Costis Davaras, are concerned with all aspects of this occupation but the CAD model is beginning with the Final Neolithic - Middle Minoan cemetery located west of the main settlement.

Students Kathy May, Lada Onyshkevych, and William Hafford, under the supervision of CSA Director Harrison Eiteljorg, II, have digitized 17 tomb plans and are currently inputting section drawings. Figure 1 shows the plans of two of the tombs and a section of one; Figures 2 and 3 show another tomb.

Once completed, the CAD model will contain significant amounts of the information recorded in the field, in its proper context. This provides an invaluable analytic tool, allowing scrutiny of the macro world in a computerized micro universe.

Of course, a model cannot be better than the data put into it, but it can make the data easier to analyze and may even bring out associations which might otherwise go unnoticed. By placing separate analytical units on different layers (data segments in a CAD model), distinctions made in the field are preserved and the 'big picture' may be viewed or, by manipulating layer combinations, one aspect may be studied in a specific context.

The goal of a good model is to increase analytic capability, and the students working on this project must continually ask themselves how best to accomplish this.

 Elevations could not be taken at every point in the plan, thus, a true 3-D model is not being generated. Tomb plans have been placed at their median elevation so that their relations to one another and to the general topography of the area may be seen, but individual tombs will not be three-dimensional models.

 The topography of the cemetery area has been mapped (using SURFER), and it is the next task of the CAD team to import the contour map to their model.

 They have begun work on placing individual finds within the tombs and coding find-density from a 5-meter grid survey of the entire area. Figures 2 and 3 show how the tomb finds can be added to the model and printed, with or without details from the tomb and labels, to enhance understanding.

 Eventual plans for the model extend to the settlement, placing individual buildings, topography, and finds for this area as well.

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 [The drawings reproduced here were made as plot files in AutoCAD®, translated by Hylaja Pro®, and transferred to Adobe Illustrator® for the addition of text and selections of appropriate line weights for the Newsletter. - ed.]

SCANNING POTTERY PROFILES

The CSA Newsletter has contained several articles on the merits of drawing pottery profiles directly into the computer. In my work with the materials from Tell en-Nasbeh (12 km northwest of Jerusalem) I have been faced with a different problem. The excavators of this site recorded ca. 23,000 objects, about half of which were drawn, usually at a 2:5 scale. The artifacts were drawn on "millimeter cards," the millimeter grid being done in a pale green-gray. On average, three artifacts are recorded on each card, yielding over 7,000 cards. The drawings were done in the 1920's and 1930's and so do not match the standards generally used today. In order to speed up my analysis of the pottery (and eventually the other artifacts as well) I decided to create a visual data base using Paradox for Windows. Paradox allows users to store graphics as well as text; the graphics are stored in .pcx format.

I decided to experiment with resolutions, image sizes, and the ability to transform bitmap images into vector-based images for producing pottery plates. Figure 4 is the result of these efforts. (The author provided hard copy for this illustration; it was pasted up on the paper as part of a camera-ready page.) These images were scanned from the original record cards.
Zorn: Figure 4

Fig. 4 - Plate with Pottery Profiles

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using a Logitech Scanman Easy Touch hand-held scanner; it should be available for less than $200. This is a handy little scanner in that it does not require any sort of board to be plugged to your computer. It plugs into a parallel port and comes with a splitter which allows you to keep your printer plugged in as well. However, it only does gray-scale images, not color. A straight edge should be used to guide the scanner and the scanner should be dragged at a slow, even rate across the image. Scanning at 300 dpi yielded an image the same size as the original and completely indistinguishable from it when the scanned image was laid over the original and held up to the light. However, it also gave me files averaging about 125 KB. This is not large if you are only doing a few hundred images, but for the 12,000 images in this project I would need a 1.5 GB hard disk! At 150 dpi image size was reduced to about 32 KB, requiring only 384 MB of disk space. Scanning at 150 dpi had the added benefit of automatically reducing the dimensions of the image by half, turning 2:5 images into 1:5. I reduced the millimeter drawings to 1:5 and was satisfied that the scanned images were still true to the original. Scanning each image took only a minute or so once my work area was set up. If your software is TWAIN compliant you can scan directly into your favorite image editor. I have not upgraded from Corel Graphics 3, which is not TWAIN compliant, and so had to scan into the software which came with the scanner and then edit it in Corel Photo Paint. Switching between programs required a little extra time. Cleaning up scanning blemishes took the most time, between 5 and 10 minutes per image. If I only wanted a .pcx file to copy into Paradox my work would have been finished here. I believe that with a comfortable work area, a steady hand, and a good image editor it should be possible to scan in and clean up each image in about 10 minutes.

At this point I decided to set up a pottery plate for an article I was working on using the images I had scanned. Since I was not sure at what scale I would eventually reproduce the images for the article I decided to set up my plate in Corel Draw where rescaling all the images is a simple prospect since it uses vector-based images. To convert my .pcx files into a format usable by Corel Draw I used Corel Trace. I found that I could give Corel Trace "orders" to trace about 10 images at a time, a very handy feature! Corel Trace produces .eps files which can then be imported into Draw; note that you cannot open .eps files directly into Draw, they must be imported.

Once I had set my page size in Draw I imported all my images and discovered that even at 1:5 they would require four plates in the journal to which I wanted to submit the article. Since the article itself was only three pages, I decided to try reducing the scale to 1:10 so they would fit on one plate and hopefully still be recognizable. I selected all the images by drawing a box around them and "stretching" them to 50%. This rescaling took less than one minute. Once the images were to the right scale it was simple to arrange them on the page and add lettering, numbers and a scale. I spent most of my time here on trying to group vessels logically and making sure they were aligned properly.

It was while working in Corel Draw that the importance of cleaning up bitmaps before tracing them was made clear. When Trace traces a bitmap it also traces any blemishes in the bitmap and it traces the entire file as one entity, i.e. once the image is converted it is impossible to directly select one "node" and delete it. You have to select the image and then "ungroup" it; this breaks the image down into the individual geometric forms which make it up. Only then can you edit individual nodes. It is a good idea to "regroup" the image after you edit it as this makes moving, scaling, etc. the entire image much easier.

Draw saves files in its own .cdr format, but can export them into the more widely used .dxf format. I would say that with practice, and "clean" bitmaps, someone with an eye for laying out pottery plates could produce this plate in one or two hours.

Setting up the pottery plate was a learning experience. I am not sure if photo reducing the images and cutting and pasting them would have been faster. I think scanning them and printing them on a laser printer would give a crispier image than photo reducing would. Had I had to redraw the images to 1:5, and then again to 1:10 I am certain that scanning them saved me time. For me, however, the main benefit will come once the images are scanned into the visual data base. Instead of flipping through thousands of cards to retrieve all 100 examples of an artifact type, which would certainly take more than an hour, it will be possible to view them on screen or print them out as a group in only a few minutes.

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VIRTUAL REALITY AND RENDERING

Virtual reality systems are getting more and more attention. Even people who are not interested in computing have been persuaded that this technology can bring us great benefits. The possibility that we can see photo-realistic representations of complex structures, move around them, perhaps manipulate them - all without leaving the comfort of home - is truly