

Perseus

An Interactive Curriculum
on
Classical Greek Civilization

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REDEFINING THE BOOK: SOME PRELIMINARY PROBLEMS

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Forms Of Publication

Publication has nothing to do with computers — or with paper. When an unlettered bard composed songs to celebrate some heroic feat, he presented the events in a standard format. Because his audience understood the conventions of heroic poetry and had a general idea of what to expect, they could focus their attention on the particulars of the story and performance at hand. An apprentice (or rival) bard could quickly grasp the gist of the song and, in turn, recreate it according to his own predilections. The bard, with his vast knowledge of heroic and mythic traditions and his skill at weaving those traditions into song, was himself the most effective medium of publication available at the time.

But, of course, the human voice can only carry so far, and men's lives are short. No one knows how long poets had wandered across Ancient Greece before writing was discovered and recorded history began. How many and who they

were are long forgotten — even Homer is, at best, a shadow, a name rather than a man.

Even within the lifetime of a single poet nothing remained constant. A true oral poet does not memorize his songs word for word, but in outline. He recreates the songs for each performance, expanding a bit here if the audience is enraptured, contracting or deleting an episode if time is short or the performance is not going well. Record such a poet as he sings the same song on two different occasions, and you will find that the two performances differ. Tell that same poet that he has altered his song in slightest degree, and he will, at first, probably not believe you.

The papyrus and the alphabet changed everything. Written poetry is not tied to a single individual, but can be copied and the copies shipped across the civilized world. A wealthy Sicilian lord could commission the great lyric poet Pindar to compose a poem honoring his victory in the Olympic games, and that

poem would be recited and admired throughout the Greek world. The poem had a fixed form that could be precisely defined. The oral poet, recreating what he had heard, would inevitably recast it according to his own sensibilities. Pindar defined every syllable in his poems. The oral poets who had sung the traditions of Greece had also striven to make these traditions stable, but the stability of a fixed text could only come with writing.

Writing also separated a literary work from its author. Words became more widely available, and the information that these words represented attained a new importance in human society. Yet, while it represented a revolutionary change, this system had its own limitations. Everyone knows that it takes time for people to copy material by hand, thus making knowledge stored in manuscript an expensive commodity. Few remember an even more insidious problem: even the best copyist makes mistakes, and once a mistake has entered a manuscript, the next scribe will probably copy that mistake and add several of his own. Over the generations a kind of informational entropy eats away at the text that is copied from one manuscript to the other. The *Agamemnon*, for example, a tragedy by Aeschylus, survived in a manuscript tradition that was plagued by such errors. Within the 1,673 lines (roughly 60 printed pages) of that play, there are more than 500 places where we do not know for sure what Aeschylus actually wrote.

The printing press, therefore, not only made written knowledge infinitely cheaper than it ever had been before, but made that knowledge more reliable. For the first time in history, an author knew that all the thousands of copies of his work produced by a press would be identical. A reader in Italy and in England would scan the same words on the same place on the page. Thus, not only did the medium for distribution become more economical, the information being dis-

26 ΑΓΑΜΕΜΝΩΝ
πόλει μὲν ἄλλος ἐν τῷ δήμῳ τοχαῖν,
πολλοὺς δὲ πολλῶν ἐξαγισθέντας δόμοισιν
ἄνδρας διπλῆ μάστιγι, τὴν Ἄρης φέλει,
διόλκον ἄτην, φοινῶν ἐκφυράδα
τοιαῦδε μέγιστα κημάτων σεσαμμένον
πρέπει λέγειν παῖδά τοσδ' Ἑρμῖον
σωτηρίων δὲ πραγμάτων εὐεργετων
ἦκοντα πρὸς χείρας αὐτοῖσι πόλι,
πῶς κενὰ τοῖς κακοῖσι συμμείψω, λέγων
χευμῶν Ἰθακῶν οὐκ ἀμνηστῶν θεοῖσι;
ζευγύμοσαν γὰρ, ὅτετι ἐχθιστοὶ τὸ πρῶν,
πῆρ καὶ θάλασσα, καὶ τὰ πῶν' εὐειδέων
φθέροντα τοῦ δισσηνοῦ Ἀργείων στρατῶν.
ἐν νυκτὶ δυσσύνεματά δ' ἄμυρμι κατα-
ναῖε γὰρ πρὸς ἀλλήλοισι θρηνημαῖσι ποταῖ
ἦρικον αἰ δὲ κεροτυποῦμενα βία
χευμῶν τυφῶ σὺν ἄλῃ τ' ἀβροστέντη.
ὄχρον' ἀφαντοῖσι, πομπῆσι κακοῦ στρατῶν.
ἔπει δ' ἀπῆλθε λαμπρὸν ἥλιον φάος,
ὄραμεν ἀνθῶν πέλαγος Αἰγαίου νεκροῖς
ἀνδρῶν Ἰθακῶν ναυτικοῖς τ' ἑρμῖοισι
ἦμάς γε μὲν δὴ ναῦν τ' ἀνιέρων σάφους
ἦτοι τις ἐξέκλειθεν ἢ ἔρηποντα,
θεὸς τις, οὐκ ἄνθρωπος, οἴσασθε θηγῶν
Τύχη δὲ σωτηρῆ ναῦν θέλουσ' ἔφειτο,
ὡς μήτ' ἐν ὄρωσι κῆματος ἄλῃν ἔχειν
μήτ' ἐρκεῖλαι πρὸς κραταίωμα χθόνα.
ἔπειτα δ' ἄθῃν πάντων πεφουγότες,
λευκὸν κατ' ἦμαρ, οὐ πεποθήτες τύχη,
ἔβουκαλοῦμεν φροντίαν νέου πάθος,
στρατοῦ κακῆτος καὶ κακῶς σποδοῦμένου.

FTr 022 Schütz: σεσαμμένον FTr 028 μῆω FTr 054
λαοῖσι Tr 055 ἑρμῖον Tr κερῶν FTr 060 Aulartus:
ναυτικῶν τ' ἑρμῖον FTr

ΑΓΑΜΕΜΝΩΝ
καὶ νῦν ἐκείνων εἰ τις ἐστὶν ἐμπεδῶν,
λέγουσι ἦμάς ὡς ἀκαλόγως, τί μήτ'
ἦμαίς τ' ἀεικῶν ταῦτ' ἔχειν δοξάζουσαν.
γένετο δ' ὡς ἄρ' αὖτα: Μενέλαω γὰρ οὐ
πρῶτον τε καὶ μάλιστα προσδοκῆται μολεῖν
εἰ δ' οὐκ εἰς ἀκτῆς ἤλιου καὶ Ἰσθμοῦ
καὶ Ἰωντα καὶ Βύβρασσα, μηχαναῖς Διὸς
αὐθῶς θέλοντος ἱερακλῶσαι γένος,
ἔλαίς τις αὐτῶν πρὸς δόμοισι ἦεν πόλι.
τοσαῦτ' ἀκούσας ἰοθὶ πάλῃθ' εὐαῖν.

Χο. τίς ποτ' ἀκούσεν ὄσδ'
εἰς τὸ πᾶν ἐγγύθων;
μή τις δοτῶν' οὐκ ὄραμεν κρηνοῖ-
σιν τοῦ περὶ κρηνοῦ
γλώσσων ἐν τύχῃ ἤμαρ,
τὰν δοκίμων ἄμφοτε-
ρη δ' Ἐθέλων, ἐπεὶ κρηνοῦσι
ἄλλως, ἔλασθον, εὐαῖν.
πολλοί, ἐν τῶν ἀβροστέων
προκαλοῦμεν τὴν ἑλευσιν
ἐφέρον γένετον αἴρω,
κατακροῦναι τε φερῶσι δὲ κρηνοῖσι
κατ' ἴχθους κρηνοῦ ἄμφοτε-
ρα, τὰς δὲ κρηνοῖσι ἀ-
κτῆς ἐπ' ἀεικῶν
δὲ ἔρω αἰματώσων.
Ἰλίω δὲ κρηνοῦ ὄσδ'
δύναμιον τελευτήσων
FTr 022 Linwood: τί μή FTr 023 Casaubon: ταῖς FTr
027 χλαῖναι τε καὶ βλαῖναι: ἀντι τοῦ ἰοντα Hesych., unde χλαῖναι τε
καὶ ἰοντα 028 ἄλλως Tr, καὶ (sacr. cas.) F 029 ἑρμῖον F
053 Froum: κρηνοῖσι FTr 054 ἑρμῖον: ἀβροστέων FTr 055
Hesych: κρηνοῖσι FTr 056 Aulartus (deleatque rōs): κρηνοῖσι FTr
057-7 ἀκτῆς F 057 ἐπ' ἀεικῶν, εἰς ἀεικῶν Tr

RE 1: A sample page from a scholarly text. Note the list of variant readings at the bottom of the page which allow scholars to see whether or not they agree with the current editor's decisions. The line numbers in the right hand margin present a local reference system that is the same in other editions of the same work.

tributed assumed, by its newfound reliability, a more important role in society. Since that time, information has steadily become more readily available and diverse, but only because we are able to copy and manage that information with ever greater precision.

However, neither accuracy nor economics were really the driving force of change. The easier information is to use, the more valuable it becomes. The cost of information is only important because the more expensive information becomes, the fewer the people will come to have access to it. An abbot with even the most princely scriptorium could never have dreamed of a major research library. If you cannot trust the accuracy of the information at your disposal you must either check it or, failing that, use it with great caution and reduced freedom. The more effort required to ask a particular question, the fewer questions you will be able to ask.

The Layout Of A Scholarly Text

Printed books have generally evolved so that they will be as easy and as pleasant as possible to use. Thus, the typographer and the graphic designer strive to make a document readable. Standard reference works, which often combine many different types of data, tend to have standard forms so that a practiced user can quickly find the answers to his or her questions.

Tables of contents and indices are obvious examples, but consider a more specialized example. Figure 1 shows a page from the Greek text of Aeschylus's *Agamemnon*. As in most texts, there is a header at the top of the page. Here the word ΑΓΑΜΕΜΝΩΝ tells the reader which play this is. Such a device is common. At the bottom of the page, however, there is an *Apparatus Criticus*. This is a list of the major variant readings that either appear in different manuscripts or have been suggested by scholars. Anyone reading a scholarly text will expect to find such a listing at the bottom of the page,

regardless of whether the text was printed in Germany, England, or America.

Further, details of typography orient the reader even before he or she has read a single word of the text. The lines at the top of the page all share the same justification and are roughly the same length. This tells the reader of Greek tragedy that these lines are in a particular kind of

When studying an idea, we need to move rapidly back and forth between a number of sources such as maps, dictionaries, texts, or encyclopedic information.

meter and form part of a spoken dialogue. The lines at the bottom of the page are shorter and more uneven and are, therefore, probably in a variety of meters that would have been sung. Further, the words "Str." and "Ant." that appear in the right hand margin tell the reader than lines 681ff. follow the same metrical pattern as lines 699ff.

Most important of all, perhaps, are the numbers in the right hand margin. These determine the line number within the play and form a canonical reference system. Thus, even if a colleague and I are using different editions of the *Agamemnon*, we can be confident that when we refer to line 675, we will be referring to essentially the same section of the play.

The layout of this page evolved over a long period of time. Canonical reference schemes were not, for example, rigorously employed until the nineteenth century. Furthermore, the above design not only includes but also leaves out crucial information. A scholar might want a running commentary on the text, or a description of the meters in a particular choral ode, but there is only so much room in a book. You might also want a small dictionary and purely grammatical notes at the end of the book so that intermediate students

would find it more accessible. Finally, you might even want to include a translation so that those who know no Greek at all could get some benefit from the learning of the editor. A single book is sufficient to print all seven surviving plays of Aeschylus if they are in the format of Figure 1. Add commentary and other categories of information, and you would have to split it into several volumes. In the struggle for space on the page, the *Apparatus Criticus* won out over the commentary and the translation, as in this example.

Ultimately, the various needs of scholars defined the shape which a page in a scholarly edition would take, but that shape, in turn, defines the field of scholarship. Without the translation, the only people who can read that text are those who know Classical Greek well enough to interpret the text with the help of a dictionary. This defines the audience. Though you can create separate school editions or translations, you have begun to fragment your field. Translator and editor become separate (sometimes adversarial) positions.

Electronic Forms

Clearly, the same factors do not constrain paper and the electronic medium. Paper still has higher visual resolution than any normal electronic display: will be some time before interactive systems will match the quality of conventional typeset print, much less high quality color prints. The paperback book is also logistically simpler to manage than even the smallest laptop. Most people sitting down to read a sixty page play may prefer to read from a book.

Much of the time, however, we do not want to read sixty pages in a row. When studying an idea, we need to move rapidly back and forth between a number of sources such as maps, dictionary texts, or encyclopedic information. A single compact disk devoted to a single subject could certainly store a complete online library. The five hundred or so

books that could fit onto a CD would not, of course, replace a major research collection, but they could easily include the most basic resources (texts, dictionaries, grammars, bibliography, commentary, etc.).

Simply entering five hundred books will not, however, fully exploit the possibilities of the new medium. Some tools must be redesigned to take advantage of the computers strengths.

An Historical Atlas

Consider, for example, an historical atlas of the ancient world. This might

contain maps illustrating the dimensions of the Roman Empire at various periods, the major sources for raw materials and trade routes in the Mediterranean, or detailed views of important cities such as Athens. Such an atlas would also probably include a separate map for each major war or geopolitical conflict. Thus, one might expect to find a map on which all the major battles of the Persian Wars were marked. A student with a book on ancient history might read that the Persian Emperor Xerxes built a canal across Athos in northern Greece in 483 and that this engineering task pointed towards

the military action that followed in 480. If that student were particularly energetic, she might go and look up the Persian Wars map. If she gets so far, she would then have to find Athos on a map with one or two dozen other objects. Once she had done that, she would see that Athos was located on the path from Persia to Greece — a useful point, but probably not worth all the effort. More likely, she would simply scan through references to Athos or Thermopylae or Salamis in her book and never develop a sense of where things happened.

In an electronic environment (such as

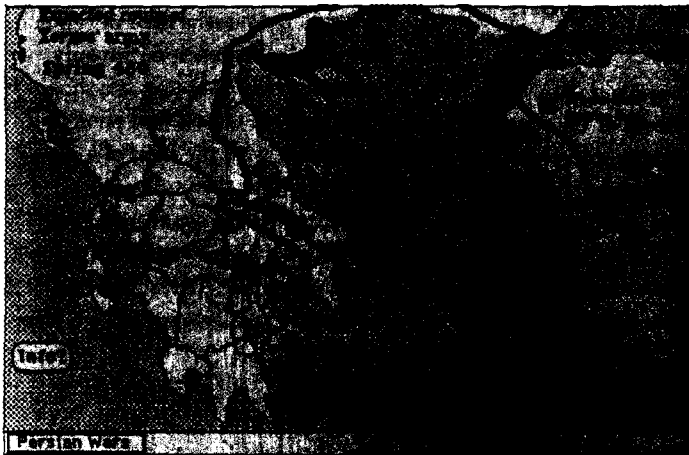


FIGURE 2

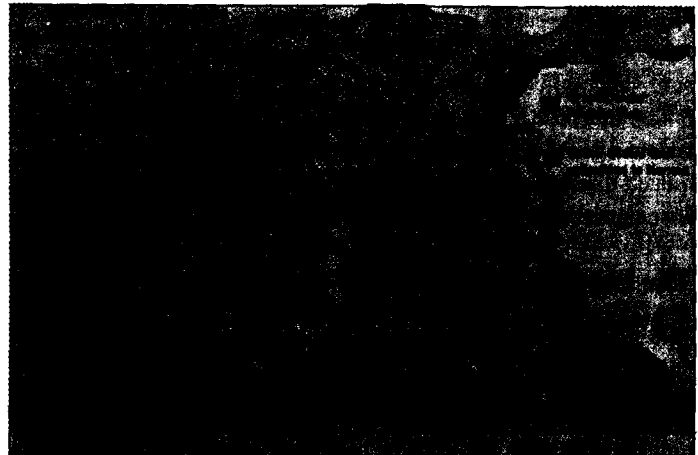


FIGURE 3

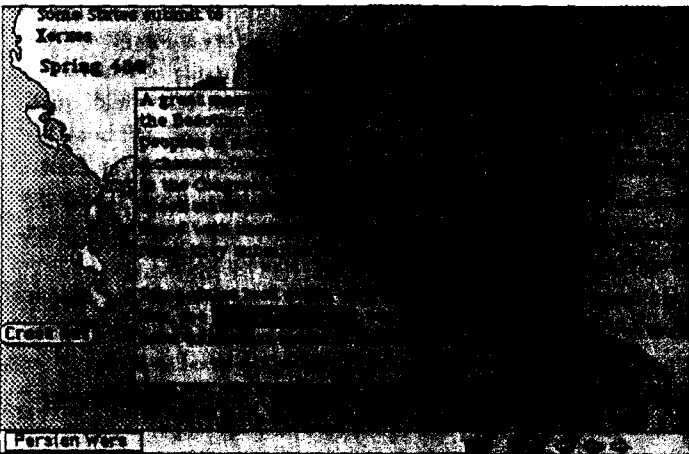


FIGURE 4

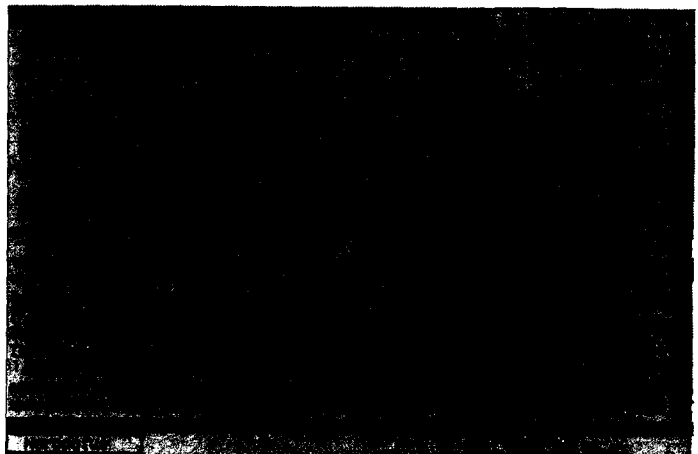


FIGURE 5

FIGURES 2, 3, 4 and 5: Illustrations of an electronic historical atlas implemented in HyperCard on the Macintosh. Figures 2 and 3 show two maps that cast light on each other, but which a normal historical atlas would not have room to include. Figure 4 shows how text can be associated with such a map, while in Figure 5, the user has called up the passage "Herodotus 7.132," highlighted in Figure 4, by clicking on the button "Cross Ref". Being able to jump from image to secondary description to primary material is one of the most striking advantages of an electronic book.

that currently offered by Apple's *HyperCard*), it is possible to separate the background map from the objects on the map that you wish to mark. You can then present each event as a separate overlay onto a single background offering the student two dozen individual maps instead of a single map with two dozen objects.

A structure of this type allows the user to approach the atlas in an entirely different way. Instead of simply reading the sequence of events in a text, she could flip through a sequence of maps and see geopolitical events on separate maps that reflected the actual chronology of the Persian Wars. Each individual map can further be linked to the relevant section of an ancient history text, so that the user can move immediately from the map to a detailed description of the event portrayed on the map.

In this scheme, a secondary resource in print assumes a qualitatively different shape. We have not simply copied an atlas onto a computer, but also reorganized its material to take advantage of the computer's flexibility. We have restored the events to their natural sequence. Instead of using words such as "Athos" or "Thermopylae" or "Salamis" as pointers from text into a map, the user can first see these geographical entities as objects, and then read about the subject at greater length.

Reorganizing an atlas in this way raises a fundamental issue. Clearly, an ancient historian who has studied the Persian Wars for years will learn little from such a tool. The obvious beneficiary would be the undergraduate who has never heard of Salamis or Athos. But, while most Classicists would be familiar with the locations and events of the Persian Wars, many, particularly those who specialize in literature rather than history, might want a quick overview of political events in, for example, fourth century Greece or the latter part of the Peloponnesian War. The easier it is for professionals to move around within their own discipline, the

more likely it becomes that they will move beyond their immediate area of expertise. Much of the effort that makes material more accessible to the undergraduate can serve the interests of the professional as well. Thus, technology continues its historical role of making more kinds of information more available and easier to use.

An Online Dictionary

Consider a problem peculiar to Classics, but with implications for those in other disciplines. The morphology of Greek is far more precise than that of English, French or German. Suffixes and prefixes, rather than word order, determine the grammatical role of words in a sentence. Thus, the sentence "he threw the javelin" could be also written "javelin he threw" or "javelin threw he," because suffixes would mark the Greek forms of "javelin" and "he" as object and subject. The notorious English sentence "time flies like an arrow, fruit flies like a banana" illustrates the disadvantage of loose morphology. Here, the word "time"

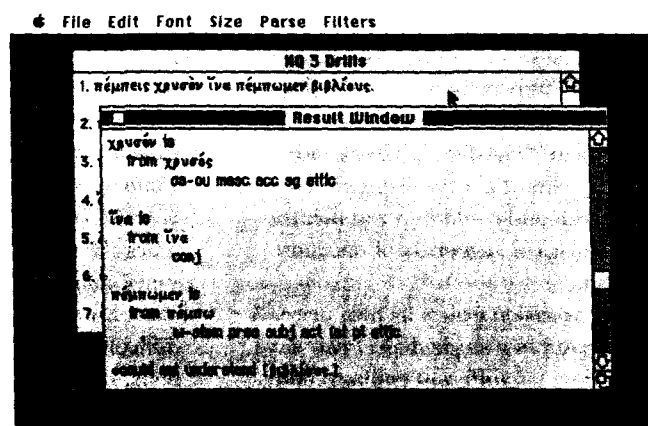


FIGURE 6

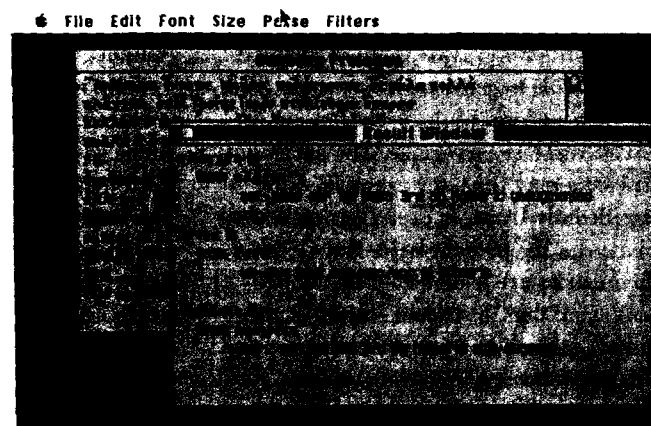


FIGURE 7



FIGURE 8

A general tool such as *Morpheus* could serve a wide range of needs. Used by a first semester student as a spelling checker (see Figure 6), *Morpheus* analyses all the words except βιβλίους, which is a mistake and should be βιβλία. In Figure 7, an intermediate student has asked *Morpheus* to analyze various forms in the *Odyssey*. In Figure 8, *Morpheus* analyzes obscure linguistic phenomena in a fifth century B.C. inscription from Sparta. The keyword "interv-s-to-h" points out a peculiarity of the Laconian dialect of Greek, and would be helpful to many professional classicists.

could grammatically be construed not only as the subject of the sentence, but also as an imperative ("time the flies with a watch") or part of a compound ("time-flies" as in "fruit-flies"). Greek morphology almost always distinguishes noun from verb and could never match the morphological vagueness of ordinary English.

But precision exacts its own price. A single noun in a single dialect can have more than ten different endings, and there are three major classes of ending types. Verbs become a major obstacle: a single Greek verb can not only generate hundreds of different forms, but it also has six different major stems. Sometimes it is possible to generate all six stems from the present form of the verb, but many Greek verbs are irregular. The aorist passive stem may thus, for example, differ significantly from, or even bear no resemblance to, the present stem. But Greek dictionaries are lemmatized by the present stem: thus, a student staring at the aorist passive form ἠνέχθη must know that this word derives from the verb φέρω before he or she will be able to look up the meaning of that word.

The student attempting to read Greek thus must carry on a tedious and frustrating dialogue with his dictionary applying one heuristic after another as he tries to analyze the word in front of him and divine its proper dictionary entry. The ability to perform such an analysis is a specialized skill that all who wish to read classical Greek must now perfect by reading Greek texts over a number of years.

At the same time, however, this skill, while it marks and validates the professional Classicist, also excludes most of those people to whom Greek literature should be important. Almost all philosophers or political scientists must, sooner or later, teach Plato or Aristotle; Herodotus and Thucydides are important to the specialist in history and historiography alike; the Greek tragedians Aeschylus, Sophocles and Euripides play a fun-

damental role in the history of theater; the Homeric poems remain among the most imposing examples of epic poetry.

But the philosophy professor, responsible for Kant and Nietzsche as well as Plato and Aristotle, cannot always devote years of study to perfect her Greek. Sometimes she may, in fact, spend one or two years studying Greek, but this will only allow her to read Plato slowly and with difficulty. Distracted by her other obligations, she will probably forget the Greek that she has learned and soon lose the ability to read Greek at all. The language discourages many of those who might benefit most from the literature that it contains.

Suppose, however, that both Greek texts and a Greek-English dictionary exist online so that one could look up a Greek word by typing in its dictionary lemma. This might facilitate the dictionary lookup problem (it would still be faster to type in a word than to flip back and forth in the large Greek dictionary), but the problem of analysis would still remain. How would the student determine (a) that ἠνέχθη was the "3rd person singular aorist passive indicative" form and (b) that it derived from the verb φέρω?

If you express the morphological data (e.g., what stems go with what words, what endings belong to what classes, what rules govern vowel contraction and accentuation, etc.) in a machine readable form, you can automate the analysis and lookup process. For example, the Greek morphological parser *Morpheus*, begun by D. Neel Smith (now at Bowdoin College) and Joshua Kosman, and further developed at Harvard University

(funded by Harvard University and UCLA), can generate the possible analyses for a Greek form. Its dictionary of stems is still small, but it can understand all the words in a first year Greek text book (*Greek: An Intensive Course*, Arthur Hansen and Gerald Quinn [Fordham, 1980]) and knows enough other words to analyze sample passages of Homer, Theocritus, and Herodotus, each of which reflects a different dialect of Greek. Now the problem we are facing with *Morpheus* is not software so much as data.

We have, in collaboration with the Packard Humanities Institute, contracted for a professional data entry firm to enter a 30,000 word Greek dictionary. This resource will allow *Morpheus* to analyze any word in all the most important texts of Classical Greek. A student reading an online text of the *Odyssey* or of Plato's *Apology* will be able to select a word, ask *Morpheus* to analyze that word, and then call up the relevant dictionary entry. This will fundamentally alter the way in which the non-specialist interacts with the text.

Rethinking The Study Of Greek

Consider, however, one possible negative effect. If students of Greek do

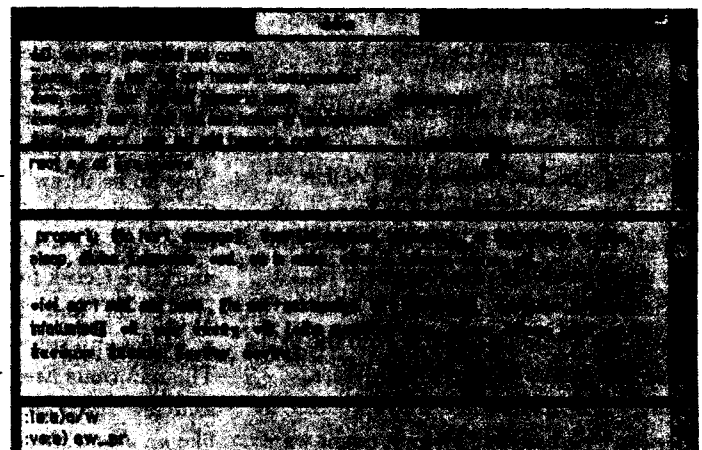


Figure 9 illustrates a sample dictionary page. The top field displays the morphological information for the reader, but the bottom field contains the same data in the form that *Morpheus* uses. (Note the work-around to allow English and accented Greek in the same *HyperCard* window: a capital letter such as "O" is represented as "o"; italics are surrounded by double brackets. No formatting information is lost: true upper case characters and italics will appear when newer versions of *HyperCard* allow more than one font and text style per field.)

not absolutely have to understand Greek morphology (as they now must), they may never learn their morphology at all. The online word analysis and lookup might become a crutch that stultifies rather than invigorates the student. Forever consulting their computers, students would never really learn to understand Greek.

This problem could (and will) be debated at length. One might, for example,

If we can reduce the barrier that separates the beginner from reading Homer or Plato, we make Greek a more attractive subject of study.

argue that rapid access to accurate information will allow most students to learn more things more efficiently. Strategies can be developed to encourage the student to learn. The system might require that the student try parsing every fifth word for which they request analyses, or might remind the student that she had already looked a particular word up several times. *Morpheus* could also be inserted at an earlier stage of instruction serving as a Greek spelling checker for the student's translations. Any words that *Morpheus* could not understand would be interpreted as mistakes, and the student would have to fix them before handing in the assignment (see Figures 6, 7, 8 and 9). This would not only reduce the most tedious part of correcting homework, but would also attack students' mistakes before they became habits. A number of other techniques have been suggested, but, in the end, only experience will ultimately show how resources such as *Morpheus* and an online dictionary affect the learning of Greek.

The real question is not, however, "will the student who uses *Morpheus* to read Greek fail to learn Greek morphology," but "will that student or scholar learn more or less Greek than she currently does." The philosopher referred to above

wants to understand the Greek of Plato as accurately as possible, but probably cannot devote much time to the study of Classical Greek. Furthermore, the intricate knowledge that she has painfully acquired will, unless constantly renewed, gradually evaporate. For such knowledge to be useful, she still needs to be able to work her way through a text of Greek twenty or thirty years after her graduate school classes.

As things stand now, this philosopher might compare a translation with the text and puzzle out the Greek as best she can, but will expend much of her time trying to remember such things as the second aorist active of *mi* verbs. She will ultimately encounter many forms which she once knew, but now simply cannot interpret, since these are precisely the details that slip away. Her real goal is to elbow her way past the translator and see how Plato really does use the term δίκη (which is translated as "justice"), but, bogged down in the morphology, spending two minutes hunting down every third word in the dictionary, she will get relatively little out of the Greek and may abandon the problems of Greek altogether. Because she will never pierce the relatively superficial and facile surface of a translation and confront Plato's own words, a piece of her intellectual life will wither and die.

Philosophers (or historians or political scientists or students of drama) will use *Morpheus* and the online dictionary to enhance the Greek that they already know. They will be able to read Greek faster and more accurately at an earlier stage of preparation. Able to move more quickly through the text, they will be able to focus better upon the content of what they are reading. Later in their careers, they will also be able to pick up their Greek again without spending weeks reviewing Greek morphology.

