# Making Color Slides with an Intecolor Microcomputer

Alan W Grogono
State University of New York
Upstate Medical Center
750 E Adams St
Syracuse NY 13210

Slides are required for many demonstrations and lectures. Instuctional slides often consist of a few words or a simple diagram or graph which the lecturer wishes to discuss. In recent years such slides have commonly been prepared as a blue diazo (white writing on a blue ground). Even the simplest slide is subject to about twelve processes: rough drafting, typing, checking, type setting, rechecking, photography, developing negatives, brushing out imperfections, diazo exposure, pickling, cutting, and mounting. Misunderstandings and interpretations mean that it is not uncommon for one or more stages to be repeated; the process is moderately expensive, and a diazo slide tends to fade with time. This article describes a quick, convenient method of preparing color slides using a computer.

Equipment

The computer employed is an Intecolor eight-color intelligent terminal equipped with BASIC and dual floppy disk. The choice of camera and film may depend on individual circumstances, but the author suggests the following: a single-lens reflex (SLR) 35 mm camera, mounted on a tripod, with telephoto lens (to reduce barrel distortion). Close-up

1a

1b
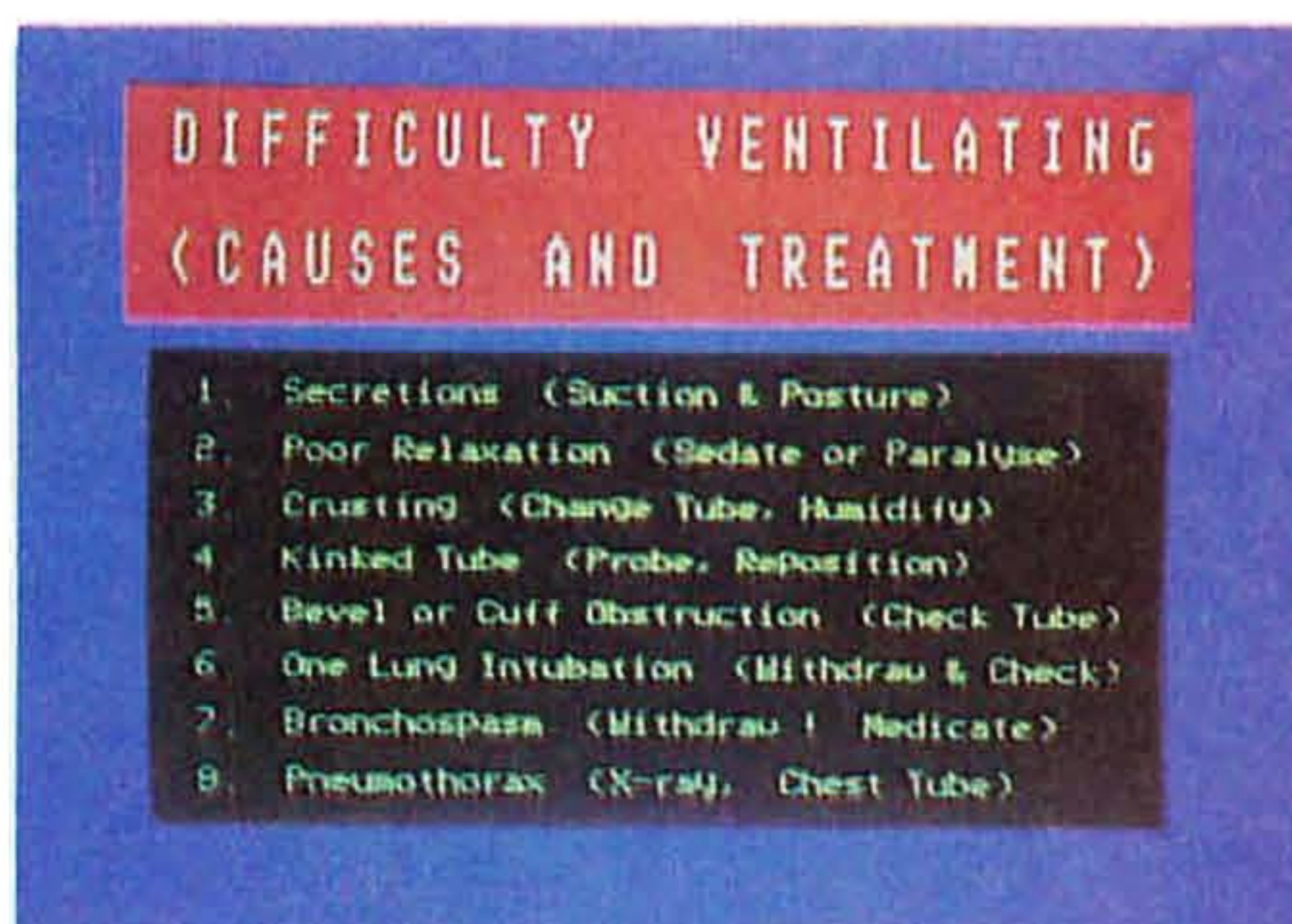
Photo 1: *Two examples of computer-generated slides containing color text material.*

