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ABSTRACT

This report evaluates findings of the Perseus hypermedia project, a digital library of resources for studying the ancient world, especially Greece. Specifically, this evaluation examined Perseus-elated assignments, activities, and methods developed from fall 1993 to spring 1996 at a number of institutions of higher education. It found that Perseus had been used in directed assignments, open-ended assignments, as a translation tool, as the basis for classics "labs," as a library resource, as a lecture/demonstration tool, as a correlate to museum activities, for online exams, and as part of an online telecourse. Evaluation concluded that: (1) Perseus amplifies and augments teaching/learning; (2) Perseus requires substantial physical infrastructure investment; (3) Perseus demands new conceptual infrastructures for teaching/learning; and (4) Perseus is bringing systemic changes to the classics. Individual sections of the report describe Perseus uses at: Ball State University (Indiana), Holy Cross College (Massachusetts), the University of Michigan, Rhodes College (Tennessee), Bates College (Maine), Miami University (Ohio), Skidmore College (New York), Tufts University (Massachusetts), University of Houston (Texas), Illinois Wesleyan University, and Virginia Tech. Also provided is an analysis of the evaluation questionnaire. Four appendices provide the questionnaire, a correlation matrix, statistical tables, and a sample Perseus web site usage summary. (DB)

Perseus Evaluation Final Report 1995-96

"Developing and Evaluating a Curriculum for Exploratory Learning in Ancient Greek Culture"

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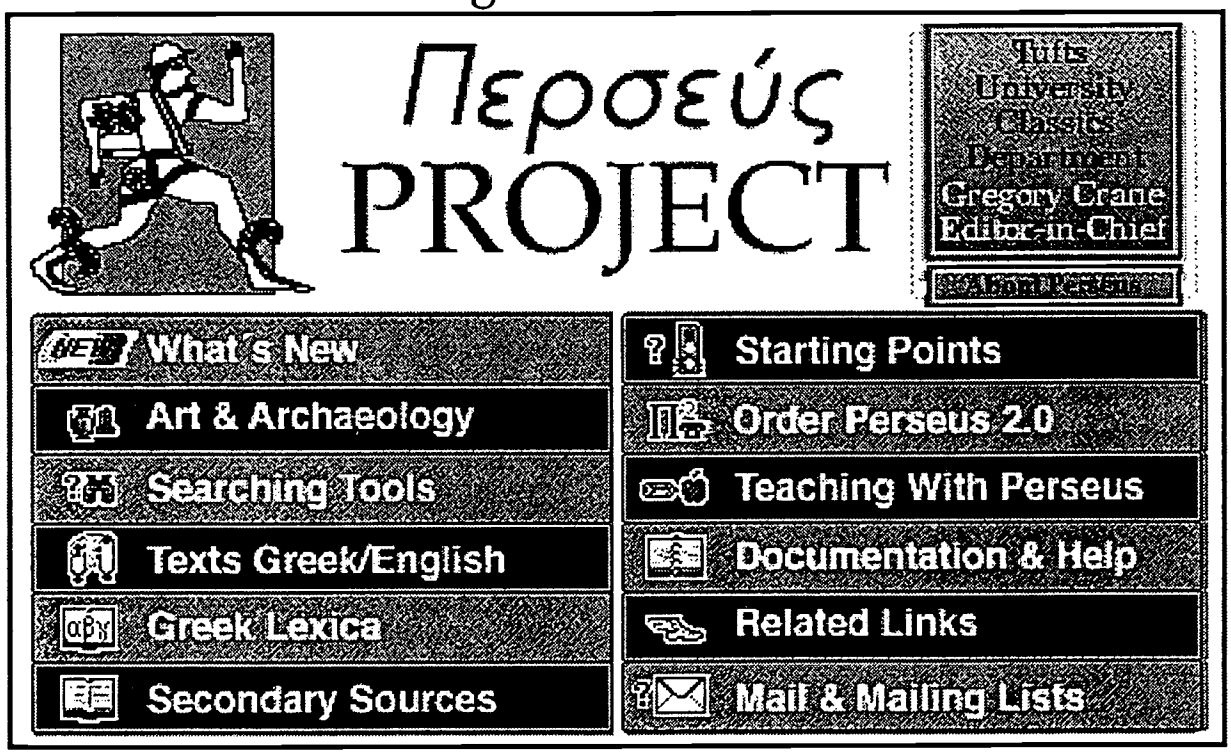

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Executive Summary

The Perseus hypermedia corpus has been evaluated throughout its development over the past seven years. This report summarizes the FIPSE-sponsored evaluation of assignments, activities and methods developed during the three academic years from the Fall of 1993 to Spring of 1996. During this time, Perseus has been used in a variety of ways, including: for directed assignments where students follow instructor-created paths or worksheets; for open-ended assignments where students use Perseus to investigate themes or concepts and then write papers or create their own Perseus-paths; as a translation tool; as the basis for classics "labs" where groups investigate classical evidence; as a library resource and supplement to the course; as a lecture/demonstration tool during class sessions; as a correlate to museum activities or assignments; for online exams; and as part of a team-taught, online telecourse.

The many syllabi and assignments created during this three-year period as well as previous years' evaluation reports may be found at the Perseus web site: http://www.perseus.tufts.edu. Readers are strongly encouraged to consult those electronic documents. The key findings are summarized into four categories.

Perseus amplifies and augments teaching and learning. A common theme reiterated throughout the evaluation is that Perseus brings much new content to a course. This amplification takes two forms: more texts (including some not available for students in print forms) and more images and maps than most department slide and map libraries offer; and an integrated corpus that allows text-oriented courses to easily add image-based context and vice versa. Another type of amplification often noted is that content may be accessed more quickly and easily than physical versions in libraries (mechanical advantage).

Perseus was also found to augment courses by allowing instructors to introduce new activities that would have otherwise been impossible. The philological tools allowed instructors in class to illustrate points with word analyses or to visually and easily correlate geographic characteristics and textual passages. In addition, entirely new courses were created that integrated the varied and multiple resources in Perseus. More importantly, Perseus empowered new kinds of student learning such as sophisticated philological investigations by students who knew no Greek, visual investigations of themes, and new discoveries by students alone or as part of a class.

Perseus requires substantial physical infrastructure investment. At every site, hardware and network problems caused frustration for faculty and students, substantial economic and human resources were necessary to make Perseus available in classrooms and laboratories, and laboratory staff had to be trained to support faculty and student access. These challenges are faced by all educational institutions introducing technology into instruction and reflect the larger learning curve investments taking place in all disciplines at the close of the twentieth century. One effect apparent when Perseus was used through the WWW was the relative ease of use when compared to the HyperCard-based version--students did not have to learn a new system but used the mostly familiar interfaces of web browsers. One result that recurred over the years is that self-reports on the system interface and learning effects are highly correlated while demographics, computer experience, and frequency of Perseus use are not statistically correlated with learning effects.

Perseus demands new conceptual infrastructures for teaching and learning. Instructors must learn to teach with Perseus and students must learn how to learn with Perseus, and both these requirements involve substantial amounts of time. Many instructors noted the large investments in time required to create assignments and Perseus-augmented lectures. Likewise,

some students complained about the amounts of time it took to learn to use and access the system and to find the information needed. Several instructors noted that students took longer to complete assignments than anticipated and that classroom use often took longer than planned since interesting alternatives or additional examples could easily be pursued with the system. Instructors should take into consideration that the novelty and amount of work an innovation demands may lower student course evaluation results during the early years of adoption. Several instructors noted that Perseus raised their levels of expectations about the scope of material accessible to students. Likewise, students at schools where Perseus was used in multiple courses came to expect that such resources would always be available for use in their courses.

A number of opportunities and challenges related to teaching emerged. The traditional dilemma of how best to mix open-ended and guided instructional activities is exacerbated by the many possible uses that Perseus offers. Likewise, how to best use class time and what content is displaced when Perseus-based content is introduced into a course or curriculum must be considered. Perseus allowed instructors to model how they do their own research and the risks and time required to model research should be considered. Instructors must learn to evaluate electronic assignments. One instructor noted that more extensive feedback was made possible by having assignments and his comments in electronic form since he could leverage all the advantages of word processing while grading. Certainly, instructors and administrators must understand that iterative planning and implementation cycles are required over years rather than weeks or semesters, and appropriate allowances, resources, and rewards must be available.

Opportunities and challenges related to learning were also varied. Students are certainly motivated by Perseus, especially by the images. In the final year of the project, students were observed to work harder and better when their assignments were put on the web--the persistence of the assignment beyond the end of the course and the "publication" of the work are likely explanatory factors in this regard. Some students reported being overloaded by the amount of content available in Perseus. Likewise, some students were overwhelmed in lectures that included many Perseus examples and multiple verbal themes. The learning curve necessary to use Perseus tended to be more problematic in large, general studies courses than in advanced courses for classics majors who tended to recognize the time it took to learn to use the tool as an investment to be amortized over multiple courses.

Perseus is bringing systemic changes to fields of classics. There are several indicators that Perseus is changing the way that classics is taught and studied. There are more than 50 courses included on the Perseus web site representing more than a dozen colleges and two dozen instructors. These courses use Perseus in a variety of ways and illustrate the penetration of Perseus into the classics curriculum internationally. In some sites discussed in this report, multiple instructors used Perseus for several of their courses. Several instructors noted that Perseus use has led students, faculty, and administrators to see classics as technologically "plugged-in" leading to more recognition and resources on campus. While it is too soon to generalize, the new courses created based on Perseus tend to integrate textual and visual materials and illustrate ways to break down barriers between distinct areas such as philology and art history.

There are other, broader indicators of Perseus' influence on the field of classics. New faculty position announcements list computer experience as requisites. The entire edition of Perseus 1.0 has sold out and the current Perseus web site receives more than 25,000 hits per day. Popular textbooks now include Perseus companion paths, and a Spin-off company: Classical Technology Systems provides training and support. The Perseus project continues to attract funding for expanded work, and workshops and papers related to Perseus are standard fare at professional conferences in the multiple fields of classics as well as education.

Introduction

This report summarizes the results of the three year Fund for Improvement of Post-Secondary Education (FIPSE) project to create assignments, activities, and methods for using Perseus and to evaluate the effects these creations have on students, instructors, and classics curricula. Examples of materials created and the course contexts in which they were used are available on the "Teaching with Perseus" section of the Perseus web site (www.perseus.tufts.edu). The web site itself represents the product of this project and its impact is demonstrated by the extremely high levels of access (20-30 thousand hits per day in September 1996). Because most of the assignments and materials were meant to be used in electronic form (e.g., require electronic search and display tools, depict high-resolution color images, etc.) it is essential that anyone wishing to understand what was done in this project visit the web site itself. The focus in this report is on evaluation results from the third year (1995-6) of the evaluation component of the project. These results are related to the evaluation results from the first two years (1993-4 and 1994-5), which may be found at http://www.perseus.tufts.edu/FIPSE/.

The focus of this report is on FIPSE test sites with additional evidence from other sites where Perseus was used. The FIPSE test sites are seven colleges/universities (Ball State University, Holy Cross College, University of Michigan, Rhodes College, Tufts University, Wesleyan University, and the University of Wisconsin) that agreed to participate in development and evaluation. Over each of the three years of FIPSE support, different sites were selected for focused evaluation. In the third year, Ball State, Holy Cross, Michigan, and Rhodes were studied in detail.

Data were collected in several ways, including:

- interviews with students and instructors,
- written questionnaires completed by students,
- written structured reflections completed by instructors, and
- presentations by instructors at meetings held May 12-14, 1996 at Tufts University,
- notes, messages, and materials posted to the Perseus electronic list and the Perseus web site.

This data was analyzed during the summer of 1996 and together with results from the first two years, serve as the basis for this report. The report is organized as follows. First, summary sections for each of the four 1995-6 FIPSE sites are given, second, brief summaries of experiences at other sites are given, next an analysis of all student questionnaires returned in 1995-6 is given, and finally, a summary of the Perseus Listserv and website is provided.

Ball State University: Incremental and systemic integration

Instructors at BSU continued to use Perseus in multiple courses and in different ways in the 1995-6 academic year. Walter Moskalew continued to use Perseus for his CC 105 (Classical World) course where he used Perseus in the classroom for illustrating lectures and discussions and students completed two assignments that required access to Perseus in the laboratory. The first assignment guided students through a series of vase paintings to introduce concepts and vocabulary and to give students practice in visual investigation. In the second assignment, students were able to select one of four topics to investigate (kylixes, architecture, weapons, or furniture) and to use Perseus to gather information to write an interpretive paper. Moskalew also continued to used Perseus as a warehouse for raw materials that were used in Persuasion presentations during class lectures.

Bill Magrath continued to systematically build on his previous years' experience with Perseus in CC 305. In the past three years he had added more Perseus iconography and increased the weight of Perseus assignments in grading. He reported at the Evaluation meeting that student course evaluations dropped over these years although he believes he received good student papers as a result of the availability of Perseus resources. In 1995, he made a fundamental shift to decrease the grade attributable to Perseus and gave students a choice between an open-ended group project (as in past years) or a pre-fabricated project. All students chose the pre-fabricated project. He noted that there is an inverse relationship between what and how much students are asked to do and their ratings of the course. He also articulated a need to discover how to mix open-ended and strongly guided assignments. These issues are central to the development of conceptual infrastructures for teaching and learning with Perseus and other technologies (see Marchionini & Crane, 1994; 1993-4 and 1994-5 FIPSE Evaluation reports).

With respect to the FIPSE evaluation, Chris Shea was the primary Perseus user in 1995-6. She used Perseus in her section of CC 105 (Classical World) and CC 304 (The Ancient City—see http://www.perseus.tufts.edu/classes/CS.96s.html for an overview and rationale for this course). Her instructor reflections explicate the time investments professors make in adopting Perseus and suggest ways that Perseus and classics departments can support the instructional needs of other disciplines. Professor Shea also kept a journal of her experiences over the semester. The questionnaire analysis for these two classes illustrate two extremes in student ratings and suggest that instructors consider how Perseus is used in different courses.

CC 105 is a general studies course that attracts a wide variety of students, most of whom are not classics majors. The CC 105 class in the Spring 1996 semester was composed of mainly freshman and Professor Shea remarked that they had high levels of computer literacy. Students were given assignments to use Perseus to find specific facts or objects (the first assignment required students to find seven objects, e.g., "What is an aulos? Find an object which depicts it.) and to find information about topics or themes (a second assignment required students to find five objects and describe the process used; e.g., "Print out a map, find Thera and mark it on the map. How far is it from Thera to Knossos?"). In her journal, she noted that students took longer than expected to complete the assignments. The most significant event of the semester was the server crash in mid-semester that deeply frustrated students and the instructor. Of the 30 questionnaires turned by these students, only eight said that they would use Perseus again, even if it were not required. Students complained about difficulty of use and time required to use Perseus. Typical comments follow for the questionnaire item: What was the worst thing about using Perseus? "Took too much time to find information--not very user-friendly." "It was hard to work. Things I needed to look up, I went through about every entry and still could not find what I wanted." "Not being able to find a Perseus program that worked." "It's difficult to find your way around." "Get lost a lot;

sort of hard to use." "Trying to get the server up." "Took up a lot of time. Frustrated with path to information." "System problems, inconsistencies between net and CD-ROM versions." "I pulled all of my hair out and got a migraine headache." The few students who responded to the "Best thing about using Perseus" question made comments about the usefulness of images. The overall frustration these students felt is perhaps best summarized by one students' response to the final question about how Perseus affected learning: "[It] made it harder and made me mad!" These results contrast sharply with those from the CC 304 course.