Some, of course, will abuse the tool, using *Morpheus* uncritically, hiding their own ignorance behind the output of the

machine. But the same argument holds true for every reference tool (including the printed dictionary). Responsible readers know the limits of their own knowledge, and use their knowledge accordingly, and it is for this type of readers that scholars prepare their work.

In one sense, then, determining the form of a Greek word is a mechanical process, but designing a program to perform this task raises profound and difficult issues. It forces us to reevaluate what it is that we really wish to teach and allows us to reconsider what it is that our students will be able to accomplish. If we can reduce the barrier that separates the beginner from reading Homer or Plato, we make Greek a more attractive subject of study. We may consequently not only make two years of study more valuable, but attract more students. Far from cheapening our field, we would thereby widen its appeal and enhance its value: the more people who can derive benefit from Classical Greek texts, the more important those texts become.

Finally, the online dictionary continues the evolutionary path that leads from the oral poet to the printed book. The lexical information, once entered and made available, can be disseminated more efficiently and at lower cost. Even with current technology, it would be cheaper to buy a compact disk player and computer than to buy the five hundred printed books that a compact disk could store.

But the online dictionary also makes information more reliable. Paper dictionaries assume that the user has an intimate acquaintance with Greek (or another language). By placing the dictionary online and tying it together with a morphological analyzer such as *Morpheus*, it is possible to reduce the amount of Greek that the user must know. While the professional Hellenist may not feel the need for such a tool (just as oral poets probably saw no need for writing), the peripheral user, whether student or scholar, will be able to
(Continued on page 36)

Redefining The Book

(Continued from page 11)

examine Greek morphology with far greater accuracy than ever before. Writing separated poetry from the poet capturing the most crucial element of the poet's performance — his words. A tool such as *Morpheus* moves in the same direction, for it takes a dynamic skill, the ability to analyze Greek morphology, and gives that skill a new life that is distinct from the practitioner of that skill.

Reorganizing A Dictionary

Simply writing a morphological analyzer such as *Morpheus* and putting a dictionary of Greek online will not, however, create an effective online tool. To analyze the form ἐνεχθέντες, *Morpheus* must know that "ἐνεχθ" is the aorist passive stem of the verb ἔρχομαι. *Morpheus* can only do so if it can analyze the information in the dictionary, but, though a human user might feel that the morphological information is stored in a consistent format, the format will in fact differ subtly from entry to entry. Key words will change, their order will vary, anomalous categories will appear, obvious information will be occasionally (though not always) left out. In the end, sophisticated programs will parse most of the morphological information, but the 50,000 stems for 30,000 words will all have to be checked and perhaps 5,000 of them will have to be edited by hand.

The problem of entering something like a dictionary is pervasive and will affect every discipline that depends upon stable, paper archives. Even a highly structured document such as a dictionary cannot simply be typed or scanned into the machine. Software must understand the syntax of that document (e.g., lemmas are boldfaced, definitions italic, etc.), and it is not easy to make such software work without substantial modification for a variety of different texts. Ultimately, the content of the dictionary must be defined and described using a rigorous form,

each "first aorist" verb stem tagged and distinguished from each "second aorist" stem, each dictionary article interpreted and its hierarchical structure represented in a way that a program can understand. One of the key members of the *Perseus Project* is Ms. Elli Mylonas who spends the lion's share of her time groping after structures flexible enough to implement such "content markup" schemes.

The process of restructuring printed documents may never be wholly mechanical. Any time we try to enter more than the simple ASCII characters of a printed document, a person will have to check its redesigned content and structure. The consequences, logistical and economic, are daunting for the coming generation of scholars who must begin the great process of converting their paper tools to the electronic medium.

Converting A Bilingual Greek Text Into An Electronic Medium

This fall, we began to define the precise form that an online bilingual Greek text should take. We chose Herbert Weir Smyth's text and translation of Aeschylus's play, the *Agamemnon*, because the language of this play is extremely difficult to understand, and its text riddled with manuscript errors. If we could establish a reasonable format for this play, we would have made considerable progress towards designing a template for all of Greek drama.

The text was scanned in at the University of Chicago by students supervised by Professor George Walsh, a member of the Classics Department. Once entered and corrected, it was mailed electronically to Harvard, where we began to restructure the play.

The first decision was a simple, but profound, consequence of having the play in an electronic format. Normally, we would never have offered the printed text of Smyth's *Agamemnon* to students. First, there are perhaps two or three dozen places where Smyth chooses variants that

differ from more recent editors such as Fraenkel and Page. The professional scholar would hesitate before basing a course on such an edition. Second, the translation not only reflected Smyth's interpretation of the Greek, but was written more than sixty years ago in a style that now appeals to few. What would an undergraduate think when confronted with "But, O daughter of Tyndareos, Queen Clytaemestra, what hath befallen? What tidings hast thou? On what intelligence and convinced by what report is it that thou sendest about thy messengers to enjoin sacrifice? etc."

Before we began to work with this text, we assumed that we would edit it. The translation was a simple problem. We spent several days removing the archaisms and rearranging the syntax. A passage such as the one quoted above became "But, daughter of Tyndareos, Queen Clytaemestra, what has happened? What news do you have? Because of what intelligence and convinced by what report do you send your messengers about to command sacrifice? etc." In the end, we did not have the most elegant possible rendering, but we had made the English clearer and less offensive to contemporary sensibilities. For the immediate future, we do not need to have the best available translation online. Anyone reading a translation of the *Agamemnon* from start to finish will probably use a printed book. Students, however, studying a topic such as *hybris* in Greek tragedy will use the computer so that they can rapidly examine passages scattered throughout Greek literature. For this purpose, the revised translation is quite satisfactory.

The simple ability to edit a translation is a major change. The harassed teacher trying to cover everything from Homer to Dante may generally take any translation that she can find, but if that person's specialty is the *Iliad*, she may feel that the best translation is either inaccurate or misleading. She could edit parts of that translation herself, tailoring it to her own

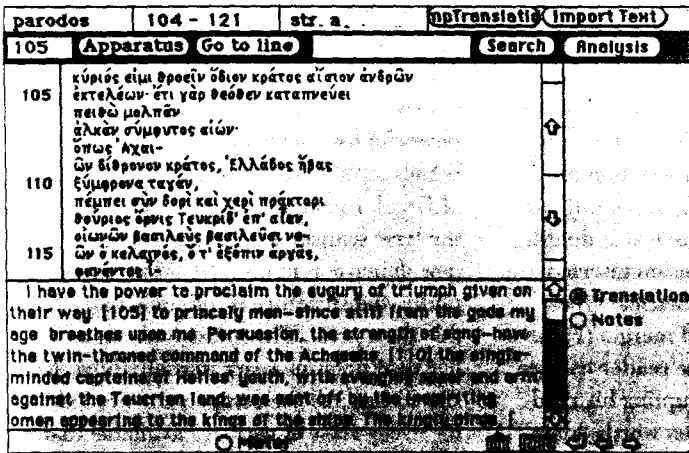


FIGURE 10: A bilingual text of Greek poetry, viewed in *HyperCard* (Note the difficult English of the translation.)

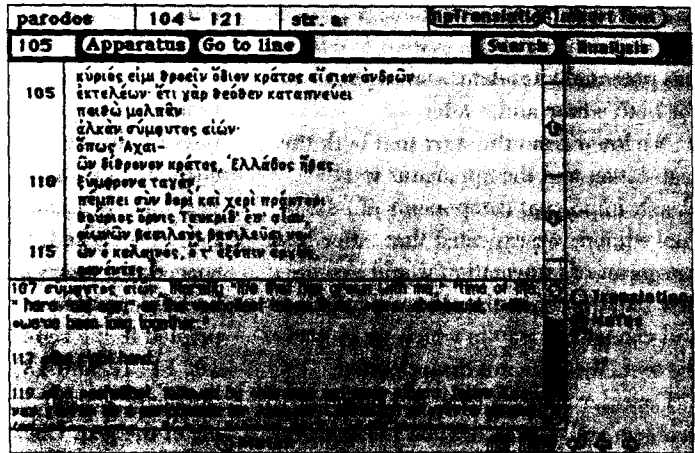


FIGURE 11: The same text, but with the notes field displayed instead of the translation. (Note the presence of Greek at the cost of capital letters described in connection with Figure 9.)

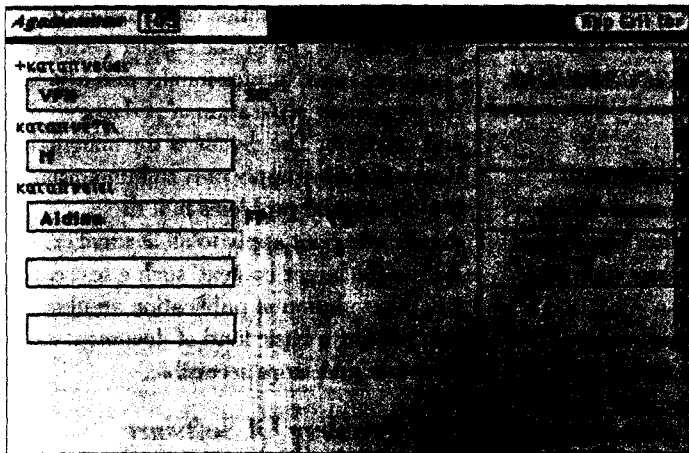


FIGURE 12: A sample *apparatus* entry, listing variant readings, the sources for these variants, and codings to indicate which editor chose which readings.

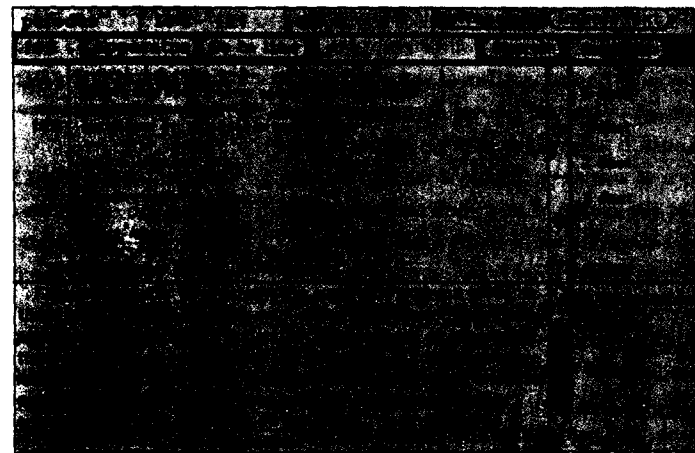


FIGURE 13: The reader has clicked on the Meter button, and the metrical analysis for this choral passage has been inserted into the text.

purposes. She could add her own notes or comments to illustrate problems in the translation. She could also review the translation in a professional journal, pointing out her objections in detail. If the text is stored or disseminated as part of a constantly updated database, her criticisms could, if they prove valid, be incorporated into next year's edition of the text.

To the scholar, however, the problem of variants takes on a wholly different complexion. We could, of course, add to Smyth's own choice of variant readings, but we were also able to give a precise structure to the variants. Thus, Figure 1 illustrates a sample entry for line 105 of

the *Agamemnon*. There are three possible readings. The form *καταπνέει* appears in manuscripts V, F, and N. The manuscript M contains a reading *καταπνέει* (where the "?" indicates that a letter has been erased and is now illegible). Finally, the scholar Aldina, believing that neither reading was appropriate, conjectured that Aeschylus had, in fact, written *καταπνέει*. A scrollable text window is associated with each reading, so that an editor could add her own comments if she chose.

Any printed apparatus could convey as much information, but the electronic medium offers different possibilities. The "+" indicates that the text currently con-

tains the reading *καταπνέει*. But if the reader prefers Aldina's conjecture, he need only click on *καταπνέει*, and that variant will replace *καταπνέει* in the text, while the "+" will move to the appropriate place in the apparatus. The scholar can thus create his own private edition.

Note, however, the letters SM and FP that follow the first and third readings. These abbreviations indicate that Smyth and Murray chose the first reading, while Fraenkel and Page preferred the third. A program could, therefore, scan through the apparatus and insert all those readings chosen by Murray, thus recreating Murray's text. Simple "versioning" of this type allows a single electronic document

to do the job of many editions. A protean text that can shift from edition to edition has potentially fundamental implications for both editor and reader.

We knew from the start that both the translation and the apparatus were clearly important components of a bilingual edition. We expected that other basic categories of information would assume a new importance in the electronic medium and change the way in which we viewed the text. We were not disappointed.

Consider a specialized, but difficult, problem with Greek drama. Lyric poetry, sung by the chorus, separates scenes of spoken dialogue (the effect is roughly like that in the German *Singspiel*, but music played a less important role in Greek drama). These songs follow complex metrical patterns. Choral songs generally consist of several paired stanzas in which stanza *b* follows the precise metrical pattern of stanza *a*. There is no way to predict the meter of any such pair of stanzas. The dramatic poet freely chooses from dozens of metrical types, and each metrical type may assume a wide variety of shapes. Every editor of a Greek play must decide what he thinks the meters of a choral ode are. Only after this has been done, can one make any reasonable attempt at reading the lyrics aloud. Even though the music that accompanied the songs has long been lost and we are not even sure precisely how Greek sounded, we must follow the meter as best we can if we want to get as close as possible to what an Aeschylus or Euripides wrote. All Greek drama was written to be read aloud.

Standard Greek texts, however, almost never include the metrical analyses for choral lyric. Each editor has his own analysis, but conventions of typography and limitations in space generally prevent this information from being printed. The advanced scholar could, but rarely does, deduce what the editor's metrical analysis was. The non-specialist is helpless. The result is predictable. People generally ig-

nore the meter — and thus impoverish their view of Greek drama.

In the electronic medium, however, we realized that we could make metrical analyses readily accessible. When the reader encounters a choral ode, a button appears at the bottom of the screen. If the button is clicked, then the text is double spaced, the metrical scansion inserted and descriptions of the metrical types printed in the right hand margin (Figures 10, 11, 12 and 13). The reader can see the meter without interrupting his reading of the text. Clicking on words “dact”

In the electronic medium, however, we realized that we could make metrical analyses readily accessible.

or “ia” in the right hand margin will bring the reader to descriptions of dactylic or iambic meter or allow him to find other places in the play where such meters appear.

In restructuring the *Agamemnon*, we entered metrical analyses for all the choral lyric passages in the play. Smyth, however, followed standard conventions and did not provide a full metrical analysis with his text. Therefore, we had to create these analyses by looking at other reconstructions of the meter. The task became far more complicated and required a relatively high level of expertise because conventions of print had not required Smyth to write down all the information that we needed in the electronic medium. Such metrical analyses are not like some interpretative problems on which the editor may not wish to pass judgement. Metrical analysis is an integral part of the text which the editor must have worked out in detail. Restructuring the text for a machine thus uncovered a flaw in the conventions which print had defined.

To conclude this section of the discussion, let us consider the range of needs

served by the electronic book. On the one hand, it contains a translation for those who do not know Greek. For the advanced scholar, it provides a far more powerful tool for managing technical details such as variants. For the student of Greek reading his first Greek tragedy, the lyric scansion opens up an entire new dimension in the play. Most importantly, the structure is infinitely more flexible than print. The individual can add her own notes or rearrange anything that she wishes. All the components needed for every class of user are available under a single roof. Even if one scholar develops the apparatus, while someone else provides an elegant translation, we can still lessen the fragmentation of textual critic and translator, lower the barrier between “popular” and “professional,” and attack the pernicious separation of pedagogy and research. The details of the bilingual Greek text may apply only to humanists, but the general problems that these details bring out apply to all academics. Within the larger context, such a text carries the evolution of publication another step making a basic kind of document easier to use and more accessible.

The Problem Of Software

The humanist cannot work without data. No matter how impressive emerging hypertext systems may become, they will not attract as much interest as they should until they already contain useful information. Those of us in the *Perseus Project* have many different perspectives on our work, but we all recognize that our task is not so much to provide new software (which the market can generally develop and support better than we) as to prepare well organized and edited information that works with someone else's software.

Morpheus, which we wrote ourselves and which currently consists of approximately 7,000 lines of C, is the exception that defines the rule. It will be a long time before the industry produces a Greek

morphological parser: not only is the market for such a tool small, but one must understand Greek exceedingly well to make the tool powerful enough to satisfy the Classicist. *Morpheus* illustrates precisely the kind of programming that individual disciplines must design themselves.

Linking a passage of Aeschylus to a commentary is, however, a specific instance of a generic function. Members of a discipline such as Classics should be able to find this functionality in standard hypertext systems. They should only build their own hypertext systems (like Professor Jay Bolter of the University of North Carolina at Chapel Hill) if they wish to illustrate a different and well developed model for hypertext.

Using someone else's hypertext system, however, has its own dangers. Suppose you implement a one hundred megabyte hypertext in software package X. Five years later, software package X is no longer supported or has been superceded by software package Y. You might be forced to save all your data as raw text and then rebuild thousands and thousands of links by hand. Clearly, it is necessary to find or develop some structure for the information that will be separate from whatever particular system(s) are used. If it is not possible to import and export all of the information (including links) from a generic format into a given hypertext system, then that hypertext system is to be avoided.

Working With HyperCard

So far we have done much of our work with *HyperCard*, the "personal information toolkit" developed for the Macintosh by Apple's Bill Atkinson and Dan Winkler. Anyone who has worked closely with *HyperCard* will have a long list of improvements that they would like to see implemented. I, for example, would like to be able to display Greek and English in the same text field and to make selections of text within a scrolling text

field into buttons. *HyperCard* is evolving, and we expect that this type of functionality will be available in coming versions. But *HyperCard*, even in its current incarnation, is an extraordinary achievement, and it implements several ideas that far more ambitious software systems have not.

The easier new tools are to use, the more readily they will be adopted. For a

computer program, however, ease of use means more than a simple interface. From a practical point of view, the early Xerox Star Workstations were much harder to use for wordprocessing than a PDP 11/44 running Unix. Of course it was easier to write a ten page report in the Star Environment than in TROFF (so long as you didn't need footnotes, in

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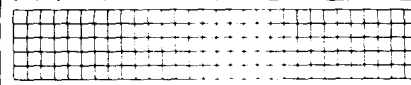
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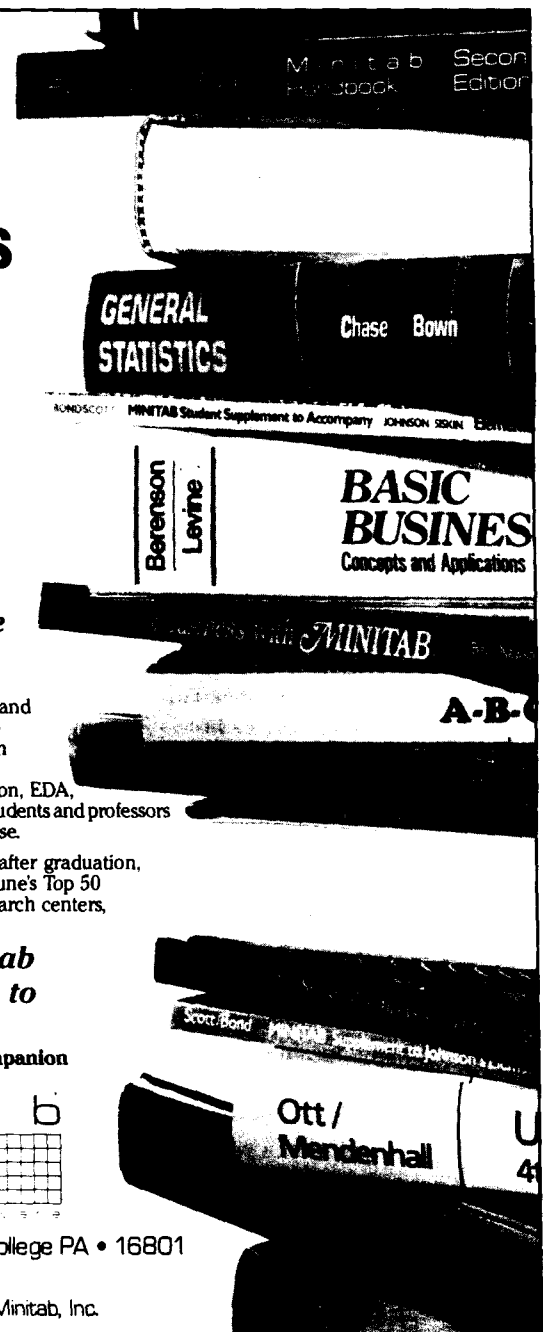
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which case you had to use TROFF), but the difference was that ten people could share a PDP 11/44 while it cost \$50,000 to buy one Star. It doesn't matter how nice the software is if you can't get to the machine.

Bill Atkinson understood this principle and designed *HyperCard* so that it would run on a Macintosh Plus. To do this, he could not provide all the functionality of systems (such as *Xerox NoteCards* or Brown's *Intermedia*) designed for more powerful computers, but he focused his effort on those things which most appeal to users. *HyperCard* is stunningly fast, flitting almost instantaneously from map to

Restructuring the text for a machine thus uncovered a flaw in the conventions which print had defined.

text to digitized image. *HyperCard* is also easy to use. An undergraduate can learn how to create and link documents in an afternoon. Someone with minimal programming experience can build interactive programs using *HyperTalk*, *HyperCard's* scripting language. An experienced programmer can prototype applications with disarming ease, then rewrite his work in C or Assembly Language, and add the new code to *HyperCard* itself.

HyperCard has thus benefited us in three ways. First, we were able to store documents such as the bilingual text in a descriptively tagged ASCII form. We could then write *HyperTalk* scripts that allowed us to move our information back and forth between *HyperCard* and our ASCII files. We have thus, in some measure, succeeded in abstracting our data from the system that we use to view that data.

Second, it has been much easier to prototype objects such as the atlas or the bilingual text. Even *Morpheus*, which is written entirely in C, benefits since many of its data files are stored in *HyperCard*

stacks. Our colleagues at Boston University who manage the visual component of the Perseus Project have been able to drive a videodisc player. They can, for example, click on a map of the Acropolis that is visible on the Macintosh screen and call up an image of the Acropolis from the videodisc and display it on a color video monitor. We have been able to go farther and faster than we had ever anticipated in exploring our ideas.

Third, many of our colleagues either own Macintoshes or could easily acquire one. They all want to use the machine that they can have on their desk for text processing. A program that runs on a Macintosh Plus or Macintosh SE has for Classicists (and most humanists) a reality and concreteness that nothing on a Sun workstation, for example, can match. This is a critical step forward because it decentralizes development. The best person to develop reference tools for ancient history, for example, is an ancient historian. Someone trained to study literature may understand quite a bit about ancient history, and have a fairly good idea as to what problems ancient historians approach and what kinds of information (i.e., maps, inscriptions, texts of Thucydides and Plutarch, etc.) they need, but only someone pushing against the frontiers of ancient history will be able to imagine the kinds of tools that he does not have, but which are now becoming possible.

For example, because we are using *HyperCard*, my colleague Thomas Martin, a Classics professor at Pomona College and specialist in ancient history, can already use documents developed at Harvard and Boston University or the University of Chicago or Bowdoin College on the Macintosh in his office. He can, therefore, directly build on or remodel those tools. The more control we can give to those most advanced in a subject, the better they will be able to apply the intuitions and instincts of the expert, and the more innovative and intellectually stimulating

new academic materials will be.

HyperCard also takes a significant step forward in a larger process. First, it not only runs on all supported Macintoshes, but is given away with every new Macintosh. Bill Atkinson designed it specifically as a tool to make information easier and cheaper to exchange. Second, it reduces the importance of the individual programmer. Professors can either reduce or even eliminate altogether the need for programming help. Concretely, this means that they do not have to keep harassing overworked student programmers. Put more generally, a system like *HyperCard* reduces the user's dependence on an individual author, and in this it carries further the same process that was at work when writing separated poetry from the poet. In both cases, *HyperCard* provides a tool that promises to make information more widely accessible and easier to use. If *HyperCard* itself fulfills that promise or even clarifies that promise for rival systems, it will occupy a position not merely in the marketplace of the 80s, but in history as well.

The Network Of Reference Tools

Put an atlas, a dictionary, and a collection of texts onto a single compact disk, and you have done more than make three kinds of reference work available. Each affects the form of the other. Together, they change the speed with which questions can be answered and can thus accelerate the intellectual process of scholarship.

The appearance of an online dictionary, for example, affects other kinds of documents as well. Consider the task of someone writing a commentary. He may wish to comment on the particular usage of a word in Aeschylus. The same usage may show up in Sophocles and Aristophanes, and the commentator would now discuss all three passages in his remarks on Aeschylus. Someone reading the relevant passages in Sophocles or Aristophanes would not, however, see this dis-

ussion unless they had read the commentary on Aeschylus.

If, however, texts of Sophocles and Aeschylus, as well as a Greek dictionary were all available on the same compact disk, the commentator might well want to place his remarks in the dictionary. A reader who encountered that passage and wanted to know if there were any relevant annotation would not only learn whether there were anything in the notes, but would also be directed to the relevant dictionary article. Unlike the case of the autonomous printed commentary, the reader would also be directed to the dictionary article if she were reading Sophocles or Aristophanes.

Every kind of document influences the shape of all those documents that are relevant to it. Change one document type (like a dictionary) and it may affect the shape of related documents (such as texts or commentaries) and even enhance the connections between other new document types (e.g., an online dictionary, by making Plato more accessible, can create a much stronger link between the actual Greek text of Plato and professional journals on Philosophy). Basic tools reinforce each other. One might go from a text to a map to another text to a dictionary to another map. Linking three such resources together does not triple a library so much as triple the value of each of the three components in that library.

Conclusion: Synergy Of Research And Teaching

Some of the things discussed so far will have relatively little interest for specialists: a professional Hellenist, for example, recognizes a Greek verb form without consciously analyzing it, but a student or specialist in some other discipline could benefit greatly from a system that analyzed verb forms. On the other hand, variant readings have far more importance for the specialist than for the general reader. The demands of students and scholars superficially, at least, pull in

different directions, but each group needs the other.

Electronic tools will never properly influence education unless they also support the research interests of graduate students and faculty. Research, not teaching, determines who receives tenured positions at the major universities of this country. Even those who teach at smaller colleges generally receive their Ph.D. training at large universities, and they are constantly reminded that research is rewarded far more than teaching. While faculty nevertheless often lavish energy on their instruction, they will find it far easier to adopt a new technology that also relates to their scholarly work.

At the same time, research alone cannot adequately support those who, like humanists, lack natural corporate sponsors. There are relatively few Classicists, but a single translation course that attracts five hundred students is a significant fiscal entity. If we can develop tools that reinforce our teaching as well as our research, we will find it much easier to find the resources that we need to develop such tools. Even if student and professional fear that their needs are separate and even incompatible, the economic necessity of serving both groups will, I suspect, bring greater benefits to each than work aimed solely at one group or another.

Scholars should not simplify their problems, but present them in the

Softcopy And Hard

(Continued from page 17)

writing becomes an effective strategy for thinking and communicating about a wide range of topics. To develop this sense of control, students need to understand many strategies for writing as well as when and why to use them; they also need to practice writing often and conveniently.

It is no surprise that those of us who have revised our curricula to emphasize the writing process have been enthusiastic to bring wordprocessing into the class-

room. They may use graphic illustrations where these are more appropriate, as in the historical atlas, or develop systems that perform mechanical, deterministic computations, such as the analysis of Greek morphology, or revise their basic documents, as when they restructure their bilingual texts for the electronic world. In each case, however, professionals must rethink their basic goals and will inevitably acquire a better understanding of what they themselves are doing. Ultimately, new documents that we are now struggling to devise will, like writing or print, make information accessible to entirely new groups of people. This principle has implications far beyond classics. □

Note: As Co-director of the Perseus Project, Professor Crane and his team are responsible for assembling and structuring Perseus' textual database which will ultimately comprise roughly one hundred megabytes of source material. Perseus researchers based at Boston University have begun to attack the problem of creating and using a visual database of 10,000 images. The Perseus Project is funded primarily by the Annenberg/CPB project.

Gregory Crane
Assistant Professor of Classics
Co-director, Project Perseus
Harvard University

room. The wordprocessor is indeed aptly named: it is a tool which seems ideally designed for demonstrating and practicing the writing process, providing as it does the ease of function, effective use of time, and visualization of process which have also been reshaping the habits of experienced writers. But the wordprocessor has generally been under-utilized as a resource for teaching writing. Too often instructors of composition begin and end with wordprocessing as a tool for revising already drafted text. I think we can draw

An outline of the *Perseus* Overview

Thomas R. Martin

1. The Crystallization of Greek Civilization in the Dark Age and the Archaic Period (1000 TO 490 B.C.)

Aristotle said that human beings are “beings of the *polis*,” by which he meant that human beings are creatures whose nature requires them to live in a group with a political, social, and religious structure. For the Greeks, the *polis* (a word usually translated as “city-state” and the source of our word “politics”) was both the necessary and sufficient condition for human life. For us today, the *polis* represents a laboratory of the past in which we can investigate a model of civic life that has much to teach us through its intriguing mix of the strange and the familiar.

The goal of Part One is to investigate the mysterious process in early Greek history that led to the emergence of the *polis* and to indicate how its development created new tensions even as it solved essential human problems.

1.1. The Origins of Greek Culture

(Section 1 will concern the emergence of a recognizably Greek culture from the material poverty of the so-called Dark Age from about 1000 to 800 B.C.)

A. *The Construction of an Aristocratic Society*

(Subsection A will use the oral poetry of Homer and Hesiod to draw a picture of the aristocratic society of early Greece. Since social and religious values that emerged at this time remained decisively important throughout Greek history, this background information is essential. The reintroduction of writing in this period will be the focus for a discussion of the impact of this revolutionary technology on society.)

B. *The Cultural Context of Early Greece*

(Subsection B will concern both myth and archaeology. Myth will be presented as a crystallization of central problems of human existence, such as the relationship of human culture to nature, the role of the gods in human life, and the nature of the family. Burial customs and other archaeological evidence will be used to illustrate the level of material culture of early Greek society and its social structure.)

C. *The Creation of the Greek City-State (the polis)*

(Section 2 will discuss current ideas about the problem of how to understand the sudden emergence of the city-state after the Dark Age. A central issue is the nature of the city-state as we find it at the beginning of the historical period in the eighth and seventh centuries and the problems of overpopulation and social unrest that had developed earlier and now had to be solved.)

D. *The Role of Technology in Reforming Greek Society*

(Subsection A will concern the impact of the development of new military technology in bringing about major changes in the way political power was distributed in the emerging city-state.)

