale: Design Graphics people have been associated with Departments of Mechanical Engineering, Engineering Mechanics, Engineering Fundamentals, Freshman Engineering, and General Engineering -- just to name a few. In most colleges and universities, Design Graphics people play some role in the motivation, teaching, or advising of freshmen.

Objective: This event will explore the meaningfulness of the freshmen common demoninator. "Where are we going and who's going along?"

Who Should Contribute Papers: (1) anyone who has facts and statistics on these trends; and (2) any EDG people who have had recent meaningful experiences in graphics staff realignment toward freshmen.

III. "EDGD - What Is Our Role in Developing Engineering Creativity?"

Rationale: Some schools emphasize design and some emphasize graphics. The Creative Engineering Design Display has become a looking glass through which the work and emphasis of the Division educators can be viewed and promoted.

Objective: This event will be looking at the Creative Engineering Design Display to ask such questions as : (1) "How much design and how much graphics?"; (2) "How much attuned to industry and how much to education?"; (3) "How is this incentive valued and perceived by students?"; and (4) "How can soft designs be evaluated against hard designs?"

Format: This event will be moderated by Prof. Borah Kreimer. The VPI student(s) who won the 1974 EDGD Design Display competition will be a panelist and speak for the students. A person from industry (and a former judge of the Design Displays) will be a second panelist. The third and final panelist will be from education and will be drawn from a school which has participated broadly and/or had several designs judged to be of award quality.

Who Should Contribute Questions for Panel Considerations: Anyone having a question, which they would like to address to the panel, should send the question to Borah Kreimer at Northeastern University. Similar questions will be grouped and these "concensus" questions will be addressed to the panel before questions from the floor. "Where are we going and who's going along?"

IV. "EDGD - What Is the Relevancy of Computer Graphics?"

Rationale: New and intriguing computer technologies are rapidly placing computer graphic (CG) capabilities in the financial range of most educational institutions. Natural language software packages are coming out which make the utilization of CG both easy and pleasant. Batch mode CG processing is now available -- improving job turn around and also making introductory CG courses feasible from a cost-per-student point of view.

Objective: This event will examine emerging hardware and software in the field of Computer Graphics. It will also be looking at self-paced CG instruction as coupled with batch mode computer processing. "Where are we going and who's going along?"

Who Should Contribute Papers: (1) persons having facts and statistics relative to the emerging educational and design usage patterns of CG; (2) persons having special familiarity with emerging hardware sophistications; (3) persons who have developed and/or utilized CG packages which are suitable for the classroom; and (4) persons who are cognizant of what "top-down programming" and "structured programming" techniques will mean in the development and utilization of CG software.

How Does a Person Contribute Papers?

There is great interest in the work of our Division as evidenced by 75 persons attending each of the events which we co-sponsored at R.P.I. In order to give authors maximum notification that their papers will be on the program, authors must get abstracts in as soon as possible.

What Size: 25 to 50 word abstracts, with an indication as to which topical area is being addressed.

When: Soon - but the abstracts must be in by December 1 for program planning at the Mid-Year Meeting. Final abstracts must be received by January 15, 1975.

Who: Mail to Prof. Gordon Sanders
Engineering Graphics
403 Marston Hall
Ames, Iowa 50010

Highlights and Shadows Cast at RPI

The Highlights:

Although not at all times were there a blinding succession of events at R.P.I., there were many bright spots that reflected the effort of several people who generated various rays of special enthusiasm and interest. Number one (because it was probably Number One) was the Creative Design Display. Some 74 entries representing 39 schools provided a wide and interesting variety of projects of excellent quality.

The place for the display - the uniquely beautiful R.P.I. Communications Center - was super and the organization and handling of the entry material was outstanding viewed in any light. Thanks and congratulations were earned by the winners, the judges, contributing companies, Mrs. James S. Rising for the Rising Award and the following Display Committee for a truly professional job!

Professor Ralph Blanchard, General Co-Chairman - Northeastern University

Professor Borah Kreimer, Co-Chairman and Judging and Awards - Northeastern University

Professor Paul Daitch, Chairman for Local Arrangements - Rensselaer Polytechnic Institute

Professor Paul DeJong, Publicity and Space Coordinator - Iowa State University

The schools not promoting entries to this display are really missing a great opportunity to share in one of the most positive educational exhibits to be realized to date at the Annual ASEE meeting.