In the CC 304 course, participants were upper-level students from a variety of majors. Professor Shea regularly used Perseus in the classroom to introduce concepts and model scholarly inquiry (e.g., in an early session she used it to conduct a "tour" of ancient Athens and suggested students follow up by conducting tours on their own). In her reflections she eloquently noted: "On days devoted to this serendipitous straying I believe we as professors are teaching the students the second of our great skills: learning. By taking them through the process of inquiry, assembling and (perhaps more importantly) culling data, learning is being modeled by the campus's best practitioners of that craft, by the professors, the ultimate lifelong learners."

These students were asked to maintain and hand in journals documenting their progress through the course. Students were free to use Perseus as a resource in writing short essays and were given some guided assignments (in one of these assignments, students were to simulate a walk around the Agora and answer five questions, e.g., "Choose a building you might have had some business in some sunny morning in ancient Athens. Describe it. Why did you choose it?" In her journal, Professor Shea noted that these assignments took longer than anticipated and she planned to abbreviate them in the future. She also noted some variations to try in another course--illustrating the important element of iterative planning necessary to develop the conceptual infrastructure for using technology in education.

The term project was linked to a museum exhibit on campus and required students to choose an object from the exhibit and explain its cultural significance to the people who created or used it. The project took the form of a paper and a presentation that could include Perseus demonstrations. These presentations were video taped and thus students were involved in orchestrating a complex process that demands alternative forms of expression. Students were told that their presentations could be used as "labels" for the objects in the museum, with the intention that students would be motivated by the authentic nature of the curatorial learning experience. That students are motivated to strive for excellence due to the persistent nature of their product (as opposed to assignments that only aim to achieve a grade) is echoed in remarks from Tufts and Holy Cross where students' web projects remain active after the course is over.

Students in this course were also affected by the three-week server outage and a late semester outage. However, the total experience clearly overcame these physical infrastructure problems. Ten of the 13 students turning in questionnaires reported that they would use Perseus again even if it were not required. It is important to note that only one of the 13 was a classics major and four were history majors. Some of their comments about why they would use it again follow. History major: "Very enjoyable just to browse through. Excellent visuals. Nice excerpts and documentation." History major: "I actually think I will enjoy Perseus more when I can skip from topic to topic. Having to trudge through a list of sites of questions diminishes the enjoyment of using Perseus." Anthropology major: "To look up things within the context of the culture for comparison/argument/etc." Psychology major: "Good information unobtainable elsewhere."

These students also noted problems of access in response to the "worst thing about Perseus" question. For example: Industrial technology major: "Finding the time to get to the lab--it would

have been easier to use if I could have accessed it at home." History major: "When the system was down and I couldn't get anything done." History major: "Confusion about how to find things." The impact of system performance was directly expressed in one student's journal: "Perseus is fun to use when everything goes as it should or as it was programmed to run, but if even one glitch appears, the whole experience is ruined." Another student journal entry reflects the impact of system problems on students' self-esteem: "Met with Dr. Shea. Perseus system worked like a charm. I am not stupid!"

The images and maps in Perseus typically draw praise. A history major summarized an impression many students expressed: "Visually--much easier to understand concepts when you can see a photograph of an object and the scale of buildings and sites."

That Perseus images, maps, and texts were viewed as one key component of the course is illustrated by comments on the last question about how Perseus affected learning. An industrial technology major noted on the questionnaire: "After reading the book for the class and listening to the lectures, the Perseus program filled in any gaps or explained some things better." Another student journal entry described an integrative outcome: "My knowledge of Athens has come to its zenith. I have just analyzed something in depth, that I knew little about before coming into this class. Everything that I have learned seems to be represented by this one temple. Wow, they [the Greeks] did a pretty good job."

Another outcome that echoes some of the discussion in Tom Martin's journals of past years is the vocational theme. One student describes in a journal entry how learning about computers will lead to his career. The final sentence of that entry is: "In this program the past is linked to the future."

In both classes, Professor Shea was surprised at how much time students took to complete the assignments. Likewise, instructors are not immune to the time demands of tools such as Perseus. Professor Shea discusses in her reflections the time investments for professors as they plan to use Perseus in their course. She also notes in her March 11 journal the time tradeoffs during class time. This entry describes a session in which she ran out of time for a planned demonstration. "This, incidentally, points up the biggest problem with using Perseus in class--unlike slides which ar too low-tech and familiar to excite much attention, Perseus itself distracts students and professors from the task at hand. ('How 'bout an aerial here? Cool. Do that again. Oh, this one is much better. Wait a sec. Oh, no, it's not this one, it's the next one..." Bell.)"

As the questionnaire analysis shows (see Questionnaire Analysis section) the overall ratings of these two classes were quite different. The CC 105 ratings are the lowest of all groups returning questionnaires on most items, whereas the CC 304 ratings were consistently in the positive half of all groups. The following interpretation may be informative to others planning to use Perseus. In general studies, introductory courses that attract a wide variety of students, it may be unwise to create assignments that demand that students invest substantial time in learning to use a tool specialized to that course. Students, after all, are highly conscious of time-grade tradeoffs, especially for non-major courses. This tool learning curve tradeoff is strengthened when the tool is useful for only a portion of the course content (e.g., only the Greek part of a Greek and Roman course like CC 105). For such settings, using Perseus as a classroom augmentation to illustrate lectures and discussions seems to be the minimal solution. This interpretation is consistent with the Michigan experience, where students were able to use Perseus materials for assignments but through the mostly familiar (at least on the Michigan campus) World-Wide Web; i.e., they did not have to learn to use a new tool. In courses with mainly majors or concentrators and when the course can take advantage of Perseus throughout the entire semester, the investment in learning to use the Perseus tools may be judged to be above the time cost. Additionally, these students may

see the value in learning the tool for subsequent courses.

In summary, it seems apparent that Perseus is a part of the culture at Ball State. Perseus acts as a library and a visual gateway for several of the BSU professors and students who are majors accept Perseus as a common resource rather than something experimental or special. The Classics department has leveraged it to gain new resources and campus attention (Perseus and the department were featured in a campus promotional video and Moskalew, Magrath, and Shea were featured in the alumni magazine). Most importantly, the faculty at BSU who have used Perseus over multiple years are developing the conceptual infrastructure necessary to teach with electronic resources. They actively share their experiences with other faculty at conferences and continue to study the impact over the years.

Holy Cross College: Perseus as part of the classics culture

For the fall 1995, Professor Smith used Perseus in a Pausanius course in which students read selections from all ten books in Perseus. Professor Smith admitted that teaching this course would have been "impossible without Perseus" since no good Pausanias texts are available. The most visible proof of this were the voluntary presentations given by the students to an open audience, including a FIPSE evaluator and at least two professors at Holy Cross. Relying only on their knowledge of Greek and the use of Perseus, each student developed an original thesis. For instance, one student used the English to Greek word search for "narrative" and "story" in order to determine how Pausanias viewed his own work. During the presentation, the Perseus text was projected onto the screen to better illustrate his point. Professor Tom Martin commented to this student that without the Perseus tool, he would not have been able to make these findings. After all the students had finished, Professor Martin commended them on the 'amount of original scholarship...I hope you will take this for granted ...I hope you will feel the sense of empowerment." Professor Smith also lauded them for doing what only someone with years of experience could do without Perseus.

Professor Smith also used Perseus in the Pausanias course to include archaeological materials for contextualizing the Greek language students were learning. The students were required to compare Pausanias' descriptions of the monuments in the Agora to the visual images of the Agora in Perseus. They then explored why Pausanias mentioned some monuments, but ignored others.

In the fall, Professor Smith also used Perseus to augment his two sections (each had more than 30 students with no archaeology background) of Introduction to Greek archaeology. Like the Pausanias course, all the course information was on the web, with many links directly to Perseus. One assignment involved reading Pindar's 7th Olympian Ode and then designing a monument for the ode's victor. The students' final project involved "teams of two or three students [who] will publish catalog entries of an object in the Worcester Art Museum on the World Wide Web." These catalog descriptions are still available on the web, for parents and friends to read (http://perseus.holycross.edu/Courses/Intro_Greek_Arch/wamguide/). Professor Smith also made it clear to a FIPSE evaluator that the students would not have been able to do this assignment without Perseus.

At the evaluation meeting Professor Smith noted that Perseus raises expectations for scope of accessible materials by students and for better quality student work by professors. He commented that students liked using Perseus to study for quizzes. He also noted that Perseus is part of the classroom environment at Holy Cross now and students are less aware of it's uniqueness.

In the Spring semester, Professor Smith used Perseus in an Art and archaeology in the Archaic age

course (http://perseus.holycross.edu/Courses/Archaic/Syllabus.html) and two sections of an Ancient Science course. He noted that many science majors were in the ancient science course and their experience with long labs for other courses prepared them well for Perseus lab activities. He had those students analyze terms in Herodotus and found that they discovered things about Herodotus that he himself did not know (Herodotus was the subject of his dissertation); moreover students said that they had never before thought much about language or history until using Perseus for these assignments.

At the Evaluation meeting and in his journal, Professor Smith reported that Perseus was used by six professors, making Holy Cross the most Perseus-intensive campus in the world. (See the Perseus and Holy Cross websites for detailed syllabi and sample assignments for the courses described above.) Professor Smith offered three possibilities to explain why Perseus is so prevalent at Holy Cross: "1. Philosophical reasons: There is general enthusiasm about Perseus throughout the department, perhaps even a conviction that Perseus is an important part of the department's future. 2. Technical reasons: Greatly improved access to networked computers on campus in this year has both raised awareness of networked resources, and has simplified the problem of getting access to Perseus 2.0: students are using the Multimedia Resource Center, with a dozen PowerPCs, reliably, and now a number of classrooms also include network access. ... 3. Increased experience. Getting a networked machine into [one of the professor's] office has let him use networked Perseus 2.0 long enough to gain confidence as well as gain an understanding of what is possible with it...." He also mentioned that "I have often felt in the past that limited use of Perseus in class time combined with open-ended invitation to students to use Perseus outside of class is a bad idea, but my objections were that students need mechanical and intellectual models of how to use Perseus, and must be convinced that their instructors take Perseus seriously. In this department, it may be that there is enough activity with Perseus that students will find models, and will believe that everyone takes Perseus seriously --whether it is demonstrated briefly or used daily in their course."

On a similar note, the Greek history professor and Professor Smith both noted that when "technologically-borderline" professors made a mistake with Perseus in class, not only were the students able to correct him, but they also had more respect for the technology as they could relate to his problems with it. Furthermore, Professor Smith commented that one of his FIPSE funded student assistants went on to get a job at the campus computer lab. His advice to new Perseus professors: "get your technologically border-line colleagues committed; get your students trained' prop up the colleagues with students behind the scene, and you may bring the rest of the student body along."

This same history professor also shared with Professor Smith that "Perseus made a notable difference in their [student] performance [on the exams]. Even a single weekend...with a system permitting them to check themselves reliably on morphology and definitions seems to have made an impact."

University of Michigan: Toward a common interface

The University of Michigan has a large classics department that provides several courses that serve as core undergraduate courses. For the 1995-6 academic year, Professor David Potter used Perseus in his Spring semester course: Classical Civilization 375: War in Greek and Roman Civilization (see web site for syllabus and assignments http://www.umich.edu/~classics/cc375/). Perseus was incorporated as an resource for assignments on Herodotus and Thucydides. A web site for the class was created by Sebastian Heath to support the class and provide access to Perseus

and other electronic resources. It is important to note that Perseus was delivered via this web site rather than as a stand-alone system. Thus, students were able to move easily among Perseus and other web-based resources (e.g., the Celts home page) using one familiar interface. Although there were some remnants of the physical infrastructure problem highlighted in all previous years, these were limited to waiting for workstations to become available and some system crashes. Instead of the unique Perseus interface, however, students (and faculty) accessed Perseus resources through the ubiquitous Netscape interface with which they typically had experience in other courses. Although this limited what was possible (the specialized Perseus browser and some of the atlas were not available), it made implementation much easier at all instructional levels (campus network and labs, instructor, and student). This was perhaps the most significant result to come from the Michigan experience.

A site visit to Michigan was conducted on April 4, 1996 during which time students in one discussion section (approximately 15 students) as well as the two teaching assistants and Professor Potter were interviewed. Several themes common to other sites arose at Michigan.

Students reported finding the maps helpful in providing context in assignment one (one of the objectives of the assignment was to do exactly that). One student said: "There were a lot of maps on the web pages too so that does help you, when Professor Potter does point out all the locations on the maps because otherwise there would be just words there on a page, you know if you say this guy moved his army from point A to point B you have no idea where they are unless you have some background information, unless you know what those maps look line and where those cities are located and they did have good pictures on there that showed what the area looked like."

Students noted that information overload was a concern. One student's expression summarizes one aspect of overload: "It's hard to use so much information...A lot of it is information that you totally cannot use, its kinda annoying to have that in front of you because you have to go through all of that, get around it, and sometimes it takes a half and hour just to get into the section that you want to get into." Another student noted: "Not all of this is going to be important, not all of this could possibly be on the final. There is no way to figure out, there is a lot." Other students pointed out that it depends on what is wanted from a course: an interesting learning experience or a grade. "You have to look at what you want to get out of the class also, the professor tells you all of the detailed information because he or she, they know it themselves. And its up to you really if you want to memorize all the little facts, it does help to draw connections and it does give you background information and I do think that it does help you understand the overall issue of what is going on. I suppose what you really need to know, as far as what is necessary, is what is the issue going on at any particular point in time. I do think that all the little pieces of information do help you draw conclusions and help you understand what is going on." This tension between students who are grade and outcome oriented versus those who are experience and process oriented is independent of Perseus but Perseus (and WWW resources even more so) expands the potential resource base dramatically.

One student related the information access and use issue to a highly satisfying experience using online information resources in a political science course. He noted that he found resources on the WWW that were not otherwise available. He said: "Other classes [inaudible] in terms of accessing information and writing papers, and we won't ever go back to simply using books and resources like that. Now the first place I go is the Lycos research."

Perseus assignments were the essential difference between this course and offerings in previous years. In the past, students were not given assignments that were to be turned in (a paper and exams were the basis for grades). Sebastian Heath stated that the assignments were designed to

give students a context for the topics of the course and "To get students to interact with the text." Just as Professor Shea at BSU had underestimated how much time students would take to complete assignments, Heath noted "...we designed them to take under an hour and I think we might have been off in that estimation, especially for the first one (upon prompting, he clarified the assignments took longer than anticipated). Professor Potter said that he wanted to make Perseus more interactive: "I think that one of the things that really has to be worked on in interactivity--they click and stare--it's where you have to start, but the next area of development is click, stare, and answer the question you were asked." He described the assignments as follows. "There were assignments in which you get the computer to ask them a question, which makes them go back and check the text do that they go back and they look at things a second or a third time." He also noted the importance of having the syllabus and the assignments online together (see the course web site for the syllabus and prompting questions). Thus, the innovation in the Perseus assignments at Michigan was in finding ways to prompt students with questions right from the system rather than verbally or with paper handouts. On the 35 student questionnaires, of the 19 students who responded to the "worst thing about Perseus" question, six noted system problems, six said the Perseus experience was a waste of time, and three noted that the assignments were not applicable to the course topics. Some of these reactions may be attributed to the expectations students bring to general studies courses, especially one that in previous versions had only one assignment and exams. However, as with the general studies course at BSU, the time investment in learning to use a specialized tool like Perseus, even on the ubiquitous WWW, should be considered as instructors integrate digital resources into those courses.