E. *The Effects of Overpopulation*

(Subsection B will concern the social and political impact on early Greece of a growing population. Especially important is the issue of sending of colonies to areas that are now Italy and southern France in the West and to Turkey and southern Russia in the East.)

F. *The Religious Context of the City-State*

(Subsection C will introduce religion through an analysis of the role of the oracle of the god Apollo at Delphi in colonization. This will lead to the topic of the special relationship between the city-state and the gods that the Greeks perceived and how this perception affected social and political life.)

1.2. **The Polis of Sparta**

(Section 3 will concern the remarkable nature of the polis of the Spartans. This city-state with its overwhelmingly military orientation and its odd forms of slavery reveals many of the preconceptions of polis life and helps to show just how striking are the differences between Sparta and Athens, which will come up in the next section.)

A. *The Pressures of the Spartan Environment*

(Subsection A will outline the conditions that determined the harsh structure of Spartan government and society. The need to maintain a defense against a conquered and hostile population of non-Spartans meant that military preparedness had to outweigh all other interests of the state. This centrality of defense needs in turn meant that the conquered population had to be kept on in a state of perpetual dependency to provide agricultural labor to support the Spartans, who could not support themselves by farming because they had to spend all their time in military training.)

B. *The Society and Culture of the Spartan State*

(Subsection B will concern the consequences of the peculiar situation of the Spartan polis for family life—especially the role of women and the bizarre conditions of Spartan marriage and sexuality, for politics—only oligarchy was possible, and for art—the vibrant tradition of Spartan decorative art was killed off.)

1.3. **The Democratic Polis of Athens**

(Section 4 will concern Athens, the other, and markedly different, great representative of the Greek polis. The famous democracy of Athens came from the same background of aristocratic society as had the oligarchy of Sparta, a strange fact that needs explanation.)

A. *The Background of Democracy*

(Subsection A will explore the enigmatic relationship between the short-lived tyrannies of the archaic period and the emergence of democracy. At Athens, for example, the tyranny of the family of Pisistratus saw the implementation of populist programs in the support of agriculture and the administration of justice, the construction of expensive public buildings, and governmental influence on the performing arts. The question to be answered is what these programs meant for the development of the truly radical idea of democracy as a government for the city-state.)

B. *The Bloody Origins of Democracy*

(Subsection B will concern the paradoxical birth of democracy at Athens as a result of the violent struggle between aristocrats for supremacy. It will investigate the radical nature of the institutions of democratic government that emerged so rapidly from these struggles in the last decade of the sixth century and their precariousness at this point.)

1.4. **War with Persia**

(Section 5 will describe the way in which the new democracy of Athens incurred the wrath of the king of Persia, which is now Iran. The “Great King,” as the Greeks called him, ruled the international superpower of the age.)

A. *The Background to War between East and West*

(Subsection A will concern first the role of Croesus, the king of Lydia famous for his riches, in entangling the Greeks with the Persian king. Then it will describe the astounding resources of the Persian kingdom, which stretched from the western border of India to the shores of the Mediterranean, and the nature of Persian kingship.)

B. *The Punishment of Athens*

(Subsection B will explain the hostility that arose between Athens and Persia, the Persian military expedition sent to punish the Athenians, and the wholly unexpected defeat of the Persians by the Athenians on the plain of Marathon in 490 B.C. The subsequent Persian plan for revenge on a massive scale put the future existence of Athenian democracy very much in doubt. This point in Greek history makes a fittingly suspenseful place to end Part One.)

1.5. Ancient Sources to be given special emphasis:

Poetry by Homer and Hesiod on aristocratic values:

The poetry of Homer and Hesiod reveals the fundamental assumptions of Greek culture and the tensions between rich and poor. This example will also teach students about the nature of Greek oral poetry and its role as the “Bible” of Greek culture.

The colonization inscription for Cyrene:

This inscription gives detailed information on what it meant to send out people to found a new *polis*. This example will help students learn how to handle an inscription as an historical document and an archaeological object.

Poetry by Tyrtaeus on the values of the Spartan city-state:

Tyrtaeus’ poetry reveals the peculiar and militaristic values of Sparta and the ends to which art could be put in the context of Spartan society.

Herodotus on the battle of Marathon:

This historical text on the unexpected Athenian victory will help students learn how to handle a historical author and how to relate textual information to geographical and archaeological information.

Soldier's grave from Argos:

A grave of around 700 B.C. that provides the earliest evidence of the kind of heavy hoplite armor that was the basis of the technological revolution responsible for fundamental social changes in this period.

Chigi vase:

The most elaborate example of narrative in Corinthian vase painting, the Chigi vase presents a variety of mythical and historical scenes. It will serve to demonstrate how Greek art constructs multi-faceted message for its audience.

2. The Golden Age of Greece (490 to 377 B.C.)

The Golden Age of Greece is the modern term for the period when the democratic polis of Athens flourished economically and artistically beyond the grandest expectations of previous generations. In monumental architecture, in decorative arts, in literature, in drama, indeed in every facet of public life, the Athenians of the Golden Age achieved unsurpassed heights. Yet, their achievements could not insulate them from the ultimately

disastrous consequences of their decisions about foreign and military policy and of plain bad luck. The story of the Golden Age is a story of success and failure that reflects the inescapable difficulties of living a human life in a democratic society. The story of the Golden Age offers a lesson for all democracies in all times and places. The goal of Part Two is to investigate the strengths and the weaknesses of the democracy of Athens in the Golden Age.

2.1. The Crisis of Greek Unity

(Section 1 will concern the military and political crisis in Greece caused by the massive Persian invasions of the late 480s B.C.)

A. *The Splintering of the Alliance*

(Subsection A will analyze the pressures that led the Greek states to split up into collaborators with the Persians and resisters against the apparently overwhelming foreign threat. Like the members of the NATO alliance of today, the Greeks could not agree on how to respond to the greatly superior power of a hostile neighbor. The political consequences of their disagreement endured throughout the Golden Age.)

B. *The Role of New Technology*

(Subsection B will present the evidence for the role that new naval technology played in the astounding victory of the resistor states over the Persians and the collaborator Greek states. The great naval battle of Salamis in 480 B.C. will receive special attention for the light that it sheds on this new development. The background of this development lies in two different areas: the discovery and successful exploitation of mineral resources in the territory of Athens, and the unprecedented incorporation into the Athenian armed forces of the poorest segment of the population. In contrast to modern practice, Greek armies had traditionally restricted service to the part of the population that possessed substantial property. The decision to use propertyless men to row the new ships produced unanticipated pressures for a realignment of political power at Athens.)

2.2. The Empire of Democracy

(Section 2 will concern the political, social, and economic aftermath at Athens of the victory in the Persian Wars.)

A. *Democratic Imperialism*

(Subsection A will explore the circumstances under which Athens became an imperialistic power dominating other Greek states. The economic advantages to Athens of imperialism will receive special attention, especially in the context of popular support in Athenian democracy for the state's imperialistic policy. The growth of increasingly radical institutions of participatory democracy will be analyzed in the context of the linkages at Athens between foreign and domestic policy.)

B. *Private Life in the Golden Age*

(Subsection B will explore the consequences of democratic imperialism for private life, especially in the context of the greater availability of money both to private individuals and to the state for public purposes. The position of women in Athenian society will be particularly stressed here in the context of the family. This topic will also involve the structure of Athenian society as a slaveholding society and the role of propertied women in managing slaves and poor women in running small businesses.)

C. *Public Life in the Golden Age*

(Subsection 3 will concern the tremendous outburst of public construction and the expensive upgrading of official festivals in this period. Famous buildings of the Golden

Age at Athens, most notably the Parthenon, owe their existence to the funds brought in by imperialism. Lavish cultural festivals, such as those at which the plays of Aeschylus, Sophocles, and Euripides were produced for audiences of tens of thousands, also became standard at this time. Since many of these buildings and festivals had explicit religious connections, an investigation of the strictly reciprocal and apotropaic nature of Greek religion will be appropriate here.)

D. Tragedy and Comedy in the Golden Age

(Subsection D will present the plays of the famous tragedians Aeschylus, Sophocles, and Euripides and the bawdy comedies of Aristophanes. Special issues for investigation will be the question of the role of these plays in supporting or criticizing public policy in peace and war, and the question of the prominent roles that women characters have in these plays written by men for a male-chauvinist society.)

2.3. Philosophy and Education in the Golden Age

(Section 3 will concern the ground-breaking achievements of Greek philosophy in the fifth century B.C. and the tension created in Athenian society by the appearance of highly-paid, sophisticated private teachers—the sophists—for the first time in Greek history.)

A. Early Greek Philosophy and Education

(Subsection A will investigate the wide-ranging doctrines of Greek philosophers of the sixth and fifth centuries B.C., the necessary background for understanding the new developments in thinking in the Golden Age. It will also present the evidence for traditional education of men and women, the importance of the gymnasium and the symposium, and the role of homosexual relationships between older and younger men in perpetuating traditional views.)

B. The New Teachers

(Subsection B will explore the reasons why the new teachers, the sophists, were so controversial and why rich young men were willing to pay them exorbitant fees for instruction.)

C. The New Thought in Politics

(Subsection C will center on Pericles, the leading Athenian politician of the Golden Age and a subscriber to the new intellectual trends that the sophists had introduced. A central issue is how a practical statesman like Pericles could subscribe to the relativistic views of the sophists on subjects such as politics and religion. The traditional stability of the city-state that he led depended on a contrary assumption: that the identification of the political good was a constant and that the conventional view of the special relationship between the gods and the community was valid.)

2.4. The Peloponnesian War between Athens and Sparta

(Section 4 will investigate the causes and the course of the Peloponnesian War, the twenty-seven-year struggle that destroyed the dream of an enduring Golden Age.)

A. The Structure of Greek Warfare

(Subsection A will explore the structure of Greek warfare in the context of the atypical course of the Peloponnesian War from 431 to 404 B.C. The economic and political causes of the catastrophic defeat of Athens in 404 B.C. will be investigated in the context of the strengths and weaknesses of Athenian radical democracy in deciding on public policy.)

B. The Literature and Architecture of War

(Subsection B will examine the issue of how the Athenians dealt with the political, economic, and ethical strains of a protracted, expensive war in their drama and their public

architecture. Denial, fantasy, and patriotism all had their place in these vibrant areas of cultural life.)

C. The Postwar Restructuring of the International World

(Subsection C will analyze the political and military restructuring of the Greek world after the defeat of Athens in 404 B.C., with special emphasis on the re-emergence of Sparta as a Greek power and the ominous reentry of Persia into Greek affairs by 377 B.C.)

D. The Execution of Socrates

(Subsection D will examine the trial and execution of Socrates in 399 B.C. as an incident that encapsulates both the intellectual successes and the unresolvable social tensions of the Golden Age. His career and death reveal the abiding difficulty of reconciling a commitment to individual freedom and personal development with the necessity of the state to preserve order and tradition as the bulwarks of a civilized stability of life. This incident marks an appropriate close to Part Two, the story of the rise and fall of democratic Athens.)

2.5. Ancient sources to be given special emphasis:

Dramas by Aeschylus, Sophocles, Euripides, and Aristophanes

These plays are poetry that can be analyzed to reveal inherent tensions in the city-state between male and female, private and public, and old and new.

Chalcis decree

This inscription reveals judicial relations between Athens and the city-state of Chalcis. It makes clear the intense level of control that the Athenians exercised over the Greek states in their empire.

Treatise on Athenian democracy by the "Old Oligarch"

This is a fascinating prose work by an Athenian who despises democracy, written to show how strong Athenian democracy is and why it promotes a freer, more individualistic style of life. Students will learn how to read between the lines, so to speak, by analyzing this crucial and complex historical work.

History of the Peloponnesian War by Thucydides

This innovative prose work explores the social and ethical paradoxes of war as well as the harsh military reality of warfare.

The warship of the Athenian imperial fleet

The trireme was a ship of revolutionary design that sported three banks of superimposed rowers recruited from the lower classes of society. Students will learn from study of this source how a major change in technology had a correspondingly profound effect on Greek society.

The Parthenon

This most famous temple of fifth-century Athens demonstrates the overlaps among the categories of evidence that a single source can provide when the complexity of its messages is decoded. The iconography of the Parthenon's sculptural decoration, for example, can be fully understood only when the financial and political policy behind its construction are explored.

3. The Reshaping of the Classical World (377 to 275 B.C.)

The political and social structures of the Greek world underwent fundamental reshaping in the fourth and early third centuries B.C. The kingdom of Macedonia, homeland to

Alexander the Great, became the greatest power in the ancient world and came to dominate the foreign policies of the Greek city-states. Foreign kings, some of whom presented themselves as gods, now had the final say in the destinies of oligarchic and democratic city-states alike. The formerly completely independent citizens of Greek city-states now had to confront a new reality. Although for many people this changed reality may have affected their daily lives only in minor ways, it had a decisive influence on everyone's vision of the possibilities for control of one's fate and for freedom in human life. Thinkers like Plato, Aristotle, and Epicurus offered differing solutions to the political, religious, and moral dilemmas that this reshaping of the world had brought about.

The goal of Part Three is to investigate the changes in the Greek world from the end of the Golden Age of the city-state to the establishment of the divine monarchies that mark the beginning of what historians call the Hellenistic period.

3.1. The Growth of Macedonian Dominance

(Section 1 will explore the reasons for the rise of Macedonia from the status of an insignificant backwater on the northern border of Greece to a superpower strong enough to dominate Greece and conquer Persia.)

A. The Resplintering of Greece

(Subsection A will examine how and why the Greek city-states in the fourth century once again failed to stand united, just as they had splintered a century before when faced with the threat of Persia.)

B. The Macedonian Miracle

(Subsection B will present the evidence for the dramatic changes in Macedonia in the fourth century that transformed it into a world power in a matter of decades. Issues of special interest will be the role in this transformation of new military technology, the nature of charismatic leadership by Philip II, the father of Alexander the Great, and the political reorganization of the Greek world by Philip.)

3.2. The Career of Alexander the Great

(Section 2 will concern the almost incredible conquests of Alexander the Great in the Near East as far as India.)

A. Marching to the End of the World

(Subsection A will investigate the strategy and the infrastructure of Alexander's conquest of Persia. Understanding of his astounding achievement requires thinking about his military, political, and social policies as well as the contemporary geographic conception of the world. Above all, students must address the controversial question of the nature of Alexander's personality and why he wanted to march all the way to China (only the mutiny of his weary troops in India stopped him).

B. The Human God

(Subsection B will concern the disputed evidence for Alexander's request to the Greeks to be worshipped as a god. The investigation will also involve the thorny question of whether the deification of a human being represents a break with Greek tradition or a logical extension of its fundamental assumptions about divinity and human nature.)

C. The Aftermath of Alexander's Untimely Death

(Subsection C will concern the political division of the Greek and Near Eastern world among the commanders of Alexander after his death in Babylon in 323 B.C. at the age of 33. Major questions to be addressed include how these army men turned themselves into a

new kind of king and how they developed new military technology and novel forms of political and religious ceremony to buttress their ambitions.)

3. The Philosophic Response to a Reshaped World

(Section 3 will investigate the response of Greek philosophers to the calamitous changes in their world in this period.)

A. The Response of Plato and Aristotle

(Subsection A will first investigate Plato's thought as a reaction to the relativism of the sophists and the failures of the city-state, in Plato's opinion, to serve as a morally acceptable form of government. Then, this subsection will explore Aristotle's response to Plato. The Aristotelian notion of science is an especially important development of this period. On the one hand, it is related to the quantum leap in basic information about geography, ethnography, climatology, botany, and zoology that Alexander's conquests in the East had made available to Aristotle, his former tutor. On the other hand, Aristotelian scientific thought is important because it influenced thinking on science and technology in the Western world for the next two thousand years.)

B. The Response of Epicurus

(Subsection B will examine the doctrines of Epicurus on atomic physics, religion, and morality against the background of Platonic and Aristotelian thought. His views, especially on how to lead an undisturbed private life even in a time of public turbulence, represent a marked contrast to the utopian views of Plato in particular on how human beings should live their lives and how they should relate to society. The inclusion of women in Epicurus' philosophic circle, on the other hand, represents a logical implementation of Plato's heterodox views on the capacities of women. In short, his intellectual program points the way to the Hellenistic future; that is, Epicurus reshapes what he sees as good from the past and combines it with novel views of his own to produce a powerful new vision of reality and the appropriate human response to it.)

3.3. The Fate of the Reshaped Greek World

(Section 4 will explore the political, social, and religious trends that were to determine the fate of Greek civilization in the Hellenistic period.)

A. The Emergence of Bureaucracy

(Subsection A will examine the political and economic structures of the kingdoms set up by Alexander's commanders, the Hellenistic kings. These kingdoms foreshadow the development of a world that in its entangled and entangling bureaucracy, elaborate taxation, and attempts at complex economic structures resembles our own. One lesson emerges from this story clearly: bureaucratic institutions endure more tenaciously than political regimes.)

B. Greek and Local Cultures in the Near East

(Subsection B will concern the ways in which Greek culture influenced local cultures and was in turn influenced itself in the areas affected by Alexander's conquest. Egyptians, Syrians, Jews—all these peoples and more now interacted with Greek culture in ways unimagined in the classical world. Like our world of today, the Hellenistic world consisted of various communities in transition that absorbed foreign influences while simultaneously trying to maintain their own identities.)

C. The Specter of the Romans

(Subsection C will investigate the causes for the first military contacts between the Greek world and the Romans around 275 B.C. By this time the Romans were poised to become the next international superpower in the Mediterranean world. These contacts foreshadowed

the future domination of the Romans over Greece and the changes that their presence meant for Greek politics, society, economy, and culture. The involvement of the Romans, marking as it does the beginning of a new age in Greek civilization, represents an appropriate point to close this investigation of Greek civilization during the archaic, classical, and early Hellenistic periods.

3.4. Ancient sources to be given special emphasis:

The Republic of Plato

This immortal work lays out Plato's prescriptions for a utopian political world based on the theory of unchanging notions of the good.

Plutarch's biography of Alexander the Great:

The famous biographer's treatment of Alexander's life serves as an example of life lived at the ultimate edge of human possibilities as envisioned by the ancient world.

The Athenian hymn to Demetrius the City-Besieger:

This extraordinary poem was commissioned by the Athenians to honor this infamous Macedonian successor of Alexander the Great as a living god. Like no other document, this poem sums up the contradictions of the Hellenistic age.

Theophrastus' Characters:

This is a prose work vividly portraying the mores of a changing society by its depiction of personality types and social stereotypes that range from the admirable to the utterly ridiculous.

The Temple of Apollo at Didyma

This massive and enigmatic structure allows the student to explore the complex interplay between cult ritual, the architecture of an oracular shrine, and the politics of Hellenistic life.

Portraits of contemporary rulers on coins

These elegant, tiny sculptures in relief give us some of the earliest examples we have of genuine portraiture as well as a fascinating glimpse into the iconography and the assumptions of the controversial Hellenistic practice of regarding rulers as gods.

USING *PERSEUS* IN A VARIETY OF EDUCATIONAL SETTINGS

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Perseus Project
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In order to discover how **Perseus** might be used in a variety of educational settings, two members of the project conducted interviews with professors, instructors and other educators about the use of **Perseus**. In November and December of 1987, Eleanor Hight contacted art historians at Brandeis, the Rhode Island School of Design and Boston University; Elli Mylonas interviewed the rest. The subjects of the interviews were chosen so they would represent a variety of disciplines, as well as different types of institution (See below, and page 16). Altogether, twenty professors at twelve colleges and universities were interviewed.

Procedure

The interviews took place as follows: first, appropriate candidates were contacted. Those who agreed to the interview were sent a short introduction to **Perseus** consisting of a sample list of textual and visual material, a written description of its features and a list of questions to stimulate discussion, as well as a brief statement of our goals and purpose in conducting the interview (included as Appendix A). When the candidate had had a chance to think about the material, the actual interview took place, in person if geographically possible, otherwise over the phone. Although **Perseus** has not progressed far enough to be able to show actual material from the database, a demonstration version of some materials does run on a Macintosh. Whenever possible, this was used to give an impression of how the system might look and act.

The disciplines canvassed were both the obvious audience for **Perseus**—people who teach ancient literature, history or art at the college level—as well as some who are less immediately involved with the Classics. For example, we approached professors who teach western civilization, surveys of western art, and classical philosophy. We also interviewed those who are not in the position to use **Perseus** as a primary instructional material, but might incorporate it into their curriculum as a reference tool, or as a smaller research assignment, if it were already available at the university. For example, professors of French and German literature, philosophy other than classical philosophy, architecture, and English. The interview subjects were not chosen at random. Usually they were known to the interviewer or another member of **Perseus**. This made it possible to contact more people. Although we did not account for computer experience in our choice of subjects, the resulting pool included varying amounts of expertise. A pool in which knowledge of and partiality to computing in education was slightly predominant was inevitable, once again, because these are the people who were interested in being interviewed. Neither of these two points seems to have biased the interviews, since these are the same people who would be the first to use **Perseus** in the classroom.

In order to get a wide range of opinions, it was important to talk with professors at many different types of institution. The range of institutions includes large private universities such as the Ivy League schools, small private colleges such as Brandeis and Boston College, large public universities such as the University of Illinois at Urbana, and smaller public colleges such as Rhode Island College (see list on p. 16). Many of the schools are in the Northeast, since it was much easier to contact people at colleges and universities that are geographically close to us. It was not possible to interview

representatives of each educational category at each institution, but we believe that a generous distribution across types was achieved.

Evaluation of the Interview Process

Not all the interviews were equally successful. A common problem arose when we told people to bring colleagues who might also be interested; they would bring the department computer enthusiasts, who held the conversation to technical topics and intimidated the other faculty present. These people offered some good suggestions, but were not necessarily good interview subjects. The author also had to learn how to lead the discussion and how to best put the questions. As a result, the first few interviews conducted were not as fruitful as the later ones. With practice, she became more adept at focussing the conversation on the topic, and better able to elicit the proper types of information. The most successful interviews consisted of a combination of directed questions from the interviewer and free conversation proceeding from the issue at hand.

It was also interesting to discover that the demo on the Macintosh was not always an advantage. A few times, the person being interviewed became fixated on certain technical aspects of the demo, and was not able to get past these and visualize the project as a whole. Most of the time, however, the Macintosh was helpful not only in showing what **Perseus** can do, but why a computer can offer so much to education. The speed and the ability to make connections among different types of information are difficult to grasp for a person who has had no contact with computers, or just with traditional computer applications such as word processing or traditional databases.

The interviews were, on the whole, very productive and informative. We gathered a great deal of information on how different people might use **Perseus**; some confirmed what we already assumed, a few contradicted it, and many had novel ideas to add to it. There was also a by-product from the interviews that may ultimately turn out to be more significant for the project. Often we did not get straight answers to the suggested questions that we had sent out, but many questions in return, and qualified answers based on our response. Most of the interview subjects made demands for particular types of material and suggestions for its presentation. Many of these suggested improvements and requests were very well thought out, and will influence the content and design of **Perseus**.

Interviews

Although there were some differences in how teachers from different institutions felt **Perseus** would fit into their curricula, there were more similarities across schools and disciplines than differences. The opinions voiced by professors who are more peripherally involved with Classical material in general, or less familiar with either the visual or the textual sides of the database were different from those in Classics. These scholars saw in **Perseus** just as much a research tool for themselves to use when preparing lectures as a resource for their students.

Brown University

As might be expected, reception at the Ivy league schools was warm. Professors are eager to use *Perseus* and can come up with many different ways to integrate it into their curriculum. At Brown, professors could imagine using *Perseus* in many different classes; both ones required of Classics majors, as well as courses for other majors, such as History. Each of the Classics professors interviewed discussed one particular course in detail, and one then went on to describe a wide variety of possible ways he might use *Perseus* in almost all the courses he teaches¹.

The three detailed descriptions were of two smaller upper level undergraduate courses of about 30 to 50 students each, and a big lecture course on Ancient Greek civilization which has about 100 students. All three are taught in translation (no Greek is required). In "Beginnings of Political Thought" which is part of both the Classics and the History major, Prof. Kurt Raaflaub felt that the primary source material that *Perseus* provides would be very helpful and could be used as background material for students who are not always familiar with basic information they need in order to be able to understand the concepts the course is trying to develop. The maps and the ability to interconnect literary with historical material were also attractive features. Prof. William Wyatt, who teaches the Ancient Greek civilization course, has similar expectations from *Perseus*, although at a less advanced level. In this class, too, reference material is needed to supplement lectures and readings. Students could benefit from the rich collection of maps, the timelines, and from encyclopedia entries on proper names. Since this is a course on Greek civilization, images would be necessary; the variety in *Perseus* and the ease with which even a novice to Greek art can browse them would make these objects less exotic to the student. In Prof. Alan Boegehold's "Ancient Greek Political Theory and Practice," images and text are equally important. Artifacts, plans of the public areas of Athens, and texts about political practices and procedures would all be used to show a student how the Athenian legal system worked, and what evidence our knowledge is based on. The spatial browsing tool is especially relevant for this class, because the student must be familiar with the topography of Athens in order to understand the significance of archeological and literary evidence.

Finally, Prof. Boegehold made a number of suggestions for using *Perseus* in other classes, including lower and upper level language classes, prose composition, and even methods classes for undergraduate majors and graduate students. In the language classes the database could play the role of a primary text,² and any of the text tools such as the parser, dictionary and metrical views could be available to the student. Prof. Boegehold would have upper level courses use the on-line texts as a basis for building a commentary. This is practicable today, but would have new relevance in electronic form, since

¹ This professor had the least computer experience of the three, being only a confirmed user of word processing software. It was often the case that teachers who were less familiar with computers had more to say when presented with the idea of *Perseus*, perhaps because they have fewer preconceptions about how computers should be used.

² Few faculty seem ready to abandon hard copy books for electronic media entirely, perhaps rightly so. Their confidence in the readability and versatility of the new medium has not yet been established (see p. 11 for further discussion).

collaborative work and cross referencing become much easier. In his prose composition classes, the morphological parser used as a spelling checker would take over much of the mechanical correction that the professor usually does, and give instant feedback to the student as well. In all these classes the wealth of related pictorial and geographical information in **Perseus** would enhance the experience of any student coming into contact with antiquity, because she would have instantaneous and easily navigable reference material at hand.

Syracuse University

Prof. Karen Bassi, at Syracuse University, would be able to use **Perseus** both in a large lecture course on mythology and in smaller Greek language reading courses. In the lecture course, which is taught each year and has about 150 students, **Perseus** would be useful both for Prof. Bassi, to help in preparing lectures, and for the students, as reference material. She was very interested in the collection of images, and would use whatever authoring system **Perseus** provides to make up her lectures and to compile collections of images to show in class. Making up lectures, even for a course that is taught year after year, means sitting at a desk with fifteen or more books scattered all around. Prof. Bassi felt that being able to use an on-line linked database or hypertext system would make the job easier and more interesting, and ultimately better for the students. She would also replace the library assignment that is used to familiarize the students with the library and group work by an assignment in **Perseus**. For this assignment, the students are divided into groups and sent into the library to research a particular topic. By replacing the library with computer, students will be able to concentrate on the research methods and on the materials, and also be exposed to far more information, more easily than before. For the survey course, she did not want to use **Perseus** as more than reference, although this does not preclude the creation of course units that would be used to clarify a particular subject covered in class.

In the smaller Greek reading classes, Prof. Bassi would be able to use all the text tools, and she would customize the texts with her own comments. She looks forward to spending a great deal of time in the preparation of materials for these courses, especially when she teaches works which do not have an appropriate commentary.³ The result would be like a custom text book, made especially for the class, and tailored to any problems that a particular class might have. It also would be a much richer experience for students, who are often stymied by conventional commentaries, which seem never to address the problems that the student is having. The information on the texts themselves would be supplemented with historical information about the period, and especially geographical and topographical information and relevant vase paintings.

³ Often works that have enough low level grammatical commentary do not have an equally good critical commentary. This is because many of these were written when the only readers needing help with simple grammar were schoolboys. Students now are older, and need more interpretive information, but this is either not available, or it is too technical, to be found only in commentaries for scholars.

Rhode Island College

Rhode Island College is a state commuter college. All freshmen are required to take a class called "The Western Experience," and most professors in history and other disciplines teach a section of the course. However, the RIC professors did not think *Perseus* would be an appropriate teaching tool for students at this level. They felt that the wealth of material, and the ability to move around by oneself, together with the amount of primary material the student would have to assimilate, would be too confusing for a freshman. Many incoming students are not capable of extracting information from a reading assignment and using it in a discussion section or a paper. Therefore, faculty prefer to give only secondary material to the freshmen, and using this, try and teach them the basic techniques they need to read critically.⁴

Prof. Donald Sippel, who teaches classical history, however, could use *Perseus* in any and all of the more advanced courses that are required of Classics and History majors. The college has an eclectic but not very large library, and students cannot be expected to buy many books, so the database would provide material to which students do not ordinarily have easy access. He would be eager to use the maps and plans of historical sites, as well as the available texts and history book. His students could use as much background information as is provided. Thus, the encyclopedia would provide a needed set of references, and the ability to move quickly from text to encyclopedia entry would make the student more likely to follow a query. Prof. Sippel would be very eager to use available authoring tools and prepare "reading assignments" through the information that the students would peruse at their leisure. Greek is not taught at RIC, so the language tools would not be of use to students, but the historians said that they themselves could use them, in researching material to be used in lectures.

Brandeis University

At Brandeis, as well, there is a required course that all freshmen must take, called "University Studies in the Humanities." Because it has about 400 students each semester, many faculty members teach it; each person customizes it as they see best, but all classes adhere to some basic guidelines and there is a common core of assigned readings. Since some ancient material is included each year, *Perseus* would be appropriate for this course. As did faculty at other universities, Prof. Leonard Muellner felt that it would not replace the books that students are assigned to read for two reasons. First, the Loeb translations planned for *Perseus* are not the best available, and are not always easy to read, and second, he did not want to take the student away from books. However, the texts in the database would be used as a means to get the student to look at other information. The visual material and the spatial browsing tool are especially attractive to Prof. Muellner, because he feels that pictures help to interest students who would not otherwise get involved with the material. He pointed out that this is a way of looking at antiquity that students cannot often get, even if the images are available in books in the library or on slides. He preferred the loose structure of built-in links and optional authoring tools that *Perseus* provides, so that he can prepare his own assignments for his classes.

⁴ *Clio*, a computer aided instruction program is being developed at RIC for just this purpose.

