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Foreword

It hardly seems possible that nearly twelve months have passed since the Conference on Classics and Computing was held at UCLA on July 19 and 20, 1986. Since then, much has happened in this very exciting area of Classical studies—so much, indeed, that I feel I must almost make this "foreword" into an "afterword" (or perhaps a "forward"!) to bring readers of this volume up to date. But first, let me give the conventional—and very sincere—notes of thanks to the many individuals who helped make the conference such a great success.

Seventeen speakers and over sixty participants attended the conference, and it is only proper that I begin by thanking our guests for taking the time to come to Los Angeles in the middle of summer vacation and for helping to make our exchange of ideas so intense and fruitful. Special thanks are owed to David Blank (UCLA) and Tom Martin (Pomona), who moderated the three sessions of the conference and who guided the discussion periods in a most stimulating way. Marion True, Curator of Antiquities at the J. Paul Getty Museum, graciously arranged for our visit to the museum and for our inspection of her videodisc project on Greek Vases. I am sure that all who attended will join me in thanking Jeanne Costello, formerly on the staff of the UCLA Department of Classics, whose coordination work was truly flawless. Last, but not least, I should gratefully acknowledge the fact that crucial financial support for the conference was given by Mssrs. Kurt Forster, Director of the J. Paul Getty Center for the History of Art and the Humanities, and Herbert Morris, the Dean of Humanities at UCLA.

Since last summer, developments have proceeded apace in what is surely the most rapidly changing area of Classics. Ibycus Systems has marketed its Ibycus Scholarly PC, of which a prototype was shown at the conference. Paul Kahn has completed Isocrates and delivered it to the Classics and Religious Studies departments at Brown. He has published an extremely informative final report ("Isocrates Project Final Report," IRIS Technical Report 87-2), which is available from IRIS, c/o Brown University, Box 1946, Providence, RI 02912. Elli Mylonas has finished her new user interface and incorporated it as part of Isocrates. Marion True's videodisc project (about which she spoke at the conference, but which is unfortunately not described in one of the papers that follow in this volume) has been completed and is being used by hundreds of Getty Museum visitors each week. Karl Squitier and Luci Berkowitz have now published the second edition of their Canon of Greek Authors and Works (New York and Oxford 1986). Theodore Brunner has published the paper he gave at our conference ("Data Banks for the Humanities: Learning from
Thesaurus Linguae Graecae") in *Scholarly Communication*, Number 7 (Winter 1987). Major progress can also be reported on Dan Veditz' Online Greek-English Lexicon project and Neel Smith's Morpheus, a morphological parser for Greek (described at the conference but not published here). Undoubtedly the single most exciting piece of news during the past twelve months is that Greg Crane, Jud Harward, and others have received a commitment for a major grant from the Annenberg/CPB Project to support development of their project Perseus, a total computing environment for exploiting the TLG and other Classical databases. Perseus and complementary projects at UCLA and elsewhere will be the subject of a special session to be held at the October, 1987 meeting of EDUCOM in Los Angeles.

Let me conclude by thanking Robert Cape, editor-in-chief of *Favonius*, for agreeing to publish these conference papers as a supplementary volume of his important new journal and for his tireless work in ensuring that the publication is both well-edited and beautifully designed. How appropriate that *Favonius*, a journal devoted to publishing the work of the Classicists of tomorrow, should provide the forum for recording how today's Classicists are planning to revolutionize their field in the future!

Bernard Frischer,
10 July 1987
Classics and Computing at UCLA and in the Profession

Bernard Frischer

University of California, Los Angeles

I speak to you today not as a computer specialist—which I cannot claim to be—but as the chairman of a department that has recently experienced the computer revolution. I am here to report on what we have done with Classics and computing at UCLA, what we plan to do in the future, and how I think we can progress most efficiently by cooperating with other departments around the country.

One year ago, the UCLA Department of Classics owned just one computer—an IBM PC XT, which was mainly used for administration. Much has changed in the last ten months. In the summer of 1985, thanks to a contract with the Getty Center for the History of Art and the Humanities, the department was able to rent six ports on a UCLA VAX 11/750 running Berkeley UNIX 4.3 and to purchase a 420 mb. hard disk and the TLG tapes. Greg Crane was kind enough to make us a beta testing site for his Harvard TLG Search Programs and for a version of MacTerminal which enables the VAX to communicate with a Macintosh. Mark Cogan kindly gave us an early version of his program, KADMOS, which permits the Apple LaserWriter to print Greek. Macintoshes give access to the system twenty-four hours a day, seven days a week in departmental offices or from home via modem.