During the interview, Professor Potter pointed out the need for commentaries in Perseus texts but questioned whether it would be cost-effective to produce new commentaries. "I don't like uncommented text anyway, I think it is too foreign for students." He noted: "One of the problems is that Perseus uses Loebs and students buy Penguins," and argued that instructors will continue to use the printed texts that are commented. These comments were made as part of a larger discussion about the transition from a print to a mixed (BOTH print and electronic) educational culture.

Another theme that arose in the interview was related to the notion of a "plugged in classics" expressed by Professor Martin at Holy Cross in previous years and by students at BSU this year. Potter summed up his expectations about the effects of Perseus by pointing out the effects on student perceptions about classics. "I don't think there is any of this stuff [from which] you can expect great mental and moral transformations. I think what you can expect is just they generally make the subject more interesting to people, make them think. I think one thing we can say there are 600 people on this campus who know that classics is well plugged into the electronic age, and don't think that it is some boring discipline locked up in some dusty library somewhere. I think if there is any contribution it is, above all importance, our classics is here, it's here and now."

The Michigan experience demonstrated that delivering Perseus on the web greatly reduced the number of system specific problems for both instructors and students. This is not to say that all problems were solved (note the student questionnaire responses), however Sebastian Heath was able to spend time developing assignments and working with students rather than trying to get HyperCard-based Perseus to run on the campus network. Likewise, students did not need to learn a new, specific system but could use the Netscape browser with which most were already familiar. The use of assignments that prompt students to explore represents another direction for future development to make Perseus more interactive. A substantial side-effect contribution of this project at Michigan was the development of Heath's classics resources on the web, (http://rome.classics.lsa.umich.edu/welcome.html) which has become a heavily used link on the Perseus site itself.

Rhodes College: Perseus labs

Professor Kenneth Morrell took a new approach to teaching a Greek history class in the Fall 1995. Rather than rely on modern and ancient historians for a look at Greek history, the students used Perseus in a hands on approach to using primary materials to learn history through artistic and social developments.

Perseus was fully integrated and was the primary source of historical information and course assignments. His objectives ranged from traditional goals:
"1. To become familiar with the major political events and the defining cultural characteristics of the ... [four main periods];
2. To study the evolution of material culture preserved in vase painting, sculpture, coins, and architecture;
3. To follow the development of historiography, beginning with the conceptual perspectives of Herodotus and Thucydides"

to more contemporary goals:
"1. To develop the skills and strategies needed to find, access, and use information in a variety of traditional (printed) and non-traditional (electronic) formats;
2. To gain experience in forming research teams, formulating a research agenda, subdividing and managing responsibilities, and bringing group projects to successful completion." (quotes from course syllabus on www)

The course was composed of 14 students from a variety of majors. Students reported taking the class because they thought it would be interesting or because they knew Professor Morrell was teaching it. They also noted that they knew that Professor Morrell uses Perseus in his courses.

The course syllabus, information and all assignments were posted on a course web site (http://198.78.27.19/GRS/Courses/GRS/GRS221.html). Students were expected to turn in all assignments electronically. They used Perseus, Wordperfect or the word processor and spreadsheet in Claris Works, and a jpeg utility. They often inserted images into their papers, which seemed to have caused the most technological difficulty in the class.

Professor Morrell created a series of "labs" which he explains in the course syllabus "are modelled on labs in the natural sciences. In teams of two or three, you will work with an extensive collection of digital images and selected secondary sources to become familiar with the architecture, pottery, and sculpture of the periods under consideration." Though the intention had been for these to be large group projects, after the first few unsuccessful attempts, they were done either independently or in small groups.

There was no text book used in this course; instead Professor Morrell had the students read sections of the Historical Overview in Perseus. The primary text authors used in this course were available for purchase in the bookstore or students were able to use Perseus.

Professor Morrell also gave "traditional" (content-based) examinations. In keeping with the non-traditional approach, however, he gave these on-line. Students were given a time during which they needed to go to the lab and download the exam document; when they were finished, they left the completed exam in an electronic drop-box for Professor Morrell. Initially, Professor Morrell had intended to leave electronic voice notes correcting the exams, but due to technological limitations, he resorted to cutting and pasting notes into the papers. He also noted that with this system, as opposed to the conventional handwritten notes, he was able to give much more

feedback to the students as he could type faster and more legibly than he could write in longhand. Additionally, this electronic commentary helped in paper revisions, since he could directly link the two papers and highlight what should have been corrected. A key innovation that deserves future study is the notion that handling assignments electronically offers new possibilities for increasing the amount of feedback and number of student-faculty iterations. This notion should be testing in light of time-benefits and the potential for depersonalization of interaction.

Professor Morrell "spent considerable time incorporating Perseus, primarily in reviewing materials and designing lab assignments." For each of the six labs, Professor Morrell put very detailed directions on the web. Each had an Introduction, Objectives, and Description of Assignment. Professor Morrell also supplied study guides for each exam on the web. They were comprised of an Overview and Sections, which provided sample images and passages for review.

Another challenge he faced was how to best use class time. Professor Morrell's intention had been to use the computer in class. Due to Apple's failure to fill his order on time, however, he was not able to do so. When the laptop did arrive, rather than disrupt the schedule the course had already established, he rarely used the computer in class. Several sessions were held in the Macintosh Language Lab so Professor Morrell could demonstrate the labs before the students worked on their own. During the class observed during the site visit, for example, Professor Morrell led the students through an in-class "mini-lab" with the computer. One student expressed frustration, however, that things never worked as smoothly when working alone as they did when Professor Morrell was doing them. This comment echoed those of students at Ball State, illustrating again the investments students must make in learning to use Perseus itself.

In his reflections statement, Professor Morrell explained that the most difficult part of the course was evaluation "because I had to devote so much energy into designing materials." He expressed an observation made by other professors teaching with non-traditional methods: "I have yet to develop a satisfactory way of evaluating laboratory assignments, particularly for teams."

Though Professor Morrell was "unsure about how Perseus affected learning in this particular course" he was "certain ... that nearly every student learned to do something on the computer that they had never done before." He was not surprised by how many questions the students had about the computers, and his resolve to devote time to computers and information-seeking skills is in concert with the plugged in classics experiences at Ball State, Holy Cross, and Michigan.

A relatively common complaint about Perseus from history teachers is the lack of information about the Bronze Age. Professor Morrell again ran into this problem, but because his class was web-dependent, they were able to access notes for Jeremy Rutter's Bronze Age course at Michigan. Furthermore, the students were encouraged to email Professor Rutter. Professor Morrell notes that this would have been possible, but more difficult if done without the network: "Although there are a number of books on the Bronze Age, I do not believe that these notes or similar summaries and views are available in printed sources, and although it is possible for students to communicate with authors and faculty members at other institutions, the ease and immediacy of the network make such interaction far more likely to take place than if we were to rely on more conventional channels of communication."

Perseus and the Internet also provided materials that would otherwise have been unavailable to students at a small, non-research focused college. Professor Morrell explains that "this may be the first course I have taught using Perseus that students could do a few things that could not have been done before because some of the resources we used are simply not available in printed sources." He goes on: "The point I should stress ... is access for students who do not have the

range of resources in our modest library to support similar approaches using printed resources. This is particularly true for the work we did on vase paintings. ... Our slide collection is not comprehensive enough to even begin to do what we did."

During the site visit and at the Evaluation meeting in May, Professor Morrell expressed frustration with the course. One factor was the infrastructure problems caused by the delay in Apple's delivery of the equipment. He felt he "might have been able to make better use of Perseus" if he had the equipment in the classroom. On the other hand he did note that: "The course promoted independent thought and creativity."

Not only was this Professor Morrell's first time teaching a Greek history course that spanned such a wide time frame (Bronze Age to the end of the Hellenistic Period), he was also faced with the challenges of the content limitations of Perseus, as noted above. "Consequently, I [Professor Morrell] struggled with the normal problems associated with teaching a course for the first time as well as problems with he infrastructure and certain limitations in the database. I do, however, look forward to the next iteration because I will have a much better sense of the pacing and the types of projects to try."

Time factors are always an issue when deciding what to concentrate on in a course and what to gloss over. At the Evaluation meeting, Professor Morrell noted: "Everything takes longer than we expect." When teaching this course in the future, he would cut the number of labs in half, time them better with what is being taught in the class, and shrink the time the lab takes to complete. The labs were very comprehensive and time consuming for the students, especially after they stopped working in teams. This assignment time issue reflects those at Ball State and Michigan as well.

During site visit interviews and on the Perseus questionnaires, the students seemed to have a reaction to the course that was opposite of Professor Morrell's--they thought it was quite successful. Knowing Professor Morrell and his style before the course, many of these students interviewed expected a technology component. When one student saw the syllabus, however, her first reaction was that she would not have enough time to do everything, "but it really has been easier than I would have thought." Another student expressed a similar intimidation at the beginning of the course, but towards the end, felt: "more confident now. I mean, Professor Morrell's always there to help, you can call him at home if you were having problems."

As illustrated at Holy Cross this year, the more a professor seems "down to earth" and like a "real person" (i.e. if the professor shared the students' frustration with computer troubles) to the students, the more credibility they and the technology gets. During an interview, two students were discussing Professor Morrell's accessibility and patience with the students when teaching them how to use Perseus. One of these students said: "You can not catch the man in a bad mood. Except when he's having problems with his computer. Even then, he's like, whatever, can't come to the phone, whatever." Both students then agreed that his attitude towards their learning makes learning easier since "he doesn't ever get that superior thing." This student continued that Professor Morrell was more interested in the fact that they did learn the history and the technology than producing the papers on time: "As long as it gets done, you can take your time. He can't make you become an expert in a matter of days."

This realistic approach to learning had a great impact on the students, since they all went away from the class feeling satisfied with what they had accomplished and how they had learned Greek history. While they were all impressed with the amount and the diversity of the content in Perseus, many of them did also recognize that they had approached learning differently in this course than in

most others they had taken. One student expressed that this "hands on type of learning ... made learning fun and interesting...It was really a lot easier to learn the material by being able to see it myself."

Another student credited Perseus with helping Classics "come alive." This student continued: "Perseus is a wonderful supplement which adds to the professor's instructions and class discussions. For example, when looking at the images for our architecture, vase, and sculpture labs, the ability to read about the specific dimensions, unique characteristics, and the importance behind the piece not only gave me a deeper appreciation of the art itself but also a deeper appreciation for the craftsmen and their ability and skill. Also, it helps [me] understand the work when I was able to look it up in the Greek."

A Biology major explained in her end of the semester questionnaire that "it was much more dynamic and exciting to learn about Greek history from the cultural perspectives I gained through my use of the Perseus program." She continued that though "the course was definitely more challenging as a result of Perseus, the way Professor Morrell integrated the use of the program into the course promoted independent thought and creativity."

A History and Greek & Roman Studies major who had used Perseus in other courses at Rhodes, also thought that with the use of Perseus in the course, Professor Morrell expected more from students. At the same time, however, this student did not "think his expectations are so high that it's impossible to do well and learn." He also credited the diverse content of Perseus with allowing him to "extend my inquiries beyond texts." He also added that "it has become a vital part of my studies into the world of ancient Greece."

In summary, the experience at Rhodes reinforces several themes apparent at other sites. First, Professor Morrell invested enormous amounts of time in preparing assignments and integrating Perseus into the course; likewise students invested more time than the instructor expected to complete the assignments. Second, Professor experienced physical infrastructure problems, waiting for a laptop computer to arrive for classroom use and having to change his plans as a result. Third, Perseus served as a library and resource that extended the boundaries of materials available on campus. There were several assignment innovations at Rhodes as well. First, as at Holy Cross, there was a concerted effort to treat the Perseus assignments like the labs that students take in science courses. That the large group labs were abandoned for small group and individual labs in fact demonstrates that they were indeed like science labs that are typically small group oriented. Second, students read texts online using Perseus. This is somewhat radical and the lack of complaints suggests that these students accepted reading online as part of the course approach. Third, getting exams online is a step in the direction of fully integrating technology into courses and communicates the significance of the technology to students. Fourth, the use of web-based resources at other sites (Bronze age material) and the instructor's encouragement to students to send email to the Michigan professor is another illustration of how technology breaks down classroom wall barriers and opens up new avenues of learning. Although the instructor was somewhat disappointed that he was not able to achieve all his expectations, students were highly positive about the course and the role Perseus played in it.

Other Sites and Events

Bates

Professor Robert Allison integrated Perseus into his spring 1996 course, Anthropology/Religion 225 Gods, Heroes, Magic, and Mysteries: Religion in Ancient Greece. Students could choose to do several of the readings directly on Perseus rather than from paper texts and Perseus served as a

key research resource for student papers and assignments (about 60% of students' grades were dependent on using Perseus). See the electronic syllabus that contains links to instructions for using Perseus at Bates and well as to Perseus and other web-based materials. (http://www.bates.edu/Faculty/Philosophy%20and%20Religion/rel_225/syl-225-w96.html).

In his presentation and discussion at the Spring Evaluation meeting, Professor Allison made several observations. He said that Perseus was an invaluable library for the Bates community, especially given the good campus network that provides widespread access (of 45 students in the class, only one did not have a computer in his/her room). He said that students were frustrated with the amount of unproductive time they spent using Perseus. He noted that this was the second time Perseus was used in this course and there was an enrollment dropoff from the first to the second year and within the Spring 96 course (from 70 registered to 45 who actually took the course). In the first course, there were a variety of problems using Perseus and so for the Spring 1996 course, everything was done on the web and he was able to include more Perseus activities based on his first year experience. He also initiated a newsgroup for the class and reported spending an extraordinary amount of time managing the electronic communications and the ongoing class project using Perseus. He was pleased with the student evaluations for the course and noted that there was a wide range of usage intensity across the class. His plans for next year are to develop a Perseus proficiency credential and perhaps be more topical rather than chronological in the overall course structure.

Miami University of Ohio and Skidmore College

Professors Suzanne Bonefas at Miami and Michael Arnush at Skidmore conducted an innovative experiment in the Spring 1996 semester by team-teaching a course titled Democracy in Athens. Once or twice a week, the classes would meet on their own and once a week they would meet together using Apple Quick time tele-conferencing software and a speaker phone. That day each student would also have access during class to a computer with the course web page and the day's notes on it. Professor Arnush did note, however, that students tended to be more engaged in the web page at which they were looking than the discussion that was taking place between both classes; when the web page was just projected, the discussion tended to be of a better quality. Professors Bonefas and Arnush would usually each teach part of the class and then they would have a group discussion.

In one activity, the Miami students acted as a collective Socrates and the Skidmore students as the Athenians. Professor Bonefas noted at the Evaluation meeting that her four students gained a lot from the critical mass of students at Skidmore. She also noted that three of the four students now have web-related jobs and the fourth has an internship at Wired Magazine--clearly another example of the plugged in classics theme discussed at other campuses.

Because there was one speaker phone at each location and up to 22 students at Skidmore (Miami only had four), it was sometimes difficult to hear each other and they spent much of the beginning of the semester getting adjusted to having to speak louder than usual and often to repeat themselves. The classes also shared a newsgroup and discussion list. At the Evaluation meeting, Professor Bonefas noted that one very bright but 'shy' student blossomed on the newsgroup.

Both professors were not as satisfied with the course as they hoped. One reason they both cited for this was the difference in class size between the two schools. Because the Miami students were so out numbered, they usually worked together rather than taking advantage of the MOO (MOO stands for MUD object oriented where MUD stands for multiuser dungeon) to collaborate with the Skidmore students. Professor Arnush also noted the difficulty of developing and uploading the web pages each week. Having taught this course four times before, without computers and with

slides, Professor Arnush also mentioned that there were much more successful class discussions previously and the images looked better than the projected slide images from the web. Although this experiment did not meet all the professors' expectations, it did provide an existence proof for intercampus courses that take advantage of Perseus content and network technology.