He would also build **Perseus** assignments for his Classics courses, both in Greek and in translation. As in the Humanities course, in these classes too, visual material is very important for helping students understand the context of the texts that they are reading, and can also impress and attract them. Greek language classes would make use of tools such as the morphological parser and the dictionary. To make **Perseus** more useful in beginning reading courses, Prof. Muellner asked for brief sections on Greek grammar, that could be called up when a particular construction or usage was encountered.⁵ On the whole, he felt that the varying complexity of **Perseus** was one of its advantages. A student can browse it at lesser or greater depth, depending on his or her abilities, or on the paths that the professor has laid out. He thought that **Perseus** would be “intuitive and appealing.”

Prof. Elaine Loeffler, who teaches Greek and Roman art at Brandeis, thought that **Perseus** would be an excellent way for students to study images. In the past professors and students were tied to unwieldy means such as slide carousels and black-and-white study photographs. Images in **Perseus** would be more widely available, and the color would make them easier to understand. Prof. Loeffler would use **Perseus** to assign images for study and comparison. She would also use it as a complement to her larger general courses (50 students or more). In these classes, she has been constrained to either use an anthology of texts, or to assign readings that are on reserve. Neither procedure is ideal, because the anthologies are restrictive, and the reserve books can only be used by a limited number of students. **Perseus** would allow her to choose from among a wide assortment of texts. She would also use it to refresh her own memory, and to find new ways of approaching the material that she teaches every year.

Boston College

The professors at Boston College were the most critical and negative of all the interview subjects. However, they had many useful comments, and they will certainly not be the only ones to come up with these worries and concerns (see below, p. 11). However, they too could see many advantages in using **Perseus** for some of their classes. They also felt that it would have a place in the library, where it could be consulted by anyone who needed it, and used as a kind of reserve book. Prof. Dia Phillipides would like to use **Perseus** in a general course that looks at the performance of ancient plays from antiquity to the present day. Vase paintings of actors and pictures and plans of ancient theaters would be necessary for this, and are often hard to collect. The **Perseus** material could be used with a projector to show images in class, as well as being source material for the students.

If enough grammatical and critical commentary is provided, **Perseus** could be used in middle and upper level Greek classes. One of the professors interviewed said that a few plays, well commented and with rich grammatical annotations, would be preferable to a database containing many plays accompanied only by translations. Another request was

⁵ These would be brief grammatical units like the numbered grammatical comments that are used in *Prose*, a Kinko's program written to help teach English composition. The professor pointed out that standard reference grammars like Smyth are too complex and detailed for a beginning student of Greek.

for search capabilities through the texts and the images. The quality of the information is also an issue; tools must work as expected, and give reliable results, if students are to depend on them. Finally, although the Boston College faculty did not want prepared course material, they did express an interest in having course “kits” distributed with **Perseus**. These were described as collections of primary materials that can be used in teaching a particular subject, preferably made up by a specialist in that subject. An example of this is the collection of pictures that an archeologist specializing in vase paintings would use to illustrate a class on drama. The overall view was that if **Perseus** could provide an enhanced classroom experience, it would be used.

Rhode Island School of Design

Rhode Island School of Design is primarily an art school, but it has a liberal arts program, and students must take courses in art history. Prof. Eva Hoffman, who teaches Greek and Roman art would like to use **Perseus** both for preparing her courses and for student assignments and reference. According to her, the way art history is traditionally taught makes it a passive experience for the student, and a system like this would make it much more exciting and fun. She would like to give weekly assignments using **Perseus**, as well as having her students research their term papers in it. The assignments she would make up in it would incorporate more problem solving than she could expect to, before. Prof. Hoffman does not think that using **Perseus** will have either a positive or a negative effect on whether students are inspired to pursue further research in the library, although she does feel that the immediacy and color of the pictures will make art history more attractive to undergraduates.

Lehigh University

Lehigh was originally an engineering school that is now trying to build up its humanities program. It has a small Classics department with three or four faculty members, in which most of the undergraduate majors are doing a double major of Classics and Engineering. Prof. Julie Williams teaches one of the large required humanities courses, and would like to make limited use of **Perseus** in that, but can see more uses for it in traditional Classics courses. This is not so much a fault of **Perseus** as a result of the goals of the western civilization course. The professor does not want to take the students away from books, especially in an environment where most college study will be outside the humanities. For the western civilization course, **Perseus** could serve as a resource for images to be shown in class. A small university like Lehigh does not always have a good slide collection or even adequate library holdings in the humanities, and students like pictures. It would be presented to the students as reference material, and they would have an assignment in it, as well as use it to find and research paper topics.

This professor saw more scope for using **Perseus** in Greek classes, and classes on literature in translation. As did many other of the interview subjects, she based her discussion of how she could teach **Perseus** on several qualifications of how the system should work. In Greek classes the on-line texts could be used as primary reading material, if the textual tools could be turned on and off by the professor. Students who are just learning to read Greek should not be tempted to look at translations, or to turn to the parser

before they puzzle out a word, whereas students taking Greek prose composition can be trusted to use a dictionary and a parser constructively. The reference material in *Perseus* would be very useful, and would serve to bring the readings into focus for the student. This professor looks forward to authoring courses in *Perseus*, and being able to pull together textual and visual material, and to use the tools provided with both.

Another professor at Lehigh teaches classes in medical etymology, and found that *Perseus* might be tailored to make these classes more interesting. If translations of selections from the better known medical writers—Galen and the Hippocratic corpus—were included in the textual database, they could be used in conjunction with the usual vocabulary exercises to show how the Greeks thought about medicine.

Prof. Williams had some reservations and recommendations for *Perseus*. Students, especially when they are exposed to large amounts of information in an unstructured way, tend to “mislead” themselves, and make associations that are not valid. *Perseus* should make an effort to avoid this, by somehow showing that not all points to which a train of thought might lead are relevant.⁶ This is a part of a teacher’s job that *Perseus* can provide.

Clark University

The most important factor in deciding whether to use *Perseus* is cost and availability, according to Prof. Lora Johnson. She would not even consider it if it were not within the economic reach of some students, and if it were not publicly available to others in the university library or computer facilities. Although she would not find it necessary for her own research, she would use it extensively in her teaching. Small universities like Clark cannot maintain large libraries and slide collections, so *Perseus* could supplement these resources. Prof. Johnson teaches a class in ancient art and a survey of western art in which she would use *Perseus* material for assignments and reference. She would avoid directing students to it to research their papers, since they would not learn the methods of library research. One feature that she would require of *Perseus* is the ability to add images, and to be able to juxtapose existing paintings and sculptures with sketches highlighting elements of their composition.⁷ This is now done in lecture, but it would take up less class time, and be more effective if the student could go through it by herself. She would also like to explain architectural composition by juxtaposing geometrical shapes with pictures of buildings. *Perseus* could be the base for both of the above, if the professor can intervene in the database, and add of her own material.

Prof. Johnson would use the spatial browser, but also wants to be able to browse images temporally, so as to be able, for example, to see the work of sculptors who are contemporaries, but geographically separated. She also recommended the inclusion of

⁶ The problem is inherent when doing any type of research, but would be intensified in *Perseus*, because there would be more connections between different pieces of information, so the student might assume that any proximity is meaningful. Steps to rectify this would also be easier in *Perseus*. If links are mediated through an encyclopedia article or other means of categorization such as a specialized browser, the student will see more clearly which connections are relevant and which are specious.

⁷ *Learning to Look*, by Joshua Taylor, is often used in elementary art history courses to teach students the elements that make up a picture such as form, composition, color, movement, etc.

bibliography, so students would always be aware that more scholarship exists outside a database. Another navigational suggestion she made was to have detailed links around a few central topics, ten or twelve important sculptors of the fifth and fourth centuries, for example. She identified the problem of orientation in the database; a solution that she proposed was to have a defined set of historical and conceptual landmarks that students could come back to.

Peripheral Disciplines

A number of interviews were conducted with faculty in disciplines that are less directly in contact with classical material, such as French, English, Philosophy, Sociology, and Modern Greek. These professors do not teach classes in which *Perseus* could be a principal requirement, but they would use it if it were available, and would like to have at least one copy as reference material for their department. As might be expected, most of the professors interviewed had suggestions for the use of *Perseus* that were different from the classicists and archeologists surveyed. For most of them *Perseus* was as much a tool for their own research as for teaching, as for the students. Most of these disciplines need to have access to classical art and literature, but they do not always have the time or the training to be able to manipulate the volume of information correctly.

Prof. Laura Durand, who teaches French at Brown, said that *Perseus* would be the ideal reference tool for teaching and researching Renaissance literature, for her and her colleagues, as well as her graduate and undergraduate students. Renaissance writers in France were all familiar with Greek literature, and allude to it constantly in their work. For example, in a course on Rabelais, it is necessary to be able to verify references to Greek literature, since he not only mentions most works known at that time, but also adds his own embellishments. The classical encyclopedia and the collection of vase paintings could be used in any class on French literature, because students are not familiar with Greek myths or their iconography. She also said that a major function of *Perseus* would be to serve as a model and a trailblazer for building a similar system for French civilization, and other disciplines as well.

Perseus would be primarily a research tool for Prof. Margaret Alexiou, who teaches Modern Greek literature at Harvard, although she would like students to use maps of Greece, Anatolia and the Balkans. She teaches a Harvard core⁸ course, "Death and the Afterlife," in which she treats ancient and modern literature and folk songs. The vase paintings and texts in *Perseus* would initially be helpful as a personal reference tool for preparing the class, and later, when she was more comfortable with the system, she would like to prepare material in it for the students.⁹ A loosely linked system like *Perseus* "encourages lateral reading." She would also like to use the linguistic information in it for teaching post classical Greek. Prof. Alexiou's main concerns were that the student might get lost in the quantity of information, and that they might be led to believe that there is no

⁸ Core courses are part of Harvard's general education requirement and are taken by students not majoring in that area.

⁹ Prof. Alexiou is a novice computer user, and did not feel confident enough to even imagine guiding her students through electronic material before she had had a chance to use it herself.

need to look beyond **Perseus**. She also suggested that **Perseus** be provided with samples of several translations of well known texts, so students could be introduced to the problems inherent in translation, and also so an instructor can choose among editions to teach from.

Ancient Greek sources have not been as widely used as they should in studying English literature, and one reason may be that they are not accessible to those scholars who are not trained in Greek. Prof. Mary Crane, at Boston College, points out that **Perseus** would open up a whole new area of research. Although she would find a Latin database of more general use for teaching, she could still use information on Greek tragedy and examples of Greek literary forms when she teaches Milton and 17th century literature. Whereas now she has to explain technical allusions and influences in her lectures, she could direct students to **Perseus**, and rely on it to provide examples for them. Prof. Crane has also taught a larger course (60 students) on "Classical and Biblical Background," in which the iconographical and secondary material in **Perseus** would be a welcome addition. The purpose of this class is to familiarize the students with the standard references that they are likely to find when reading English literature. She would assign reports on mythical and historical figures that students could research by using **Perseus**.

At the University of Illinois, Prof. Robert Jones is setting up a Macintosh lab,¹⁰ to be used both for classes and independently. The lab will be supplied with as much electronic teaching and research material as possible, and **Perseus** is exactly the type of application they would like to have. The professors who teach Western Civilization (300 to 500 students each semester) have said that they are eager to use the Macintosh lab, and any software or databases that it can provide. Prof. Jones also teaches the "History of Social Thought," which studies social thought from the time of Plato to the present day, and a course in classical social thought, in which students read Plato and Aristotle. He would use **Perseus** in both of these classes. He sees **Perseus** as a supplement to lectures and discussions, and says that its power lies in giving students easy access to large amounts of material. Professors can only devote about six hours a week to actively teaching one class, so a system like **Perseus** could be used to provide further interactions with the primary material.

Classical philosophers also can describe numerous ways in which **Perseus** fits into their research and teaching curricula. Prof. Charles Young mainly teaches graduate philosophy courses at Claremont Graduate School, but he does teach at least one undergraduate philosophy class a year. He would like to use **Perseus** as a primary source for research, and as such would use search capabilities, the *apparatus criticus* and the translations. Students at all levels could use the same tools, with more or less guidance from their professor. Often students who are studying philosophy need to look at the Greek text, but they are not proficient enough in Greek to read on their own. Parallel Greek and English texts can help them to read and to locate important concepts in the originals.

¹⁰ They plan on having 12 to 14 Mac II's, as well as other equipment.

Attitude to and Availability of Computers

Most of the professors surveyed had a positive view of using computers for teaching and research. However, their attitude is more guarded with respect to teaching, because they are afraid that the machines may take over and displace books if they are not handled properly. For this reason, they do not always want to use the computer heavily in assignments for lower level courses. One goal of lower level humanities courses is to show students how exciting it is to read critically and understand a text. For this purpose, the book as a physical entity is very important because it is easier to read and to internalize in this form. On the other hand, the professors are all very aware of the computer's potential as a research tool, for themselves and, as a consequence, for their students. They have no qualms about advising their students to do research using a computer. Most also mentioned that students themselves are well disposed towards computers, and like to work on them. It appears that faculty have not yet clearly fixed on what the role is to be of *Perseus* in their classrooms. One task facing the *Perseus Project* is to work with them in order to understand and clarify this. On a more practical note, one of the first points to arise when people were asked what worried them about *Perseus* was that it would be impossible to use for many hours because CRT's are hard on the eyes.

Another issue that influenced how *Perseus* was received was cost and the actual or potential availability of computing facilities at the various institutions. Some schools, like Brown, make computers widely available, and provide support to students and faculty alike. Others, like Syracuse and the University of Illinois, have already started creating electronic classrooms and labs that will be available to students and faculty, and plan on helping faculty develop courses to use these facilities. At the Rhode Island School of Design, students learn typography and design on Macintoshes. Professors from these schools had few qualms about introducing computers to their teaching. They were also more confident about the students' willingness to use them effectively. Certain schools, however, can buy very little equipment, as is the case with Rhode Island College, and will probably never have enough to allow widespread student use. In these cases, people were interested by the idea of teaching with *Perseus*, but could not see actually being in the position to do so.

Negative Impressions

Even the most favorable reception of *Perseus* was balanced by concerns about its effect on students and suggestions for its content and presentation. Many faculty surveyed made similar criticisms of *Perseus* and felt that the same features that recommend it for some levels of teaching make it inappropriate for others. Their comments fall into two broad categories; quality, choice and availability of information, and suitability of the electronic format and tools over hard copy and traditional methods. More than one said that a system is only as good as its creator, and wanted assurances of the integrity of the data, the results produced by tools like the morphological parser, and the thoroughness of the links. One particular complaint was about the choice of Loeb editions for the Greek texts and translations. Some professors considered them unacceptable as editions of Greek texts, and unreadable as English translations. Others, more temperate, still would not

assign a Loeb translation for the class to read, but had no objection to using these translations as an entry point into the rest of the database. These professors said that the advantage of having many texts at the students' finger tips offset the negative effects of the lower quality. Another issue of quality arose with respect to tools such as the morphological parser. Some professors wanted to be sure that the results produced by these tools would be accurate. Prof. Phillipides said that even one incorrect or null answer per page was too misleading and frustrating for the students.

Other doubts centered around the effects of **Perseus** on teaching and learning. Profs. Bassi, Boegehold and Williams, among others, felt that students might be led to believe that there is no further information outside **Perseus** and that they need not pursue their research beyond it. The converse of this is that a student might be shocked at coming to an abrupt end of the information in the database by "falling off the edge." A solution that they suggested for both these problems was to terminate each end point in the database with bibliography.¹¹ This would serve the double purpose of pointing those who want to further pursue an investigation towards the library, and of showing that the limits of **Perseus** had been reached. Most professors wanted to be sure that they could have control over which tools were in effect for particular classes and what the presentation of the material was. For example, Prof. Williams did not want her beginning Greek students either to see a translation, or to be able to use the morphological parser. Students tend to mislead themselves, according to Prof. Williams, and this will be intensified in **Perseus**, because of the volume of data and the ease of movement through it. This makes it even more likely that they will be trying to relate information that is not related. She thinks it is very important that **Perseus** find a way to avoid this. Finally, those teachers who depend on images stated that they could not use **Perseus** if the image quality was not at least as good as in art books.

The most severe criticism came from a professor who was not among the official interview subjects. She said that **Perseus** was too easy and pat, and would discourage students from further research. She seemed to feel that the accessibility of the information would make students complacent and less inquisitive. This is an extreme view, but other professors wondered whether **Perseus** would become static and dull when the novelty wore off. Although they were, on the whole, attracted by the the whole idea of **Perseus**, they wanted to spend more time deciding if its attraction was only skin deep, and arose from the use of electronic media, or whether this was a versatile system that could grow and change. Prof. Leoffler also wondered if students would not make use of the unavailability or failure of the computer as an excuse for not doing their work.

Prof. Jones brought up another type of issue completely when he was asked about the negative implications of **Perseus**. He foresees difficulties with the legal and moral issues of copyright, and the right to privacy of one's information. Because electronic media are new, these transactions have not been clearly defined, and **Perseus** will have to

¹¹ Project members had already noted this problem and proposed the same solution. However, it is significant that so many of the professors with whom we talked also identified it as important. Entries in traditional reference works such as the Pauly Wissowa, Oxford Classical Dictionary, Pictorial Dictionary of Ancient Athens and Princeton Encyclopedia of Archeological Sites all conclude with bibliography, and **Perseus** should, too.

proceed into areas that have not been defined. He also mentioned the problem facing junior faculty who want to work with new systems and methods like **Perseus**, and who will be penalized if they do not at the same time produce the requisite hard copy articles and publications. He feels that this will not be solved until the university support structure changes to accommodate new types of academic endeavors.

Suggestions

Most of the professors who were interviewed made suggestions about the content, presentation and delivery of **Perseus**. One interesting request for source material came from Lehigh, where the medical etymology class would become more interesting if selections from the best known ancient medical writers were available. Another idea was proposed by Prof. Alexiou, who would find a selection of several modern translations of texts useful, not only for teaching comparative translation, but also for selecting which translation she would choose for the class to read. Prof. Muellner requested short summaries of basic grammar, which he would use when teaching lower level language courses. Prof. Bassi would like to see a scansion tutorial, so students could look up and study the different types of meter. Incorporated into this she would like short entries that describe the poetry defined by the different meters. Other requests were for annotated bibliographical entries, so that students have more on which to base a decision to look for a book, an index of proper names and an iconographic index for look-up purposes. There were also many discipline-specific requests for material that might be entered later, such as the maps of Byzantine and Modern Greece requested by Prof. Alexiou.

None of the professors with whom we talked wanted to use any prepared course material. Two, however, Profs. Bassi and Williams, suggested that syllabi or other material that show how **Perseus** has been used in the past would be of great help to new users. Prof. Loeffler thought that perhaps some prepared material would be helpful for younger faculty who do not yet have teaching experience, and who need all their spare time in order to publish articles. Prof. Phillipides also said that she would find some collected primary material useful; for example, a collection of images that are all relevant to one subject. Almost all faculty wanted to be able to customize the presentation of the material on the screen by setting filters that would allow certain tools and views, and to have enough authoring tools to be able to provide some guidance for their students. For research purposes, almost everyone wanted to have search capabilities.

Some more practical requests were made as well. Prof. Williams said that the system really required multiple windows in order to be effective. Others wanted to be sure that **Perseus** material could also be moved outside **Perseus**. They pointed out that it is important for students to be able to print out information, and also to be able to move sections of text or commentary into a word processing application. A piece of advice from Prof. Loeffler was that **Perseus** should work together with young faculty of about ten years teaching experience, since they are the most likely to be in touch with students and to understand the need of students today.

General Conclusion

On the whole, *Perseus* was well received, and the criticisms and suggestions made were constructive. The professors who were interviewed all indicated two basic ways of using it. They want to be able to use it as reference for their teaching and research, and they want their students to use it, as primary course material and as reference. In college, students learn to think like scholars, so a system that is used both by the instructor and the student will narrow the distance between the two roles. It is also easier for faculty to teach using the same system in which they do their own work, as they already do in the paper world. The contents of *Perseus* will not be sufficient for in-depth research by an expert in a particular field, however, the *Perseus* software tools can provide the framework for a scholar's own original research. A specialist might conduct research in the library and then use *Perseus* to organize her original information, thus adding to the database in the process. Many professors would use it either to go over the material they teach each year and look for new ideas, or to brush up on areas with which they are not familiar. In smaller departments especially, two or three people may have to cover all areas of classics and archeology; for example, in one semester, a single professor might have to teach western civilization, intermediate Greek language and an introduction to classical archeology. In such cases, *Perseus* would be a reference for the subjects outside the teacher's expertise. Professors outside the domain of classical knowledge presented similar plans for the use of *Perseus*. They emphasized its relevance in their own research, but welcomed its role in teaching, since it would be able to provide needed background for the students, and free up class time for discussion.

The concerns that were raised were one of the most useful results of this survey. The quality of the information in *Perseus*, the problems of orientation and navigation in the database, and the role of the database with respect to the rest of scholarship were the most prominent ones. The project team will use this information in their planning and design. Some concerns appear to stem from the use of an unfamiliar new medium. Others are pitfalls that must be avoided in any educational tool. For example, project members must be sure that all information is accurate and up to date, and that answers from software tools are at least as correct as paper analogues, if not more. Another problem, of which we are aware, is the choice of Loeb editions as the texts and translations in *Perseus*. Although these are not the most recent or authoritative versions of all texts, it is possible to get rights to them and then to update archaic translations and editorial additions. Furthermore, these are the editions used most often by non-Classicists who work on Greek texts. The problem raised most often, however, is unique to *Perseus*; because it is using a new medium, and because it will have so much information in it, students may not be aware that there is much that is not included. The suggestions, however, were all very innovative and forward looking. It seemed as if faculty finally had an opportunity to ask for, or to be able to create the teaching materials they had always wanted.

The professors interviewed often felt that *Perseus* would not change their model of how they want to teach, but that, by allowing them to come closer to it, it would definitely affect how students learn. *Perseus* is a tool that can provide access to the information they had always hoped students would discover. Using it, teachers would have to worry less

about transmitting information in class, and be able to concentrate on its analysis and assimilation. This shift in emphasis might change their actual teaching methods, but it would bring them closer to the model they have of how classes should be taught. Many remarked that the speed with which the students could follow a reference or look at related material using the computer would “enhance their learning experience.” Another point of view came from all the professors outside Classics. **Perseus** can act as a useful tool for scholars and students who do not have extensive training in Classics, but who need to be able to use Classical material. They saw **Perseus** not only as a research and teaching tool, but as a model for similar databases that they hope will be created for their own disciplines. An encouraging final question from many respondents was to ask when **Perseus** would be available.

Colleges and Universities Surveyed

Boston College Newton, MA Catholic university 7500 students	Harvard University Cambridge, MA private 6000 students
Brandeis University Waltham, Mass private 3000 students	Lehigh University Bethlehem, PA Private, engineering school 5000 students
Boston University Boston, MA private 13000 students	Rhode Island College Providence, RI State commuter college, 4 years 8000 students
Brown University Providence, RI Private 5000 students	Rhode Island School of Design Private, fine arts college 1900 students
Claremont Graduate School Claremont, CA Private 6000 students (1000 graduate)	Syracuse University Syracuse, NY private 12000 students
Clark University Private Worcester, MA 2000 students	University of Illinois Urbana, IL public 12000 students

Professors and Teachers who were interviewed

Margaret Alexiou Harvard University, Modern Greek	Leonard Muellner Brandeis University, Classics
Karen Bassi Syracuse University, Classics	Jeff Newton Rhode Island College, History
Alan Boegehold Brown University, Classics	Dia Phillipides Boston College, Classics
Michael Connelly Boston College, Slavic Languages	Kurt Raaflaub, Chairman Brown University, Classical History
Mary Crane Boston College, English	Donald Sippel Rhode Island College, Classical History
Laura Durand, Chairman Brown University, French	David Thomas Rhode Island College, History
Eva Hoffman Rhode Island School of Design, Art Historian	Julie Williams Lehigh University, Classics
Lora Johnson Clark University, Archeology	William Wyatt Brown University, Classics
Robert Jones University of Illinois, Sociology	Charles Young Claremont Graduate School, Philosophy
Elaine Loeffler Brandeis University, Art History	

PERSEUS PROJECT EDUCATION SURVEY

Purpose

The purpose of conducting this interview is to understand how *Perseus* might be used in one of a number of different educational settings. We would like to find out in what ways you might incorporate a system like *Perseus* into your curriculum. We are providing a written sample of what *Perseus* is, what types of things it will be able to do, and a list of questions that you may use as a jumping off point for your own ideas. The project is still at its very beginning, so many of the descriptions and list of contents and features are necessarily incomplete, however, we consider it an advantage to have the opinions and contributions of its intended audience before we proceed too far into development.

Interconnections

All the material in *Perseus*, both visual and textual will be linked together by subject, so that if the person using it is reading a play and sees a reference to Herakles, she will easily be able to find references in other texts, look Greek words up in a dictionary, examine visual representations, and read the classical dictionary entry on Herakles. Images will be retrieved by *topic* to allow access to a number of images that depicting the same subject. For example, there may be a number of different views of the Erechtheum, which will all belong to the same *topic*. This will be part of the distributed database.

Navigation

In addition to the general thematic links discussed above, there will be a number of other ways to navigate through the database. A number of visual tools will permit browsing of the visual parts of the database; a spatial/temporal browser to move between spatially related visual subjects, and a typological browser to display material that belongs to the same class. For example, the spatial browser can zoom in from a plan of Athens to a plan of the Acropolis, to a view of the Parthenon. The typological browser might be used to view all the vases of Exekias.

On the textual side, there will be a morphological parser that can lemmatize any Greek word, giving the grammatical information. This may either be used as is, to parse Greek, or as a basis for looking a Greek word up in the dictionary. Greek and English parallel texts will be truly parallel, so that a reader who is unfamiliar with Greek will be able to read the English and compare the Greek when necessary. Greek texts will also be provided with an *apparatus criticus*, which may be called up at will.

Authoring

Perseus is not immutable, it can be tailored to the needs of the individual professor or reader. Although the textual and visual databases may not be changed, it will be possible to add new links or paths that navigate through the data, as well as supplementary materials. Tools will be provided for this purpose, so that professors may build their own courses around a particular topic and distribute it to the students.

LIST OF IMAGES

Ideally, the visual database will include reproductions of works from the major collections of Greek art in America and Europe, and from excavations. In addition, architectural monuments will be represented through a variety of means. Selected topics and subjects will have associated articles and detailed catalogue entries. The following list is a representative sampling of the visual material that will be in the finished version of **Perseus**.

Maps of countries, regions, and cities

Architectural drawings, including plans, sections, restored elevations and perspectives, and details

Drawings and diagrams of artifacts

Landsat Images

Color and black-and-white images of topography and architecture

Color and black-and-white images of art and artifacts (sculpture, vase paintings, etc.)

3-D computer modelling that will enable walking tours of buildings and sites

Videotaped segments on architecture and sculpture to be made in museums in the US and in Europe, and in selected sites in Greece

A numismatic atlas of ancient Greece

LIST OF TEXTS

The following list is a representative sampling of the textual material that will be in the finished version of *Perseus*. It is partially based on the Harvard graduate reading list, and the University of Chicago Readings in Western Civilization. It is not a complete list, however, and there is no guarantee that texts appearing on this list will be in the final product.

Primary Texts (in Greek and English)

Aeschines	selections
Aeschylus	all
[Pseudo] Apollodorus	all
Apollonius Rhodius	all
Aristophanes	all
Aristotle	<i>Ath. Pol., Nichomachean Ethics, Poetics ...</i>
Demosthenes	<i>Olynthiacs, Philippics, On the Crown, ...</i>
Dionysius of Halicarnassus	selections
Epictetus	<i>Encheiridion</i>
Epicurus	<i>Letter to Menoeceus</i>
Euripides	all
Herodotus	all
Hesiod	all
Homer	all
Homeric Hymns	selections
Isocrates	selections
Lyric and Elegiac	selections
Lysias	selections
Old Oligarch	all
Pausanias	selections
Pindar	selections
Plato	<i>Apology, Crito, Gorgias, Phaedo, Republic, Symposium ...</i>
Plutarch	selections
Sophocles	all
Strabo	selections
Thucydides	all
Xenophon	selections

Secondary Texts

Liddel and Scott	<i>An Intermediate Greek-English Lexicon</i>
Bury	<i>A History of Greece</i> (portions)
<i>Harper's Classical Dictionary</i>	
A Greek grammar	

QUESTIONS TO PONDER

These are some questions which reflect the kind of information we are trying to collect. Please do not restrict your comments and potential uses to them, we have included them merely as a guide.

- In what classes could you use **Perseus**?
- How might you use it in a traditional class?
- A less traditional class? Adult Education?
- Would you be more likely to use it throughout the course, or just for certain parts?
- How would you use the visual part of the database?
- How would you use the textual part of the database?
- What types of work would you want students to do with **Perseus**?
- Could **Perseus** be a reference work in your curriculum?
- Would you prefer to enhance it with your own material, or use prepared material?
- Would you develop your own courses using **Perseus**?
- How might **Perseus** enhance the learning experience for the students?
- How could **Perseus** serve you as a research tool?
- How might it serve as a resource for preparing a course?



Teaching with *HyperCard*

An Evaluation of the Computer-Based Section in Literature and Arts C-14: The Concept of the Hero in Hellenic Civilization

1. Introduction

During the fall semester of the 1987-88 school year, the *Perseus Project*¹ prepared courseware for a computer-based section of Literature and Arts C-14: The Concept of the Hero in Hellenic Civilization, which is taught by Gregory Nagy, Francis Jones Professor of Classical Greek Literature and Professor of Comparative Literature at Harvard University. Our purpose was to gain an understanding of how students responded to computer-based instructional materials, which offered to a very limited extent the types of information and tools that *Perseus* will incorporate. The following brief description of the course will introduce the problems that the experimental section hoped to solve.

Heroes, as the students informally refer to the course, is part of Harvard's Core Curriculum that "seeks to introduce students to the major approaches to knowledge in areas that the faculty considers indispensable to undergraduate education."² Since 1982 all Harvard students have been required to take at least one course for a grade in eight of ten subdivisions in the Core.³ In some cases students may take courses in the Core to fulfill requirements for their fields of concentration. For many students, therefore, the primary reasons for taking the course are the requirement and a lack of other choices, while for others, the course may represent a chance to enhance their already significant understanding of the material. Such different reasons for taking the course as well as the students' widely varying educational and cultural backgrounds can often create problems for professors as they formulate their presentations of the subject matter.