The reception of this system by our graduate students and faculty has been quite enthusiastic. Most faculty now own Macintoshes and modems. Almost all faculty and graduate students have attended one or more of the quarterly Saturday afternoon tutorial sessions on using the system offered by the chairman of our computer committee, Prof. David Blank. Computer competence, from word processing to string searches
through the TLG, is very high. As faculty have become adept at using the system in their own research, they have given graduate students assignments requiring use of the TLG. Most graduate papers written this year reflect our students' familiarity with text and word processing. One professor--Andrew Dyck--has made a successful foray into the world of desktop publishing. He has produced on our LaserWriter his own edition with commentary of some essays by Michael Psellus. When the printer for the Austrian series Byzantina Vindobonensia, in which the book will appear, saw the high quality of Prof. Dyck's printout, he remarked, "I am very envious of you." When the scholars in this room hear that the book is appearing in print a scant five weeks after it was sent to Vienna--and without ever having gone through galleys and page proofs--they will, I am sure, be equally envious of Prof. Dyck.

The impact of the computer on our department has thus been quite marked. Faculty research has been speeded up; the quality of graduate student work has increased. Social relations between students and faculty have improved as members of the department have found they share a new and very important common interest. Our ability to attract excellent undergraduate and graduate students has perceptibly increased. Next year, for example, we will be welcoming two new graduate students with programming experience; they chose to come to UCLA in part because of our system and the opportunity it affords for new research in traditional areas of Classics as well as in computer applications.

Our use of the enormous TLG database is presently limited to two functions: (1) the library function, whereby the user can read a text on the computer; and (2) the search function, whereby the user can find all the occurrences of a word or string in an author, genre, or in all of Greek literature, usually in just a few seconds. We have made modest progress this academic year toward implementing a third function--the grammatical and stylistic function. We have co-sponsored, with Harvard University, the creation of an Attic Greek morphological parser by Neel Smith and Joshua Kosman at Berkeley. We recognize that the current system needs to be enhanced in many ways to realize its great potential as a tool in Classics research and instruction.

What are some of these ways? First, there are no instructional uses of the database, for the simple reason that current software presumes a fairly high level of fluency in ancient Greek. Second, the available search programs leave much to be desired in user-friendliness and in power to manage and manipulate the database. Boolean operators are not yet available, nor have the resources of the Macintosh been tapped to any degree. Finally, the preoccupation with string searching, while understandable, has given many Classicists the wrong impression that the primary use of the database is that of an electronic concordance or library. There are many other things that we can do with the TLG.

At UCLA, we have been encouraged by the central administration during the past academic year to develop a three-year plan for use of the
computer in research and instruction. In our department, we began by envisioning an ideal multimedia expert system for Greek, Latin, and Classical Civilization. We proceeded on the assumption that our vision could be realized in the next ten to fifteen years, when Fifth-Generation Computer Systems and massive textual and visual databases will be created and made commercially available. Our three-year plan was thus understood to be a step in the direction of a definable goal.

Before describing our short-term plan, let me sketch out my vision of where we will be in ten or fifteen years. By that time, we should have created a Classics Expert System serving everyone from the beginning student to the most advanced scholar. At the heart of the system will be vast visual and textual databases of the primary materials of the field—manuscripts, inscriptions, archaeological sites, art, architecture, and other artifacts—as well as the major reference works and that 25% or so of the secondary literature which is used over 50% of the time. Communication with the system will be almost entirely by voice. Voice recognition and synthesis and the natural language processing of Greek and Latin will have progressed far enough to permit computer-managed instruction in the ancient languages, starting from the elementary level. Machine translation will permit students of Classical Civilization—i.e., those who study antiquity through English translations—to access the same textual database as is used by students and scholars of Greek and Latin. Instruction and research will emphasize interdisciplinary approaches, since the expertise of the ancillary specialties of the field will have been incorporated into the Expert System. For instruction, this means that learning will take place in environments in which a linguistic signifier is encountered with immediate visualization of—and, when possible, dramatized interaction with—the corresponding signified. For scholarship, this means that quantification and statistical analysis will become increasingly important, as will the methodologies of economics, psychology, and sociology, which facilitate


2 The Thesaurus Linguae Graecae project gives us ancient Greek literature through modern scholarly editions; the ideal Classics Expert System will include a database of the actual manuscripts and papyri on which the modern editions are based along with a collation program for automatically representing the ancient, medieval, and modern evidence for the a text.

3 Using a library database program such as UCLA's ORION, it should be easy to determine the most frequently consulted books and journals within a certain range of call numbers. It is my undocumented suspicion that a very small percentage of books accounts for a very high percentage of what readers actually use in a field.

the analysis of cultural artifacts of different periods, proveniences, and types. In this ideal world, students will learn faster and better and will even be able to speak Greek and Latin, for the first time in centuries. Scholars will be freed from much, if not all, of the drudgery presently spent on data collection and will have more time to develop and discipline their informed historical imaginations.