At the Evaluation meeting, Professor Bonefas noted that many professors were creating web sites for various courses and often included pointers to Perseus from their sites. She has done so in the enormously successful Diotima web site that she maintains with Ross Scaife. She also raised an interesting tradeoff between web-based and CD-ROM version of Perseus by pointing out that downloading images from Perseus requires substantial RAM (always in shortage given the requirements of new versions of Netscape) and thus the CD-ROM version could be an attractive alternative. In her other classes (see the teaching with Perseus web site for syllabi and materials for six of her courses) she includes a number of in-class lab activities where she models the use of electronic resources and communication facilities and students follow up by working in small groups. She noted that in-class modeling is essential before "turning students loose" in the computer lab. Example lab activities for the Greek Civilization course include: examining Greek homes to better understand the culture and building a Greek building. For the former site, one group built a Temple to Dionysos with links to Perseus (see http://miavx1.muohio.edu/~bonefas/gkciv.html for the actual student projects). Professor Bonefas' experience with Perseus exemplifies how classics professors with technological skills are reshaping the teaching of classics by drawing materials from a wide variety of new electronic resources (such as Perseus) and linking students together in new collaborative work settings.

Tufts

Perseus development is based at Tufts and Professor Greg Crane has long used Perseus in a variety of ways. In the Spring 1996 semester, he and Lisa Cerrato used Perseus in a Greek language class. Due to problems in the Mac labs, they used the web-based version of Perseus to introduce new Greek words and paradigms. Cerretto noted in her course reflections: "My goals were: first, to enhance the presentation of the grammatical studies with the HTML pages, and second, to introduce the students to the Perseus tools and encourage them to use all aspects of Web Perseus right away." She noted that this approach took an enormous amount of time early in the course and after the first two weeks she stopped developing vocabulary webpages and "devoted more of my time to traditional instruction. Two reasons were behind this: the difficulty I had in using the computer in class [she had to physically bring computer to class], and the lack of student interest in these materials." She noted that students were interested in the Perseus corpus itself and continued to use Perseus as a translation aid tool. She gave an illustration of how Perseus helped her convince students of the importance of certain verb forms--she used the Perseus word frequency tool to show how one verb form was used over 19,000 times across all Perseus authors but another is used only 19 times. She also used Perseus images to contextualize the reading students did. She noted: "I discovered that whenever Perseus was running, the class took time to ask a variety of questions. Most of these inquiries were not specifically related to our readings;" Students used Perseus in interesting ways to make presentations about Greek culture and were very positive about these activities--to the point of encouraging professors in other courses to use Perseus. These uses were clearly outside the typical scope of a Greek language course and Cerreto noted: "I felt that the need to liven and enrich the study of the language far outweighed the need to complete additional lessons. If I had not used Perseus, I believe that the class most likely would have studied two, possibly three, more lessons." This issue of expanding the scope of courses as a result of Perseus, especially the breaking down of distinctions between linguistic and visual course, will be debated by pedagogists for generations to come.

The Classical Mythology course taught by Professor Halpern in the Spring of 1996 used Perseus

as a supplement to readings and discussions. Perseus was not used in the class discussions by the professor, although the teaching assistant did do demonstrations in some classes. A significant problem was setting up equipment in the classroom and many equipment problems in the Mac lab. This course served as a general studies course for non-majors and as was noted in the BSU and Michigan sections, students do not see value in learning specialized tools for such courses outside their major area. Just as learning to use a centrifuge or other tool in a general studies chemistry course is part of understanding the culture of chemistry, so Perseus and electronic technology is becoming a part of the culture of classics at some departments. The burden of such learning will inevitably affect student course evaluations, as it did at BSU and in this case.

University of Houston

Professor Dora Pozzi used Hypercard Perseus 1.0 for class presentations in a large Mythology course in Fall 95 and Gender and Race in Ancient Greek Myth in the Spring 96. In the Mythology course, she found that this diverse student body "respond[ed] very well when encouraged to watch actively, 'reading' the art, imagining the experiences that occurred in the spaces shown, and relating what they see to what they read."

Some upper-level students were required to write a paper using Perseus as well. While Professor Pozzi admits that "the quality of the papers they wrote varies considerably," she also recognizes that "without exception, these students would not have been able to find even a small part of the evidence they got from Perseus [in books]." One student agreed that he would use Perseus again "because I could find and obtain the info without walking in a big library and getting tired quickly, I was able to spend a lot more of my energy actually thinking and learning than I would have otherwise."

Illinois Wesleyan University

Professor Nancy Sultan used Perseus in her May term course Classical Greek Art and Architecture. Students "were asked to work in teams of two to create a path on a topic related to the course theme...They were asked to create 20-22 stops, with full annotation and bibliography." Students then presented the paths on the last day of class. Some even created web sites to correlate with their paths.

Professor Sultan explains the benefit of this assignment: "the students...found themselves learning about topics they would never have dreamed of without cruising through the program. In order to find a topic for a path, for instance, I suggest that they peruse the historical overview and check out the indices for art and architecture. One group discovered Fountain Houses and really got into the architecture and use of these little buildings. They never would have come up with that as a topic on their own. In fact, I gave the students a list of about 30 topics to chose from for their paths, and most students struck out on their own, finding topics that weren't even covered adequately on the program (they discovered after having been titillated with an image or two). For example, a group became fascinated with the little bronzes, but once they decided to do a path there were not enough bronzes on the program to satisfy them. No matter, they created a website to take up the slack. It was very creative of them."

Virginia Tech

In Professor Terry Papillon's Fall 1995 course, the Classical Age of Greece, the Historical Overview and Encyclopedia were integrated into the course syllabus, yet there was very little mention of Perseus as something special in the course notes.

The students were given a Perseus assignment during the beginning of the semester entitled Achilles Project on Perseus, which required the students to produce a 4-6 page paper addressing a

specific set of questions. In the assignment notes, Professor Papillon explained that the"goals of this project are threefold: to get you more familiar with the Perseus system, to continue thinking about Achilles as a part of Greece's world view, and to think about the relationship between verbal and visual arts in Greece." At the Evaluation meeting, he admitted that this was an ambitious list of goals, but also pointed out that "we need to be economical with our time."

The assignment required students to compare the literary descriptions of Achilles in Pindar, Sophocles, and the *Odyssey* and visual depictions of him on vases. Professor Papillon then gave a 26-step instruction sheet on how to use Perseus for this assignment, yet students complained of technical and access problems on evaluations.

At the Spring Evaluation meeting, Professor Papillon highlighted that Perseus allowed "students to make connections among different kinds of evidence." One student commented that Perseus was "much easier than trying to look up the same information in books and encyclopedias." Many of the students recognized that Perseus helped them conceptualize the ancient Greek world better than if they had not had the tool and so used it to study for exams.

Questionnaire Analysis

A Perseus questionnaire has been used in all years of the evaluation (see Appendix A). In addition to the participating sites, a posting to the Perseus List was made asking instructors to have their students complete the questionnaire at the end of their Perseus experience. Table 1 summarizes the questionnaires returned for the 1995-6 academic year.

Table 1. Perseus Questionnaires Returned

Fall 1995

University	Course	Number of Questionnaires
Houston	Greek & Roman Myth	11
Virginia Tech	Classical Humanities	18
Tufts	Latin 1	20
Tufts	Classics of Greece	21
Tufts	Advanced Greek	10
Total Fall 95		**80**
Spring 1996		
Rhodes	History of Greece	7
Houston	Greek & Roman Myth	10
Ball State	Intro to the Ancient World	30
Ball State	Classical Myth & Theory	13
Johnson CCC		20
Michigan	Classical Civilization	35
Total Spring 1996		**115**
Total 1995-6		**195**

The questionnaire elicits three types of data: demographic information about the respondent, assessments about the Perseus interface, and assessments about learning effects due to Perseus use. Demographic data (variable names in the analyses that follow are in upper case) include major, age (AGE), class standing, types of computers used, frequency of computer use (COMPUSE), number of software applications used (COMPAPPS), frequency of Perseus use (PUSE), number of Perseus features used (PFEAT), and hours using Perseus (PHOURS). Interface data include ease of learning to use Perseus (LEARNEAS), ease of use after learning (USEASE), frequency of feeling lost (LOST), ease of recovery when lost (RECOVER). Learning effects data include likelihood that needed information was in Perseus (INFONEED), confidence about finding information in Perseus (CONFID), degree of difference between Perseus and traditional assignments (ASNDIFF), degree Perseus contributed to understanding content of course (PCONTRIB), amount of useful information in Perseus (INFOAMT), value of Perseus use time to learning (VALUE), and satisfaction about learning with Perseus (SATIS). Other open-ended questions are also included on the questionnaire.

As was the case in previous years, correlations between variables showed that demographic data is less strongly related to either learning effect ratings or to interface ratings than are learning effects

and interface ratings. Table 2 reports the number of Pearson Correlation coefficients that were statistically reliable at the .05 or lower level for each of the variables (note there are a 16 coefficients for each variable). Correlation statistics may be found in Appendix B.

Table 2. Number of Statistically Reliable Correlations for Each Variable

Demographic Variables	
AGE	1
COMPAPPS	5
COMPUSE	9
PFEAT	4
PHOURS	4
PUSE	8
Interface Variables	
USEASE	12
LEARNEAS	11
LOST	13
RECOVER	12
Learning Effect Variables	
ASNDIFF	4
CONFID	11
INFOAMT	12
INFONEED	12
PCONTRIB	11
VALUE	10
SATIS	8

It is interesting that age is not correlated with any variable except frequency of computer use ($r=.14$, $p=.05$), with older students using computers less frequently than younger students. More surprising are the few correlations between amount of Perseus use and the other variables. It is not surprising that the number of times Perseus is used (PUSE) is correlated with many of the learning effect variables (the negative values are due to positive ratings coded as lowest numeric values). The few correlations for number of Perseus features and number of hours using Perseus perhaps suggests that users quickly form impressions about Perseus and these impressions may be difficult to change. These results are consistent with data from previous years and reinforce the finding that interfaces are more strongly related to learning effects than are previous computer experience, age or degree of system use. This result suggests that the success of technological innovations are more dependent on good interfaces and the first impressions that users gain with systems than on user characteristics and experience levels. This puts substantial burden on innovators to deliver attractive and usable systems.

A one-way analysis of variance across the eleven sections of questionnaires was run for the following variables: ASNDIFF, COMPAPPS, COMPUSE, CONDFID, INFOAMT, INFONEED, LEARNEAS, LOST, PCONTRIB, PFEAT, PHOURS, PUSE, RECOVER, SATIS, USEASE, and VALUE (see Appendix C for the complete ANOVA tables). All the runs showed statistically reliable ($p<.05$) differences in means across the different class sections except for COMPUSE and PHOURS. Table 3 summarizes the number of times a specific class section differed from the other ten sections based on a Tukey-HSD post hoc analysis at alpha .05. Clearly, students in section 531 (Ball State Introduction to Classical World) and to a lesser extent students in section 121 (Tufts Classics of Greece) rated their Perseus experiences quite differently than other groups. Examination of the means shows that the BSU class consistently were more negative in rating their

Perseus experience. The Tufts group rated their experience more negatively than other groups but reported using statistically reliably more Perseus features. As discussed in the BSU and Tufts sections, learning to use a specialized tool in a general studies course (both these courses were mainly composed on non-majors) will typically lead to lower course evaluations.

Table 3. Number of Statistically Reliable Differences from other Groups

Group	Number of Statistically Reliable Differences
121	5
131	2
141	1
311	1
411	2
531	10
532	0
711	1
811	0
812	1
911	0

The Perseus Community

Perseus Discussion List

Between September 1, 1995 and June 15, 1996 the Perseus discussion list generated 271 messages. Two-hundred forty-six of these (90.8 percent of the total) originated in the United States. Of the remaining 25, seven originated from the United Kingdom, seven from Canada, five from Germany, and one each from Australia, Brazil, France, Italy, Japan and the Netherlands.

Two-hundred fifty-five (94.1 percent) of the 271 messages originated from educational institutions, all but 4 of them colleges or universities (Table 1).

Table 4. Perseus List origination sites

Message originator	Number	Percent
All colleges and universities	251	92.6
U.S. colleges and universities	228	84.1
Foreign colleges and universities	23	8.5
Secondary schools	4	1.5
U.S. secondary schools	3	1.1
Foreign secondary schools	1	0.4
All educational institutions	255	94.1
All sources	**271**	**100.0**

The 271 messages sent during the period under consideration were originated by 83 individuals. As Table 5 shows, some of these originators proved more voluble than others: while 49 individuals contributed just one message to the discussion, 5 contributed ten or more messages. In fact, these 5 originated a total of 109 messages, or 40.2 percent of the total number.

Table 5. Frequency of messages by originator

No. of messages	1	2	3	4	5	6	7	8	9	>=10
No. of originators	49	8	10	3	2	2	1	1	2	5

The subject line of the messages proved to be an unreliable guide to their contents, particularly where message replies were concerned. Consequently, the topics discussed had to be determined by examining all 271 messages in turn. Since 18 of these messages dealt with two topics and 2 messages with three topics, the total number of topic "treatments" totaled 291 instead of 271. These treatments have been arranged into ten topic groups as shown in Table 6.

Table 6. Topic frequencies

Topic Group	Treatments	Percent
Problems running Perseus, display glitches, or software bugs	71	24.4
Perseus accessibility, availability, or distribution format	63	21.6
Broader implications of Perseus	41	14.1
New Perseus features and using available ones	22	7.6
Perseus spinoff proposals	21	7.2
Perseus evaluation and feedback	18	6.2
Copyright and licensing issues	14	4.8
Informational questions and answers	7	2.4
Suggestions for improvement	7	2.4
Other	27	9.3
Total number of topic treatments	**291**	**100.0**

Not surprisingly--given that this is the first time anything like Perseus has been put on the Web--the majority of these treatments had to do with problems running Perseus, with 33 of the 71 treatments in this topic group focusing on Greek-text display problems in Netscape, and another 13 on apparent bugs in the Perseus software itself.

Sixty-three treatments, or 21.6 percent of the total, addressed issues of Perseus availability, accessibility, or distribution format. Thirty-six of these involved the format in which Perseus will be, or should be, distributed commercially.

Forty-one treatments (14.1 percent) discussed topics related to the broader implications of Perseus not only for the future of classical studies online (9 treatments), but also for the affordability of education (12 treatments), for the future of classroom instruction (19 treatments), and for the willingness of college administrators to back new technological initiatives (1 treatment).

Twenty-two treatments (7.6 percent) involved either announcements of features new to the Web version of Perseus, or questions relating to the use of available features. No single topic in this group generated more than two treatments.

A number of treatments (21, or 7.2 percent) dealt with proposals to apply Perseus technology in other contexts. A proposal to create a "Roman Perseus" (or, alternatively, "Latin Romulus") project appeared to stimulate particular interest, generating 14 treatments.

Fourteen treatments (5.9 percent) dealt with copyright or licensing issues most notably the question of whether Perseus images could be used in non-Perseus Web home pages without attribution or without license (9 treatments).

Eighteen treatments (6.2 percent) provided explicit general evaluations of Perseus. Although no negative evaluations were received, two subscribers asked to have their names removed from the list. Seven treatments (2.4 percent) contained suggestions for improving Perseus by the addition of new features. An additional seven treatments dealt with informational questions.