lenses or close focusing attachments are essential.

The computer allows images to be formed on a high-resolution screen offering eighty characters per line and either forty-eight lines of small letters or twenty-four lines of double-height letters. Lines, bar graphs, vector graphics, and simple drawings can also be constructed. The color for the background and for the foreground (the character or line) can be separately selected from the eight available colors.

Software

A program called Menu is used to:

- prepare a new floppy disk for saving images,
- prepare images,

About the Author

Dr Grogono is an Associate Professor of Anesthesiology at the State University of New York, Upstate Medical Center, in Syracuse New York. He trained in London, England, and emigrated to the United States in 1974. He uses microcomputers with graphics for teaching, for recreation, and as described in the accompanying article, for color slide making. He has written many scientific papers in his specialty, anesthesiology, and is author and/or editor of several books. He is an active member of the American Heart Association and directs the Advanced Cardiac Life-Support Instructor's Course in Syracuse NY. For the New York State Society of Anesthesiologists annual meeting in New York, he runs the panel "Research by New Investigators." He is also a member of the Icarus high-speed hydrofoil sailing project which set a B-Class, World Sailing speed record in Weymouth, England, in 1976.

● transfer the contents of the display memory onto the floppy disk

The program also places the computer into a suitable mode. The scroll mode is replaced by the page mode, and the screen image is made to correspond with the appropriate memory locations.

Image Preparation

Simple word slides are best prepared in *CRT mode* (a mode which allows direct user interaction with the graphics display). The keyboard allows letters to be positioned anywhere on the screen. Colored text, borders, and backgrounds are used for effect. Considerable rearrangement and adjustment is possible using the delete and insert keys for characters and lines. When the image is complete, the disk is inserted and the AUTO key is pressed to run the storage program. The image is automatically transferred to the disk to be photographed later. Examples of text slides prepared in this way are shown in photos 1a and 1b.

More complicated slides may be produced by employing a program to prepare the display (eg: to generate a graph or a histogram). Examples of slides prepared in this way are shown in photos 2a and 2b. When such a program is being written, it is important to remember that the process of transferring the image to disk uses a BASIC program that will replace the preparation program in memory.

Color Selection

Color slides are usually most successful when the image or letters are brighter than the background. With the bright foreground image, any spreading due to light-scatter on the cathode-ray tube, the film or the projection screen tends to enlarge a line or a character instead of extinguishing it. Therefore, of the sixty-four color combinations available, only about twenty are useful for slides.