As we see it, the great challenge during the next three years or so is to create a flexible framework for software design that will persevere through years of innovation in technology and educational theory. The framework we have been developing has three parts: a core of multimedia databases; around the core, an inner ring of scholarly utilities for using and modifying the databases; and an outer ring of pedagogical applications, which use the scholarly utilities and the databases. The nature of the core and inner ring is fairly clear and requires more funding than imagination to create. The core includes databases for Greek and Latin texts, morphologies, dictionaries, syntax; images of archaeological artifacts of all kinds, from coins and lamps to statues and buildings; and an encyclopedia and bibliography. The inner ring—which might be imagined as a Classicist's "toolkit" or "workbench"—includes search programs with Boolean operators for data collection from the databases; and parsers for morphology, syntax, rhetoric, semantics and meter. The character of the outer ring—the interface with the student on all levels—has taken over a year to sketch out through the collaboration of subject experts and specialists in instructional-media development.

Whereas the structure of the core and inner ring reflect that of the field of Classics itself, that of the outer ring must be dependent both on this field and on a theory of knowledge acquisition. The theory we have devised is a hybrid based on the key notions of student interaction with the

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5 This feature of CALI in Latin and Greek cannot be overemphasized since it will enable Classicists to benefit from "modern language" techniques of interactive oral instruction. Thus, while CAI has been found to have only modest effectiveness in general (see J. A. Kulik C.-L. C. Kulik, P. A. Cohen, "Effectiveness of Computer-based College Teaching: A Meta-analysis of Findings," Review of Educational Research 50 (1980) 525-544; K. Ahmad, G. Corbett, et al., op.cit., 119-122), it is reasonable to expect that CAI will have a high level of effectiveness in Greek and Latin instruction. Significantly increased effectiveness via videodisk-based instruction is reported by A. M. Abdulla, L. O. Watkins, J. S. Henke, "The Use of Natural Language Entry and Laser Videodisk Technology in CAI," Journal of Medical Education 59 (1984) 739-745.

6 Many of these databases are already being created; for example, the American Philological Association is digitizing the standard Classics bibliographical annual; the J. Paul Getty Museum is creating a videodisk for Greek iconography; and our department is digitizing the Greek-English lexicon.
learning environment\(^7\) and the arousal of the student's curiosity.\(^8\) The theory of interaction holds that students learn best when they become actively involved in their own education; the theory of curiosity (or, "effectance") arousal explains how we become motivated to learn in proportion to the confusion we experience in a new environment.

It seems to me that these two theories of learning are complementary—one stresses the need for the student to be curious, the other tells us how to make people curious.

In an ideal world, each college or high school student would be assigned a private tutor of enormous erudition, charm, and pedagogical skill and would be taken on a grand tour of the worlds of nature and culture to realize this theory of education. In the real world—especially at an enormous state university like UCLA, where we are presently constructing a multimedia lab with 250 workstations and where the number of Classics students has grown from 1100 per year to 3000 since 1980—computer-assisted instruction is undoubtedly our best hope. One of the strengths of CAI is, of course, its highly interactive nature.\(^9\) As for curiosity arousal, the

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\(^7\) The importance of active student involvement in learning has been emphasized in two recent reports on American education; see M. J. Adler, *The Paideia Program* (New York 1984), especially pp. 167-179; and *Involvement in Learning* (National Institute of Education, October 1984), especially pp. 17-19.


\(^9\) See, e.g., K. Ahmad, G. Corbett, et al., *Computers, Language Learning and Language Teaching* (Cambridge 1985) passim, especially p. 4: "the computer can offer interactive learning. This means that it can conduct a two-way learning session with the student. It is much more than a mere programmed textbook, whose powers of interaction are virtually limited to an ability to reveal the correct answer: the computer can 'assess' the student's response. It can also display messages, take the student through subsequent attempts at a question, and even take the student to a different section of the package, depending on the nature of the response. The computer can do all this very quickly--its response is practically instantaneous. If the computer is impersonal and literal-minded, it is also unfailingly accurate and precise. It does not tire, and its attention does not falter. It can repeat an activity with none of the errors which easily arise from repetition by humans, and it is impartial and unbiased as the linguistic material which is typed into it. It can handle a very large volume of interaction and can deliver to the student feedback of some subtlety, at more frequent intervals than would be possible for a human teacher in all but individual tuition sessions. And it is flexible in a number of significant ways...." On the importance of eliciting student interaction in language learning, see J. H. Schumann, "Second Language Acquisition: The Pidginization Hypothesis," *Language Learning* 26,2 (1976) 391-408, at p. 403.
computer with multimedia programming is an ideal tool for creating an imaginary world that is at the same time confusing and intriguing to the student and for providing him with a friendly guide for successfully navigating through that world.