Twenty-seven treatments (9.3 percent) were placed in the "other" category. Eight of these dealt with Perseus-related administrative matters--meeting announcements and the like--and the remainder with matters having nothing to do with Perseus.

Clearly, the Perseus list is used by the Perseus community to deal with implementation and logistical issues. The range of participants illustrate the depth of Perseus penetration in the classics field.

Perseus Web Site Logs

The Perseus web site "took off" dramatically in 1995-6. Appendix D provides one glimpse of usage, giving summary data for accesses from different countries and domains. For the period July 25, 1966 to August 11, 1996, the site transmitted 3,034,294 files, an average of 8694 files per day. By the time classes were in session in September 1996, Perseus was receiving between 20,000 and 30,000 accesses per day. It should be noted that access rates are based on page accesses rather than file transmissions (i.e., the access per day rate does not count image files on a page as separate hits). This extremely high hit rate (e.g., the entire Library of Congress site exceeds 100,000 per day) demonstrates the range and size of the Perseus community.

Acknowledgements

The evaluation team acknowledges the cooperation of the many instructors and students during site visits and students who completed questionnaires. We thank Charles Peterson for doing the content analysis of the Perseus list messages.

References

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http://www.perseus.tufts.edu

Appendices

A. Perseus Questionnaire
B. Correlation Matrix
C. ANOVA Tables
D. Perseus Example Web Site Summary

Appendix A

Perseus Questionnaire

Perseus Questionnaire

What is your major?_____
What is your age?_____
What is your class standing (e.g., Sophomore, etc.)?_____
What is the title of the course you took using Perseus?_____

Please check the types of computers you have used.

IBM PC or clone____ Macintosh____ AppleII____ mainframe____ other_____

How often do you use computers?
every day____ a few times a week____ a few times a month____ rarely or never_____

Please check which types of computer applications you have used more than three times.
computer-based instruction (e.g., drill and practice)____ word processing____
database management____ spreadsheet____
games____ programming languages____
library catalogs/databases____ electronic mail____ other___

About how many times did you use Perseus this semester?_____

How accessible was Perseus (i.e., where did you have to go, did you have to wait, etc.)?

Please check which of the following Perseus features you used.
Broser_____ English Index____ Historical Overview____ Other essays____
Atlas____ Encyclopedia____ Sources Used____ Notebook____
Help____ Search Saver____ Paths____ Enter Destination____
Vases____ Sculpture____ Coins____ Sites____
Architecture____ Primary texts in Greek____ Morphological Analysis____
Greek-English Lexicon____ Greek Word Search____ English_Greek Word Search____
Greek Dictionary Entry Search____ Greek word frequency-overview____ Greek word frequency by author____

Please estimate how many total hours you spent using Perseus for this course_____hours

How easy was it to learn to use Perseus?
Very Easy <—1 2 3 4 5—> Very Difficult

How easy it was to use Perseus after your initial learning?
Very Easy <—1 2 3 4 5—> Very Difficult

Did you use the printed documentation for Perseus?_____
If you did, rate its usefulness
Very Useful <—1 2 3 4 5—> Not Useful

Please rate the quality of the images in Perseus
Very Poor <—1 2 3 4 5—> Outstanding

How often did you feel lost?
Never <—1 2 3 4 5—> Always

How easy was it to recover when you felt lost?
Very Easy <—1 2 3 4 5—> Very Difficult

– PLEASE TURN OVER –

Please rate the liklihood that information you needed was actually in Perseus.
Very Likely <—1 2 3 4 5—> Very Unlikely

Please rate how confident you feel about finding information in Perseus, assuming that information is actually in the system.
Very Confident <—1 2 3 4 5—> Vey Unconfident

How different were the Perseus assignments from what you are used to?
Very Different <—1 2 3 4 5—> Highly typical

Please rate how much Perseus contributed to your understanding of the ideas/content of this course.
Very Much <—1 2 3 4 5—> Very Little

Please rate the amount of useful information you found in Perseus.
Very Much <—1 2 3 4 5—> Much less than I expected

How valuable to your learning was the time you spent using Perseus?
Very Valuable <—1 2 3 4 5—> Never worth the time

With respect to your use of Perseus, how satisfied were you with your learning in this course?
Very Satisfied <—1 2 3 4 5—> Very Unsatisfied

Would you use Perseus again, even if it were not required?_____Why or why not?

Did your expectations about the study of classics change as a result of using Perseus?_____How?

What was the best thing about using Perseus?

What was the worst thing about using Perseus?

We are intetested in how Perseus affects learning. Do you think Perseus affected your learning?_____ How? Please give specific examples, if possible.

Appendix B

Correlation Matrix

--- SPEARMAN CORRELATION COEFFICIENTS ---

CONFID	-.1396					
	N(174)					
	Sig .066					
INFOAMT	.0831	.3971				
	N(172)	N(186)				
	Sig .278	Sig .000				
INFONEED	.1487	.3522	.4861			
	N(173)	N(186)	N(184)			
	Sig .051	Sig .000	Sig .000			
LEARNEAS	-.1919	.3421	.3185	.1142		
	N(174)	N(188)	N(186)	N(191)		
	Sig .011	Sig .000	Sig .000	Sig .116		
LOST	-.1642	.4942	.3364	.3376	.5051	
	N(174)	N(187)	N(185)	N(190)	N(193)	
	Sig .030	Sig .000	Sig .000	Sig .000	Sig .000	
PCONTRIB	.0330	.3970	.6824	.3435	.2683	.2694
	N(173)	N(186)	N(184)	N(184)	N(186)	N(186)
	Sig .666	Sig .000	Sig .000	Sig .000	Sig .000	Sig .000
RECOVER	-.1362	.4866	.4575	.3723	.4146	.6576
	N(170)	N(183)	N(181)	N(186)	N(189)	N(188)
	Sig .076	Sig .000	Sig .000	Sig .000	Sig .000	Sig .000
SATIS	-.0674	.4463	.6317	.3468	.4032	.3838
	N(172)	N(184)	N(182)	N(182)	N(184)	N(184)
	Sig .379	Sig .000	Sig .000	Sig .000	Sig .000	Sig .000
USEASE	-.1075	.5473	.4107	.3203	.5502	.6372
	N(170)	N(184)	N(182)	N(187)	N(190)	N(189)
	Sig .163	Sig .000	Sig .000	Sig .000	Sig .000	Sig .000
VALUE	.0134	.5020	.6913	.4005	.3662	.3754
	N(173)	N(187)	N(185)	N(185)	N(187)	N(186)
	Sig .861	Sig .000	Sig .000	Sig .000	Sig .000	Sig .000
	ASNDIFF	CONFID	INFOAMT	INFONEED	LEARNEAS	LOST

--- SPEARMAN CORRELATION COEFFICIENTS ---

AGE	-.0960	.0320	-.1186	-.0800	-.0355	.0960
	N(174)	N(188)	N(186)	N(191)	N(194)	N(193)
	Sig .208	Sig .663	Sig .107	Sig .271	Sig .623	Sig .184
COMPAPPS	.2070	-.1170	.0142	.0544	-.1036	-.3032
	N(174)	N(188)	N(186)	N(191)	N(194)	N(193)
	Sig .006	Sig .110	Sig .848	Sig .455	Sig .151	Sig .000
COMPUSE	-.1179	.1757	.0323	-.0306	.1464	.2844
	N(174)	N(188)	N(186)	N(191)	N(194)	N(193)
	Sig .121	Sig .016	Sig .661	Sig .674	Sig .042	Sig .000
PFEAT	-.1277	-.0430	-.1692	-.1639	-.0715	-.0076
	N(174)	N(188)	N(186)	N(191)	N(194)	N(193)
	Sig .093	Sig .558	Sig .021	Sig .023	Sig .322	Sig .916
PHOURS	-.1263	-.1085	-.3057	-.2251	-.0996	-.0036
	N(165)	N(178)	N(176)	N(181)	N(184)	N(183)
	Sig .106	Sig .149	Sig .000	Sig .002	Sig .178	Sig .962
PUSE	.0548	-.4363	-.3253	-.2805	-.1651	-.2980
	N(168)	N(182)	N(180)	N(185)	N(188)	N(187)
	Sig .480	Sig .000	Sig .000	Sig .000	Sig .024	Sig .000
	ASNDIFF	CONFID	INFOAMT	INFONEED	LEARNEAS	LOST

RECOVER	.3246				
	N(181)				
	Sig .000				
SATIS	.6067	.4583			
	N(183)	N(179)			
	Sig .000	Sig .000			
USEASE	.4484	.5921	.5707		
	N(182)	N(185)	N(180)		
	Sig .000	Sig .000	Sig .000		
VALUE	.6916	.4323	.7097	.5435	
	N(185)	N(182)	N(184)	N(183)	
	Sig .000	Sig .000	Sig .000	Sig .000	
	PCONTRIB	RECOVER	SATIS	USEASE	

(Coefficient / (Cases) / 2-tailed Significance)

" . " is printed if a coefficient cannot be computed

--- SPEARMAN CORRELATION COEFFICIENTS ---

AGE	-.0687	.0313	-.0606	.0172	.0210	
	N(186)	N(189)	N(184)	N(190)	N(187)	
	Sig .352	Sig .669	Sig .414	Sig .814	Sig .775	
COMPAPPS	.0043	-.1653	.0343	-.2603	.0219	-.0129
	N(186)	N(189)	N(184)	N(190)	N(187)	N(195)
	Sig .953	Sig .023	Sig .644	Sig .000	Sig .766	Sig .858
COMPUSE	-.0302	.1789	-.0006	.2280	.0546	.1387
	N(186)	N(189)	N(184)	N(190)	N(187)	N(195)
	Sig .683	Sig .014	Sig .994	Sig .002	Sig .458	Sig .053
PFEAT	-.0925	.0087	.0067	.0013	-.0445	-.1226
	N(186)	N(189)	N(184)	N(190)	N(187)	N(194)
	Sig .209	Sig .906	Sig .928	Sig .986	Sig .545	Sig .089
PHOURS	-.2876	-.0800	-.1280	-.0802	-.1372	-.0026
	N(176)	N(179)	N(174)	N(180)	N(177)	N(184)
	Sig .000	Sig .287	Sig .092	Sig .284	Sig .069	Sig .972
PUSE	-.3136	-.2724	-.3156	-.3764	-.3340	.0111
	N(180)	N(183)	N(178)	N(184)	N(181)	N(188)
	Sig .000	Sig .000	Sig .000	Sig .000	Sig .000	Sig .879
	PCONTRIB	RECOVER	SATIS	USEASE	VALUE	AGE

COMPUSE	-.4792			
	N(195)			
	Sig .000			
PFEAT	.0264	-.1398		
	N(194)	N(194)		
	Sig .714	Sig .052		
PHOURS	-.1207	-.0872	.3954	
	N(184)	N(184)	N(184)	
	Sig .103	Sig .239	Sig .000	
PUSE	.0658	-.2315	.1022	.3243
	N(188)	N(188)	N(188)	N(181)
	Sig .369	Sig .001	Sig .163	Sig .000
	COMPAPPS	COMPUSE	PFEAT	PHOURS

(Coefficient / (Cases) / 2-tailed Significance)
" . " is printed if a coefficient cannot be computed

Appendix C

ANOVA Tables

- - - - - O N E W A Y - - - - -

Variable ASNDIFF
By Variable PSECTION perseus secion

Analysis of Variance

Source	D.F.	Sum of Squares	Mean Squares	F Ratio	F Prob.
Between Groups	10	34.1492	3.4149	4.0836	.0000
Within Groups	163	136.3106	.8363		
Total	173	170.4598			

Group	Count	Mean	Standard Deviation	Standard Error	95 Pct Conf Int for Mean
Grp121	21	1.8571	.7270	.1587	1.5262 TO 2.1881
Grp131	20	2.9000	1.0208	.2283	2.4222 TO 3.3778
Grp141	3	2.6667	.5774	.3333	1.2324 TO 4.1009
Grp311	7	1.8571	1.0690	.4041	.8684 TO 2.8458
Grp411	30	2.6667	.8442	.1541	2.3514 TO 2.9819
Grp531	27	1.8148	.7357	.1416	1.5238 TO 2.1059
Grp532	12	1.5833	.6686	.1930	1.1586 TO 2.0081
Grp711	17	2.7059	.7717	.1872	2.3091 TO 3.1027
Grp811	11	2.0909	1.3003	.3921	1.2173 TO 2.9645
Grp812	8	2.3750	1.0607	.3750	1.4883 TO 3.2617
Grp911	18	2.5556	1.1991	.2826	1.9592 TO 3.1519
Total	174	2.2989	.9926	.0753	2.1503 TO 2.4474

GROUP	MINIMUM	MAXIMUM
Grp121	1.0000	3.0000
Grp131	1.0000	5.0000
Grp141	2.0000	3.0000
Grp311	1.0000	3.0000
Grp411	1.0000	4.0000
Grp531	1.0000	3.0000
Grp532	1.0000	3.0000
Grp711	1.0000	4.0000
Grp811	1.0000	5.0000
Grp812	1.0000	4.0000
Grp911	1.0000	5.0000
TOTAL	1.0000	5.0000

- - - - - O N E W A Y - - - - -

Variable ASNDIFF
By Variable PSECTION perseus secion

Multiple Range Tests: Tukey-HSD test with significance level .050

The difference between two means is significant if
MEAN(J)-MEAN(I) >= .6466 * RANGE * SQRT(1/N(I) + 1/N(J))
with the following value(s) for RANGE: 4.61

(*) Indicates significant differences which are shown in the lower triangle

Mean	PSECTION	Grp532	Grp531	Grp121	Grp311	Grp811	Grp812	Grp911	Grp141	Grp411	Grp711	Grp131
1.5833	Grp532											
1.8148	Grp531											
1.8571	Grp121											
1.8571	Grp311											
2.0909	Grp811											
2.3750	Grp812											
2.5556	Grp911											
2.6667	Grp141											
2.6667	Grp411	*	*									
2.7059	Grp711											
2.9000	Grp131	*	*	*								

- - - - - O N E W A Y - - - - -

Variable COMPAPPS
By Variable PSECTION perseus secion

Analysis of Variance

Source	D.F.	Sum of Squares	Mean Squares	F Ratio	F Prob.
Between Groups	10	89.2252	8.9225	2.1718	.0213
Within Groups	184	755.9235	4.1083		
Total	194	845.1487			

Group	Count	Mean	Standard Deviation	Standard Error	95 Pct Conf Int for Mean
Grp121	21	4.4762	2.3795	.5192	3.3931 TO 5.5593
Grp131	20	5.4000	1.9304	.4316	4.4966 TO 6.3034
Grp141	10	4.0000	1.0541	.3333	3.2459 TO 4.7541
Grp311	7	5.8571	1.3452	.5084	4.6131 TO 7.1012
Grp411	35	5.8000	2.2596	.3819	5.0238 TO 6.5762
Grp531	30	5.0000	1.8937	.3457	4.2929 TO 5.7071
Grp532	13	4.4615	1.7614	.4885	3.3971 TO 5.5259
Grp711	18	5.7222	1.6380	.3861	4.9077 TO 6.5368
Grp811	11	6.1818	1.7787	.5363	4.9869 TO 7.3767
Grp812	10	4.6000	2.9515	.9333	2.4887 TO 6.7113
Grp911	20	4.1500	2.0590	.4604	3.1864 TO 5.1136
Total	195	5.0974	2.0872	.1495	4.8026 TO 5.3922