The annually published *Course Evaluation Guide* provides the following formal description of the Heroes course: "Literature and Arts C-14 seeks to offer alternative perspectives on the individual and society through a study of the ancient Greek hero. Since the Greek concept of the hero had a ritual dimension not readily apparent from the semantics of our word 'hero,' this course confronts the historical reality of Greek hero-

¹The *Perseus Project* is working to create an interactive database of texts and graphic images for the study of Ancient Greece. Currently in the pilot phase, the project is in the process of determining the range of materials that will be included, designing the data structures, and evaluating potential delivery environments and user interfaces. Support for the Perseus Project is provided by the Annenberg/CPB Project, Apple Computer, Inc., The Packard Humanities Foundation, and the Xerox Corporation. Those who have made significant contributions to the design and implementation of the courseware are Elli Mylonas, Gregory Crane, and D. Neel Smith of the Perseus Project; Randall Trigg, Lucy Suchman, and Deborah Tatar from Xerox PARC, and, of course, the students themselves who were patient, forgiving, and extremely helpful throughout the semester.

²Faculty of Arts and Sciences, *Courses of Instruction 1987-1988* (Cambridge: Harvard University, 1987), p.1.

³Faculty of Arts and Sciences, *Handbook for Students: Harvard College, 1987-1988* (Cambridge: Harvard University, 1987), p. 23.

cults, a religious practice that is contemporaneous with, but not derivative from, the portrayal of heroes as found in the Homeric epic.”¹ Nearly 500 students enroll in Heroes each year. Professor Gregory Nagy presents a lecture twice each week.² All students attend these lectures and are expected to participate once a week in sections of approximately twenty students each. Teaching fellows, who are generally graduate students in related fields, e.g. classics, religious studies, or comparative literature, lead the sections meetings. They are responsible for answering questions that arise from the lectures and readings, and conducting discussions on the major themes of the course. Section leaders also help students prepare for the midterm and final examinations and guide students in the composition of a term paper.

Given the diversity of the enrollment, over the past several years two problems have become endemic with the current approach in Heroes. First, students often find the material confusing because they lack a sufficient background in Greek Mythology.³ Students do eventually learn about the underlying multiforms of the Greek mythology and the relationships among the gods and heroes through a careful reading of the primary works; however, in the early weeks of the course students often do not enjoy and fully comprehend the material. Secondly, the term paper assignments often erroneously presuppose that students have an adequate command of the methods that are appropriate to the analysis of Greek literature.⁴ Although reading in the primary literary works and

¹The Committee on Undergraduate Education conducts an annual survey of undergraduate courses and publishes the results in the *Course Evaluation Guide*. For each course, the reviewer provides a summary of the students' comments from evaluations that they complete in class near the end of the semester. The description quoted above comes from the 1987-88 edition. The following is a complete list of the primary readings: Homer, *Iliad*, *Odyssey*; Proclus, *Summaries of the Epic Cycle*; *Homeric Hymn to Demeter*, *Homeric Hymn to Aphrodite*; Hesiod, *Theogony*, (lines 1-115), *Works and Days*, selections from Theognis of Megara; Herodotus, *Histories*; Aeschylus, *Agamemnon*, *Libation-Bearers*, *Eumenides*; Sophocles, *Oedipus the King*, *Oedipus at Colonus*, *Antigone*; Euripides, *Medea*, *Hippolytus*, *Bacchae*. The students were also asked to read G. Nagy's, *The Best of the Achaeans: Concepts of the Hero in Archaic Greek Poetry*.

²To provide the reader with a better idea of the course's content, the following is a schedule of lectures given during the semester: 1. Tentative definition of the Greek hero. Relationship of hero and epic. Case in point: Herakles in the *Iliad*. 2. Introduction to the epic poetry of Homer. 3. Outline of the *Iliad*. 4. The hero as ritual substitute. 5. Achilles and the Greek customs of lamentation/"keening." Meleager's "ascending scale of affection": a hero's mode of defining the self. 6. The hero's tomb and the hero's other self. 7. Slide lecture, featuring Black Figure paintings, with focus on the hero's other self. 8. Poetic categories for the hero. 9. Outline of the *Odyssey*. 10. The concepts of Homeric *noos* 'mind' and *nostos* 'return'. 11. Odysseus and St. Elias: a look at the continuity of Greek traditions. 12. Alternative types of hero. 13. The hero as exponent of *dike* 'justice.' 14. The hero as exponent of *dike* (continued). 15. The concept of the hero in Herodotus. 16. The concept of the hero in Herodotus (continued). 17. Oedipus. 18. The *Oresteia*. 19. The *Oresteia*. (continued). 20. The female hero. 21. The female hero (continued). 22. The hero's agony. 23. The hero's agony (continued). 24. The hero as savior.

³In 1987-88 edition, the *CUE Guide* reports the following about Heroes under the category "difficulty," in which the reviewer gives the "respondents' comments on grade competition, course workload, and suggested background." (p. vii.): "Most students feel that the workload in Literature and Arts C-14 is easily manageable and agree that no particular preparation is necessary for the course. A small number of respondents, however, note that some knowledge of Greek mythology or previous exposure to some of the required texts is helpful." (p. 59.)

⁴In the fall semester of 1984 the paper topic required students to analyze a recognition scene in the *Odyssey* in terms of Aristotle's definition of *anagnorisis* (Poetics 1452a:30-32). In 1985 students were asked to discuss the role of heroes as "revenants" in Herodotus' *Histories*. In the following year students were asked to analyze or compare the "Cretan Lies" of Odysseus. In 1987 students were asked to discuss the garden

writing term papers are indispensable components of the curriculum, students should also have access to information and take part in exercises that will give them necessary background and enhance their skills.

2. Class Survey and Section Selection

In the second week of the semester, students received a sectioning card, on which they listed their five choices for a section meeting time. At the same time, we distributed a questionnaire that asked for the respondents' classes, their concentrations, and for information on their level of experience with computers.¹ Figure 2.1 below provides an overview of the responses. (Responses about experience with other systems other than the Macintosh are not included.)

	Seniors	Juniors	Soph.	Fresh.	Non-Responding	Totals
Class:	60	77	143	126	2	408
Concentration:						
Social Sciences	31	42	83	37	1	194
Physical Sciences	6	7	6	13		32
Life Sciences	13	14	24	15		66
Humanities	10	14	30	15		69
Undecided				46		46
Non-responding					1	1
						408
Macintosh owners:	16	19	35	14		84
Owners of :						
Macintosh Plus	2	2	9	7		20
Macintosh SE	2	7	2	6		17
Macintosh II			1			1
						38
Willing to be in section:						
Yes	11	12	22	16		61
Maybe	1	5	2	4		12
No	48	60	116	105	2	331
Non-responding			3	1		4
						408

Figure 2.1

The principal reason for distributing the questionnaire was to determine who would be willing to participate in the computer-based section. Seventy-three students who

imagery in works from the *Iliad* and *Odyssey* to Herodotus' *Histories* as it relates to the character of the hero. Although the topic and scope of the paper are not necessarily inappropriate, they can, as can all similar paper assignments, emphasize the finished essay over the processes that underlie interpretive writing. Inasmuch as only 17 per cent of the enrollment concentrated (Harvard's term that corresponds to 'majored' at most colleges and universities) in the humanities, the assignments are of questionable value with regard to improving skills that are transferable to the other fields of study.

¹Although we asked about the respondents' experience with all types of computer systems, we were most interested in the number of students who owned or had worked with Macintosh computers.

responded with “yes” or “maybe” to the final question on the survey, “Would you like to participate in the computer-based section?” became the pool, from which we formed the section. Although twenty is generally the maximum number of students for a section, we initially chose twenty-five students because we anticipated a slightly higher level of attrition than one would normally expect. Our selection criteria, in the order of importance, included location of residence, ownership of a computer, class, and experience with computers.

Our ability to provide support for members of the computer-based section was the highest criterion for selection. Because we held section meetings in Winthrop House, one of thirteen student residences at Harvard, and would have more frequent contact with the residents, we preferred students from that house. We ultimately chose 63 per cent of those residents of Winthrop House who expressed a desire to join the section.¹

The next highest priority was to select students who owned machines that could run the software for the course. Although the university made five Macintosh Pluses available at the Science Center for students who did not otherwise have access to a computer, we wanted to minimize the students’ inconvenience whenever possible. We selected six students or 15.8 per cent of those who owned the appropriate systems.

The third priority was to balance the composition of the section according to class. We placed six freshmen in the section (4.76 per cent of freshmen respondents), seven sophomores (4.84 per cent of sophomore respondents), eight juniors (10.4 per cent of junior respondents)², and four seniors (6.67 per cent of senior respondents). Finally, because we would be working with potentially problematic software, we wanted to have a relatively large percentage of experienced users in the section. In the group of willing participants, thirty-four, or 46.4 per cent described themselves as novices; 43.8 per cent called themselves intermediate users; and 9.6 per cent characterized themselves as experts. In selecting members of the section, we reduced the percentage of novices and increased the relative number of intermediate and expert users: seven (28 per cent) were novices, fourteen (56 per cent) were intermediate users, and four (16 per cent) were experts.

As expected, we experienced some attrition. Six students decided against continuing in the section. One student dropped the course because of a scheduling conflict. Two students continued in the course but joined other sections, again because of scheduling conflicts. Two other students left the course early in the semester for unknown reasons. One student, however, continued in the course but joined another section because he worked more effectively as a “lone wolf” instead as a part of a team with other students. To our knowledge he was the only person who discontinued as a participant on the basis of the content and approach of the section.

We also gained two participants during the course of the semester. One, a sophomore concentrator in classics, transferred into the section because of the computer-based approach, and the other, a senior concentrator in English, joined the section on the

¹One-fifth of all students who were willing to participate were from Winthrop House. The relatively high percentage of Winthrop House residents was attributable largely to the convenience of the meeting place.

²A greater percentage of the juniors initially joined the section because a greater percentage of juniors (22 per cent) expressed a willingness to participate than seniors (20 per cent), sophomores (17 per cent), and freshmen (16 per cent); also a greater number of willing residents from Winthrop House were juniors: 15.6 per cent as opposed to 13.3 per cent of the seniors and 8.4 per cent of the sophomores (freshmen do not live in the house).

recommendation of her roommate, who was familiar with the Perseus Project and also a concentrator in classics. The final number of participants was twenty-one.

3. Section Objectives

3.1. Presentation of the standard material.

Inasmuch as students in the computer-based section would be writing the same examinations as the others, our immediate objective was to cover the same material in the section as students in other sections would cover. We decided early in the design process that the use of the computer and work on the projects should not represent a significantly larger work load than the teaching fellows from other sections would expect of their students. With the exception of the two projects that students would do in lieu of the paper, the required work for the section would remain similar in all other respects. Instead of using the hardcopy version of the coursebook,¹ students of the computer-based section used a *HyperCard* version distributed on floppy diskette. The discussions in the section revolved around the standard set of study questions that were provided both in the printed coursebook and as part of the courseware.

3.2. Introduction to the use of computers in the humanities.

Secondly, we wanted to give students who were not extremely familiar with the use of a computer an opportunity to learn basic computer skills that they could readily transfer into other learning situations. Although we expected most students to have had some experience with word or numerical data processing, we anticipated that very few students would have used computers for the study of primary literary works and historical settings.

3.3. An atmosphere of collaboration.

We structured the projects as collaborative works. We sought to convey the sense of scholarship as a collective process in which the contributions of many individuals increase the general understanding of a discipline. We designed each student's assignment as part of a larger work and, by organizing teams for each project, encouraged students to work with other members of the section in completing their assignments. We sought to base the success of the collaboration on the quality of the finished work and give the teams

¹The published version of the coursebook contained the syllabus, Proclus' *Summary of the Epic Cycle*, Nagy's translations of the *Homeric Hymn to Aphrodite*, *Homeric Hymn to Demeter*, *Theogony* (lines 1-115), and *Works and Days*, a glossary of key Greek terms, study questions for section meetings, and sample papers from previous semesters. The *HyperCard* version of the coursebook did not contain the sample papers, but was expanded with a set of event charts that presented an overview of the major artistic, literary, and political events for the period covered in the course, an historical atlas, and a bibliography. See the appendix for examples.

the responsibility for ensuring that each member's work conformed to a high standard. Finally, we hoped that the team arrangement would minimize competitive tension.

3.4. Peer review.

We structured the projects to allow students to see and use each other's work. By distributing each student's work to the other members of the section, we hoped to develop a system of peer review that would work analogously to the world of scholarly research beyond undergraduate studies. We hoped that a process of peer review would increase a student's critical competence in two ways: first through having others identify areas of possible improvement and, secondly, through increasing her own ability to criticize effectively not only others' work but also her own.

4. Section Curriculum and Courseware

In keeping with the overall structure of the course, the computer-based section met each week for an hour to discuss the course material. (In the first meeting, however, students met for two hours. During the first hour we discussed the nature of oral poetry, and in the second we introduced *HyperCard* and previewed the courseware.) A small portion of each section meeting was devoted to a review of the students' computer use and work on the projects. In addition to the eleven regular section meetings during the semester, each team also formally met at the end of the semester to review the team's work on the second project. Judging from experience in past years, the time that we devoted to computer-related matters was roughly equivalent to the time normally allocated to the planning, writing, and evaluation of term papers.

4.1. The Courseware

The printed version of the coursebook contained Professor Nagy's translations of the shorter works on the reading list, a syllabus, a set of discussion questions for the weekly section meetings and a few sample papers from previous semesters. We converted all materials except the sample papers into *HyperCard* stacks and augmented them with a time line of historical events, an historical atlas, bibliographical information, and a passage identification tutorial. We distributed the stacks on a single diskette at no cost to every member of the section.

4.2. Organization of the *HyperCard* Stacks

The organization of the stacks mirrored the hardcopy version of the coursebook in some respects. Through the use of cards that served as indices, the information appeared to the user in a hierarchical arrangement. (See figure 4.2.c for an illustration that shows the hierarchical layout in abbreviated form.) From the *Home* card, users entered the data

through selected entry points that we believed would represent the most often used or most relevant places to start. Initially we provided buttons that would take the user from the Home card to the Help stacks, the first card of the syllabus, the table of contents, and three cards that each user could determine. We modelled the user-determined entry points on the tendency for users of reference books to open them to the most frequently used passages, hoping that students would identify such “passages” and create a link to them from the Home card. (See the icons in the second column of the Home card depicted in figure 4.2.a.) After viewing the students’ stacks after the second project, we found that no one had determined her own entry points.¹ In the final version of the courseware that we distributed to the students after the final examination, we removed the user-defined entry icons and the button to take the user to the syllabus. (The entry point in the syllabus would be of little use to the students after the completion of the course.) Because the courseware was designed so that the menubar did not normally appear on the screen to save display space, we also added a *Quit* button to the final Home card. (See figure 4.2.b.)

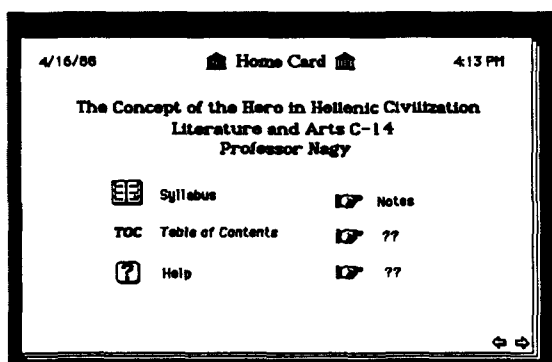


Figure. 4.2.a.

The Concept of the Hero
in Hellenic Civilization

Courseware Diskette

Literature & Arts C-14
Professor Gregory Nagy

4/19/88
12:35 PM

Copyright ©1987
President and Fellows of Harvard College
Annenberg/CPS Project

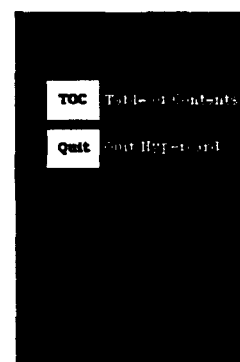


Figure. 4.2.b.

After the Home card, the *Table of Contents* card represented the next highest level of the hierarchical arrangement. (See figures 4.2.c. for the arrangement and 4.2.d. for the Table of Contents Card.) Each of the titles visible on the card existed in an active field that would take the user to the indicated stack or card if the user clicked on the field. The first card in every stack was an *Index* card that displayed the contents of the stack to the user. Following the paradigm of the Table of Contents card, each listing on the Index cards was “active” and provided the user with direct access to cards within the stack. (See figure 4.2.d., the index card of the texts stack.) The three types of cards, Home, Table of Contents, and Index, represented nodes in the database that a user could reach from every card² through the four fields that were located at the bottom of the card.³

¹Judging from responses on the surveys that asked for more training in the basic use of *HyperCard*, we can assume that some students never learned how to create the necessary link. The more experienced users may simply have found the provided entry points sufficient.

²With the exception of the “Home” card, which was the highest node in the organization and did not have the orientation bar at the bottom of the card.

³We were divided over whether we should replace the three active fields in the orientation bar with buttons inasmuch as they only contained labels and functioned essentially as buttons. We also agreed that buttons should bear labels indicating the function or the destination of any movement that they initiate and not information about the current state. Because the fields in the orientation bar provided the user with

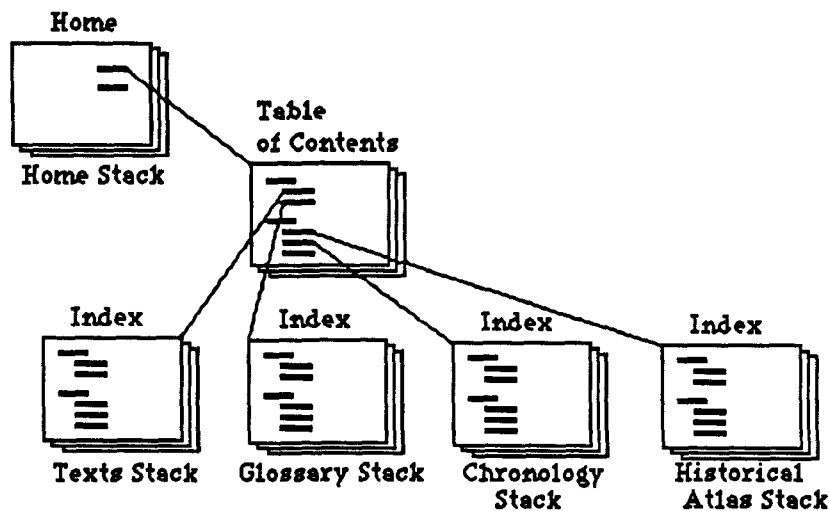


Figure 4.2.c

The field on the far left contained “Heroes” to designate the courseware stacks; by clicking on this field the user could go to the Table of Contents card. Field two, the second field from the left, indicated the name of the current stack; by clicking on this field, the user would go to the first or Index card of the stack. The third field from the left provided the name of card, subset of the stack, or background, depending on the design of the stack. In the final version of the courseware, this button moved the user to the final card in the stack where she could find information on the features of the stack. The final card also contained a button that provides the user with access to the Help stacks. (See figure 4.2.e. that shows the layout of the fields in the orientation bar.) Finally, the field to the far right contained the number of the card in the stack. Every card had the Home button that would take the user to the Home card. For the “Heroes” stacks, the Home button displayed the temple icon.

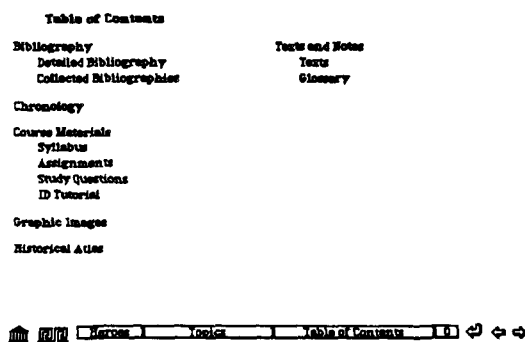


Figure 4.2.d.

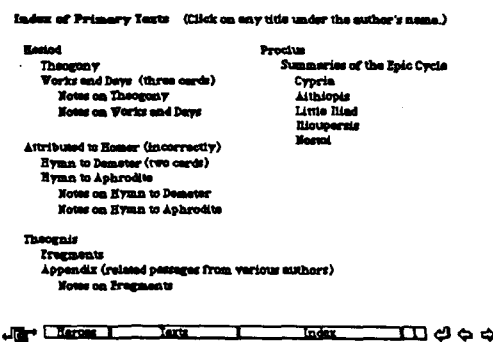


Figure 4.2.e.

information on her current location and always initiated movements to fixed nodes in the network, we left them as fields. In the next version of the courseware, we plan to replace the orientation bar with pop-up or pull-down menus that will give the user more information on her location within the network and more precise control over her movement.

In addition to the Home button and four fields, each card contained *Path* buttons and the usual *Go Back* or *Pop* button, left arrow or *Previous* button, and the right arrow or *Next* button. The *Go Back* button provided the user with means of traversing back over a nonlinear jump, and the *Previous* and *Next* buttons, with means of moving linearly either backwards or forwards from one card to another in the stack. The *Path* buttons allowed users to define a list of cards from anywhere among the stacks that they wished to view sequentially. We envisioned *Paths* for use with the curriculum of the section but never fully implemented them for student use.¹ (See figure 4.2.e., which shows the layout of the buttons in the orientation bar.)

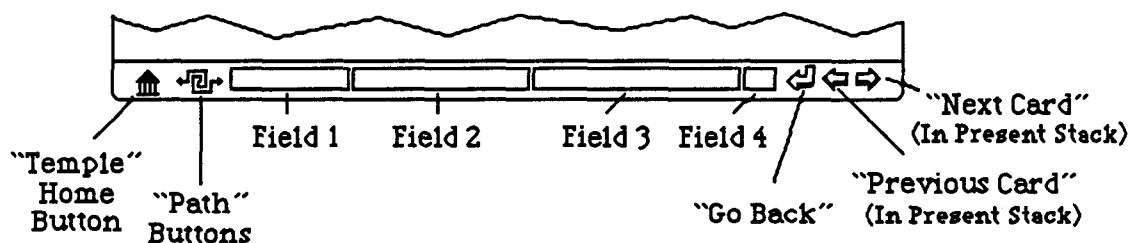


Fig. 4.2.e.

4.3. Text, Notes, and Glossary Stacks

When moving the printed versions of the texts into *HyperCard* we had to decide between a paging and scrolling format. In the paging format we would create a stack for each work and place approximately fifteen lines of text in a non-scrolling field on each card. In the scrolling format we would consolidate all the texts into a single text stack and place each reading in a single scrolling field on one card if possible. Because the number of works was fairly limited and most were rather short, we decided on the latter format to reduce the need to move from one card to another when working with one of the readings. (See fig. 4.3.a.) Using the scrolling format, our largest selection, the *Works and Days* by Hesiod, occupied three cards. In the next version of the courseware, however, we will switch to a modified paging format that will incorporate scrolling fields to accommodate logical segments of the text. Whenever possible, this segmentation will conform to ancient referencing systems. We intend to make the change for four principal reasons: first, the smaller segmentation, which is analogous to the page convention of texts in printed formats, will permit users to transfer materials more easily from an electronic to a paper medium; secondly, the paging format will allow more flexible linking strategies;² thirdly,

¹"Paths" were designed by Elli Mylonas who helped create several of the functions found in the courseware. We hoped to use paths to provide small guided tours through the stacks that would provide background material on a particular topic, much as an instructor in art history would organize a set of slides to illustrate a style or period. In the next version of the courseware, we expect the path cards to play a significant role as originally hoped.

²In *HyperCard* the "go" function provides for movement from one card to another. This does not represent a true bi-directional link but rather a unidirectional pointer. This makes it impossible to "link" one arbitrarily limited element of text--e.g., a word, phrase, sentence, paragraph, or chapter, or graphics--with another. As

the user may more easily transfer reading and referencing skills that she has developed through the extensive use of printed matter to materials in a computer medium;¹ finally, by presenting the material in segments that conform to the logical parts of each work, we can place emphasis on those parts in relation to one another and give readers a better sense of the formal structure.

In the initial version of the courseware, the notes for the texts were placed in a separate stack to give the users easier access to the notes independent of the texts. They have since been consolidated into the texts stack. In the next version, each work will be placed in a stack with the notes. If the user wishes to consult the notes without accessing them from the reference in the text, she may access them by selecting the entry on the index card as is illustrated below in figure 4.2.d.

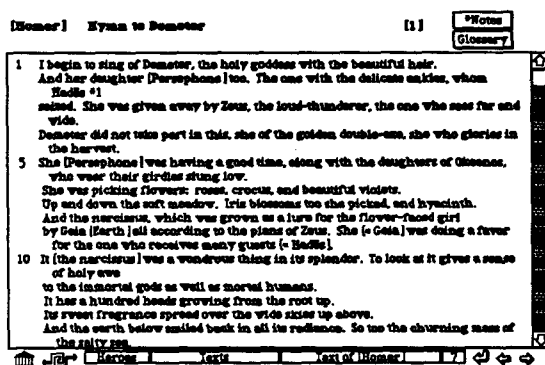


Figure 4.3.a.

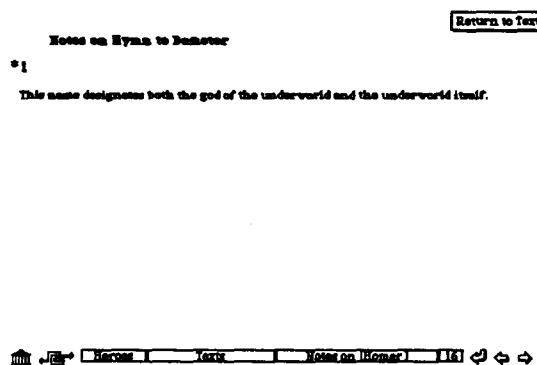


Figure 4.3.b.

Because one cannot create a bidirectional *link* in *HyperCard*, i.e., a record that contains information about the two objects that are linked (generally the source and destination) and about the link itself,² we used a combination of the *go* and *find* *HyperTalk* functions to move the user from the reference in a text to the corresponding note. The user first highlighted the asterisk and number that marked a reference and then clicked on the *Notes* button (see figure 4.3.a. above). The system then went to the first card of the notes, found the name of the work in the text field that contains the title of the card, and finally located the card that contained the appropriate asterisk and number. Figure 4.3.b. above shows a note card.

the element of text or graphics conforms more closely with the "card" unit, the ability to create buttons and scripts that perform similarly to bidirectional user-defined links is enhanced.

¹See K. Morrell & R. Trigg, "From Books to Workstations: Problems in developing a computer-based curriculum in the Humanities," forthcoming in *Proceedings of the International Conference of Data Bases in the Humanities and Social Sciences*, Montgomery, Alabama, July 1987, section 3.2.

²For the brief description of a "link" I have used two models from currently available hypertext systems: NoteCards from Xerox Corporation and Intermedia from I.R.I.S. (Institute for Research in Information and Scholarship) at Brown University. For more information about NoteCards see: F.Halasz, T. Moran, and R. Trigg, "NoteCards in a Nutshell," in *Proceedings of the ACM CHI+GI '87 Conference*, Toronto, Canada, April 5-7, 1987; and R. Trigg, "NoteCards Programmer's Interface: Release 1.3k," Xerox PARC, 1986. For information about Intermedia, see: N. Meyrowitz, "Intermedia: The Architecture and Construction of an Object-Oriented Hypermedia System and Applications Framework," in *OOPSLA '86 Proceedings*, Portland, Oregon, September 29- October 2, 1986.

The texts in the courseware were Professor Nagy's translations. These contained a number of Greek phrases that remained in transliterated form to give students a greater familiarity with terms in the original language. Professor Nagy also created a small glossary of Greek terms that appeared in the texts and lectures for inclusion in the course materials. In transferring the glossary to the computer-based medium, we felt that students should be able to refer to the glossary both from the texts in the texts stack and use the glossary as a reference work when reading printed versions. To use the glossary from a card in the text stack, students highlighted the Greek term and pushed the *Glossary* button in the upper right hand corner of the card (see figure 4.3.a. above). The appropriate glossary card then appeared. To return to the text, the user clicked on the *Return to Text* button that appeared in the upper right hand corner of the glossary card. (The placement of the button in the same approximate position as the Glossary button on the text cards eliminated the need to move the cursor.) The user could also use the glossary stack when reading from the printed version of the texts in the coursebook by using the Index card.¹ Selecting any entry would take the user to that card. When the user accessed a glossary entry from the Index, the Return to Text button was hidden. The user returned to the Index card in the conventional manner by clicking on the second field in the orientation bar. Figure 4.3.c. shows the Index card for the glossary stack, and figure 4.3.d. illustrates a glossary card with the Return to Text button hidden.

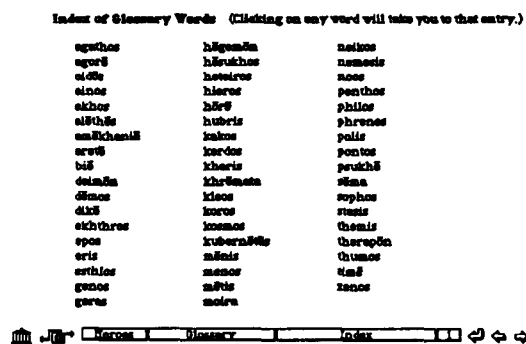


Figure 4.3.d.

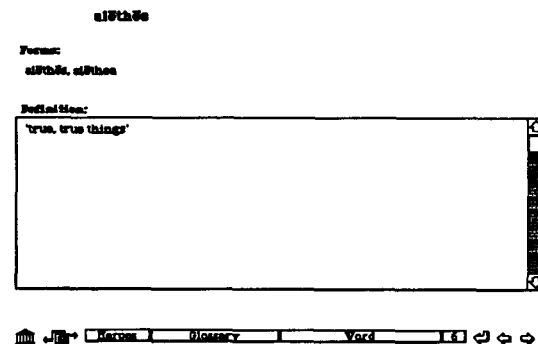


Figure 4.3.e.

4.4. Chronology, Historical Atlas, and Bibliography Stacks

We also supplemented the materials that were available to students in the printed coursebook with a chronology, historical atlas, and bibliography. The additional materials provided historical and geographical information that would help the student develop a better contextual understanding of the readings. We integrated the three supplemental stacks so that each card or event chart in the chronology stack corresponded to a card or

¹We did not collect data on whether the members of the section used the computer-based texts more or less frequently than the conventional hardcopy versions. We have always assumed that given the present display characteristics of the Macintosh and the students' study habits--not to mention the limited access to a computer for most students--members of the section would still use the printed materials for much of their reading. We hoped, however, that for closer reading and study, the computer would become the medium of choice. Under section 7.5 below I will discuss our strategy for monitoring the extent to which computer-based materials displace printed forms in a study session that includes the use of a workstation.

map in the historical atlas. The user could reach a map from the corresponding event chart by clicking on the *Map* button located in the upper right hand corner of the card. Each map indicated only those sites that were mentioned in the event chart along with a few important sites, e.g., Athens, Sparta, Corinth, and Thebes, that would act as orientation points for the user. Thus, users would be able to quickly find a given location because each map contained only a relatively small number of sites.