If the alignment of the red, blue, and green electron beams in the cathode-ray tube is imperfect, the focus of the screen image may suffer. This problem may be minimized by judicious choice of foreground color. In such cases, use a color scheme in which the image is formed by turning only a single beam on and off as it
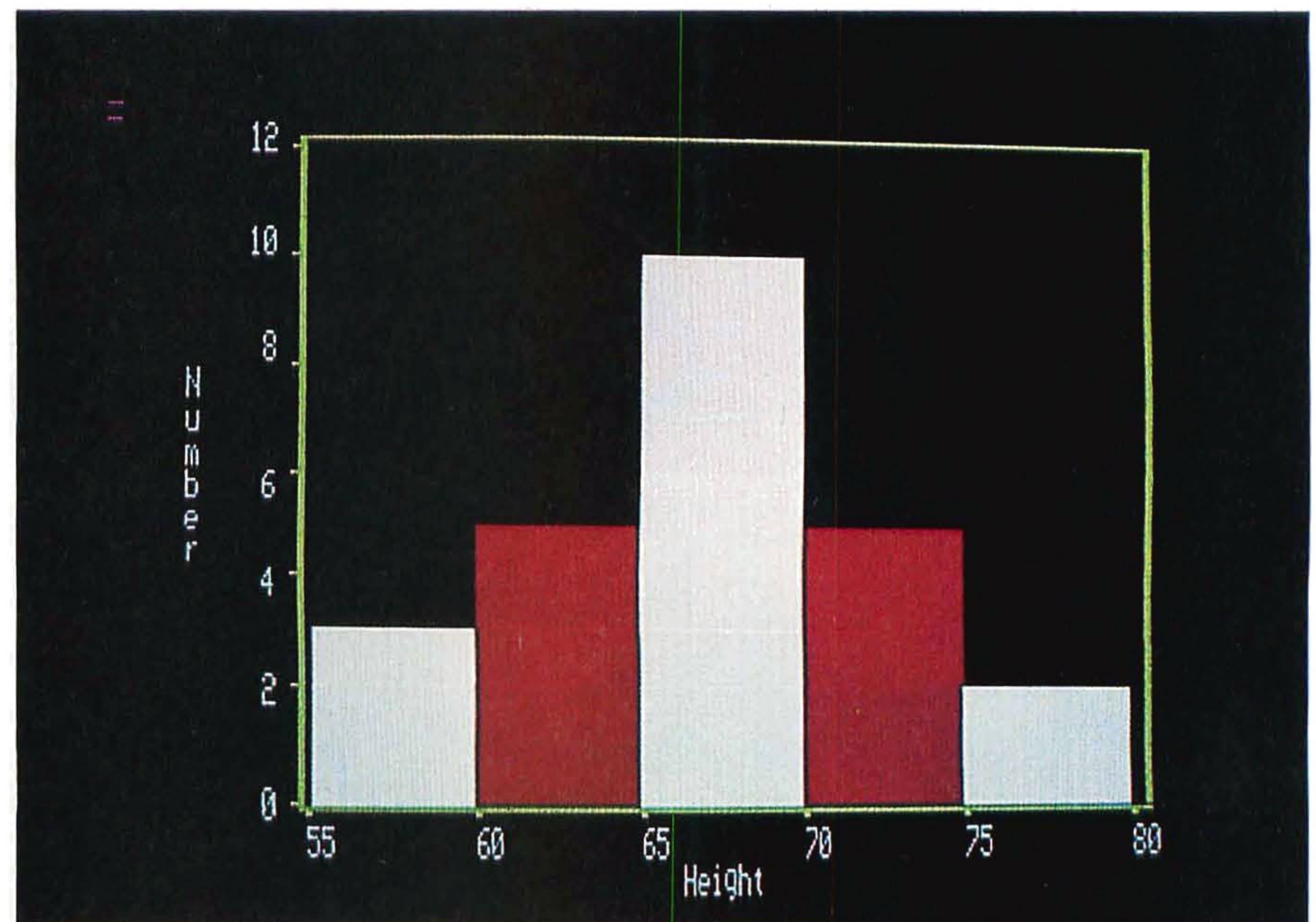
Photo 2: *Two examples of computer-generated slides containing colored graphic material.*

sweeps across the tube. For example, with white text on a magenta background, only the green electron beam is modulated, and a good image can be obtained even if the beam alignment is poor.