GROUP	MINIMUM	MAXIMUM
Grp121	1.0000	9.0000
Grp131	1.0000	9.0000
Grp141	2.0000	6.0000
Grp311	4.0000	7.0000
Grp411	1.0000	9.0000
Grp531	1.0000	9.0000
Grp532	1.0000	7.0000
Grp711	1.0000	8.0000
Grp811	3.0000	9.0000
Grp812	.0000	8.0000
Grp911	1.0000	9.0000
TOTAL	.0000	9.0000

- - - - - O N E W A Y - - - - -

Variable COMPAPPS
By Variable PSECTION perseus secion

Multiple Range Tests: Tukey-HSD test with significance level .050

The difference between two means is significant if
MEAN(J)-MEAN(I) >= 1.4332 * RANGE * SQRT(1/N(I) + 1/N(J))
with the following value(s) for RANGE: 4.61

- No two groups are significantly different at the .050 level

- - - - - O N E W A Y - - - - -

Variable COMPUSE
By Variable PSECTION perseus secion

Analysis of Variance

Source	D.F.	Sum of Squares	Mean Squares	F Ratio	F Prob.
Between Groups	10	11.1592	1.1159	1.2435	.2660
Within Groups	184	165.1280	.8974		
Total	194	176.2872			

Group	Count	Mean	Standard Deviation	Standard Error	95 Pct Conf Int for Mean
Grp121	21	1.8095	.8729	.1905	1.4122 TO 2.2069
Grp131	20	1.5000	.5130	.1147	1.2599 TO 1.7401
Grp141	10	1.7000	.8233	.2603	1.1111 TO 2.2889
Grp311	7	1.5714	1.5119	.5714	.1732 TO 2.9697
Grp411	35	1.7429	1.3578	.2295	1.2764 TO 2.2093
Grp531	30	1.5667	.6261	.1143	1.3329 TO 1.8004
Grp532	13	2.0000	.8165	.2265	1.5066 TO 2.4934
Grp711	18	1.1111	.3234	.0762	.9503 TO 1.2719
Grp811	11	1.3636	.6742	.2033	.9107 TO 1.8166
Grp812	10	1.9000	1.4491	.4583	.8633 TO 2.9367
Grp911	20	1.9000	.9679	.2164	1.4470 TO 2.3530
Total	195	1.6513	.9533	.0683	1.5166 TO 1.7859

GROUP	MINIMUM	MAXIMUM
Grp121	1.0000	4.0000
Grp131	1.0000	2.0000
Grp141	1.0000	3.0000
Grp311	1.0000	5.0000
Grp411	1.0000	8.0000
Grp531	1.0000	3.0000
Grp532	1.0000	4.0000
Grp711	1.0000	2.0000
Grp811	1.0000	3.0000
Grp812	1.0000	5.0000
Grp911	1.0000	4.0000
TOTAL	1.0000	8.0000

- - - - - O N E W A Y - - - - -

Variable COMPUSE
By Variable PSECTION perseus secion

Multiple Range Tests: Tukey-HSD test with significance level .050

The difference between two means is significant if
MEAN(J)-MEAN(I) >= .6699 * RANGE * SQRT(1/N(I) + 1/N(J))
with the following value(s) for RANGE: 4.61

- No two groups are significantly different at the .050 level

- - - - - O N E W A Y - - - - -

Variable CONFID
By Variable PSECTION perseus secion

Analysis of Variance

Source	D.F.	Sum of Squares	Mean Squares	F Ratio	F Prob.
Between Groups	10	72.8828	7.2883	7.1203	.0000
Within Groups	177	181.1757	1.0236		
Total	187	254.0585			

Group	Count	Mean	Standard Deviation	Standard Error	95 Pct Conf Int for Mean
Grp121	21	2.2857	.9562	.2087	1.8505 TO 2.7210
Grp131	20	2.1000	1.0712	.2395	1.5987 TO 2.6013
Grp141	10	1.6000	.8433	.2667	.9968 TO 2.2032
Grp311	7	1.7143	.7559	.2857	1.0152 TO 2.4134
Grp411	30	2.3333	1.1547	.2108	1.9022 TO 2.7645
Grp531	28	3.5357	1.2317	.2328	3.0581 TO 4.0133
Grp532	13	2.3846	1.1929	.3309	1.6637 TO 3.1055
Grp711	18	1.4444	.6157	.1451	1.1383 TO 1.7506
Grp811	11	2.0909	.9439	.2846	1.4568 TO 2.7250
Grp812	10	1.4000	.6992	.2211	.8998 TO 1.9002
Grp911	20	2.4000	.8826	.1974	1.9869 TO 2.8131
Total	188	2.2819	1.1656	.0850	2.1142 TO 2.4496

GROUP	MINIMUM	MAXIMUM
Grp121	1.0000	5.0000
Grp131	1.0000	4.0000
Grp141	1.0000	3.0000
Grp311	1.0000	3.0000
Grp411	1.0000	5.0000
Grp531	1.0000	5.0000
Grp532	1.0000	5.0000
Grp711	1.0000	3.0000
Grp811	1.0000	4.0000
Grp812	1.0000	3.0000
Grp911	1.0000	4.0000
TOTAL	1.0000	5.0000

- - - - - O N E W A Y - - - - -

Variable CONFID
By Variable PSECTION perseus secion

Multiple Range Tests: Tukey-HSD test with significance level .050

The difference between two means is significant if
MEAN(J)-MEAN(I) >= .7154 * RANGE * SQRT(1/N(I) + 1/N(J))
with the following value(s) for RANGE: 4.61

(*) Indicates significant differences which are shown in the lower triangle

Mean	PSECTION	G r p 8 1 2	G r p 7 1 1	G r p 1 4 1	G r p 3 1 1	G r p 8 1 1	G r p 1 3 1	G r p 1 2 1	G r p 4 1 1	G r p 5 2 1	G r p 9 1 1	G r p 5 3 1
1.4000	Grp812											
1.4444	Grp711											
1.6000	Grp141											
1.7143	Grp311											
2.0909	Grp811											
2.1000	Grp131											
2.2857	Grp121											
2.3333	Grp411											
2.3846	Grp532											
2.4000	Grp911											
3.5357	Grp531	*	*	*	*	*	*	*	*	*	*	*

- - - - - O N E W A Y - - - - -

Variable INFOAMT
By Variable PSECTION perseus secion

Analysis of Variance

Source	D.F.	Sum of Squares	Mean Squares	F Ratio	F Prob.
Between Groups	10	39.7437	3.9744	3.8510	.0001
Within Groups	175	180.6058	1.0320		
Total	185	220.3495			

Group	Count	Mean	Standard Deviation	Standard Error	95 Pct Conf Int for Mean
Grp121	20	2.6500	1.1367	.2542	2.1180 TO 3.1820
Grp131	19	2.4737	1.0733	.2462	1.9564 TO 2.9910
Grp141	10	2.0000	.8165	.2582	1.4159 TO 2.5841
Grp311	7	1.4286	.5345	.2020	.9342 TO 1.9229
Grp411	30	2.6667	.9942	.1815	2.2954 TO 3.0379
Grp531	28	3.1071	1.1333	.2142	2.6677 TO 3.5466
Grp532	13	1.9231	1.0377	.2878	1.2960 TO 2.5502
Grp711	18	2.1667	.8575	.2021	1.7402 TO 2.5931
Grp811	11	1.8182	.8739	.2635	1.2311 TO 2.4053
Grp812	10	1.6000	.8433	.2667	.9968 TO 2.2032
Grp911	20	2.4000	1.1425	.2555	1.8653 TO 2.9347
Total	186	2.3925	1.0914	.0800	2.2346 TO 2.5503

GROUP	MINIMUM	MAXIMUM
Grp121	1.0000	4.0000
Grp131	1.0000	4.0000
Grp141	1.0000	3.0000
Grp311	1.0000	2.0000
Grp411	1.0000	5.0000
Grp531	1.0000	5.0000
Grp532	1.0000	5.0000
Grp711	1.0000	4.0000
Grp811	1.0000	3.0000
Grp812	1.0000	3.0000
Grp911	1.0000	5.0000
TOTAL	1.0000	5.0000

Variable INFOAMT
By Variable PSECTION perseus secion

Multiple Range Tests: Tukey-HSD test with significance level .050

The difference between two means is significant if
MEAN(J)-MEAN(I) >= .7183 * RANGE * SQRT(1/N(I) + 1/N(J))
with the following value(s) for RANGE: 4.61

(*) Indicates significant differences which are shown in the lower triangle

Mean	PSECTION	G r p 3 1 1	G r p 8 1 2	G r p 8 1 1	G r p 5 3 2	G r p 1 4 1	G r p 7 1 1	G r p 9 1 1	G r p 1 3 1	G r p 1 2 1	G r p 4 1 1	G r p 5 3 1
1.4286	Grp311											
1.6000	Grp812											
1.8182	Grp811											
1.9231	Grp532											
2.0000	Grp141											
2.1667	Grp711											
2.4000	Grp911											
2.4737	Grp131											
2.6500	Grp121											
2.6667	Grp411											
3.1071	Grp531	*	*	*	*							

- - - - - O N E W A Y - - - - -

Variable INFONEED
By Variable PSECTION perseus secion

Analysis of Variance

Source	D.F.	Sum of Squares	Mean Squares	F Ratio	F Prob.
Between Groups	10	30.3635	3.0363	2.9700	.0017
Within Groups	180	184.0240	1.0224		
Total	190	214.3874			

Group	Count	Mean	Standard Deviation	Standard Error	95 Pct Conf Int for Mean
Grp121	20	2.4000	1.1425	.2555	1.8653 TO 2.9347
Grp131	20	2.6000	.8208	.1835	2.2159 TO 2.9841
Grp141	10	2.0000	1.1547	.3651	1.1740 TO 2.8260
Grp311	7	1.1429	.3780	.1429	.7933 TO 1.4924
Grp411	35	2.4000	.9762	.1650	2.0647 TO 2.7353
Grp531	28	2.8571	1.2683	.2397	2.3654 TO 3.3489
Grp532	13	2.1538	1.2810	.3553	1.3797 TO 2.9280
Grp711	18	2.0000	.7670	.1808	1.6186 TO 2.3814
Grp811	11	1.9091	.7006	.2113	1.4384 TO 2.3798
Grp812	10	1.6000	.6992	.2211	1.0998 TO 2.1002
Grp911	19	2.4737	1.0203	.2341	1.9819 TO 2.9654
Total	191	2.3037	1.0622	.0769	2.1521 TO 2.4553

GROUP	MINIMUM	MAXIMUM
Grp121	1.0000	5.0000
Grp131	1.0000	4.0000
Grp141	1.0000	5.0000
Grp311	1.0000	2.0000
Grp411	1.0000	5.0000
Grp531	1.0000	5.0000
Grp532	1.0000	5.0000
Grp711	1.0000	3.0000
Grp811	1.0000	3.0000
Grp812	1.0000	3.0000
Grp911	1.0000	5.0000
TOTAL	1.0000	5.0000

- - - - - O N E W A Y - - - - -

Variable INFONEED
By Variable PSECTION perseus secion

Multiple Range Tests: Tukey-HSD test with significance level .050

The difference between two means is significant if
MEAN(J)-MEAN(I) >= .7150 * RANGE * SQRT(1/N(I) + 1/N(J))
with the following value(s) for RANGE: 4.61

(*) Indicates significant differences which are shown in the lower triangle

Mean	PSECTION	Grp121	Grp131	Grp141	Grp311	Grp411	Grp531	Grp532	Grp711	Grp811	Grp812	Grp911
1.1429	Grp311											
1.6000	Grp812											
1.9091	Grp811											
2.0000	Grp141											
2.0000	Grp711											
2.1538	Grp532											
2.4000	Grp121											
2.4000	Grp411											
2.4737	Grp911											
2.6000	Grp131				*							
2.8571	Grp531				*	*						

- - - - - O N E W A Y - - - - -

Variable LEARNEAS
By Variable PSECTION perseus secion

Analysis of Variance

Source	D.F.	Sum of Squares	Mean Squares	F Ratio	F Prob.
Between Groups	10	63.4575	6.3458	2.6735	.0045
Within Groups	183	434.3621	2.3736		
Total	193	497.8196			

Group	Count	Mean	Standard Deviation	Standard Error	95 Pct Conf Int for Mean
Grp121	21	3.2381	1.2611	.2752	2.6640 TO 3.8122
Grp131	20	2.3000	1.3018	.2911	1.6907 TO 2.9093
Grp141	10	2.2000	.9189	.2906	1.5426 TO 2.8574
Grp311	7	2.0000	1.1547	.4364	.9321 TO 3.0679
Grp411	35	3.0857	2.4778	.4188	2.2346 TO 3.9369
Grp531	29	3.5862	1.1501	.2136	3.1487 TO 4.0237
Grp532	13	2.4615	1.4500	.4022	1.5853 TO 3.3378
Grp711	18	2.0556	1.7311	.4080	1.1947 TO 2.9164
Grp811	11	2.0000	.8944	.2697	1.3991 TO 2.6009
Grp812	10	2.0000	.8165	.2582	1.4159 TO 2.5841
Grp911	20	2.4000	.9947	.2224	1.9345 TO 2.8655
Total	194	2.6856	1.6060	.1153	2.4581 TO 2.9130

GROUP	MINIMUM	MAXIMUM
Grp121	1.0000	5.0000
Grp131	1.0000	5.0000
Grp141	1.0000	4.0000
Grp311	1.0000	4.0000
Grp411	.0000	8.0000
Grp531	1.0000	5.0000
Grp532	.0000	5.0000
Grp711	1.0000	8.0000
Grp811	1.0000	3.0000
Grp812	1.0000	4.0000
Grp911	1.0000	4.0000
TOTAL	.0000	8.0000

- - - - - O N E W A Y - - - - -

Variable LEARNEAS
By Variable PSECTION perseus secion

Multiple Range Tests: Tukey-HSD test with significance level .050

The difference between two means is significant if
MEAN(J)-MEAN(I) >= 1.0894 * RANGE * SQRT(1/N(I) + 1/N(J))
with the following value(s) for RANGE: 4.61

(*) Indicates significant differences which are shown in the lower triangle

Mean	PSECTION	G r p 3 1 1	G r p 8 1 1	G r p 8 1 2	G r p 7 1 1	G r p 1 4 1	G r p 1 3 1	G r p 9 1 1	G r p 5 2 1	G r p 4 1 1	G r p 1 2 1
2.0000	Grp311										
2.0000	Grp811										
2.0000	Grp812										
2.0556	Grp711										
2.2000	Grp141										
2.3000	Grp131										
2.4000	Grp911										
2.4615	Grp532										
3.0857	Grp411										
3.2381	Grp121										
3.5862	Grp531	*									

- - - - - O N E W A Y - - - - -

Variable LOST
By Variable PSECTION perseus secion

Analysis of Variance

Source	D.F.	Sum of Squares	Mean Squares	F Ratio	F Prob.
Between Groups	10	83.4291	8.3429	8.0659	.0000
Within Groups	182	188.2496	1.0343		
Total	192	271.6788			

Group	Count	Mean	Standard Deviation	Standard Error	95 Pct Conf Int for Mean
Grp121	21	2.8571	.9636	.2103	2.4185 TO 3.2958
Grp131	20	2.6000	1.1877	.2656	2.0442 TO 3.1558
Grp141	9	2.1111	.9280	.3093	1.3978 TO 2.8244
Grp311	7	1.5714	.5345	.2020	1.0771 TO 2.0658
Grp411	35	1.9429	.9684	.1637	1.6102 TO 2.2755
Grp531	29	3.7931	1.1458	.2128	3.3573 TO 4.2289
Grp532	13	2.8462	1.1435	.3172	2.1551 TO 3.5372
Grp711	18	1.7778	.9428	.2222	1.3089 TO 2.2466
Grp811	11	2.4545	1.1282	.3402	1.6966 TO 3.2124
Grp812	10	2.1000	.8756	.2769	1.4736 TO 2.7264
Grp911	20	2.8000	.8944	.2000	2.3814 TO 3.2186
Total	193	2.5544	1.1895	.0856	2.3855 TO 2.7233