Art & Architecture	Literature & Religion	Political Events	Map	Bible
c.460 Temple of Olympian Zeus in Athens completed.		459 Persians join Athenian alliance.		
460-420 Polygnotus and Phidias, sculptors, active.	456 Aeschylus' <i>Oresteia</i> ®.	457 Athenian expedition to Cyprus diverted to assist Egyptians in their revolt against Persia. Sparta defeats Melos at Ithome.		
457 Long walls connecting Athens and Piraeus are completed.	456? Aeschylus dies.	457 Spartan expedition to Phocis & Boeotia. Athenians suffer limited defeat against Spartans at Battle of Tanagra. Athenians win control of Boeotia (except for Thebes) at Battle of Oenophyta.		
456 Temple of Zeus at Olympia complete.	455 Euripides' first production.	456 Athens brings Argos, Troezen, & Aegina under its control.		
c.460-460 Hephaestion is begun.	c.454 Thucydides born.	454 Treasury of Delian League moved to Athens. Final defeat of Athenians in Egypt.		
c.450 Statue of Athena Promachos completed by Phidias.		451 Five years' truce between Athens and Lacedaemon (Sparta); thirty years' peace between Argos and Lacedaemon.		

Figure 4.4.a.

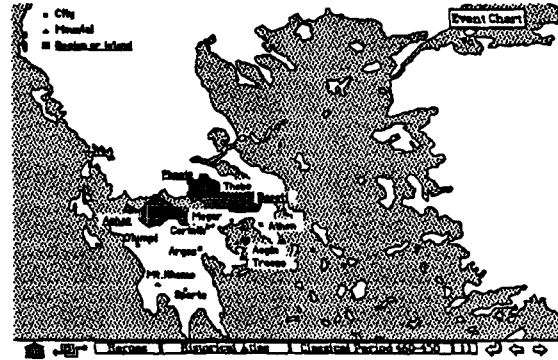


Figure 4.4.b.

Because each map illustrated a slightly different set of geographical sites, the historical atlas stack could also function as an atlas. To find a location mentioned in the readings or lectures, the user could use the find function. (See figures 4.4.a. and 4.4.b. above for examples of an event chart and the corresponding map.)

Each event chart also contained a button that would take the user to a bibliography of standard reference works for each historical period. A script kept track of the time period of the event card, from which the user accessed the bibliography. The script then selected the appropriate button that would then show the correct field. Using the design that we used in the text and glossary stacks, we placed a button in the upper right-hand corner of the bibliography card that would return the user

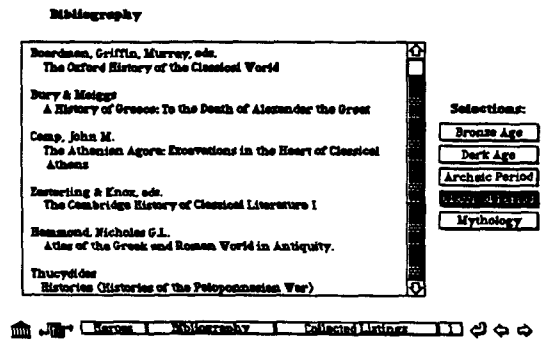


Figure 4.4.c.

to the event chart. When the user accessed the bibliography card in any other way, the button remained hidden. Figure 4.4.c. illustrates the bibliography card.

4.5. Syllabus and Identification Tutorial

A Course Materials stack contained the syllabus for the course and the study questions for discussion in section meetings (both were available in the printed version). We also distributed a stack to help students with the part on the midterm and final examination that asked students to identify key passages from the readings. The

identification tutorial was a compilation of passages that had appeared on previous examinations over the last five years.¹ We included the question or questions that appeared with the passage on the exam and supplemented the questions with the correct answers, a hint, and the reference. When the card first appeared the answers, hint, and reference remained hidden. Students could view the hidden information by clicking on the radio buttons to right of the passage as illustrated in figure 4.5.b. below. We also hoped that the stack would be a useful way of rapidly reviewing the readings if the Index card provided a listing of the passages. Again borrowing from the design of the bibliography card, we placed a field for each author on the Index card and listed the passages that users would find in the tutorial. By clicking on any reference, the user would be taken to the card that contained the passage. Figures 4.5.a. and 4.5.b. show the Index and tutorial cards.

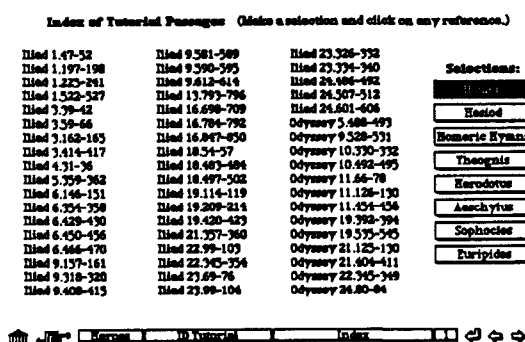


Figure 4.5.a.

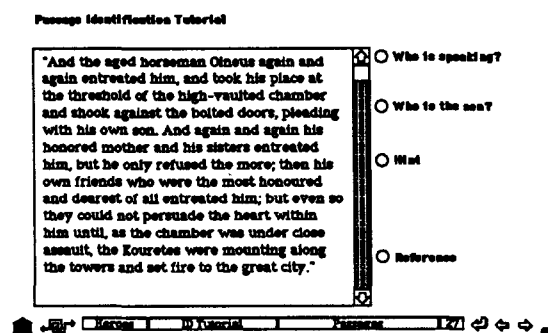


Figure 4.5.b.

We added a tutorial on the identification passages initially to save the time that we normally devoted to reviewing similar passages during the section meetings that immediately preceded the examinations. Secondly, we wanted to reduce the anxiety that students often felt with regard to the identification section of the examinations. The tutorial gave the students a tangible way of reviewing for the examinations when they were unable to reread the texts for a second or third time. Thirdly, we wanted students to develop a greater familiarity with the passages that illustrated principal themes of the course. The more often they read and thought about the passages the more familiar they would become with the primary materials that supported the ideas presented in lecture. Having that background would inevitably help them in writing the essays on the exams. Finally, the tutorial represented a powerful incentive to learn about *HyperCard* and begin using the computer-based materials. The courseware with the identification tutorial was distributed in the fourth week of the course, one week before the midterm examination. Although students were encouraged to experiment with *HyperCard* in the preceding week, by the midterm every student had learned enough about the software to use the tutorial. That basic level of proficiency enabled us to move on to the first project without further concerns about the students' preparation to use the software.

¹Harvard places copies of previous midterm and final examinations in the undergraduate libraries for students to use as study aids. In making a tutorial stack, we did not provide any information to the students of the computer-based section that was not available to all students in the library.

5. Projects

5.1. "Gods and Heroes"

As noted above, some students have not enjoyed the course in the past because they did not have the background in Greek mythology that made the primary readings more tractable. We designed the first project, therefore, to deepen their understanding of mythology in general while familiarizing them in particular with the major gods and heroes that they would encounter in the readings. Because the first project would come relatively early in the semester and before most students in the section would have a chance to become comfortable with *HyperCard*, the project had to be simple and accustom them to the basic characteristics of the system.

We identified twenty gods and twenty-nine heroes that represented a broad cross section of the mythological figures from the primary readings. We then divided the section into four teams of approximately five members. Members of each team received a stack that contained an Index card with the names of five gods and six to eight heroes and one empty template card for each. (See figure 5.1.a. that shows the empty template card for the god Pontos and figure 5.1.b. which shows the completed card for the hero Aegisthus.) The teams were free to organize their work as they wished.

Figure 5.1.a.

Figure 5.1.b.

Ideally, however, we believed that each team member would prepare cards for all of the gods and heroes assigned to the team and then compare findings with her teammates. From all the individual members' versions, the team would collectively create a set of biographical cards that we would distribute to the entire section.

Once the students collected and entered the information into the template cards and created a team set of cards, we compiled all the cards into a single stack, completed the index, and distributed the stack to members of the section as a study aid. We also constructed family trees and added them to the stack as a more graphic means of relating the gods and heroes to one another. Users could set the buttons in the upper right hand corner of the Index card, so that by clicking on the name of a god or hero the users would go to either the first instance of the god or hero in the genealogical trees or to the card with biographical information. Users could access any of the biographical cards by clicking on

the name of the god or hero in the genealogical trees. Figures 5.2.c. and 5.2.d. below illustrate the index card and one of the genealogical trees.

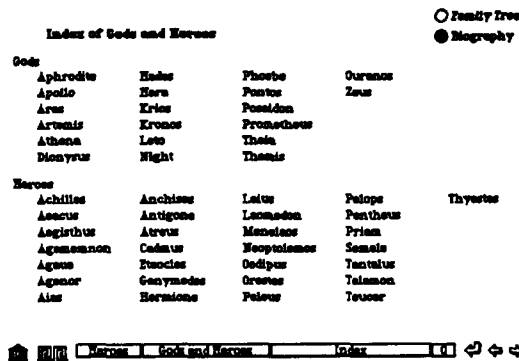


Figure 5.1.c.

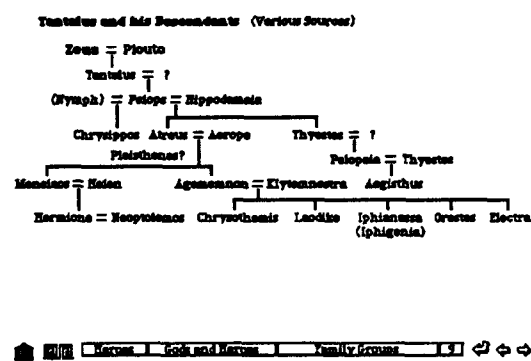


Figure 5.1.d.

5.2. "Critical Reading"

In the past some students have found the paper a difficult and troubling assignment because they were concentrators in fields outside of the humanities and were not sufficiently familiar with the analytical tools that one must have to complete such an assignment successfully.¹ Believing that for nonspecialists we should place the emphasis on the process of analysis rather than on the final product, we designed the second project to introduce traditional aspects and methods of literary criticism. Students first read Aristotle's *Poetics* and then analyzed the tragedies from the reading list. Following the design principles of the first project, we provided each team member with four templates that offered a framework for their analyses, which focused on the poetic form, plot and staging, use of tropes, motives and thematic components (See figures 5.2.a-d. below).

The format of the cards in the stacks for the second project varied from the other stacks in the courseware. We tried an alternative layout that moved buttons, which were unique to a particular stack or group of stacks, from the upper right hand corner to the middle of the bottom margin of the card where the fields in the orientation bar appeared in other stacks. We hoped to improve the economy of cursor movement and delineate more clearly the role of movement buttons and informational fields.² We moved the fields that would provide information on the location of a card to the upper margin and concentrated the buttons in the lower margin. We also experimented with adding more functions to the home button. Building on the concept that the Home button gives the user easy access to the highest level of the stack organization, we added a *Next Higher Node* function that would take the user to the Index card of the stack when the user clicked on the Home icon from any other card in the stack. If the user clicked on the Home button from the Index card, the user would move to the next higher node, the Table of Contents. Finally, from the Table of Contents, the user would move to the Home card.

¹Young Lee, a concentrator in biology, said in an interview that she did not like to write papers and would far rather do the computer-based projects even if they represented more work than writing a term paper.

²See note two on page seven.

When the analyses were completed, we compiled them into stacks, added the buttons that allowed users to move from one template to any other for a given passage, and distributed them back to the students as a means of reviewing and studying for the final examination. We will discuss the success of the projects and students' reactions to the courseware in the next section.

Form of Agamemnon		
Reference Ag 355 to 498	Dramatic Structure First Stasimon	Type of Discourse Choral Ode
Meter l. 355-366 Anapests l. 367-498 Varying Meters but Mainly Iambic		
Plot Comm. Theme		

Figure 5.2.a: Form Template

Plot of Agamemnon	
Reference Ag 355 to 498	Synopsis of Plot
Speaking Characters Chorus	In this Stasimon the chorus moves from a positive note to cynicism. The chorus begins by giving thanks to Zeus for bringing about the downfall of Troy. The chorus goes on to say that the cause of this war Paris' seduction of Helen, after she had been given a favorable reception by the Atreides. The chorus goes on to relate the pain suffered by Menelaos because of his longing for his absent wife. However, many others in Hellas are also now suffering, the ones who saw friends and relatives go off to fight in Troy and then learned of their deaths there. In fact, the Atreides are now beginning to have feelings of anger towards the Atreides, because they are responsible for so many deaths. The chorus says that the gods too will express their displeasure of the ones responsible for so many deaths. Because of the many deaths on the side of the Achaeans, the chorus begins to doubt the truth of Clytemnestra's report, and suspects the Achaean victory to be a wondrous rumor. Thus concludes the First Stasimon.
Silent Characters Clytemnestra	
Setting In front of the palace of Agamemnon in Argos.	
Form Comm. Theme	

Figure 5.2.b: Plot Template

Comm. on Agamemnon	
Reference Ag 355 to 498	Notes on People, Gods, Places & Events Emphasis in the first part of this Stasimon is the role of Zeus in the dispensation of justice. No transgression against justice escapes the notice of the gods. This is a constant theme of Greek literature. The punishment which must be suffered is oftentimes much greater than the original offense and many others there in this punishment who may have had no role in the original crime. The example given, of course, is that of Paris. The punishment for sin, insolence (hubris), is ruin (etc). Commentary on Images, Symbols, Similes, & Metaphors At the beginning of this Stasimon is the image of Zeus slinging a net over Troy, so that none can escape the disaster awaiting them. This reinforces the basic notion of Zeus as bringer of justice and punishment to everyone. The fact that the whole city is engulfed by the metaphorical net is explained by the notion that others will have to suffer for Paris' sins. [For another explanation, dealing with the hubris of the entire city of Troy, please see Thematic Structures.]
Form Plot Theme	

Figure 5.2.c: Commentary Template

Themes in Agamemnon	
Reference Ag 355 to 498	Primary Thematic Component The primary theme developed in this Stasimon is "moderation," "nothing too much." Moderation, avoidance of pride and excess are the best safeguards against punishment by the gods. The chorus wishes are: "Let me obtain no envied wealth, let me not plunder cities, neither be taken in turn, and lose life in the power of another." (lines 471-474). The one who indulges his desire to excess "wins shame that shall bring down his city." (line 393). The reference here could be seen to be Paris. However, in another sense, the city of Troy itself is responsible for its downfall. The Secondary Thematic Component Unlike much of Greek literature which romanticizes and glorifies war, this Stasimon points out the grief felt by friends and relatives when they see the ashes of those who died in battle. Dying itself is also characterized as a base trade: a corpse for dust.
Motives 1. Monotony Vocabulary	
Form Plot Comm.	

Figure 5.2.d: Theme Template

6. Evaluation

We conducted two surveys of the students in the section. We distributed the first questionnaire in section just after the completion of the first project and the second at the end of the examination period. The Committee on Undergraduate Education also conducted a survey of the entire class for the *Course Evaluation Guide*. Students completed the *CUE Guide* evaluations in class during the final week of the course. We also sought the students' opinions during informal interviews. The rest of section six will present information that we gathered from the students' responses and some of the issues they raised. Section seven addresses the problems and issues and outlines some changes we intend to implement for the next version of the courseware.

6.1. Responses from the First Survey

After the first project we were most interested in how students felt about their participation in the section and how well the section was working from an administrative perspective. Thirteen of the twenty-one members of the section completed the first survey. The first three questions asked for the students' impressions on what they were learning and how much work they were doing in comparison with students in other sections. In reply to the first question, "What have you learned from using the courseware and completing the first project that is independent of the course material?" five students replied that they learned about using the computer, and five stated that they had gained a better understanding of the mythological figures through the first project. Three students mentioned that they had gained more background information through the glossary, identification tutorial, and other stacks; and two students referred to their experience as part of a team. One respondent expressed doubts about the contribution that the medium itself made to the learning process. She wrote, "I have more of an overview of Greek mythology in general. Starting off in this class, I knew absolutely nothing about it. Now, I am familiar with more characters and stories than appear in the class. But I don't think the software helped much." Her response rightfully challenges the assumption that the computer medium inherently enhances learning. Even within the structure of the first project, students could have had an analogous learning experience without using the computer. However, most students learned simultaneously about mythology and the computer medium. Thus, we were able not only to meet our immediate goal of encouraging the students to look more closely at mythological figures but also to progress toward the long-term goal of introducing students to the uses of a computer in the humanities. We feel that the doubts of one student about the efficiency of the medium were offset by the gains that students made who had never used a computer and who then felt more comfortable and confident after the first project.

We developed the courseware under the assumption that students would gain more from the course through the supplementary computer-based materials and the focus of the first project than they might have through the printed coursebook and the paper assignment. The next sequence of questions asked, first, whether they felt they were spending more less or about the same time as students in other sections and, secondly, whether they had gained more from the course through the projects than through writing a paper. All but one student reported that they were doing more work than students in other sections. Eight of the thirteen respondents students felt that they were learning more; three students stated that they had not talked with members from other sections and could not make a judgment; one student noted that he had learned about the same but added, "I feel I understand the material better"; and, finally, one student mentioned that she had learned more, but that it had come at the expense of "going into the assigned material in greater depth."¹ When comparing the project with a paper, six students commented that the

¹Of special significance was the reply by the student who, in remarking that she had learned more, said: "I don't think that this has come from using the Perseus project--it comes from a good section." Her comment introduces the possibility that a teacher's method of preparing course materials may have an effect on the quality of the section that is unrelated to the ultimate medium of presentation. This may have implications for the design of systems that attempt to facilitate the organization of teaching materials, for the preparation process itself may have as significant an impact as the materials.

assignment of writing a paper would involve less work but the added effort was ultimately worthwhile. Two students responded that the projects would allow them to work gradually over a longer period of time instead of devoting a small period exclusively to a paper. Although one student noted that the paper assignment did have the advantage of being more closely related to the material covered in lectures, two felt that the projects encouraged a more broadly based learning experience in comparison to paper assignments that tend to be too narrowly focused. Two students replied that they simply learned more through the project. Of the other seven students, three did not respond to the question; two felt that the computer-based project and paper assignment merely emphasized different aspects of the material; one student stated that she was doing more work but was learning about *HyperCard*; and, finally, one student said that he was learning more but “under unfavorable circumstances,” since “other sections may have a [sic] benefit on the exam essays.”

In the next set of questions asked students about their access to a computer. Ten students replied that they had no problems gaining access to a machine. (Two of the respondents owned Macintoshes that would run the software.) Of those who reported problems, one student mentioned that he had gone to the Science Center on two occasions and had to wait because all five of the machines were occupied; one student reported that the five machines were frequently unavailable when he went to use them; and another replied that while access was not usually a problem, the inconvenience hindered his ability to work. When we asked if they felt disadvantaged by not owning a computer, two students replied that they were at a disadvantage. Three students said that not having one was an inconvenience, and two students said that they would like to own one.

The fourth set of questions concerned the students' teams and their experiences working with others. The responses strongly indicated that the format of the projects did not create the framework for collaborative work that we had envisioned. As outlined above in section 5.1., we originally thought that each team member would research and collect information on all of the gods and heroes that were assigned to the team. Once the team members had collected the information, we had hoped they would compare their results and draft team versions of the biographies for distribution to the other teams. We assumed the computer would facilitate this sharing and manipulation of information and provide a nexus for the interaction. Our preconception of how the students would collaborate did not require a team leader although we expected that someone might assume the role because he or she would have better access to a computer and could provide the logistical support for the teams. After work on the project began, students found the assignment sufficiently ambitious that they divided the gods and heroes among themselves, so that each student only had two or at the most three figures to research. Because each student researched a unique set of gods and heroes, they had no reason to compare the content of their findings, and limited their collaboration to establishing a uniform style for the team's cards. The responses indicated that most students thought highly of the idea of collaboration but experienced a number of disappointments or frustrations. According to the respondents' comments, the most prevalent problems were the difficulty in scheduling meetings for the team, the lack of familiarity among team members, the tendency for one person to wait for others to take the initiative, and the students' entrenched study habits that have seldom included collaborative activities.

We then asked the students to evaluate their own performance and the performance of their fellow team members. Responses from the members of the first team, who provided in their individual evaluations by far the most information about the team, indicated that they had organized very efficiently, evenly distributed the responsibilities for collecting the information on the gods and heroes, and then divided the work of preparing the final team version among the team members who seemed best able to perform the tasks. One student, a Macintosh owner, was very experienced with Macintosh computers and assumed the job of collecting and maintaining the cards for the team version; another student was a major in classics and assumed the role of checking sources; and the rest of the team proofread the cards and standardized the format. The team members spoke of no problems arranging for a time or place to meet. The other three teams were not nearly as organized or successful. The three respondents from the second team were generally satisfied with their stack, but two of the members reported organizational problems and a lack of team effort. Both respondents from the third team reported that they did not work with the other members of the team. Of the three members of the fourth team who completed the survey, one did not respond to the question; the second student reported that team members worked mostly independently; and the third and most positive member replied, "The team in general worked well, and although we did not all get a chance to meet, some of us met and helped each other."

The final question asked if they would choose to participate in the computer-based section again. Ten students replied that they would, and two students had reservations. One student wrote that the section was different but not "necessarily better." If she were to take the course again, she would "try a regular section the second time through." The second student said that he would probably not participate in the section because he did not have a computer.

6.2. The Final Survey

We distributed the final survey to the students along with versions of the courseware and projects that they could use in studying for the final examination. They were to return the surveys with their diskettes after the exam to receive final versions of the courseware and project diskettes that they could keep. To date we have received surveys from twelve of the twenty-one students. The final survey included questions on four aspects of the section: the course work, the teams, access to and the impact of the computer, and the students' general impression and suggestions. As in the first survey, we were interested in gauging their impressions of how much they had learned and how much they had worked in comparison to other sections. We also asked them to compare the projects.

In the first question we asked, "Have the courseware and the projects helped you learn things that you would not have learned by using the regular printed course materials? How?" Ten of the twelve respondents reported that they had learned more. One student did not reply to the question, and one student wrote: "I think the courseware provided superior resources but not necessarily because they utilized the computer as a medium." She went on, however, to comment about the identification tutorial, "The ID tutorial, which allowed the user to reveal a hidden answer with the computer prompt, was an

especially useful part of the courseware.” Students referred to four general areas in which they felt that they had learned more: six students mentioned that they had learned more background material generally with regard to the figures of Greek mythology; four students noted that the courseware offered expanded reference materials; two students mentioned the second project and the reading strategies; and one student referred to the improvement in her computer skills.

Students unanimously described the second project as more helpful than the first. Seven students commented that they understood the plays better. Four students mentioned that the project helped them prepare and review for the final examination, and two students reported that the project improved the way they read the plays.

When asked whether they had done more work than students in other sections, the students responded somewhat differently than they had in the first survey. In the final survey only eight out of twelve reported that they spent more time than students in other sections compared to twelve out of thirteen in the first survey. No one expressed dissatisfaction over having worked more. Two students mentioned that being able to spread the work over a longer period of time made any additional work manageable, and one student reported, “I believe the format of work better suits the Core philosophy than the regular paper assignment, for it provides a wider exposure rather than [concentrating on] a few points.” Although only two-thirds of the respondents believed that they had done more work, ten of twelve students, 83 per cent, believed that they had learned more. One of the two students who felt that they had not learned more wrote, “The projects seemed to achieve the same goal in a different way.” The other student felt that he learned more background information about the readings through the projects but that the section spent less time discussing the general themes of the course.

As in the first survey we asked the students to compare the projects to the paper assignment. Eleven of the twelve respondents reported that they preferred the projects. The reasons ranged from the opportunity for the student to present her own ideas on the material (from one respondent) to the greater generality of the projects as opposed to the limited scope of the paper topic (in three responses) and the chance to collaborate and share information with others (in two replies).

In the second portion of the questionnaire, we focused on their experience as members of teams. The first question asked them whether working on the projects as a team helped them learn. Eight students replied that working as teams was helpful. In two instances they learned more because the teams created a better social atmosphere for the students, and in three students’ opinions, the teams allowed them to experience a wider range of interpretations and ideas. Problems with the teams that students mentioned regarded the composition of teams, the structure of the projects, and scheduling of the assignments. Two students felt that their teams did not work as well when the size was increased from five to seven, and five students felt that the projects did not really encourage team work because most students worked individually and simply added their work to others without much discussion before or during the work itself.

We devoted a small part of the survey to the availability of computers and the contribution that the medium made, if any. Only two of the respondents noted any problems with accessibility. They occasionally found all of the computers occupied when they went to the Science Center. Only one student mentioned the inconvenience of not

having a computer, and another student noted that the Science Center was too far away. With respect to the impact that the computer medium had on the section, nine students responded that the computer enhanced the course material. Eight students mentioned that the computer made the material more interesting or attractive; three students noted that the computer made the work "fun"; one student reported that the computer made the material more accessible; and another student commented on the fact that the computer medium made more information available. Of the two responses that expressed any reservation, one suggested that the identification tutorial was well suited to the medium but the other reference materials, e.g., the maps, glossary, and chronology, were more accessible in a printed format. The other student commented, "I was slightly uncomfortable with using a computer as a primary tool in a literature and arts course. At first I had trouble relating the work I had done with the computer to the course syllabus. However, the computer did make some aspects of the course more attractive, such as the detailed analysis of the tragedies."

The final portion of the questionnaire addressed the students' general impressions of the course. One question asked if they would take the course again or recommend it to a friend, and a second question asked for suggestions on how the section could be improved. All but one respondent would recommend the course to a friend without reservation. The single hesitant student replied that he would "not highly recommend this course as it is currently designed." His objections were that the first project seemed only indirectly related to the themes of the course and the discussions in section seemed "stiff and uncomfortable." However, he did seem pleased with the identification tutorial and the second project as means for preparing for the final examination. Many of the students' suggestions confirmed the direction we intend to take as we refine the materials for next year. Our plans for improving the courseware and structure of the course will be more fully developed in the next section of the paper. We thought, however, that including some of the students' suggestions would be appropriate. They are as follows:

•On the number of projects:

"Two projects is a good number--three might have been excessive."

"I would suggest that it would be more helpful overall to do more smaller projects instead of two large ones. I think it would be a good idea to do enough projects so that there would be one for each type of literature studied."

"Three projects would have added up to more work than the paper."

•On the schedule of meetings:

"A meeting of the groups with the teaching fellow early in the semester to formalize them."

"Having a section, bi-weekly, strictly on computer projects will help much."

“A longer section time may be advisable: one hour for the material and one half hour for the computer.”

“More formal team meetings should be arranged.”

•On training:

“More training on how to use the computer.”

“Perhaps some more purely technical instruction could be offered--about how to do things on the programs, e.g., it took me a while at first to learn how to make new cards for each scene in the second project.”

•On the timing of projects:

“Start the first project earlier so the second can be completely finished before Christmas vacation.”

“The second project should be started sooner.”

•On the structure of the teams:

“A smaller section size overall would facilitate a more cohesive group overall (say 12-14 people) from which a dispersal into groups of three to four would be more conducive to a more productive analysis which includes input from each member.”

“Schedules are too varied to make a large team effective.”

6.3. The *CUE Guide* Evaluations

The Committee on Undergraduate Education distributes a “General Course Evaluation Questionnaire” to students during the final week of classes. Because the questionnaire asks for the students’ comments on all facets of the course, the questions that are specifically related to the sections are relatively few. The questionnaire did ask the students to rate the quality of the section on a scale of one to five with five as the highest rating. One further question asked for comments about the strengths and weaknesses of the section with regard to the “purposes or content of the sections/labs/studios and their contribution to the course.” Ten members of the computer-based section completed the questionnaire. The section received four ratings of five, four ratings of four, and one rating of two. The comments about the section were uniformly favorable and tended to be more descriptive than analytical. Only one respondent listed a weakness: “Does not help to

prepare for tests.” We might add that after this student took the final examination, he apparently had a change of heart and commented on the final survey, “The second project and the I.D. tutorials were very helpful in developing critical skills and in preparing for the exams.”

7. Epilogue

7.1. Distribution of Materials and Arrangement of Computer Facilities

We originally felt that students might experience considerable difficulties in gaining access to a computer because only four of the students in the section had computers and the Science Center had only five computers available for use. We discovered, however, that access was never a substantive problem. A number of students had access to a computer through a friend or roommate, and those who depended on the computers in the Science Center were able to continue studying in the library and working on the projects if they were unable to use a machine and had to wait.

Because students worked on stand-alone workstations, we did not have the option of distributing courseware over a network. Each student received diskettes with the course materials and projects that they were free to use during the course of the semester. We periodically collected the diskettes and redistributed revised versions of the courseware. We feel, however, that a network would contribute significantly to the success of projects that encourage collaboration among students with varying schedules and levels of commitment. A fileserver on a network would allow the students to distribute information freely among themselves without having to wait for and depend on the instructor. The network would also allow users to send and retrieve information from remote locations.

Of potentially greater importance than a network or fileserver, is a place where students can meet as a team and work with the computer. Most rooms with terminals and workstations are arranged to allow one user to work at a single workstation. Carrels often place barriers between individual students to reduce the level of noise and increase the sense of privacy. That type of arrangement reflects an emphasis on individualized work habits. When teachers encourage students to work as a team, such an arrangement works against them. Often there is little or no room for more than one person to sit at a workstation. Teams are also reluctant to work in a large room with other students for fear that the discussion among team members will disturb other students. Our experience shows that the success of the best team was due in large part to the working conditions. The team gathered regularly at a member's suite where they could freely discuss the project, have access to other course-related materials, and work at a computer. In an informal interview with one student, he commented that his team felt hampered by facilities at the Science Center where the team could not meet together in the computer room. He also felt uneasy about using a team member's room because that placed an unequal burden on the member who hosted the team meetings. We have proposed for the coming year that a cluster of workstations be placed in a room where students can gather to work as a group. When the group is not meeting, the workstations will be available for individual users.

7.2. “Assembly Line” and “Versioning” Paradigms of Teamwork

From our own observation and the comments of the students, we found that in designing the projects we had focused too strongly on merely creating a framework for collaboration, and did not concentrate sufficiently on the nature of that collaboration. As work progressed on the projects, we realized that the stacks were far too much a product of an “assembly line” process. During the “Gods and Heroes” project, for example, each member of the section simply contributed the biographical information for two or three of the gods and heroes. Consultation among team members was limited to issues of style and format. We had hoped that each member would go beyond the preparation of her biographies and critically review the biographies of her teammates. However, because the assignment was divided among team members, no two people prepared material on the same god or hero and were therefore never in the position to evaluate the content of each others’ work.