Photography

The images are recalled for photography using the same program. The program recalls the images one by one. Photographs must be made in ambient darkness to avoid unwanted reflections. Certain colors

tend to require more exposure than others (eg: red and blue on black backgrounds).

Color film does not always reproduce television images perfectly. Red, in particular, may appear somewhat brown. A Kodak CC40R filter is supposed to correct this, but the exposure time required is doubled. I have prepared slides with and without the filter. I currently use Kodak Ektachrome 64 (ER-135) with no filter. The films, filters, and exposures I used are shown in table 1.

A word of warning about returning

Film	Speed (ASA)	Filter	Aperture f 3.5 Exposure Seconds
Kodak Ektachrome ER 135	64	None	0.5
Kodak Ektachrome ER 135	64	CC40R	1
Kodak Kodachrome KM 135	25	None	1
Kodak Kodachrome KM 135	25	CC40R	2

Table 1: *Exposures and films used to photograph displays on the Intecolor microcomputer.*

films to the manufacturer for developing and mounting: if slides have a black background, an automatic film cutter may be unable to recognize the frame boundaries. Several films have been returned irreparably damaged, sometimes with half of a slide in one mount and the other half in the next mount. The use of colored backgrounds is recommended for visual pleasure as well as preservation of your work. If you are in doubt, it is probably wise to ask for your film to be returned uncut.

Discussion

Slide preparation using a small computer and color-transparency film has a number of advantages; several colors can be used on a single slide, the photography is simplified, and the color slides are more durable. In addition, when the computer is suitably located, the drafting and checking are more convenient and may even be reduced to a single step. I now find it easy to design a slide at the keyboard. Decisions about spacing, positioning, and color can be made, revised, and implemented as the image is being prepared. This has reduced the first five steps to two, namely drafting the image and saving it on disk. The photographic process is reduced to making the exposures, developing the film, and mounting the slides — a considerable saving in steps and labor.

The quality of slides produced in this way is very pleasing. Audience members inquire how the slides are made and express appreciation of the color and the technique. Distortion is negligible, and the quality of curved and oblique graph lines is adequate for lecture slides (for the graphs the resolution is 1 in 160 on the X axis and 1 in 192 on the Y axis).

The cost of making slides is hard to evaluate. The lecturer's time and the time spent fetching, carrying, and checking are often assumed by the organization. However, even those costs that remain are significant. Between $6 and $10 is probably the minimum cost of laying out the simplest text and preparing a diazo slide. Slides for a one-hour lecture may cost approximately $500.

Preparing slides on the computer simplifies the photographic process. This alone represents a saving of about $2 per slide. The time spent designing the slide and arranging the layout can be reduced as well. However, any time spent employing the additional choices of colors and layouts may offset this potential savings to some extent. The disks used for storing the images cost $5, or about 50 cents per slide. However, the disks are reusable and should therefore not represent an appreciable cost per presentation.

The greatest savings would be realized by those illustration departments that are frequently expected to prepare histograms, regression graphs, scatter diagrams and graphs of functions. A few appropriate programs would allow numerical data or mathematical functions to be directly converted to color images. A final advantage is that Ektachrome processing is commonly available commercially on a same-day basis. Slides can be prepared, photographed and reviewed in twenty-four hours.

The computing equipment described in this article costs about $6000. Any illustration department handling much slide preparation, particularly that involving slides of graphs, should find it worthwhile to review the type of material they handle and its cost. The Intecolor computer has now been used to prepare hundreds of slides. A similar program will also work on the Compucolor II with only slight sacrifice in definition, resolution, and color rendition.■