There were a few beacons of brilliance spotlighting the technical sessions. Not mentioning any names, it should be noted that E.D.G. Division people who contributed in the three joint sessions shone brightly as stars in what might have otherwise been rather darkened skys. However, it is probably safe to say that we will not likely go overboard on joint sessions again to the extent we did at R.P.I. (Editorial note: One of the best ways to assure programs of interest to the E.D.G. Division members is for E.D.G. Division members to send in good ideas and abstracts for papers to the Division Program Director - Gordon Sanders at Iowa State University).

Several plenty-watt officers and committee men were lighting up the more obscure, behind-the-scenes passages, rehearsing for the Division Mid-Year Acts at Williamsburg, December, 1974 and Arizona State, January, 1976 and the Annual ASEE meeting at Colorado State in June of 1975. A bright prospect indeed for these future meetings (planned by enlightened people).

The Shadows:

Most of the shadows cast on the R.P.I. meeting were by members (old and new) conspicuous by their absence and not by the wonderful people present at R.P.I.

Through no fault of our host
The things that hurt most
Were the energy crisis,
Skyrocketing prices
And people not there
With ideas to share.

So don't sit there blinking
Set your heart and your thinking
On how to save "bread"
For the meetings ahead!
Get there for sure
And participate more!

See you at Williamsburg!

C. Gordon Sanders

TEACHING TECHNIQUES

Dr. Ernest C. Schamehorn
Essex Community College

This Teaching Techniques column was initiated in the winter, 1974 issue of the Journal. High expectation is held that this column will serve as a medium of communication between you and me, between the Journal and members of the Engineering Design Graphics Division, and between all members, teachers, and industrial friends who share a common concern.

What is our concern? We would like to share with each other our techniques of teaching Engineering Graphics.

Why should we share ideas with each other? As college professors, teachers, industrial trainers, and engineers, we have a common goal of providing the most effective instruction possible. Since none of us have a corner on all the good ideas and each has a limited time in which to experiment with techniques, we need to be able to turn to professional journals with "teaching techniques" columns to learn what teaching techniques are being employed, how successful they are, and whether they would be worth trying out with our classes.

Your Associate Editor, Garland K. Hilliard, and myself are cooperatively endeavoring to have for you current information on promising techniques for presenting Engineering Graphics, but we need your help to provide a worthwhile and dynamic column. If each of you after reading this column will immediately compose a brief statement on some teaching technique you are now employing, we will be overwhelmed with suitable material for this column for several issues to come. A double-spaced typewritten statement one to two pages long preferably accompanied by an ink or pencil drawing illustrating the technique or device will be most appropriate for publication in the Journal. Even briefer descriptions, e.g., half a page long, can easily be inserted in this column.

We will be waiting for your help -- your contribution to our column! So come on! Let us have chapter and verse! Send directly to me for publication in the Engineering Design Graphics Journal:

Dr. Ernest C. Schamehorn
Teaching Techniques Committee
Dept. of Physics, Engineering, & Technology
Essex Community College
Baltimore County, Maryland 21237

What Do We Mean by Teaching Techniques?

Professor Robert D. LaRue of the Ohio State University, after reviewing 32 suggestions of things which the Teaching Techniques Committee in 1967 were interested in, provided us with a list which I believe still best classifies what teaching techniques are or what they should relate to:

(1) Visual and audio aids
(2) Teaching machines
(3) Television
(4) Psychology of learning
(5) Models
(6) Various modes of presentation of new teaching methods
(7) Design
(8) Computers
(9) Large classes
(10) Questionnaires or studies
(11) Grading
(12) Course content
(13) Research

Professor LaRue, in regard to the above classification, states:

> *Ultimately, of course, an individual or department will use those teaching methods that they believe in. In some cases this means doing the same thing that has been done for many years in the past. However, for those who are willing to make changes based upon ideas they conceive themselves or upon methods used by others, this committee [Teaching Techniques Committee] can do a great deal. I am including a few brief comments on some of the items previously mentioned to give those who may be interested a starting point from which to begin their investigative method or procedure which may be new to them and thus different from the one they are currently using.*

Teaching Machines

To the best of my knowledge, work on teaching machines has been done by at least two groups of individuals. One group included Professor Knoblok at the Milwaukee branch of the University of Wisconsin. Other work in this area was done by Dr. William Brown, formerly of the Ohio State University. All of this work was done with machines using special graphics oriented programs.