We believe that a far better form of collaboration is based on “versioning,” in which two students perform essentially the same task, compare results, and formulate a new version of their findings based on strengths of their individual efforts. Work in the versioning framework may proceed separately and individually or jointly and collectively. When applying the versioning method to the “Gods and Heroes” project, we would assign the same god or hero to at least two students. The students would be free to conduct independent research and then draft a biography based on each others’ findings or to work jointly in the compilation of the information and participate together in the editing and revising of their biographical card. The versioning approach does not prevent further segmentation of the task; however, the segments should remain in the same domain of knowledge and provide the students with comparative experience.

We have concluded that the future design of the projects should conform to the following guidelines:

- A. We must divide the assignment so that all members of the team have to learn and practice the same scholarly processes in order to achieve the desired goal.
- B. At least two students from the same or different teams must work on the same segment, so that each can evaluate the other’s performance. By evaluation we mean the mutually beneficial sharing of information and experience that leads to the production of a work that is better than either of the students’ works done individually.
- C. Members of the team must meet *before* work on the project begins to clarify the objectives of the project and the means by which the members can most efficiently and successfully complete the project.¹ Members will meet *during* the work to

¹In the final survey two students commented specifically on the need discuss the projects before work began. One student wrote: “I learned that the ‘team’ concept can often never materialize and that the assignments are occasionally not team completed but rather individually completed. I would take part in a project like this again with two suggestions: 1) Team size: the teams work best with 3-4 people. No more

evaluate each others' progress in light of the objectives. The meetings during the work will also provide opportunities to share information and experience gained in the course of the work that may benefit other members and contribute to the quality of the project. Finally, members of the team will meet *after* the project is completed to evaluate their performance and the quality of their work.¹ The scheduling of projects has to allow for adequate time before and after the work to permit the necessary planning and evaluation. We will have to limit the scope of the project to allow for sufficient the planning and evaluation.

7.3. Optimal Organization of Teams

In moving from five members per team for the first project to seven for the second, the size of the teams became a limiting factor because of problems in scheduling meetings. The likelihood that students have had some experience working in pairs also argues for smaller teams. In the future we intend to design the projects so that students will first work in pairs or in groups of no more than three. Depending of the success of the collaboration, the teams may then combine into groups of four or five. As noted above, the teams should meet before any of the work begins. The section leader should initiate that first team meeting to help formulate of the strategy for completing the assignment and ensure that the students fully understand their responsibilities and the time frame for the work.

7.4. Evaluation Through Observation

Although we conducted two rather extensive surveys and talked at length with a number of students, we still have little information on how the students actually used the courseware. We did learn that all students first used the identification tutorial to prepare for the midterm examination. Students also extensively used the tutorial in preparing for the final examination. A number of students loaned the courseware to roommates or friends who were also taking the course, and we distributed a number of copies of the tutorial to students outside of the section, who approached us directly to see if they could use the tutorial after hearing about the stack from members of the section. Six students commented in the surveys that they had made use of the supplementary materials, the chronology, maps, and bibliography. We sense that others may not have used the stacks at all. We know that all students participated in the projects, but only five students mentioned in the surveys that they had used the "Gods and Heroes" stack as a reference afterward, and only one student reported that he used the "Critical Readings" stacks to review for the final examination.

We realize that our surveys did not adequately address how often and in what ways the students used the courseware. However, we are not sure that comments from students

really. 2) Ensure that the team concept works. By that I mean to have teams meet and discuss the topics before the writing is done. That way scholarly exchange and debate can take place."

¹Again, students felt that they did not receive enough "feedback" about their work. This stemmed directly from our hope that students would provide that feedback themselves while the students expected the comments to come from the teaching fellow. In the future we will provide more time and emphasis on the students' evaluations.

in surveys would actually provide the type of information that would be of greatest value in modifying the stacks. We believe that we need to observe students as they actually use the courseware and determine both what they study, i.e., which stacks they use and how often they use them, and how they study, i.e., do the students use the stacks for retrieving individual facts or do they browse through the stacks; do some students read the texts on the computer and use the glossary in conjunction with the on-line texts, or do they read the printed texts and use the on-line glossary.¹ We are planning now to tape user sessions next year and simultaneously record the students' behavior at the workstation and the activity on the computer, so that we can better adapt the materials to the users' preferred study methods and increase the efficiency and clarity of the interface.

Harvard University

Kenneth Scott Morrell

¹We did find one response in the final survey that gave us some indication of how one student used the courseware. She writes: "The genealogy was an excellent reference, but unless I happened to be using the computer for some other purpose, I would more often flip open a reference book on my shelf than scurry off to load the courseware onto a Mac to look up the relevant card. I got more use out of the critical readings project, although I never fell into a habit of 'reading with the computer.'" This student's comments indicate the importance of integrating the courseware into other possible uses of the computer.

Teaching with *HyperCard* at Bowdoin College

D. Neel Smith

At Bowdoin College, the Classics Department is restructuring its basic curriculum of courses in classical archaeology, and is exploring ways of using computers to increase the effectiveness of courses in Greek and Latin. In the spring semester of 1988, we used computer-based materials in two upper level courses, one on "Greek Comedy," the other on "Archaic Greek Art." While we developed most of the course-specific materials at Bowdoin in the fall of 1987, we also enjoyed a symbiotic relationship with the *Perseus* project: we were able to exchange material, and were able to provide in Bowdoin classrooms a "live-ammunition" testing ground for *Perseus* work.¹

General pedagogical objectives

In using *Perseus* material on a modest scale in the classroom, we hoped to achieve to a modest degree some of the general goals of the *Perseus* project. We wished to automate and simplify the use of standard reference works, whether language aids like lexica and grammars, or other works such as glossaries, encyclopedias, atlases, timelines and archaeological catalogs, and, wherever possible, speed up work that is tedious and time-consuming when done manually with printed tools. Students reach a point where the quantitative change creates a qualitative change: if it is easy enough to look up a word in a dictionary, or find a point on a map, we as instructors can require they will take the time to find information that they might otherwise skip.

Beyond merely automating existing work habits, we also hoped to unify diverse but mutually relevant kinds of material that are often artificially separated in academic programs, so that students would not only increase the quantity of material they mastered, but would master qualitatively different kinds of subject matter. Closely allied to this, we hoped to give students access to, and challenge them with, the primary materials of the discipline.

In broad terms, our objectives were also consonant with those that Kenneth Morrell described for his section of Harvard's *Heroes* course: to present the standard material, to introduce students to the use of computers in the humanities, and to foster an atmosphere of collaboration.² We decided to omit Morrell's final objective, peer review, when informal discussion with a range of Bowdoin faculty members suggested that this might be too controversial an issue, or even be unfair to the participating students.

Specific Goals of the Courses

More specifically, we hoped to accomplish the following:

Greek Comedy

- Confront students visually with problems of staging and producing a Greek drama. These are often ignored or glossed over in language courses concentrating on texts, but they are of critical importance: Greek dramas were composed for the stage, not for silent reading.

¹ It is a pleasure to thank Gregory Crane and Elli Mylonas of the *Perseus* project for their cooperation and support, and especially Kenneth Morrell for freely sharing the benefits of his experience teaching Harvard's *Heroes* with *HyperCard* (see his essay in the Appendix); I am also indebted to Dennis Maurennius, the *HyperCard* magician of Bath Iron Works, for insights into improving the user interface of the *HyperCard* stacks we used.

² See Morrell, "Teaching with *HyperCard*," included in the Appendix.

Archaic Greek Art

- Develop an understanding of how primary archaeological evidence is documented: to take a specific example, what information should be included in an archaeological catalog entry for a vase, a piece of sculpture or a building?
- Encourage critical thinking by a problem-solving orientation, in which students are asked to reach independent conclusions based on primary evidence.
- Promote a collegial, cooperative model of scholarship with team assignments.

Both courses

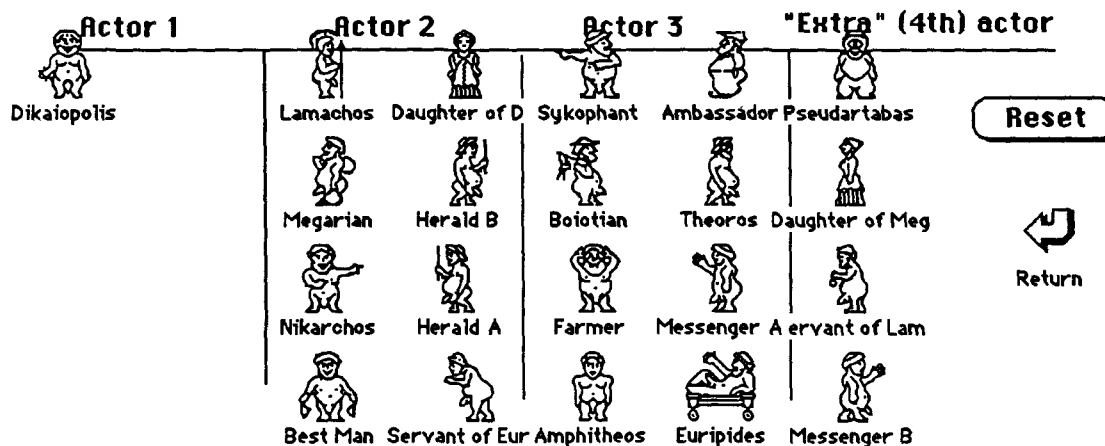
- Foster an appreciation for the frequent ambiguity of the primary material, and for the open-ended nature of humanistic disciplines like the classics.

Structure of Assignments

The assignments in the two courses were organized in very different ways. In the Greek comedy course, students were presented with a single *HyperCard* stack and given a single individual assignment to work on for five weeks outside of class, in the context of an upper-level Greek course that continued to meet three times a week. In the archaeology class, the *HyperCard* work was more closely woven into the fabric of the course. The first two-thirds of the archaeology course was based on weekly assignments that were to serve as the starting point for a seminar discussion in each Friday's class. Three of these assignments were based on *HyperCard* stacks.

Greek Comedy

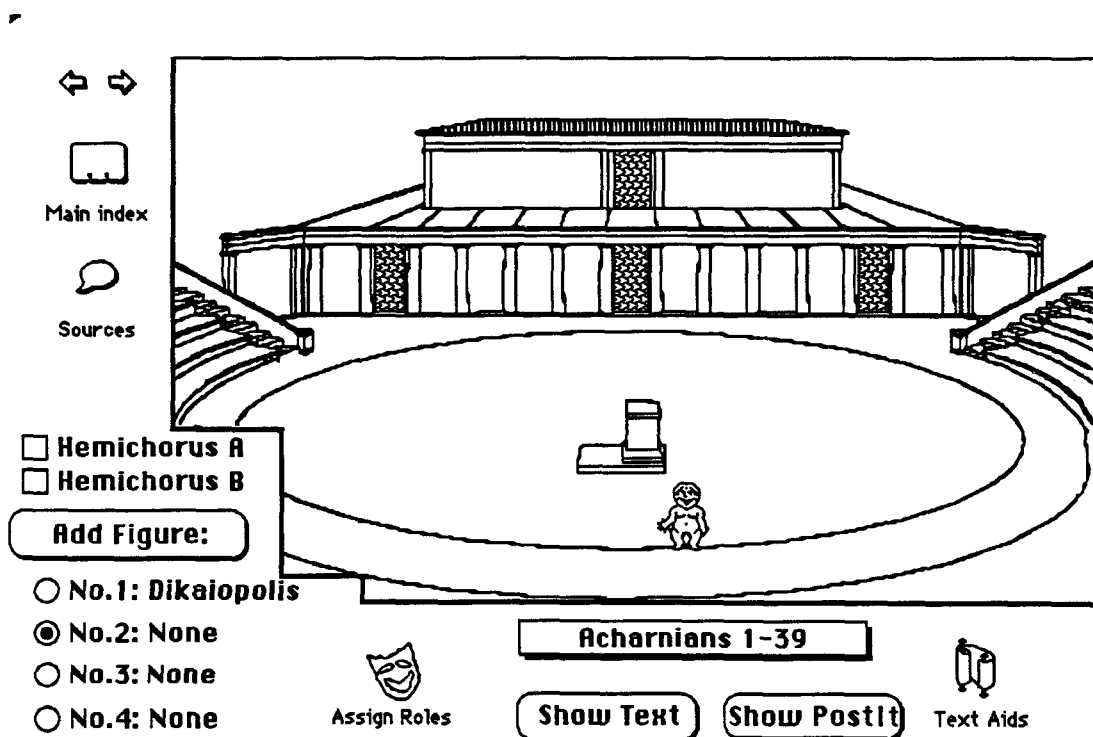
Roles remaining: 0



One student's solution to assigning all 21 roles in Aristophanes' *Acharnians* to three major speaking actors. This is the most elegant solution to this problem I know of, and may deserve publication in a professional journal.

The problem: classical Greek tragedy rigidly obeys the so-called "Rule of Three": apart from the chorus, only three actors were used to speak all the lines of the play, so there can never be more than three speaking roles on stage at one time. Comic playwrights were somewhat freer, and certainly used four speaking actors on occasion, but many scholars believe that the fourth actor played only minor parts, and that the plays can be staged so that the three main actors can play all the important roles. In the surviving corpus of Greek drama, probably the most difficult play to reconcile with the "Rule of Three" is Aristophanes' comedy, the *Acharnians*, the text we studied for the first twelve weeks of the semester.

Students were given a *HyperCard* stack that included the entire text of the *Acharnians* in Greek, along with some limited notes and grammatical help. Linked with the text was a tool for graphically blocking out the play by placing icons of the characters on the stage. Before placing the character on stage, the student had to decide which actor would play that particular role. The students had to solve for themselves the difficult problems of what actor plays what roles, who is on stage when, and at least roughly how the play might have been blocked out (who entered and left by what entrances, for example).³



Schematic reconstruction of the Theater of Dionysus in Athens; users can place characters on stage, and position them using the mouse.

Archaic Art

The *HyperCard* assignments in the Archaic Art course were only three in a series of ten weekly assignments. Students formed themselves into teams of twos and threes. (The only requirement

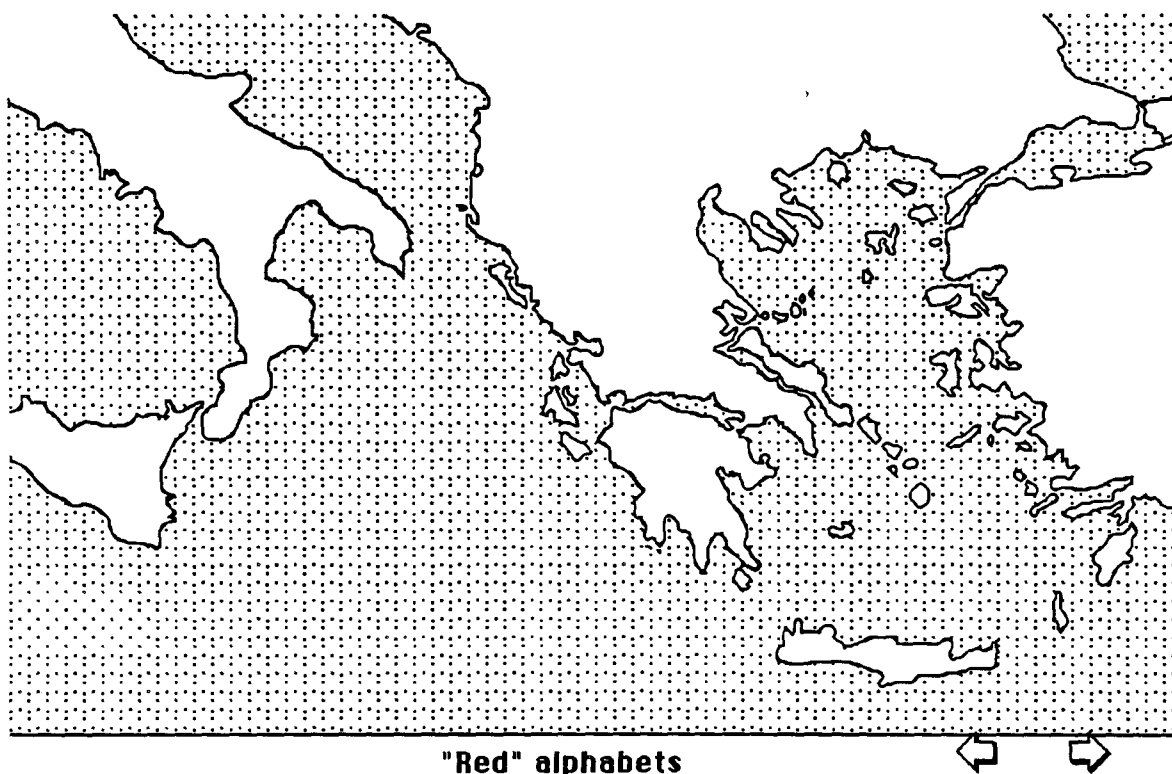
³ This is, in fact, very difficult to do. Since Greek dramas do not come with any stage directions, the modern reader must deduce from the text what is happening on stage. Some of the most fruitful work on Greek drama in the past fifteen years has, in fact, centered around stage action. A tool such as "Visualizing Aristophanes" can help the expert as well as the student.

was that they could not work in exactly the same teams for any two of the assignments.) The assignments were intended both to fit the curricular needs of the course, and to provide a graduated introduction to using *HyperCard*.

1. Site Report

Early in the course, students were given two stacks, one for bibliography, and one for an "encyclopedia of classical sites" analogous to the *Princeton Encyclopedia of Classical Sites*, a standard reference tool in classical archaeology. Each team was given a site or small group of related sites of particular importance for the major theme of the course. Their job was to research the site, record their work by filling in the blanks in their *HyperCard* forms, and report back to the class as a whole in a five minute presentation that highlighted the results of their research. This was intended to familiarize students with some of the principal subject matter of the course, with standard reference works like the *Archäologische Bibliographie* of the German Archaeological Institute. At the same time, they would get to use a Macintosh and *HyperCard*, see its text-editing conventions, and see the concept of linked files in hypermedia, since their bibliographic forms were automatically linked to the bibliographic entries in their site forms.

2. Mapping the Spread of the Greek Alphabet



Part of the assignment on the origin of the alphabet: given a template like this to draw on, students plotted the distribution of major variant forms of the Greek alphabet.

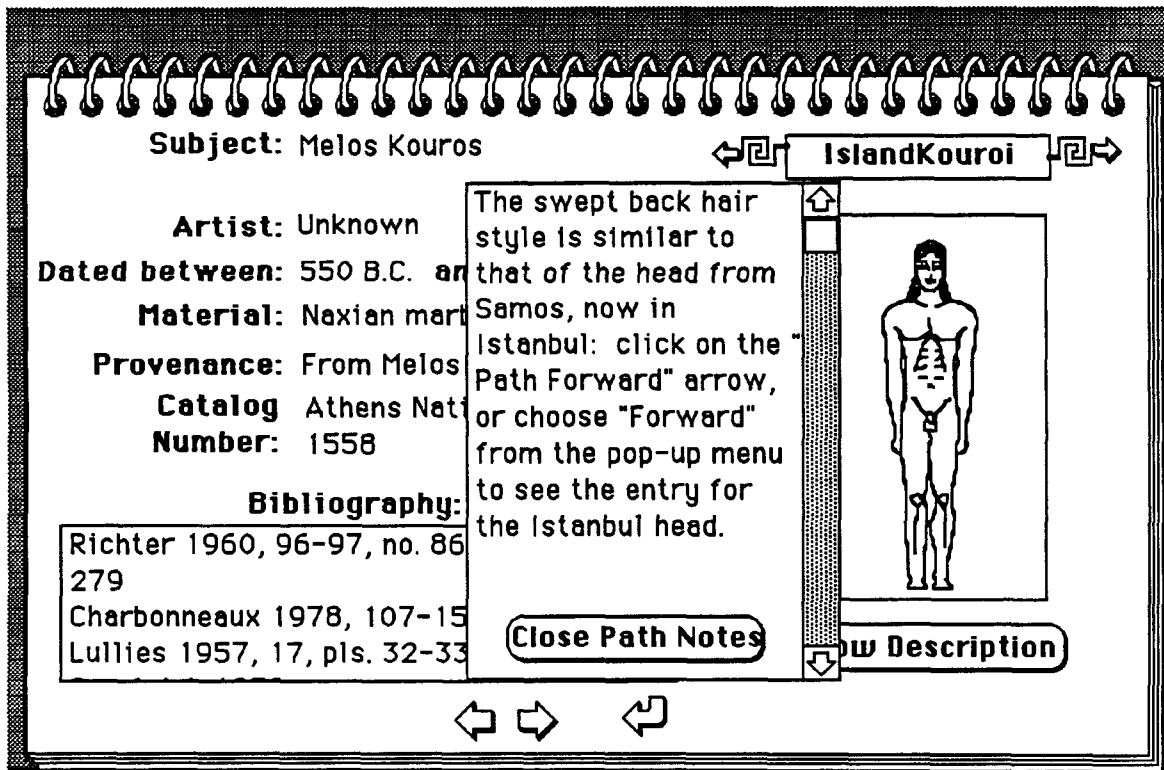
A couple of weeks later, the week's topic was a thorny one: where did the Greek alphabet originate, and how did it spread throughout the Greek world? One of the main kinds of evidence provided by Greek inscriptions are the forms of individual letters, for each Greek

city-state had its own, local alphabet. By studying which city-states used certain distinctive letter forms, scholars have tried to suggest how the alphabet may have "migrated" from its Phoenician source throughout the whole Greek world.

The student teams received a *HyperCard* stack with an introductory discussion of the problem, and references to the bibliographic sources for the primary evidence, which were placed on course reserve in the college library. The stack also included a series of maps of the Greek world, one for each of the major variations on the "standard" Greek alphabet. Using these maps as templates, the students plotted on them the location of city-states or highlighted the geographical regions which used that particular form. The end result was that they could flip quickly through a series of maps, and quickly appreciate the differing geographic distributions of the major variant forms of the Greek alphabet in a clearer and more natural way than any pure textual description.

The assignment also gave them further exposure to *HyperCard*, introduced them to some of its graphic tools, and exposed them to the notion of integrated textual and graphic documentation of a subject.

3. Creating a Commented Sequence of Images



An archaeological catalog entry for a sixth-century *kouros*. The name of the current path ("IslandKouroi") is displayed in the upper right of the screen; the window in the center of the screen contains the student's annotations to this stop on the tour.

The overwhelming monumental sculpture and architecture of Egypt duly impressed the Greeks who visited that country in the seventh century B.C. Certainly the beginnings of monumental stone working in Greece around 600 B.C. are a direct response to this experience, but beyond this obvious point, scholars disagree in how to interpret this Greek response: do Greek

sculptors follow working methods they learned from Egypt, are their works free adaptations of an Egyptian idea, or is the truth somewhere in between these two extremes? One focal point for discussion is the question of the influence of the Egyptian canon of proportions—a regular system of relations of parts of the human body to each other and to the whole. The students' problem about half-way through the course was to decide whether sixth century Greek sculptures of male youths, called *kouroi*, exhibit a canon of proportions, and if so, whether this relates to the conventions of Egyptian art.

They were given *HyperCard* stacks with an introduction to the problem, and a catalog of the sixteen best preserved *kouroi*, and a "path" tool for setting up their own annotated sequence of views of this information.⁴ This is a difficult but common kind of scholarly problem: given an organized but unordered set of data, you must create your own logical structure to present a coherent, unified point of view.



Thera1



Samos



Thera2



Melos

Path "IslandKouroi"

Clicking on card icon lets you:

- Rearrange cards
- Go to card
- Edit comments



Trash

A view of the path the student has defined. Students have the option of "editing" the path here by rearranging the sequence of stops on the tour, or editing their annotation for cards on the path.

⁴ The path tool was prototyped by Elli Mylonas, as a means of guiding users through the complex network of *Perseus* material. An extended implementation was used at Bowdoin. We gave the students a set of authoring commands, available from a pop-up menu, so that they could easily create and annotate their own "paths," as well as following pre-defined ones. While the students worked with the path tool from the stack containing the catalog of sculpture, the information that the students created was actually written to another stack, that the students did not need to look at. The experiment therefore was a valuable test of using "read-only" *HyperCard* stacks.

Physical Environment

The four Macintoshes that the Classics Department installed in the Bowdoin Language Media Center were not in place at the beginning of the spring semester of 1988. In class, we projected the computer display from a modified Macintosh SE using a Limelighter projector, so that everyone in the class could see the display. Outside of class, students worked on six Macintosh SEs in a general computing lab open to the campus at large. Assignments were handed out on floppy disks, which the students turned in on completion of their work. For the third assignment in Archaic Greek art, students were also given a collection of high resolution printouts to accompany their *HyperCard* stacks. (The artwork for the stacks had originally been drawn in Adobe *Illustrator*, so we were able to print them at the full 300 dpi of the LaserWriter.)

The Students

The students were fairly typical of upper level college courses. The Greek class was made up of four classics majors, three seniors and a junior. The archaeology class was surprisingly large with 21 students enrolled. All but one transfer student had completed a prerequisite introductory archaeology course; the transfer student was an art history major with extensive course work in art history and a relevant previous course in ancient art. Eight of the students were seniors, five of whom were majors in Classics or Classics/Archaeology, two in Art History. Four of the remaining students were Classics or Classics/Archaeology majors, one in Art History.

None of the students in either class had ever seen *HyperCard* before. Only one or two out of 25 had ever used a Macintosh.

Results and Evaluation

Anonymous student evaluations of both courses were filed with the Office of the Dean of the Faculty, in accordance with Bowdoin's standard procedures for course evaluations; the results of these student evaluations will be available to me later this summer after they have been tabulated and recorded by the Dean's Office. Apart from informally collected student comments, therefore, the following descriptions of the results and evaluation of them therefore represents the instructor's views of the students' work, and not the reverse.

Archaic Art

Students' use of *Perseus* material was a mixture of successes and failures in the upper-level archaeology course. The first two assignments presented no real technical problems to the students, and while the first assignment could just as easily have been done on paper, the second could not have, and students' comments about it were positive: the most common were,

"It was fun!"

and

"I never knew that computers could do this: it was really fun."

Two students independently commented on the value of having maps they could scribble on: the graphic representation of the maps was helpful for understanding the assignment, and they had figured out how to keep making new templates for their own maps by creating a new *HyperCard* card.

The third assignment was by far the most challenging of the three using *HyperCard*, and produced disparate results. The students' work fell into two very distinct groups, one very successful, one markedly less successful: there was very little in the middle ground. The successful groups produced uniformly high caliber work: I was impressed with how they supported their arguments with telling, specific observations. The unsuccessful groups included three groups that did not turn in a *HyperCard* stack, independently opting to hand in a short paper instead (although each of these three groups did note that the high-resolution graphic

handouts accompanying the floppy disk were a great help). Interestingly, their arguments cited secondary material much more frequently (although their assignment was to form a judgement of their own, based on their observations).

There was a direct correlation between the students' familiarity with and grounding in the subject matter, and their success using *HyperCard*. The students who decided not to turn in a *HyperCard* stack were the ones with the least previous experience in archaeology, and did not include any Classics or Classics/Archaeology majors. I believe that cause and effect are not entirely separable here: not only were the students who were comfortable with the computers able to read clues from the stacks to interpreting the material; the better archaeology students were able to read clues to how to use the machine from their knowledge of the material.

Among the three groups that did not turn in a *HyperCard* stack an interesting viral effect occurred. One group was unable to use the path tool. In panic, they found two other groups in the computing center facility, and infected them with the idea that the program was "broken:" the other two groups had not tried the path tool, and accepted this assertion without testing it. I met individually with all three groups: try as we might, we were unable to reproduce the problem that sparked the initial panic, and I have not yet identified how the computer could simply have failed to respond, as they described.

Perhaps the most telling criticism of the assignment came from students who saw the potential of a *Perseus*-like environment, but were frustrated by the lack of *Perseus* material for the whole course. They repeatedly expressed the feeling that computer based material of the kind they used in the third assignment would be invaluable— if it provided comprehensive coverage for the whole course, but they were frustrated that they were given the sculpture catalog of *kouroi*, without linked aids like the *Perseus* chronology tool, or glossary. For many of the students, this diminished the value of material to that of a mere exercise, rather than a resource. They also found it disorienting to use the computers for some weeks' assignments, and then have to switch back to books for other assignments.

Greek Comedy

In contrast to the archaeology course, the *HyperCard* assignment in Greek Comedy was an unqualified success. To my surprise, each of the four students in the class arrived at a unique solution to the problem of dividing up the roles and blocking out the action of the play. Each of the solutions was valid, in the sense that it "worked" within the limits of the problem. One senior Classics major, Susan Tegtmeyer, arrived at a particularly effective analysis of the problem: her staging of the play was more economical in using a fourth actor than any published discussion of the *Acharnians* that I know of. This was an eye-opening experience for me; although I had read the *Acharnians* several times in the years I have been studying and teaching Greek, I never imagined how closely this bawdy comedy could keep to the three-actor convention of classical tragedy. Her ideas are solidly based on a close reading of the Greek text, and documented in her notes to her staging. I hope that she will allow us to publish her staging as part of *Perseus*.

Susan recently made a presentation about her staging to the Friends of Bowdoin, an organization of alumni and other supporters of the College. In response to a question from the audience, she answered that while it was true that she had never used a computer (even for word processing) in her previous three and one-half years of college, she never thought of this assignment as "using a computer:" it was simply a way of staging the play. In this case at least, we had made the machine virtually completely transparent to the students.

Implications for *Perseus*

Both the successes and failures of the past semester have implications for the development and testing of *Perseus*. Self-standing modules like the staging assignment can be easily and effectively tested in classroom, but it may be difficult to test some parts of *Perseus* until we have a mass of material adequate to form the basis for an entire course (as Kenneth

Morrell's *Heroes* section at Harvard). If we attempt to test small modules of *Perseus*, we not only risk frustrating students who recognize the potential of a hypermedia environment, but probably put at a disadvantage the weaker students who would benefit most from the convenience and support of a fuller *Perseus*. For these students, we must plan on a more gradual introduction to the material. Similarly, it is clear that this semester at Bowdoin, we were hurt by limitations imposed by our facilities: students experienced difficulty getting access to machines for the third assignment (which overlapped in the term with mid-term exams and papers, and so with heavier use of the campus computing center), and felt that books would have been more convenient.

Conversely, it appears that even comparatively small chunks of *Perseus* can help the better student to work more effectively. We may in the near future test small portions of *Perseus* with strong students in tutorials, individual instruction, or honors projects; this would be a useful way to find bugs, sticking points in the user interface, and similar mechanical problems. In the end, however, we must evaluate our material and how to use it effectively by testing it with as wide a range of learners as possible.