As chairman of my department, I am particularly concerned to know how we will be able to develop our system in these new directions in the coming months and years. I have to ask myself: why will be our sources of funding? Do we have to do everything ourselves at UCLA, or can we continue the very fruitful cooperation with other institutions that has taken us so far so fast during the past year?

As for funding, it is clear that some progress can be made at little or no cost. I mentioned the student programmers who are already donating their time out of a sense of fascination with the computer and love of the field of Classics. I expect the number of these students to increase in the coming years because we will be introducing a new specialization in computing at UCLA in connection with the traditional majors. A Classics major will soon be able to graduate with the traditional degree and with a specialization in Classics and Computing, if he or she takes three general courses in programming and one or two specialized classes in programming for Classics. The student projects in these classes ought to be designed as modest enhancements to our present computer system. Dan Veditz's Greek Dictionary Project is a striking example of the kind of student projects we ought to be seeing in the near future at UCLA.

The UCLA administration should also be able to help through instructional development funds set aside when UCLA received a large grant from IBM. Ideally, these funds could be used for some of our projects that are relatively costly because they require sophisticated programming, large data-entry, or new equipment purchases. So far, however, the promise of significant support for the humanities has only begun to be realized.

A second source of major funding is, of course, extramural. We know that several foundations are interested in computer applications to the humanities, and we know that applications from Classicists are, in fact, pending. We welcome the support already given to the TLG project by a variety of foundations and to the new corresponding project for Latin recently begun at Yale, about which Joe Solodow will be talking in our second session. I am, however, concerned that the agenda of extramural (and, for that matter, intramural) funding sources may not correspond very well to the agenda of the Classics profession itself. I hope, by the way, that one of our purposes in this conference will be to begin defining such an agenda. In particular, I worry that it may be very difficult to make non-Classicists see the integral relationship between databases, scholarly tools, and pedagogical applications.
Assuming, then, that one is somewhat dubious that all necessary resources will be forthcoming from extramural and intramural sources, where will we Classicists find the funding we need? Thus answer, I think, is fairly obvious: either from the kind of informal cooperative arrangements between universities that I have already mentioned or else from some more formal entity. I would like to conclude by making the case that the second alternative is likely to be better in the long run.

For a year now, I have been talking to Classicists about the desirability of founding a non-profit corporation called the Classics Computing Group, or CCG for short. The purpose of the corporation would be to promote the creation and dissemination of portable computer applications for our research and teaching and to give advice to universities planning to computerize in our field. The CCG would receive funding from supporting institutions, from royalties and consulting fees, and, perhaps, from foundation grants. In the first year or two of its existence, the CCG would undoubtedly have a small number of supporting institutions and would have to have a correspondingly higher annual membership fee than should eventually be the case. For the sake of argument, let us imagine five founding universities that each contribute $5,000—or the equivalent amount in services—for the creation of new computing materials for Classics. In return for their contributions, the universities receive new products gratis and have a vote on how development funds are to be spent each year. Five thousand dollars would be well within the range of what several Classics departments are now, in fact, investing in computer activities each year but would yield a much higher return in terms of product and support. One university—for example, my own, which has considerable underutilized hardware in its system—might contribute the service of providing a bulletin board for the CCG and perhaps even dial-up access to the TLG and CCG software. In a few years, the CCG might well be able to afford a fulltime staff person, who would be on call to offer support to users around the country and would also be a programmer. After five years, the number of supporting institutions should have grown considerably, royalties for the products created should have begun to flow back to the CCG, and the annual membership fee could perhaps be substantially reduced.

The CCG would be advantageous to programmers and users, as well as to departments and universities, in a number of ways. It would offer a vehicle for bringing new Classics material to market by being represented at the annual APA/AIA convention and by other forms of publicity. It would offer a fair royalty to programmers and enable them to share ownership of their intellectual property, not with a single university which they may not always be associated, but with a national organization. It would help set national standards and priorities for Classics computing development. Most importantly, it would prevent needless duplication of efforts across the country and ensure that the profession gets the greatest return on the limited resources available to it for computer projects. For the user, the CCG would help both by providing support and
by establishing standards for product testing, compatibility, and portability. Thus users, like programmers, would not find themselves inextricably linked to a specific system at a single university.

Most colleges and universities—and certainly most Classicists—still do not have access to the greatest research and teaching tool of our age, the TLG. Even those that have the TLG use it primarily as an electronic concordance and library. Wilamowitz used to say that Classicists have to eat a lot of dust but shouldn't enjoy doing so! If we are to add new databases to the TLG and begin to realize the computer's potential to replace much of the dusty drudgery of our field with expert systems, then we need more cooperation and less competition between universities, more coordination and less wasteful duplication of our efforts. This conference is, I hope, one step in the right direction. The CCG, or something like it, would, I think, represent an even greater leap forward.