Programmed Learning for Graphics

In addition to the work on teaching machines, some work has been done on programmed learning for graphics ... one text has ... been published by Professor George [William] Schneerer of Case Institute, and other work was done by Professor McKee of the University of Nevada. [Also, in 1966, Springer, Palmer, and Clausen of the University of Minnesota prepared ten units of "programmed instruction in Basic Graphics."]

Television

Professor emeritus Oliver Stone of Case Institute has done some work on the use of TV and teaching graphics. [Several others including Prof. LaRue have worked with TV in recent years.]

Grading

While I would certainly welcome a new approach to the evaluation of student work to replace our current grading practices, I have not heard of any which are really new. It seems that eventually all programs break down to grades which can be translated into numbers which are measured by some arbitrarily defined scale. However, I have written a computer program to process grades in my graphics courses. The output of this program includes one page for each student on which is recorded all grades for work which has been completed, his current course grade, and his numerical standing in a class. There are additional sheets for my use along which include all of the information presented to the students as well as additional information such as class average, the difference between each student's grade and the class average, etc.

Once the program has been written, the time required for operating this reporting system is a few minutes each week to key punch the new grades into the data deck. This time is no more than would be required at the end of the quarter to prepare a course grade for each student. Whether this approach motivates the student to try to get a better grade or not is something I cannot say. However, they do seem to appreciate receiving this weekly report of their progress.

THE WIND OF CHANGE

By Claude Z. Westfall

In an address to the South African Parliament in 1960 Harold MacMillan, Prime Minister of England, made the statement...."The wind of change is blowing through the continent". Change is inevitable and the Division over the last 20 years has changed its name from the Division of Engineering Drawing to the Division of Engineering Graphics and more recently to the Division of Engineering Design Graphics. A number of our members have expressed interest again in discussing a change in name and have asked.... "when is the earliest that we can get a proposal for a Division name change?"

At the Annual Conference held at R.P.I. there was considerable informal discussion of a realignment of or change in emphasis of some of the Division's activities. Many of our members are now involved in a number of activities related to the first year in engineering. These include such areas as freshman advising, orientation, computation courses involving computers of all types, computer graphics, design and engineering graphics, etc. There are many outside the Division who are also engaged in similar activities. At the present time there is no committee or Division within ASEE where specific attention can be given to freshman engineering programs. The Division of Engineering Design Graphics has on the other hand held a number of sessions at past conferences related to these areas. A change in name to reflect expanding interests and activities would probably attract a number of additional members from these new areas.

The theme for the Division's Annual Conference at Colorado State University will be "Where Are We Going and Who's Going Along". This is an outgrowth of the growing concern by many members as to the proper scope and name for our Division.

A study will be conducted this year that should yield information concerning a name change. The study will be carried out by R. Wallace Reynolds, California Polytechnic State University and will attempt to determine such things as:

What is being taught engineers in the freshman year?

Who teaches what?

How many graphics departments are there?

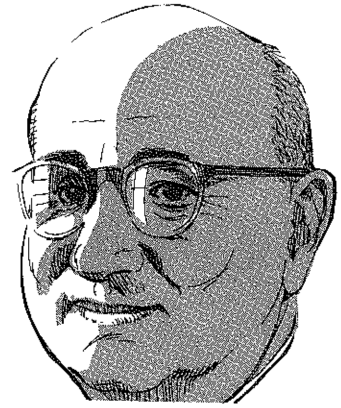
What other names are given to departments that are involved in activities or the teaching of courses related to the freshman year?

Several names currently being used by institutions working with freshman engineers include Freshman Engineering and Student Services Division, Division of Engineering Fundamentals, General Engineering, and Department of Freshman Engineering. Are there others?

The winds have changed and there appears to be a ground swell to at least discuss a new name for the Division. One comment that expresses the views of many members is..."If you can get the Division renamed and changed to do the job its already doing (or should be doing) and to thereby encompass all the activities associated with non-degree engineering activities appropriate for the people involved - then I will feel compelled to really go to bat for support of our faculty to attend meetings and get really involved with Division activities, otherwise, I'm only luke-warm to support design graphics".