GROUP	MINIMUM	MAXIMUM
Grp121	1.0000	5.0000
Grp131	1.0000	5.0000
Grp141	1.0000	4.0000
Grp311	1.0000	2.0000
Grp411	1.0000	4.0000
Grp531	2.0000	5.0000
Grp532	1.0000	5.0000
Grp711	1.0000	4.0000
Grp811	1.0000	5.0000
Grp812	1.0000	3.0000
Grp911	1.0000	4.0000
TOTAL	1.0000	5.0000

- - - - - O N E W A Y - - - - -

Variable LOST
By Variable PSECTION perseus secion

Multiple Range Tests: Tukey-HSD test with significance level .050

The difference between two means is significant if
MEAN(J)-MEAN(I) >= .7191 * RANGE * SQRT(1/N(I) + 1/N(J))
with the following value(s) for RANGE: 4.61

(*) Indicates significant differences which are shown in the lower triangle

Mean	PSECTION	G r p 3 1 1	G r p 7 1 1	G r p 4 1 1	G r p 8 1 2	G r p 1 4 1	G r p 8 1 1	G r p 1 3 1	G r p 9 1 1	G r p 5 2 2	G r p 1 3 1
1.5714	Grp311										
1.7778	Grp711										
1.9429	Grp411										
2.1000	Grp812										
2.1111	Grp141										
2.4545	Grp811										
2.6000	Grp131										
2.8000	Grp911										
2.8462	Grp532										
2.8571	Grp121	*									
3.7931	Grp531	*	*	*	*	*	*	*	*	*	

- - - - - O N E W A Y - - - - -

Variable PCONTRIB
By Variable PSECTION perseus secion

Analysis of Variance

Source	D.F.	Sum of Squares	Mean Squares	F Ratio	F Prob.
Between Groups	10	52.4488	5.2449	4.6120	.0000
Within Groups	175	199.0136	1.1372		
Total	185	251.4624			

Group	Count	Mean	Standard Deviation	Standard Error	95 Pct Conf Int for Mean
Grp121	21	2.9524	.9735	.2124	2.5093 TO 3.3955
Grp131	20	2.8500	1.0400	.2325	2.3633 TO 3.3367
Grp141	9	2.8889	1.6915	.5638	1.5887 TO 4.1891
Grp311	7	1.5714	.7868	.2974	.8438 TO 2.2991
Grp411	30	2.9333	1.1427	.2086	2.5066 TO 3.3600
Grp531	28	3.5714	1.1684	.2208	3.1184 TO 4.0245
Grp532	13	2.0769	1.1152	.3093	1.4030 TO 2.7508
Grp711	18	2.2222	.8782	.2070	1.7855 TO 2.6589
Grp811	10	2.8000	.7888	.2494	2.2357 TO 3.3643
Grp812	10	1.8000	.7888	.2494	1.2357 TO 2.3643
Grp911	20	2.4500	.9987	.2233	1.9826 TO 2.9174
Total	186	2.7204	1.1659	.0855	2.5518 TO 2.8891

GROUP	MINIMUM	MAXIMUM
Grp121	1.0000	5.0000
Grp131	1.0000	5.0000
Grp141	1.0000	5.0000
Grp311	1.0000	3.0000
Grp411	1.0000	5.0000
Grp531	1.0000	5.0000
Grp532	1.0000	5.0000
Grp711	1.0000	4.0000
Grp811	2.0000	4.0000
Grp812	1.0000	3.0000
Grp911	1.0000	5.0000
TOTAL	1.0000	5.0000

- - - - - O N E W A Y - - - - -

Variable PCONTRIB
By Variable PSECTION perseus secion

Multiple Range Tests: Tukey-HSD test with significance level .050

The difference between two means is significant if
MEAN(J)-MEAN(I) >= .7541 * RANGE * SQRT(1/N(I) + 1/N(J))
with the following value(s) for RANGE: 4.61

(*) Indicates significant differences which are shown in the lower triangle

Mean	PSECTION	Grp311	Grp812	Grp532	Grp711	Grp911	Grp811	Grp131	Grp141	Grp411	Grp121	Grp531
1.5714	Grp311											
1.8000	Grp812											
2.0769	Grp532											
2.2222	Grp711											
2.4500	Grp911											
2.8000	Grp811											
2.8500	Grp131											
2.8889	Grp141											
2.9333	Grp411											
2.9524	Grp121											
3.5714	Grp531	*	*	*	*	*						

- - - - - O N E W A Y - - - - -

Variable PFEAT
By Variable PSECTION perseus secion

Analysis of Variance

Source	D.F.	Sum of Squares	Mean Squares	F Ratio	F Prob.
Between Groups	10	1326.0115	132.6012	2.1454	.0231
Within Groups	183	11310.6741	61.8070		
Total	193	12636.6856			

Group	Count	Mean	Standard Deviation	Standard Error	95 Pct Conf Int for Mean
Grp121	21	13.5714	4.2845	.9350	11.6211 TO 15.5217
Grp131	20	8.5500	3.9132	.8750	6.7186 TO 10.3814
Grp141	10	5.9000	2.3310	.7371	4.2325 TO 7.5675
Grp311	7	11.0000	4.2032	1.5887	7.1127 TO 14.8873
Grp411	35	7.8286	14.8591	2.5116	2.7243 TO 12.9329
Grp531	29	9.6552	3.4875	.6476	8.3286 TO 10.9817
Grp532	13	12.5385	11.8716	3.2926	5.3645 TO 19.7124
Grp711	18	8.0000	2.5668	.6050	6.7236 TO 9.2764
Grp811	11	8.5455	2.7700	.8352	6.6846 TO 10.4063
Grp812	10	8.6000	8.1677	2.5828	2.7572 TO 14.4428
Grp911	20	3.9000	2.9895	.6685	2.5009 TO 5.2991
Total	194	8.8196	8.0917	.5809	7.6738 TO 9.9654

GROUP	MINIMUM	MAXIMUM
Grp121	6.0000	25.0000
Grp131	.0000	19.0000
Grp141	3.0000	9.0000
Grp311	7.0000	19.0000
Grp411	.0000	90.0000
Grp531	5.0000	19.0000
Grp532	3.0000	51.0000
Grp711	1.0000	12.0000
Grp811	4.0000	13.0000
Grp812	1.0000	30.0000
Grp911	1.0000	12.0000
TOTAL	.0000	90.0000

- - - - - O N E W A Y - - - - -

Variable PFEAT
By Variable PSECTION perseus secion

Multiple Range Tests: Tukey-HSD test with significance level .050

The difference between two means is significant if
MEAN(J)-MEAN(I) >= 5.5591 * RANGE * SQRT(1/N(I) + 1/N(J))
with the following value(s) for RANGE: 4.61

(*) Indicates significant differences which are shown in the lower triangle

Mean	PSECTION	Grp911	Grp141	Grp411	Grp711	Grp811	Grp131	Grp812	Grp531	Grp311	Grp532	Grp121
3.9000	Grp911											
5.9000	Grp141											
7.8286	Grp411											
8.0000	Grp711											
8.5455	Grp811											
8.5500	Grp131											
8.6000	Grp812											
9.6552	Grp531											
11.0000	Grp311											
12.5385	Grp532											
13.5714	Grp121	*										

- - - - - O N E W A Y - - - - -

Variable PHOURS
By Variable PSECTION perseus secion

Analysis of Variance

Source	D.F.	Sum of Squares	Mean Squares	F Ratio	F Prob.
Between Groups	10	51741.3846	5174.1385	.8737	.5590
Within Groups	173	1024502.045	5921.9771		
Total	183	1076243.429			

Group	Count	Mean	Standard Deviation	Standard Error	95 Pct Conf Int for Mean
Grp121	21	16.0476	9.6668	2.1095	11.6473 TO 20.4479
Grp131	20	27.1000	111.3226	24.8925	-25.0006 TO 79.2006
Grp141	10	29.5000	45.6295	14.4293	-3.1414 TO 62.1414
Grp311	6	27.0000	23.0130	9.3950	2.8497 TO 51.1503
Grp411	34	39.2647	127.6580	21.8932	-5.2773 TO 83.8067
Grp531	27	7.4444	15.3531	2.9547	1.3710 TO 13.5179
Grp532	11	9.3636	9.5632	2.8834	2.9390 TO 15.7883
Grp711	18	11.2222	8.0627	1.9004	7.2128 TO 15.2317
Grp811	11	14.4545	11.2282	3.3854	6.9113 TO 21.9978
Grp812	9	77.8889	163.7837	54.5946	-48.0063 TO 203.7841
Grp911	17	12.4706	15.7881	3.8292	4.3531 TO 20.5881
Total	184	23.0924	76.6884	5.6535	11.9379 TO 34.2469

GROUP	MINIMUM	MAXIMUM
Grp121	.0000	35.0000
Grp131	.0000	500.0000
Grp141	.0000	130.0000
Grp311	1.0000	60.0000
Grp411	.0000	500.0000
Grp531	2.0000	82.0000
Grp532	2.0000	35.0000
Grp711	.0000	35.0000
Grp811	.0000	40.0000
Grp812	3.0000	503.0000
Grp911	1.0000	60.0000
TOTAL	.0000	503.0000

- - - - - O N E W A Y - - - - -

Variable PHOURS
By Variable PSECTION perseus secion

Multiple Range Tests: Tukey-HSD test with significance level .050

The difference between two means is significant if
MEAN(J)-MEAN(I) >= 54.4150 * RANGE * SQRT(1/N(I) + 1/N(J))
with the following value(s) for RANGE: 4.61

- No two groups are significantly different at the .050 level

- - - - - O N E W A Y - - - - -

Variable PUSE
By Variable PSECTION perseus secion

Analysis of Variance

Source	D.F.	Sum of Squares	Mean Squares	F Ratio	F Prob.
Between Groups	10	5869.6067	586.9607	5.0469	.0000
Within Groups	177	20585.3454	116.3014		
Total	187	26454.9521			

Group	Count	Mean	Standard Deviation	Standard Error	95 Pct Conf Int for Mean
Grp121	21	8.4762	4.9053	1.0704	6.2433 TO 10.7091
Grp131	20	5.0500	8.7988	1.9675	.9320 TO 9.1680
Grp141	10	18.6000	13.9459	4.4101	8.6237 TO 28.5763
Grp311	7	20.5714	20.7514	7.8433	1.3797 TO 39.7631
Grp411	33	8.1212	5.9201	1.0306	6.0220 TO 10.2204
Grp531	28	2.6786	1.7225	.3255	2.0107 TO 3.3465
Grp532	12	5.5833	3.1176	.9000	3.6025 TO 7.5642
Grp711	18	15.2778	13.3936	3.1569	8.6173 TO 21.9383
Grp811	11	9.7273	5.4054	1.6298	6.0959 TO 13.3587
Grp812	10	22.2000	28.5182	9.0183	1.7993 TO 42.6007
Grp911	18	9.2222	11.7050	2.7589	3.4015 TO 15.0430
Total	188	9.5160	11.8941	.8675	7.8047 TO 11.2272

GROUP	MINIMUM	MAXIMUM
Grp121	4.0000	25.0000
Grp131	.0000	40.0000
Grp141	4.0000	40.0000
Grp311	.0000	65.0000
Grp411	.0000	30.0000
Grp531	1.0000	7.0000
Grp711	4.0000	61.0000
Grp811	3.0000	20.0000
Grp812	.0000	80.0000
Grp911	2.0000	53.0000
TOTAL	.0000	80.0000

- - - - - O N E W A Y - - - - -

Variable PUSE
By Variable PSECTION perseus secion

Multiple Range Tests: Tukey-HSD test with significance level .050

The difference between two means is significant if
MEAN(J)-MEAN(I) >= 7.6257 * RANGE * SQRT(1/N(I) + 1/N(J))
with the following value(s) for RANGE: 4.61

(*) Indicates significant differences which are shown in the lower triangle

Mean	PSECTION	G r p 5 3 1	G r p 1 3 1	G r p 2 3 2	G r p 5 1 1	G r p 4 2 1	G r p 1 1 1	G r p 9 1 1	G r p 8 4 1	G r p 7 1 1	G r p 1 3 2
2.6786	Grp531										
5.0500	Grp131										
5.5833	Grp532										
8.1212	Grp411										
8.4762	Grp121										
9.2222	Grp911										
9.7273	Grp811										
15.2778	Grp711	*									
18.6000	Grp141	*									
20.5714	Grp311	*	*								
22.2000	Grp812	*	*	*	*	*					

- - - - - O N E W A Y - - - - -

Variable RECOVER
By Variable PSECTION perseus secion

Analysis of Variance

Source	D.F.	Sum of Squares	Mean Squares	F Ratio	F Prob.
Between Groups	10	58.3182	5.8318	4.3154	.0000
Within Groups	178	240.5495	1.3514		
Total	188	298.8677			

Group	Count	Mean	Standard Deviation	Standard Error	95 Pct Conf Int for Mean
Grp121	21	2.9524	1.3956	.3045	2.3171 TO 3.5876
Grp131	20	2.4500	1.3169	.2945	1.8337 TO 3.0663
Grp141	10	1.8000	.7888	.2494	1.2357 TO 2.3643
Grp311	6	1.5000	.8367	.3416	.6220 TO 2.3780
Grp411	35	2.1429	1.0042	.1697	1.7979 TO 2.4878
Grp531	29	3.4483	1.1828	.2196	2.9984 TO 3.8982
Grp532	13	2.6154	1.2609	.3497	1.8535 TO 3.3773
Grp711	16	1.8750	1.2583	.3146	1.2045 TO 2.5455
Grp811	11	1.8182	1.0787	.3252	1.0935 TO 2.5429
Grp812	9	2.1111	1.3642	.4547	1.0625 TO 3.1597
Grp911	19	2.5263	.9643	.2212	2.0616 TO 2.9911
Total	189	2.4550	1.2608	.0917	2.2741 TO 2.6359

GROUP	MINIMUM	MAXIMUM
Grp121	1.0000	5.0000
Grp131	1.0000	5.0000
Grp141	1.0000	3.0000
Grp311	1.0000	3.0000
Grp411	1.0000	4.0000
Grp531	1.0000	5.0000
Grp532	1.0000	5.0000
Grp711	1.0000	4.0000
Grp811	1.0000	4.0000
Grp812	1.0000	5.0000
Grp911	1.0000	4.0000
TOTAL	1.0000	5.0000

- - - - - O N E W A Y - - - - -

Variable RECOVER
By Variable PSECTION perseus secion

Multiple Range Tests: Tukey-HSD test with significance level .050

The difference between two means is significant if
MEAN(J)-MEAN(I) >= .8220 * RANGE * SQRT(1/N(I) + 1/N(J))
with the following value(s) for RANGE: 4.61

(*) Indicates significant differences which are shown in the lower triangle

Mean	PSECTION	G r p 3 1 1	G r p 1 4 1	G r p 8 1 1	G r p 7 1 2	G r p 8 1 1	G r p 4 1 1	G r p 1 3 1	G r p 9 1 1	G r p 5 2 1	G r p 1 3 1
1.5000	Grp311										
1.8000	Grp141										
1.8182	Grp811										
1.8750	Grp711										
2.1111	Grp812										
2.1429	Grp411										
2.4500	Grp131										
2.5263	Grp911										
2.6154	Grp532										
2.9524	Grp121										
3.4483	Grp531	*	*	*	*		*				