Finally, in encouraging a more natural, unconscious use of computers we may run a serious pedagogical danger. Of course, students should be able to use the machine with minimal effort (as in the case of *Visualizing Aristophanes*). After all, most courses are not about computers, but should use computers to teach something else. But students who treat the computer as a plug-in appliance may also adopt an unquestioning attitude toward the machine: if something doesn't seem to go as expected, students may fall back to the "It's broken" attitude, and just give up (as happened in the archaeology class). When students assume that whatever the machine deals out, they have transferred to a new medium an assumption that has infuriated teachers for centuries: "If it's in print, it must be true." For *Perseus* to succeed in the classroom, we must strike a delicate balance. Students should be able to use interactive tools easily, but they must view these tools with the same kind of critical attitude that they should bring to any medium they work with, as well as to the subject itself.

Document and Hypertext Structures for Perseus: The Advantages of Content Markup

Elli Mylonas

Introduction

The **Perseus Project** will enter approximately 100 MB of textual material. The organization chosen for this material will be crucial for determining what kinds of information can easily be extracted from the database, what sorts of searches can be performed, and what kinds of links can be made. Since the nature of this project is scholarly, and most of the information that will be collected is literary, a critical part of the information that must be represented in the database is the logical structure and constituents of the texts. If properly represented, the logical structure can be used increase the versatility of all operations in performed on the text.

The structure chosen for text in **Perseus** will have to be flexible enough to accommodate various different categories of text, such as primary sources, reference materials, and scholarly commentary. Literary sources, both in Greek and in English, will constitute a large portion of the database. This poses two immediate problems: dual language texts must be keyed to one another, and most ancient texts contain preexisting referencing systems that must be accommodated. The rest of the textual database will be made up of secondary sources and reference works. These will include contemporary scholarship (for example, a history book), as well as a Greek dictionary and a classical encyclopedia. All these present their own problems for referencing. The secondary texts are referenced by pagination, a system that does not easily carry over to a computer implementation. The reference works also contain a great deal of highly structured information which must be extracted and represented efficiently.

It is also important that the type of organization chosen be as generic as possible, so that the data is portable. It should be capable of retaining both structure and link information for transport to another system. We are now creating a prototype system that will be used with hardware and software whose capabilities and specifications are still undecided. This will allow us flexibility in selecting a target system. A sufficiently generic structure will also let us plan for functionality that it may not be possible to implement immediately.

Document Structure

A lowest common denominator solution would be a flat ASCII file, or one containing only basic formatting information. This has the virtues of being easy to enter, relatively easy to port and easy to display. These advantages are, however, outweighed by its drawbacks. It does not convey essential information about the structure of the text. Instead of indicating a quotation or a section beginning, it can only show differing indents or bold type, since the only information available is presentational. It also does not allow information retrieval beyond searching for a simple string of characters.

In contrast to text with format information, text with content structured markup fits all the desired criteria, and can also be used to facilitate the inclusion of a textual database into

a hypertext system. Content structured markup is a non-system specific way of breaking down a text into its component elements. It uses tags to define the document as a hierarchy of its structural units, rather than to label individual blocks of text with formatting instructions. Thus, a play will be tagged with respect to its various units: *e. g.* speaker, speech, choral ode. A dictionary will be tagged respect to its entries: lemma, part of speech, gender, forms (either parsed or not), entries and subentries of the definition, etc. This type of markup consists of a small set of ASCII beginning and ending tags that are placed around the text element they define. The impact of the tags is determined by the type of document and the context in which they appear. For example, a tag for “verse” may appear in both lyric poetry and drama, but its significance and presentation may be different in each document type.

By retrieving information contained in and delimited by the structural elements of a document, such as searching only on chapter headings, or in dictionary subentries, content markup can create a database out of a text. Alternatively, parts of a document may be selectively hidden, depending on the prospective audience. Content markup may also be used to determine the presentation of a document. Formatting characteristics can be based on markup, so a document may be stored in a system independent format, and then formatted according to the display requirements of a particular system.

Links in Perseus

Most important of all, content markup may be used to facilitate linking in a hypertext system. In a large textual database such as the one **Perseus** will ultimately produce, there are two distinct categories of links, each of which may display some variation. The more common type is the *explicit* link; this is a unique link created by an individual. These may be coded into a distributed database, or left up to the individual user. Explicit links are generally indicated by a specific link marker (a footnote is an example of an explicit link on paper.) This is the type of link offered in most commercial hypertext systems, such as *Guide* and *HyperCard*. The other type, the *implicit* link, is less commonly available, but perhaps even more important in this type of large linked system. Implicit links are not point-to-point links made by hand and indicated by a specific link marker; they are “look-up” facilities that are accessible to the user at all times. Such links are called into existence by means of a program when they are used. Existing implicit links occur in such systems as on-line dictionaries and thesauruses.

The **Perseus** database will have a great deal of reference material that must be accessible from multiple locations. It will therefore be necessary to have many *implicit* links, that can be created by programming, and are not accessible through visible link markers. A general definition of this type of link is that it allows one to go from any one of a set of points to one particular point. In a special case, the destination might be the output of a program, like **Morpheus**. Examples of this are a link from a proper name to an entry in a classical encyclopedia, a link to a morphological parser, or even first to the parser, then to a dictionary entry. These actions may be facilitated by a static index that exists outside the data, and that has been created once, and is now fixed. Structured markup is essential for determining the proper targets for such links.

Since there may be more than one available implicit link on a particular word or phrase, it would also be helpful to have some kind of selection process by which one or more

options may be chosen. In this way, when an implicit link is followed, a user who wants to see particular types of information only sees what she expects. Either a user can set a filter with allowable categories of implicit link upon startup, or she can be presented with a menu of available links when she selects a word or phrase.

Content markup can also be used to facilitate the creation and maintenance of *explicit* links. A text will already be divided into tagged logical elements, so links may be attached to a portion of text, or, more easily, to its containing element. Since the elements are content objects, they will often delimit a natural span for a link. For example, a link can be made to a whole chapter rather than to all the words within the chapter.

Finally, there is a special category of link that is very important to include in *Perseus*, which may be categorized as a thematic link. A thematic link is a particular type of implicit link. When a student follows a thematic link, she should see a list of other places in the database that are relevant to it. For example, if she indicates "Perseus" where it appears at one point, she should be shown a list of texts and pictures referring to the Perseus myth from which she can then choose one or more to examine. Although this is an implicit link because it has no link marker, unlike the implicit links described above, it will have to be created using human intervention. The creation of these links can be partially automated by creating indices that are then edited by hand. Once again, content markup can be used to economize. If a particular entity, such as "Perseus" appears often, a link need not be made to each instance, but to the smallest markup element containing all the occurrences. So that if a certain percentage of paragraphs in a chapter contain references to "Perseus," only the chapter will be cited, and not each individual reference. This type of filtering can be built in to the indexing program.

Practical Considerations

Since most of the *Perseus* data will be scanned in, it will have to be marked up after it is entered. Tagging by hand seems like one way to ascertain that all the idiosyncrasies of the different texts and document types will be taken into account. However, this is time consuming, and will still require extensive verification afterwards. There are a number of ways to automate the content tagging of text. There is software commercially available (*Intelligent Markup System* from the Avalanche Development Company is one example) that will tag a scanned text. The shortcomings of this type of system are that it cannot deal with the complexity of literary texts, and that it is not context sensitive. Programs written in-house using utilities like Lex can make up for the shortcomings of the commercial packages. Using this technique, although careful human verification is still necessary, less time is spent on the actual markup, and later texts will be able to use the processing techniques developed for the earlier ones.

The uses for which *Perseus* is designed are such that it may have a more static structure than current commercial hypertext/hypermedia systems and that it does not require the same level of book-keeping as some of these others. This may be turned to advantage, and will allow batch processing of some information to take place while the database is being created. This will speed up performance later. An example of this kind of material is provision of indices for both implicit and explicit links that may be created ahead of time

At present *Perseus* is being prototyped using Apple's *HyperCard*. There are some obvious shortcomings to this package, notably that it cannot handle text beyond simply displaying it. However, even in *HyperCard*, it is possible to implement some of the concepts discussed above, and to test their advantages. Using separate fields, text that has a rigid structure can be marked up and used as an index into other parts of the database. An example of this may be seen in figures 1, 2 and 3, which show part of the index to the Loeb text of Herodotus, first as it appears when simply scanned in, then as it appears when tagged, and finally as it appears in *HyperCard*. This is also applicable to dictionary and encyclopedia entries. Unfortunately this system does not work at all well with most literary texts because the size and order of the document elements is not sufficiently predictable. A hypertext system like *Storyspace*, which provides hierarchical structures, would be much better suited to organizing and displaying a play or a work of history.

Perseus will consist of a large database with the implicit linking facilities described above already built in, as well as some of the explicit links. It should also offer the tools to create other explicit links, and to group selected implicit and explicit links. Until more sophisticated text handling is provided in an easily available hypertext system, content markup cannot be used to full advantage. Entering this type of information along with the text is much easier than adding it later, and it will then be available to support the full functionality needed for the final system.

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Figure 1: Herodotus Index as it appears when it has been scanned

Dionysophanes, an Ephesian, said to have buried Mardonius' body. IX. 84

Dionysus, III. 111; his cult in Greece, II. 49, 52, 145; in particular localities and under various names, I. 150, II. 29, III. 8, 97, IV. 79, 87, 108, V. 7, 67, VII. 111; identified with the Egyptian Osiris, II. 42, 47, 123, 144, 156

334

^L

Dioscuri, their worship unknown in Egypt, II. 43, 50; entertained by Euphorion, an Arcadian, VI. 127

Dipaea, in Arcadia, scene of a battle about 470 B.C. between Spartans and Arcadians, IX. 35

Figure 2: Herodotus Index as it appears when it is tagged.

ENTRY Dionysophanes
 SENSE
 SUB an Ephesian, said to have buried Mardonius' body.
 REF 9.84

ENTRY Dionysus
SENSE
REF 3.111
SUB his cult in Greece
REF 2.49, 2.52, 2.145
SUB in particular localities and under various names
REF 1.150, 2.29, 3.8, 3.97, 4.79, 4.87, 4.108, 5.7, 5.67, 7.111
SUB identified with the Egyptian Osiris
REF 2.42, 2.47, 2.123, 2.144, 2.156
PAGE* 334

ENTRY Dioscuri
 SENSE
 SUB their worship unknown in Egypt
 REF 2.43, 2.50
 SUB entertained by Euphorion, an Arcadian
 REF 6.127
 ENTRY Dipaea
 SENSE
 SUB in Arcadia, scene of a battle about
 REF 470 B.C. between Spartans and Arcadians
 REF 9.35

* The PAGE tag and number do not properly belong with the index text, but must be included since pagination is the only way of referencing into contemporary texts. It may be viewed as an additional layer of tagging that does not belong to the hierarchy as the content tags or as an in-line text element. This is also true for any references that are not derived from component units of a text, such as Stephanus pages in Plato.

Figure 3: Herodotus Index as it appears in HyperCard

Dionysus **Herodotus**

PAGE 333

3.111

his cult in Greece

2.49, 2.52, 2.145

in particular localities and under various names

1.150, 2.29, 3.8, 3.97, 4.79, 4.87, 4.108, 5.7, 5.67, 7.111

identified with the Egyptian Osiris

2.42, 2.47, 2.123, 2.144, 2.156

History Herodotus Index 42

Sample 1: Dictionary

Entry

```

{
  Lemma {}
  Part of Speech {}
  Gender {}
  Definition {
    English {}
    Citation {
      Author {}
    }
    Citation {
      Quote {}
      Translation {}
      Author {}
    }
    Citation {
      Author {}
    }
  }
  Definition {
    English {}
    Citation {
      Translation{}
      Author{}
    }
    Citation {
      Author {}
    }
  }
  Definition {
    Citation {
      Author {}
      Synonym {}
    }
  }
}

```

κερο-φόρος, *ον*, (φέρω) = κερασφόρος, *horned*, Eur.
 κέρσα, Ep. aor. 1 of κέρω.
 κερτομέω, *ι*, *ησω*, (κέρτομος) *to taunt or sneer at*, c. acc. pers., Od., Aesch., Eur.: *absol. to sneer*, Od.:—
 Pass. *to be scoffed at*, Eur. Hence
 κερτόμησις, *ως*, *ῆ*, *jeering, mockery*, Soph.; and
 κερτομία, *ῆ*, = foreg.; in pl., κερτομίας ἢδ' αἰσῦλα μυθή-
 σασθαι Il.; κερτομίας καὶ χείρας ἀπέξω Od.
 κερτόμιος and κέρτομος, *ον*, (κέρ, τέμνω) *heart-cut-*
ting, stinging, reproachful, Od.; Δία κερτομίοις
 ἐπέεσσι Hom.; also, κερτομίοισι (without ἐπέεσσι)
 Id.; κέρτομα βάζειν Hes.; χόροι κέρτομοι *abusive*,
 Hdt. II. *mocking, delusive, κέρτομος χαρά* Eur.
 κέρχνη, *ῆ*, a kind of hawk, the kestrel; also κερχνηίς,
 contr. κερχνής, ῆδος, *ῆ*, Ar.
 κέσκετο, Ion. 3 sing. impf. of κείμαι.
 κεστός, *ῆ*, *ον*, (κεντέω) *stitched, embroidered*, κεστός
 ἰμάς of Aphrodite's charmed girdle, Il. 2. later,
 κεστός, *δ*, as Subst., Lat. *cestus*, Anth., Luc.
 κέστρα, *ῆ*, (κεντέω) a fish held in esteem among the
 Greeks, Ar.
 κευθάνω, poet. for κεύθω, Il.
 κευθμός, *δ*, = sq., Il.

κευθμών, ὄνος, *δ*, (κεύθω) a hiding place, hole, corner,
 Od.; κευθμώνες ὄρων the hollows of the mountains,
 Pind., Eur. 2. of the nether world, the abyss, Hes.,
 Aesch. 3. in Aesch. Eum. 805 = ἄδυτον, a sanctuary.

κευθόσσα, Dor. for -ουσα, part. fem. of κεύθω.
 κεύθος, *εος*, *τό*, = κευθμών, ὑπὸ κεύθει γαίης in the
 depths of the earth, Hom.; in sing., κ. νεκῶν Soph.;
 κ. οἰκῶν the innermost chambers, like μυχός, Eur.

ΚΕΥΘΩ, *ι*, κεύσω: aor. 1 ἔκευσα: Ep. redupl. aor. 2 subj.
 κεύθω: pf. ἐκέυθα: plqpf. ἐκεκεύθειν, Ep. κεκεύθειν:—
 to cover quite up, to cover, hide, of the grave, δπου
 κύθε γαία where earth covered him, Od.; so, ὃν οὐδὲ
 καθανόντα γαία κ. Aesch.; also, ὅπρ' ἄν σε δόμοι
 κεύθωσι, i. e. when thou hast entered the house, Od.:
 Soph.:—pf. to contain, Hom., Soph. 2. to conceal,
 and in pf. to keep concealed, Hom.; οὐκέτι κεύθετε
 βρωτῶν οὐδὲ ποτήτων no more can ye disguise your
 eating and drinking, Od.; κ. τι ἔνδον καρδίας Aesch.;
 κ. μῆνιν to cherish anger, Eur. 3. c. dupl. acc.,
 οὐδὲ σε κεύσω [ταῦτα] nor will I keep them secret from
 thee, Od. II. in Trag. sometimes intr. to be con-
 cealed, lie hidden, esp. in pf., Aesch., Soph.

κεφαλάδιον, *τό*, Dim. of κεφάλαιον.
 κεφάλαιος, *α*, *ον*, (κεφαλή) of the head: metaph., like
 Lat. *capitalis, principal*, Ar. II. as Subst.,
 κεφάλαιον, *τό*, the head, Id. 2. the chief or main
 point, the sum of the matter, Pind., Thuc., etc.; ἐν
 κεφαλαίῳ, or ὡς ἐν κ., εἰπεῖν to speak summarily, Xen.,
 etc.; ἐν κεφαλαίῳ ὑπομνήσαι, ἀποδείξει, περιλαβεῖν τι
 Thuc. 3. of persons, the head or chief, Luc. 4.
 of money, the capital, Lat. *caput*, opp. to interest, Plat.,
 etc.: the sum total, Dem. 5. the crown, completion
 of a thing, a crowning act of wrong, Id.; κ. ἐπιτιθέναι
 ἐπὶ τινί, Lat. *corollam imponere rei*, Plat. Hence
 κεφαλαίῳ, *ι*, ὄσω, to bring under heads, sum up,
 state summarily, Thuc. II. to smite on the
 head, N. T.
 κεφαλαί-ῳδης, *ες*, (εἶδος) *capital, principal, chief*,
 Luc.:—Adv. -δῶς, summarily, Arist.

κεφαλαίωμα, *ατος*, *τό*, (κεφαλαίῳ) the sum total, Hdt.
 κεφάλ-αλγής, *ἑς*, (ἀλγέω) causing headache, Xen.
 Hence

κεφαλαγία, *ῆ*, head-ache: later -αργία, *ῆ*, Luc.
 ΚΕΦΑΛΗ, *ῆ*, the head of man or beast, Hom., etc.; κατὰ
 κεφαλῆς, Ep. καὶ κεφαλῆς, over the head, Id.; καὶ κεφαλῆν
 ὀπίσθην, Il.:—ἐς πόδας ἐκ κεφαλῆς from head to foot,
 Ib.:—ἐπὶ κεφαλῆν head foremost, head downwards,
 headlong, Hdt., Plat., etc. 2. the head, put for the
 whole person, Hom.; ἴσον ἐμῇ κεφαλῇ like myself, Il.;
 φίλη κ., Lat. *carum caput*, Ib.: in bad sense, δ κακὰ
 κεφαλαὶ Hdt.; δ μαρὰ κ. Ar. 3. the head, i. e. the
 life, παρθέμενοι κεφαλὰς setting their heads on the
 cast, Od.:—in imprecations, ἐς κεφαλῆν τρέποιτ' ἐμοὶ
 on my head be it! Ar., etc. II. generally, κ.
 σκορόδου a head of garlic, Id.: the top or brim of a
 vessel, Theocr.: the coping of a wall, Xen.:—in pl.
 the head or source of a river, Hdt. III. metaph.,
 like κεφάλαιον, the crown, completion of a thing, Plat.
 κέφαλληφι, -ῆφι, Ep. gen. and dat. of κεφαλή.
 κεφάλινος, *δ*, a sea-fish, = βλεψίας, Dorio ap. Ath.
 κεφάλιον [ᾶ], *τό*, Dim. of κεφαλή, Plut.
 κεφάλις, ἴδος, *ῆ*, Dim. of κεφαλή. II. part of a
 shoe, Arist. III. a head, chapter, N. T.

κέχανδα, pf. of χανδάνω.
 κεχάραγμα, pf. pass. of χάρασσω.
 κεχάρηκα, κεχάρημαι [ᾶ], pf. act. and pass. of χαίρω.
 κεχάρησεμεν, Ep. fut. inf. of χαίρω.
 κεχάρησεται, 3 sing. Ep. fut. med. of χαίρω.
 κεχάρητο [ᾶ], -ηντο, Ep. 3 sing. and pl. plqpf. pass.
 of χαίρω.
 κεχάρησθαι, Ep. pf. part. of χαίρω.
 κεχάρισμένος, pf. pass. part. of χαρίζομαι.
 κεχάριστο, 3 sing. plqpf. pass. of χαρίζομαι.
 κεχάριτωμένος, pf. pass. part. of χαριτόω.
 κεχάροιατο, Ep. for -οιτο, 3 pl. plqpf. pass. of χαίρω.
 κεχάροντο [ᾶ], 3 pl. Ep. redupl. aor. 2 med. of χαίρω.
 κέχηνα, pf. of χάσκω. Hence
 Κεχηναῖοι, *ων*, *οί*, Comic word for Ἀθηναῖοι, Athenians,
 Ar.

κέχλαδον, poet. redupl. aor. 2 of χλαδῶ.
 κελᾶδῶς, pf. part. of χλάζω.
 κελᾶγκα, pf. of χλιαίνω.
 κελᾶιδῶς, pf. part. of χλιώ.
 κερημένος, needy, pf. pass. part. of χρώω c.
 κερηλώσθαι, pf. pass. inf. of χολῶω.
 κερηλώσομαι, fut. 3 pass. of χολῶω.
 κερηματισμένος, pf. pass. part. of κερματίσω.
 κέχῃμαι, pf. pass. of χέω.
 κέχῃτο, -υντο, 3 sing. and pl. Ep. plqpf. of χέω.
 κερωρίδαται, Ion. 3 pl. pf. pass. of κερωρίζω.
 κερωρισμένως, Adv. (κωρίζω) separately, Arist.
 κερωσμένος, pf. pass. part. of κώνυμι.
 κέωμαι, subj. of κείμαι.
 κέων, part. of κέω = κείω, q. v.
 Κέως, Ion. Κέος, *ῆ*, Ceos, one of the Cyclades, Hdt., etc.:
 —hence Κείος, Ion. Κήϊος, *δ*, a Ceian, Id., etc.; οὐ
 Χίος, ἀλλὰ Κείος not a (roguish) Chian, but an (honest)
 Ceian, proverb in Ar.
 κῆ, Ion. for πῆ or τοῖ: but κῆ enclit. for πῆ or του, Hdt.
 κῆαι, (Ep. aor. 1 inf. of καίω) 3 sing. opt. II. κῆαι,
 3 sing. opt.

Sample 2: Encyclopedia Entry

Entry

```
{
  Headword {}
  Greek word {}
  Definition {
    Paragraph {
      Text {}
      Citation {}
      Cross Reference {}
      Cross Reference {}
    }
  }
}
```

Ocularius. An oculist; a medical specialist who devoted himself to the treatment of the eyes (Scrib. *Comp.* 37; Cels. vi. 6, 8). At Rome these practitioners were generally Greek, and appear not to have been numerous before the first century A.D. A number of seals belonging to these physicians have been found, and are described by Villosio Thédénat, *Les Cachets d'Oculistes Romains* (Paris, 1882). See also Grotefend, *Die Stempel der Augenärzte* (Hanover, 1867); and Fröhner in the *Phil. Suppl.* v. 87.

Ocyptété (Ὀκυπτέτη). "The swift-footed." One of the Harpies. See HARPYIAE.

Ocyrhoé (Ὀκυρόη). (1) A daughter of the Centaur Chiron, who possessed the gift of prophecy. She is said to have been changed into a mare. (2) A daughter of Oceanus and Tethys.

Ode. See CARMEN.

Odenathus. The ruler of Palmyra who checked the victorious career of the Persians after the defeat and capture of Valerian, A.D. 260 (Procop. *Pers.* ii. 5). In return for these services, Gallienus bestowed upon Odenathus the title of Augustus. He was soon afterwards murdered, and was succeeded by his wife Zenobia, A.D. 266. See PALMYRA; ZENOBIA.

Odessus (Ὀδησσός). (1) Now Varna; a Greek town in Thracia (in the later Moesia Inferior), on the Pontus Euxinus. It was founded by the Milesians, and carried on an extensive commerce. (2) A seaport in European Sarmatia, northeast of the modern Russian city of Odessa.

Odeum. See THEATRUM.

Odoacer, usually styled king of the Heruli, was the leader of the barbarians, who overthrew the Western Empire, A.D. 476. He took the title of King of Italy, and reigned till his power was overthrown by Theodoric, king of the Goths. Odoacer was defeated in three decisive battles by Theodoric (489-490), and then took refuge in Ravenna, where he was besieged for three years. He at last capitulated on condition that he and Theodoric should be joint kings of Italy; but Odoacer was soon afterwards murdered by his rival. See Procop. *B. G.* i. 1; Iornand. *De Reb. Goth.* pp. 128-141; and Hodgkin, *Italy and her Invaders* (1880-95).

Odryæe (Ὀδρύσαι). The most powerful people in Thrace, dwelling in the plain of the Hebrus, whose king, Sitalces, in the time of the Peloponnesian War, exercised dominion over almost the whole of Thrace. (See THRACIA.) The poets often use the adjective *Odrysius* in the general sense of *Thracicus*.

Odyssæa (Ὀδύσσεια). A town of Hispania Baetica, north of Abdera, and reported to have been founded by Odysseus (Strabo, pp. 149, 157).

Odyssæia (Ὀδύσσεια). The *Odyssey*. See ODYSSEUS; HOMERUS.

Odysseus (Ὀδυσσεύς; the Latin equivalent being *ULIXES*; erroneously written *ULYSSES*). King of Ithaca, son of Laërtes and Anticlea, the daughter of Autolycus. In post-Homeric legends he is called a son of Sisyphus, conceived by Anticlea before her marriage with Laërtes. According to Homer, his name ("the hater," from ὀδύσσομαι) was given him by his grandfather Autolycus, because he himself had so often cherished feelings of hatred during his life (*Od.* xix. 402). His wife Penelopé (or

Penelopea), daughter of Icarus (see *PENELOPE*), is said by later legends to have been obtained for him by her uncle Tyndareos in gratitude for counsel given by him. (See *TYNDAROS*.) When his son Telemachus was still an infant, Agamemnon and Menelaüs, as Homer tells us, prevailed on him to take part in the expedition against Troy. Their task was hard, as it had been predicted to him that it would be twenty years before he saw his wife and child again. Later writers relate that he was bound, as one of Helen's suitors, to take part in the scheme, but tried to escape his obligation by feigning madness, and among other acts yoked a horse and an ox to his plough and so ploughed a field. When, however, Palamedes, who, with Nestor and Menelaüs, was desirous of taking him to Troy, proceeded to place Telemachus in the furrow, he betrayed himself, and had to accompany them to the war. Odysseus led the troops of Ithaca and the surrounding islands to Troy in twelve vessels. In contrast to the later legend, which represents him as a cowardly, deceitful, and intriguing personage, he always appears in Homer among the noblest and most respected of the heroes, and, on account of his good qualities, he is the declared favourite of Athéné. He combines in his person courage and determined perseverance with prudence, ingenuity, cunning, and eloquence. Accordingly, he is employed by preference as a negotiator and a spy. Thus, after the disembarkation, he goes with Menelaüs into the enemy's city to demand the surrender of Helen. Again, he is among those who are despatched by the Greeks to reconcile with Agamemnon the enraged Achilles. With Diomedes, who delights in his company, he captures the spy Dolon and surprises Rhesus; with the same hero he is said by later legend to have stolen the Palladium from Troy. When Agamemnon faint-heartedly thinks of flight, he opposes this idea with the utmost decision. Everywhere he avails himself of the right time and the right place, and, where courage and cunning are needed, is ever the foremost. After Achilles' death, in the contest with Ajax, the son of Telamon, he received the hero's arms as a recognition of his services, and by his ingenuity brought about the fall of Troy. Shortly before it, he stole into the city in the garb of a beggar, in order to reconnoitre everything there; he then climbed with the others into the wooden horse, and contrived to control the impatient and the timid alike until the decisive moment. See *TROJAN WAR*.

His adventures during the return from Troy and on his arrival in his native country form the contents of the *Odyssey* of Homer. Immediately after the departure Odysseus was driven to the Thracian Ismarus, the city of the Cicones, and, though he plundered it, he lost in a surprise seventy-two of his companions. When he was desirous of rounding the promontory of Malea, the southeast point of the Peloponnesus, he was caught by the storm and carried in nine days to the coast of North Africa, on to the land of the Lotophagi (lotus-eaters), whence he had to drag his companions by force to prevent their forgetting their homes for love of the lotus-food. Thence the voyage passed into the legendary world of the Western Sea, then little known to the Greeks. Odysseus came first to the country of the Cyclopes (q. v.), where, with twelve of his comrades, he was

Sample 3 : Drama

Greek	English
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AESCHYLUS

ΚΑΤΤΑΙΜΗΣΤΡΑ

1050 ἄλλ' εἴπερ ἐστὶ μὴ χελιδόνος δίκην
ἀγνώτα φωνὴν βάρβαρον κεκτημένην,
ἔσω φρενῶν λέγουσα πείθω νιν λόγῳ.

ΧΟΡΟΣ

ἔπον. τὰ λῶστα τῶν παρεστώτων λέγει.
πιθοῦ¹ λιπούσα τόνδ' ἀμαξήρη θρόνον.

ΚΑΤΤΑΙΜΗΣΤΡΑ

1055 οὔτοι θυραία² τῆδ'³ ἐμοὶ σχολὴ πάρα
τρίβειν· τὰ μὲν γὰρ ἐστίας μεσομφάλου
ἔστηκεν ἤδη μῆλα πρὸς σφαγὰς πάρος⁴,
ὡς οὔποτ' ἐλπίσασι τῆνδ' ἔξειν χάριν.
1060 εἰ δ' εἴ τι δράσεις τῶνδε, μὴ σχολὴν τίθει.
εἰ δ' ἀξυνήμων οὔσα μὴ δέχη λόγον,
οὐ δ' ἀντὶ φωνῆς φράζε καρβάνῳ χερσί.

ΧΟΡΟΣ

ἐρμηνέως ἔοικεν ἡ ξένη τοροῦ
δεῖσθαι· τρόπος δὲ θηρὸς ὡς νεαίρετου.

ΚΑΤΤΑΙΜΗΣΤΡΑ

1065 ἡ μαινεταιί γε καὶ κακῶν κλύει φρενῶν,
ἥτις λιπούσα μὲν πόλιν νεαίρετον
ἠκει, χαλινὸν δ' οὐκ ἐπίσταται φέρειν,⁵
πρὶν αἱματηρὸν ἐξαφρίζεσθαι μένος.
οὐ μὴν⁶ πλέω ρίψασ' ἀτιμασθήσομαι.

¹ πείθου: Blomfield.

² θυραίαν: Casaubon.

³ τῆνδ': Musgrave.

⁴ πρὸς: Musgrave.

⁵ M is extant for ll. 1068-1158.

⁶ μὴ M¹, μὴν M².

AGAMEMNON

CLYTEMESTRA

Well, if her speech be not strange and outlandish,
even as a swallow's, I must speak within the compass
of her wits and move her to comply.

CHORUS

Go with her. Of what is thine to choose she giveth
thee the best choice. Do as she bids thee and quit
thy seat in the car.

CLYTEMESTRA

I have no leisure—mark me that—to dally with
this woman here outside; for already the victims
stand by the central hearth awaiting the sacrifice—
a joy we never expected to be ours. As for thee, if
thou wilt take any part therein, make no delay.
But if, failing to understand, thou dost not catch my
meaning, then, instead of speech, make sign with
thy barbarian hand.

CHORUS

'Tis an interpreter and a plain one that the stranger
seems to need. She bears herself like a wild creature
newly captured.

CLYTEMESTRA

Nay, mad she is and hearkens to her wild mood,
since she hath come hither from a city newly captured,
and knoweth not how to brook the curb until she
hath foamed away her fretfulness in blood. No! I
will waste no more words upon her to be insulted
thus.

[Exit