It now seems that our name may no longer be adequate. A time will be provided at this year's Mid-Year Conference at Colonial Williamsburg for members of the Division to express their views on this subject. What do you think?

Distinguished Service Award



IRWIN WLADAVER

Thirty-one years ago impelled by the eloquence of Professor William Griswold Smith, I applied for membership in the ASEE. In 1943 it was still known by the initials SPEE, the Society for the Prevention of Engineering Education, as it was affectionately miscalled. I was a 17-year veteran of the carpet business and a one-day veteran of the teaching business. Professor Smith was my mentor and I had to go along with his enthusiasm.

It was the most important step in my professional career. Yet, as a rather shy and self-effacing person--a characterization that may be questioned in some quarters--I always needed to be pushed into action. And there was always somebody ready and willing to do the pushing.

For example, Professor Cecil Spencer urged me to give my first paper at the 1951 Summer School of the Division at Michigan State. Later, Professor Warren Luzadder conned me into compiling the Index to the Journal from its earliest years onward; and then he gently guided me into candidacy for the editorship of the Journal. And so, before I was aware of anything, suddenly it was six years later and I was the newest past-chairman of the Division.

The editorship was quite a job. I had never worked so hard before and surely not since. But despite its agonies and frustrations, it never-the-less gave the editor great satisfaction, at least until the letters started arriving pointing out typographical errors and faulty syllabication.

And then, too, I remember public and private arguments with such fine scholars as Ernesto Indgren over four-dimensional descriptive geometry, arguments I always lost because I never succeeded in visualizing four dimensions; I considered myself lucky when I succeeded once in a while to visualize three dimensions! But it was good sport and nobody got hurt--much.

Best of all has been the thirty-one years of association with you, the heart-warming friendships I have gathered in the Division. These are rewards enough But when you have deemed the little I have done worthy of your Distinguished Service Award, then I humbly thank you and I accept this great honor as though I deserved it, quickly, lest you change your minds.

NUMERICAL CONTROL ASSIGNMENT IN AUTOMATED DRAFTING

By Fryderyk E. Gorczyca and
John R. Barylski

Southern Massachusetts University

Introduction

Computer-aided design, automated drafting, and numerical control are topics that are presently appearing more frequently in standard textbooks dealing with the subject of Engineering Graphics and Design. In order to present a meaningful laboratory experience in these areas usually calls for the availability for demonstration purposes of special equipment that ordinarily would be difficult to justify as required for a freshman Engineering Graphics course. However, if such equipment is present at a university as a result of requirements of other courses, it can be utilized to illustrate the fundamental operations that are affiliated with the engineering drawing function. This is the case at Southeastern Massachusetts University where a Slo-Syn Numerical Control Unit is fitted to a Bridgeport Vertical Milling Machine and is available for instructional purposes in the Manufacturing Processes Laboratory.

This paper deals with an exercise given to Engineering Technology students on the subject of automated drafting. The assignment involves the isometric drawing of a square prismatic block containing a right cylindrical extension as shown in Figure 1. Students, with the aid of instruments, draw the object in isometric form. An introduction to numerical control is then given which emphasizes the basic commands that are required to execute the drawing on the numerically controlled machine. Next, a step by step program is developed and a tape is punched. Finally, employing a felt-tipped pen, the drawing is produced on the machine and a comparison for accuracy and quality is made between the manually executed and the machine produced drawings.

Assignment

As part of the assignment, students are given a two-view orthographic representation of the object which is to be drawn in isometric form. Figure 1 illustrates the size and shape of the object. The drawing is to be completed in the fashion illustrated in Figure 2 which for purposes of explanation for this paper also contains the dimensional orientation of the part as well as the sequence numbers 0 through 32 which signify a possible path that can be followed in the numerically controlled program. Figure 3 indicates the specific dimensions which are used in the program to shape the four-centered elliptical form of the isometricized circular surface.

Once they complete the isometric drawing, students are then exposed to a general discussion involving a verbal explanation of how the drawing can be executed on the machine. To illustrate, starting at an origin as signified in Figure 2, the machine could be instructed to draw the border by moving a pen to position 1 where it would make contact with the paper and then proceed through positions 2, 3, 4 and 5 along straight lines.