- - - - - O N E W A Y - - - - -

Variable SATIS
By Variable PSECTION perseus secion

Analysis of Variance

Source	D.F.	Sum of Squares	Mean Squares	F Ratio	F Prob.
Between Groups	10	64.9383	6.4938	5.9601	.0000
Within Groups	173	188.4910	1.0895		
Total	183	253.4293			

Group	Count	Mean	Standard Deviation	Standard Error	95 Pct Conf Int for Mean
Grp121	21	2.9048	1.1792	.2573	2.3680 TO 3.4415
Grp131	20	2.2000	1.1965	.2675	1.6400 TO 2.7600
Grp141	8	2.0000	.9258	.3273	1.2260 TO 2.7740
Grp311	7	1.4286	.5345	.2020	.9342 TO 1.9229
Grp411	29	2.1724	1.0025	.1862	1.7911 TO 2.5537
Grp531	28	3.4643	1.0709	.2024	3.0490 TO 3.8795
Grp532	13	2.0000	1.2247	.3397	1.2599 TO 2.7401
Grp711	18	2.0556	.8024	.1891	1.6565 TO 2.4546
Grp811	11	1.8182	.8739	.2635	1.2311 TO 2.4053
Grp812	10	1.4000	.6992	.2211	.8998 TO 1.9002
Grp911	19	2.2632	1.1945	.2740	1.6874 TO 2.8389
Total	184	2.3424	1.1768	.0868	2.1712 TO 2.5136

GROUP	MINIMUM	MAXIMUM
Grp121	1.0000	5.0000
Grp131	1.0000	5.0000
Grp141	1.0000	3.0000
Grp311	1.0000	2.0000
Grp411	1.0000	4.0000
Grp531	1.0000	5.0000
Grp532	1.0000	5.0000
Grp711	1.0000	4.0000
Grp811	1.0000	3.0000
Grp812	1.0000	3.0000
Grp911	1.0000	4.0000
TOTAL	1.0000	5.0000

- - - - - O N E W A Y - - - - -

Variable SATIS
By Variable PSECTION perseus secion

Multiple Range Tests: Tukey-HSD test with significance level .050

The difference between two means is significant if
MEAN(J)-MEAN(I) >= .7381 * RANGE * SQRT(1/N(I) + 1/N(J))
with the following value(s) for RANGE: 4.61

(*) Indicates significant differences which are shown in the lower triangle

Mean	PSECTION	G r p 8 1 2	G r p 3 1 1	G r p 8 1 1	G r p 1 4 1	G r p 5 3 2	G r p 7 1 1	G r p 4 1 1	G r p 1 3 1	G r p 9 1 1	G r p 1 2 1	G r p 5 3 1
1.4000	Grp812											
1.4286	Grp311											
1.8182	Grp811											
2.0000	Grp141											
2.0000	Grp532											
2.0556	Grp711											
2.1724	Grp411											
2.2000	Grp131											
2.2632	Grp911											
2.9048	Grp121	*										
3.4643	Grp531	*	*	*	*	*	*	*	*	*		

- - - - - O N E W A Y - - - - -

Variable USEASE
By Variable PSECTION perseus secion

Analysis of Variance

Source	D.F.	Sum of Squares	Mean Squares	F Ratio	F Prob.
Between Groups	10	76.8174	7.6817	7.3867	.0000
Within Groups	179	186.1510	1.0399		
Total	189	262.9684			

Group	Count	Mean	Standard Deviation	Standard Error	95 Pct Conf Int for Mean
Grp121	21	2.7143	1.2306	.2685	2.1541 TO 3.2744
Grp131	19	2.2105	1.0842	.2487	1.6880 TO 2.7331
Grp141	10	1.8000	1.2293	.3887	.9206 TO 2.6794
Grp311	6	1.1667	.4082	.1667	.7382 TO 1.5951
Grp411	35	1.5714	.8840	.1494	1.2678 TO 1.8751
Grp531	28	3.2143	1.2280	.2321	2.7381 TO 3.6904
Grp532	13	2.3077	1.3775	.3820	1.4753 TO 3.1401
Grp711	18	1.4444	.7048	.1661	1.0940 TO 1.7949
Grp811	11	1.5455	.6876	.2073	1.0836 TO 2.0074
Grp812	10	1.3000	.4830	.1528	.9544 TO 1.6456
Grp911	19	2.0526	.9113	.2091	1.6134 TO 2.4918
Total	190	2.0737	1.1796	.0856	1.9049 TO 2.2425

GROUP	MINIMUM	MAXIMUM
Grp121	1.0000	5.0000
Grp131	1.0000	5.0000
Grp141	1.0000	5.0000
Grp311	1.0000	2.0000
Grp411	1.0000	4.0000
Grp531	1.0000	5.0000
Grp532	1.0000	5.0000
Grp711	1.0000	3.0000
Grp811	1.0000	3.0000
Grp812	1.0000	2.0000
Grp911	1.0000	4.0000
TOTAL	1.0000	5.0000

- - - - - O N E W A Y - - - - -

Variable USEASE
By Variable PSECTION perseus secion

Multiple Range Tests: Tukey-HSD test with significance level .050

The difference between two means is significant if
MEAN(J)-MEAN(I) >= .7211 * RANGE * SQRT(1/N(I) + 1/N(J))
with the following value(s) for RANGE: 4.61

(*) Indicates significant differences which are shown in the lower triangle

Mean	PSECTION	Grp311	Grp812	Grp711	Grp811	Grp411	Grp141	Grp911	Grp131	Grp532	Grp121	Grp531
1.1667	Grp311											
1.3000	Grp812											
1.4444	Grp711											
1.5455	Grp811											
1.5714	Grp411											
1.8000	Grp141											
2.0526	Grp911											
2.2105	Grp131											
2.3077	Grp532											
2.7143	Grp121	*	*	*		*						
3.2143	Grp531	*	*	*	*	*	*	*	*	*		

- - - - - O N E W A Y - - - - -

Variable VALUE
By Variable PSECTION perseus secion

Analysis of Variance

Source	D.F.	Sum of Squares	Mean Squares	F Ratio	F Prob.
Between Groups	10	76.1902	7.6190	7.4284	.0000
Within Groups	176	180.5157	1.0257		
Total	186	256.7059			

Group	Count	Mean	Standard Deviation	Standard Error	95 Pct Conf Int for Mean
Grp121	21	3.3810	1.3593	.2966	2.7622 TO 3.9997
Grp131	20	2.3000	1.3018	.2911	1.6907 TO 2.9093
Grp141	10	2.7000	.8233	.2603	2.1111 TO 3.2889
Grp311	7	1.5714	.7868	.2974	.8438 TO 2.2991
Grp411	29	2.8966	1.0805	.2006	2.4856 TO 3.3076
Grp531	28	3.6429	.9512	.1798	3.2740 TO 4.0117
Grp532	13	2.4615	1.0500	.2912	1.8270 TO 3.0961
Grp711	18	2.0000	.5941	.1400	1.7046 TO 2.2954
Grp811	11	2.0000	.7746	.2335	1.4796 TO 2.5204
Grp812	10	1.6000	.6992	.2211	1.0998 TO 2.1002
Grp911	20	2.4000	.8826	.1974	1.9869 TO 2.8131
Total	187	2.6471	1.1748	.0859	2.4776 TO 2.8165

GROUP	MINIMUM	MAXIMUM
Grp121	1.0000	5.0000
Grp131	1.0000	5.0000
Grp141	1.0000	4.0000
Grp311	1.0000	3.0000
Grp411	1.0000	5.0000
Grp531	2.0000	5.0000
Grp532	1.0000	5.0000
Grp711	1.0000	3.0000
Grp811	1.0000	3.0000
Grp812	1.0000	3.0000
Grp911	1.0000	4.0000
TOTAL	1.0000	5.0000

- - - - - O N E W A Y - - - - -

Variable VALUE
By Variable PSECTION perseus secion

Multiple Range Tests: Tukey-HSD test with significance level .050

The difference between two means is significant if
MEAN(J)-MEAN(I) >= .7161 * RANGE * SQRT(1/N(I) + 1/N(J))
with the following value(s) for RANGE: 4.61

(*) Indicates significant differences which are shown in the lower triangle

Mean	PSECTION	G r p 3 1 1	G r p 8 1 2	G r p 7 1 1	G r p 8 1 1	G r p 1 3 1	G r p 9 1 1	G r p 5 1 2	G r p 1 4 1	G r p 1 2 1	G r p 5 3 1
1.5714	Grp311										
1.6000	Grp812										
2.0000	Grp711										
2.0000	Grp811										
2.3000	Grp131										
2.4000	Grp911										
2.4615	Grp532										
2.7000	Grp141										
2.8966	Grp411		*								
3.3810	Grp121	*	*	*	*	*					
3.6429	Grp531	*	*	*	*	*	*	*			

Appendix D

Perseus Example Web Site Summary

World-Wide Web Access Statistics for
www.perseus.tufts.edu

Last updated: Thu, 25 Jul 1996 11:55:57 (GMT -0400)

Daily Transmission Statistics
Hourly Transmission Statistics
Total Transfers by Client Domain
Total Transfers by Reversed Subdomain
Total Transfers from each Archive Section

Totals for Summary Period: Aug 11 1995 to Jul 25 1996

Files Transmitted During Summary Period	3034294
Bytes Transmitted During Summary Period	27364320716
Average Files Transmitted Daily	8694
Average Bytes Transmitted Daily	78407796

Total Transfers by Client Domain

%Reqs	%Byte	Bytes Sent	Requests	Domain
0.01	0.01	2140492	323	ae United Arab Emirates
0.00	0.00	14679	2	ai Anguilla
0.03	0.03	7331046	917	ar Argentina
0.25	0.23	62778650	7584	at Austria
1.54	1.70	464642772	46829	au Australia
0.00	0.00	77703	14	aw Aruba
0.00	0.00	2906	1	ba Bosnia and Herzegovina
0.27	0.29	79723552	8190	be Belgium
0.01	0.01	2701738	273	bg Bulgaria
0.00	0.00	284669	29	bh Bahrain
0.00	0.00	684296	112	bm Bermuda
0.00	0.00	109232	19	bn Brunei Darussalam
0.00	0.00	159611	7	bo Bolivia
0.35	0.43	117886733	10486	br Brazil
0.00	0.00	2913	1	bz Belize
3.68	3.67	1004870854	111676	ca Canada
0.27	0.28	77543585	8065	ch Switzerland
0.03	0.03	7825920	774	cl Chile
0.00	0.00	766335	93	cn China
0.01	0.01	1879526	223	co Colombia
0.01	0.01	3469929	355	cr Costa Rica
0.01	0.01	2146619	244	cy Cyprus
0.16	0.14	38983351	4776	cz Czech Republic
0.91	0.94	256133954	27651	de Germany
0.30	0.32	87707217	9026	dk Denmark
0.01	0.02	4461185	406	do Dominican Republic
0.00	0.00	467768	71	ec Ecuador
0.03	0.02	6457831	847	ee Estonia
0.00	0.00	504533	45	eg Egypt
0.27	0.26	71963208	8126	es Spain
0.40	0.51	139536417	12005	fi Finland

0.00	0.00	31097	1 | fo Faroe Islands
0.73	0.74	203192139	22040 | fr France
0.00	0.00	631649	65 | gb Great Britain (UK)
0.00	0.00	105186	3 | ge Georgia
0.00	0.00	1317892	116 | gl Greenland
1.02	1.09	298873526	31078 | gr Greece
0.00	0.01	2207083	147 | gt Guatemala
0.00	0.00	9290	4 | gu Guam
0.04	0.03	8591276	1087 | hk Hong Kong
0.04	0.04	10718562	1067 | hr Croatia (Hrvatska)
0.06	0.07	18191438	1971 | hu Hungary
0.01	0.01	2219274	256 | id Indonesia
0.23	0.24	66001508	7119 | ie Ireland
0.41	0.38	104097135	12383 | il Israel
0.00	0.00	569505	55 | in India
0.05	0.06	16909593	1584 | is Iceland
0.86	0.96	262926300	26161 | it Italy
0.00	0.00	135644	2 | jm Jamaica
1.12	1.03	282017840	33969 | jp Japan
0.00	0.00	7604	3 | ke Kenya
0.07	0.06	17368684	2047 | kr Korea (South)
0.00	0.00	518182	69 | kw Kuwait
0.00	0.00	25188	6 | ky Cayman Islands
0.00	0.00	611584	12 | lb Lebanon
0.00	0.00	32677	7 | li Liechtenstein
0.00	0.00	767970	113 | lt Lithuania
0.01	0.01	3906759	441 | lu Luxembourg
0.00	0.00	403627	36 | lv Latvia
0.00	0.00	232386	11 | ma Morocco
0.00	0.00	723147	142 | mt Malta
0.07	0.07	19126374	2164 | mx Mexico
0.02	0.02	5374476	549 | my Malaysia
0.00	0.00	5995	6 | na Namibia
0.88	1.02	278711998	26666 | nl Netherlands
0.50	0.69	189549370	15222 | no Norway
0.21	0.21	58077623	6222 | nz New Zealand (Aotearoa)
0.00	0.00	70694	20 | pa Panama
0.02	0.01	3790905	482 | pe Peru
0.01	0.01	1395588	161 | ph Philippines
0.00	0.00	487627	38 | pk Pakistan
0.29	0.36	99356403	8818 | pl Poland
0.12	0.12	32408991	3606 | pt Portugal
0.01	0.01	3248253	435 | ro Romania
0.06	0.06	16328462	1888 | ru Russian Federation
0.69	0.86	235700241	20974 | se Sweden
0.08	0.08	22906166	2445 | sg Singapore
0.04	0.05	13065226	1312 | si Slovenia
0.01	0.01	1477736	223 | sk Slovak Republic
0.00	0.00	15029	4 | sm San Marino
0.02	0.02	5474022	565 | su USSR (former)
0.01	0.01	2837860	249 | th Thailand
0.03	0.03	7943745	1039 | tr Turkey
0.00	0.00	73688	18 | tt Trinidad and Tobago
0.09	0.23	61839966	2615 | tw Taiwan

0.00	0.00	877690	123 | ua	Ukraine
1.62	1.70	464058649	49094 | uk	United Kingdom
0.85	0.90	245625732	25735 | us	United States
0.02	0.02	5316325	670 | uy	Uruguay
0.01	0.01	2358373	183 | ve	Venezuela
0.00	0.00	72322	21 | yu	Yugoslavia
0.09	0.12	32693585	2846 | za	South Africa
0.00	0.00	26733	2 | zm	Zambia
22.27	20.78	1392497730	675612 | com	US Commercial
25.24	24.85	-1790458279	765938 | edu	US Educational
0.56	0.63	173148151	16997 | gov	US Government
0.00	0.00	271359	48 | int	International
0.38	0.29	78414768	11477 | mil	US Military
8.35	8.35	-2010910550	253353 | net	Network
0.71	0.80	219916188	21565 | org	Non-Profit Organization
0.00	0.00	76466	9 | wst	
0.07	0.07	20314425	2123 | arpa	Old style Arpanet
0.00	0.00	12943	10 | pc145	
0.00	0.00	2987	1 | earthlink	
3.80	4.17	1140871036	115370 | tufts.edu	
19.65	19.75	1108428196	596231 | unresolved	

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