Continuing to draw the object, the instructions assume the form where the pen would proceed from position 5 to position 6 without making contact with the paper and then upon contacting the paper at position 6 the pen continues to proceed along straight lines through positions 7, 8,

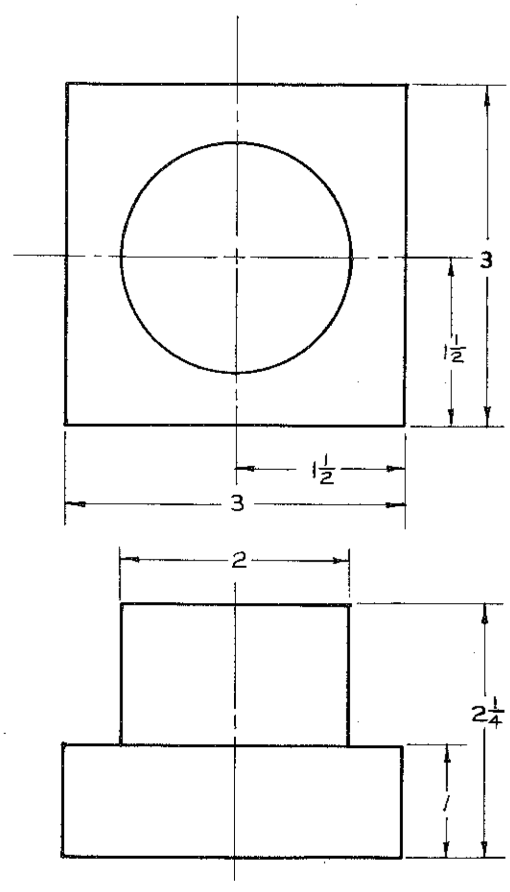


Figure 1: A part drawing.

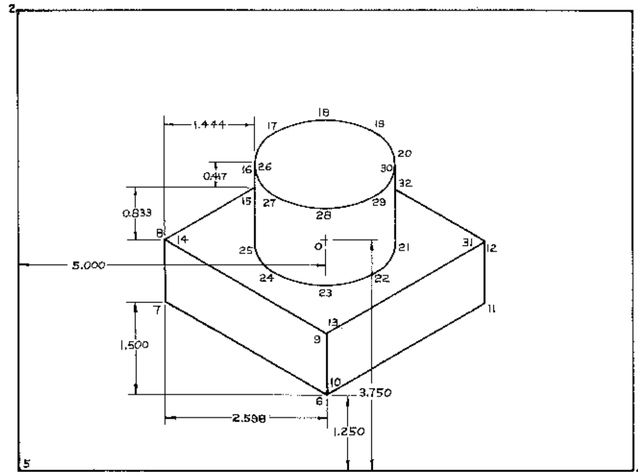


Figure 2: Isometric drawing with part orientation dimensions and sequence operations.

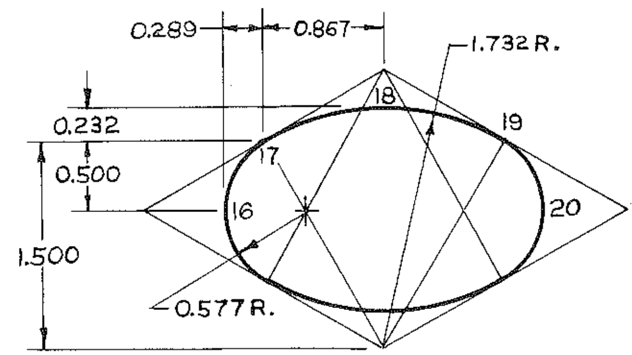


Figure 3: Dimensional increments for and ellipse.

9, 10, 11, 12, 13, 14, 15 and 16. At this point, instructions to draw circular arcs are given and the pen continues through positions 17, 18, 19 and 20. A straight line instruction to position 21 orients the pen for drawing additional circular arcs through positions 22, 23, 24 and 25. Another straight-line instruction to move from position 25 to position 26 enables the completion of the circular arcs through positions 26, 27, 28, 29 and 30. To complete the drawing, the pen is instructed to move from position 30 to position 31 without contacting the paper and then upon contacting the paper in position 31, the pen proceeds along a straight line to position 32. A final instruction for the pen to return to the origin (position 0) without contacting the paper completes the explanation of how the drawing can be executed on the machine.

At this point, the essential commands that direct the machine to follow the verbal explanation are presented to the students. Table 1 lists the commands. A step-by-step program is then developed, a tape is punched and finally students have an opportunity to observe the machine execute the drawing.

Program

An examination of the isometric drawing reveals that the entire object is represented by a series of vertical, horizontal, inclined and circular lines. For the continuous path contouring system available, the command for a straight line takes the form of a statement directing the pen to move from its present position to the next position whereas for a circular arc the command directs the pen to move from its present position to the next position along a circular arc whose center is defined by location dimensions from the starting position of the circular arc. Table 2 lists the program statements.

An acquaintance with the program is offered through the following partial explanation. Starting at the origin (position 0), the pen in the retracted position is directed to advance at a hi feed (55) to position 1 through a distance of -5.000 inches in the x-direction and -3.750 inches in the y-direction. The border is completed in four statements: advance from position 1 with the pen down (52) a distance of +7.500 inches in the y-direction; advance from position 2 a distance of +10.000 inches in the x-direction; advance from position 3 a distance of -7.500 inches in the y-direction; and advance from position 4 a distance of -10.000 inches in the x-direction.

The drawing of the object commences after the pen advances from position 5 to position 6 in the retracted position (53) and with a hi feed (55), through a distance of +5.000 inches in the x-direction and +1.250 inches in the y-direction. Incline line 6-7 is drawn by the command to advance with the pen down (52) along a straight line to a point +2.598 inches in the x-direction and +1.500 inches in the y-direction from position6.

The elliptical portion of the drawing begins to take shape at position 16. The command to advance along a circular arc to position 17, a distance of +0.289 inches in the x-direction and +0.500 inches in the y-direction from position 16, is given. In addition, the center of the circular arc is defined as being located +0.577 inches in the i-direction (x) from position 16. The ellipse changes radii from 0.577 inches to 1.732 inches at position 17. The command to advance to position 18 is of the form where the pen is directed to move a distance of +0.867

List of Commands for Program	
Symbol	Application
E	End of Block (Carriage Return Key) 1st (Defines End of One Block of Data) Entry
%	Rewind Stop 2nd Entry
T	Tab Code Preceding Positioning Information
02*	Rewind Tape Code (Miscellaneous Function)*
52*	Tool Advance (Pen Down)
53*	Tool Retract (Pen Up)
55*	Hi Feed (Rapid Traverse)
02535*	Rewind Tape, Retract Tool, Hi Feed
*All "M" Functions are Preceded by Five Tabs	

Table 1: List of commands for the program.

inches in the x-direction and +0.232 inches in the y-direction along a circular arc with center located at +0.867 inches in the i-direction and -1.500 inches in the j-direction (y) from position 17.

Additional statements following the patterns listed above advance the pen to position 32 at which point the statement appears as follows: rewind the tape, retract the tool and advance at hi feed (02535).

The time interval required to complete the drawing on the machine is less than two minutes which is approximately 1/40 of the time taken by students to manually execute the drawing.

Conclusion

The three hour laboratory session devoted to this numerical control lesson takes into account the manual drawing in isometric form of the given object, the verbal explanation of how a machine would draw the object, the introduction to some basic commands in numerical control, the writing of the step-by-step detailed statements of the program, the acquaintance with the tape processing equipment and the numerically controlled machine, as well as the individual execution on the machine of the drawing for each student. Once the pencil drawings are completed in class, students are introduced to the required commands to produce the drawing on the machine. Then the step-by-step program is jointly developed and each student writes the 33 required statements of the program. A demonstration is then given on how the tape is punched on the tape processing equipment and on how the numerically controlled machine operates. Following this, each student completes his own drawing on the machine, which uses a felt-tipped pen and produces a drawing of excellent line quality. Finally, students compare their manually executed and machine produced drawings for accuracy and quality.

As a result of this assignment, an appreciation of the capabilities of numerical control is developed.

Listing of Statements for Program

Seq. No.	Tab	"X" Increment	Tab	"Y" Increment	Tab	"I" Increment	Tab	"J" Increment	Tab	"M" Function	EOB
											E
0	%										E
1	T	-5000	T	-3750	T		T		T	55	E
2	T		T	+7500	T		T		T	52	E
3	T	+10000									E
4	T		T	-7500							E
5	T	-10000									E
6	T	+5000	T	+1250	T		T		T	5355	E
7	T	-2598	T	+1500	T		T		T	52	E
8	T		T	+1000							E
9	T	+2598	T	-1500							E
10	T		T	-1000							E
11	T	+2598	T	+1500							E
12	T		T	+1000							E
13	T	-2598	T	-1500							E
14	T	-2598	T	+1500	T		T		T	5355	E
15	T	+1444	T	+833	T		T		T	52	E
16	T		T	+417	T		T		T	5355	E
17	T	+289	T	+500	T	+577	T		T	52	E
18	T	+867	T	+232	T	+867	T	-1500			E
19	T	+867	T	-232	T		T	-1732			E
20	T	+289	T	-500	T	-289	T	-500			E
21	T		T	-1250							E
22	T	-289	T	-500	T	-577					E
23	T	-867	T	-232	T	-867	T	+1500			E
24	T	-867	T	+232	T		T	+1732			E
25	T	-289	T	+500	T	+289	T	+500			E
26	T		T	+1250							E
27	T	+289	T	-500	T	+577					E
28	T	+867	T	-232	T	+867	T	+1500			E
29	T	+867	T	+232	T		T	+1732			E
30	T	+289	T	+500	T	-289	T	+500			E
31	T	+1444	T	-1250	T		T		T	5355	E
32	T	-1444	T	+833	T		T		T	52	E
33	T	-1154	T	-833	T		T		T	02535	E

Table 2: Listing of statements for the program.

References

1. Conaway, J. O., Bringman, D., and Doane, R. C., Handbook for Slo-Syn Numerical Control, The Superior Electric Company, Bristol, Conn., 1969
2. Giesecke, F. E., Mitchell, A., Spencer, H. C., Hill, I. L., and Loving, R. O., Engineering Graphics, The Macmillan Company, New York, 1969
3. Gorczyca, Fryderyk E., A Vector Analysis Application to Graphics, The Journal of Engineering Graphics, Winter, 1969
4. Hoelscher, R. P., Springer, C. H., Dobrovolny, J. S., Graphics for Engineers, John Wiley and sons, Inc., New York, 1968
5. Link, R., and Clark, R., Taking the Mystery Out of Numerical Control Programming for the Small Shop, Western Machinery and Steel World
6. Luzadder, Warren J., Fundamentals of Engineering Drawing, Prentice-Hall, Englewood Cliffs, New Jersey, 1971
7. Patton, W. J., Modern Manufacturing Processes and Engineering, Prentice-Hall, Englewood Cliffs, New Jersey, 1970

Distinguished Service Award

NOMINATION FORM
DISTINGUISHED SERVICE AWARD

The Distinguished Service Award is one of the outstanding awards of the Society. It is awarded to a person who has demonstrated his distinguished service to the engineering profession, the Division and to education.

I wish to nominate______________________

A brief description of his/her contributions follows using the following categories as a guide:

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

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

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

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

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

____

____
(Nominator and Institution)

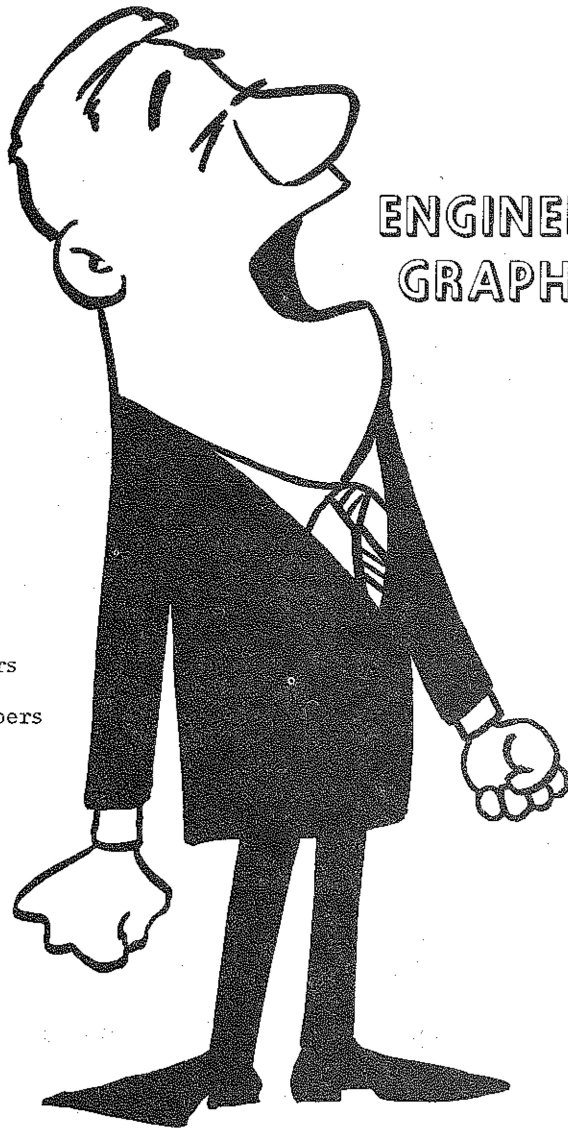
Mail to:

Professor Percy H. Hill, Chairman
Department of Engineering Design
Tufts University
Medford, Massachusetts 02155

DECEMBER 1974

S	M	T	W	T	F	S
1	2	3	4	5	6	7
8	9	10	11	(12)	(13)	(14)
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

HELP



ENGINEERING DESIGN GRAPHICS JOURNAL

SUBSCRIPTION RATES:

$3 Per Year for ASEE Members

$5 Per Year for Non-Members

$10 Per Year for ALL Overseas subscriptions

MULTIPLE YEARS:

$5 For Two Years for ASEE Members

$10 For Five Years for ASEE Members

TREASURER and CIRCULATION MANAGER
C.H. KEARNS
THE OHIO STATE UNIVERSITY
2070 NEIL AVENUE
COLUMBUS, OHIO 43210
PHONE 1-(614)-422-2634

START MY SUBSCRIPTION NOW!

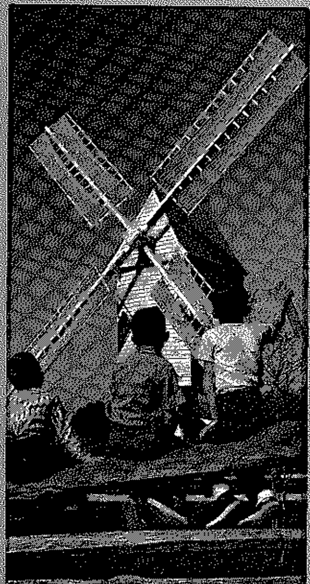
NAME: ____________________

MAILING ADDRESS: ____________________

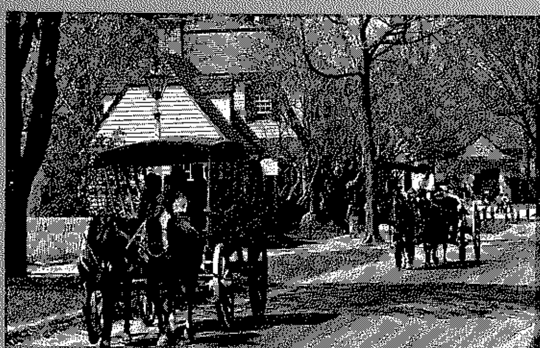
CITY AND STATE: ____________________

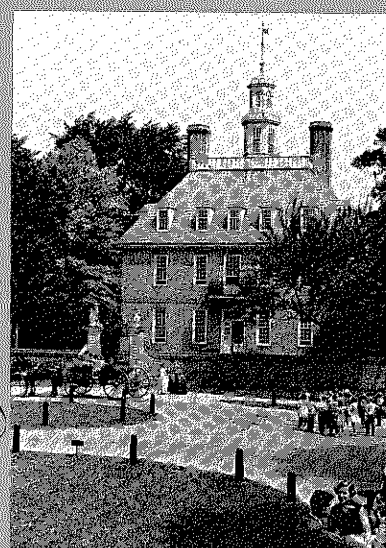
ENGINEERING DESIGN GRAPHICS JOURNAL

FALL 1974, VOL. 38, NO. 3, SERIES 115



WINTER MEETING
December 12-14
1974





Colonial Williamsburg
Foundation
Williamsburg, Virginia 23185

THE OHIO STATE UNIVERSITY
2070 NEIL AVENUE
COLUMBUS, OHIO 43210
(Address Correction Requested)

PAID
Bulk Rate
Dubuque, Iowa
Permit No. 477