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**Personal Computers and Iconography:
Issues and Lessons Arising
from the Macintosh Emblem Project**

In assessing the potential or actual value of any computer-assisted research project in the humanities, I believe we must be more than usually vigilant in the way we ask three crucial questions, which are: How much has it cost so far, and how much more is it likely to cost in future? What new benefits does it promise to confer on scholars which would justify the cost of the project? Are scholars in general likely to participate in the project or to benefit from it, or is it more likely to remain the property of a coterie of technocratic initiates? The answers to these questions may not always be to the liking of those of us who advocate applying computer technology to humanities research, but the fact that they can be asked at all is in itself significant: only a few years ago the cost of computer technology was such as to prohibit its use entirely in our field, and the difficulty of using computers was daunting to all but a few enthusiasts. I believe that my own experience creating software for emblem study shows that the personal computer and iconographic research are made to go together, and that even a single scholar can produce software of high quality. My work has left me convinced that only when a comprehensive hypertextual database has been created and made widely available through our collective efforts will emblem studies be able to attain full maturity.

My emblem database software, as I use it, now consists of half-a-dozen HyperCard stacks running on a Macintosh PowerBook 170 computer. HyperCard is simply a form of computer software which offers great flexibility in mixing text and graphics on the same computer screen, so that the pictorial and textual codes which characterize emblem books can readily be displayed simultaneously. A HyperCard 'stack' can be thought of as something akin to a drawerful of file cards which can be displayed on the computer screen in any sequence. In addition to the display of text and pictures, however, the software — and this is what has consumed most of my time with the project — offers users a number of additional features: the ability to conduct visual or textual searches, to make notes on individual emblems or on groups of emblems, to assign emblems to thematic groups of their own devising, to create reciprocal links between emblems, to

collect copies of emblems to a separate stack, to create an index of interesting words in the text of an emblem book, to export their notes, or the emblem texts, or the index, or the table of contents of any stack to a computer text file suitable for use in a word processing program, and so on.

I learned early on that cost is the single biggest drawback to computer-assisted research projects conducted by individuals. When I first began to work some five years ago on a computer-assisted visual database of emblem books, I had no inkling that something which I had imagined primarily as a way to save myself time and effort would in the end exact from me not only far more of those precious commodities than I could well afford but more money than I had thought possible. I little dreamed at that time of the effects which a steady diet of intensive computer-assisted research could have on a scholar's health, career or family relationships. I had no notion at all of how profoundly frustrating it can be to develop computer software on one's own with no prior experience.

There is no escaping the fact that computer-assisted research is first and foremost a radically different financial proposition from a visit to the library with pencil and paper. Once involved in computer-assisted research, one needs and wants to acquire ever-better computer hardware, of course, but buying a computer is only the beginning: there are very substantial expenditures involved in peripheral equipment, and computer software of various kinds has to be purchased and kept up to date: Iconographic work is especially costly: a scanner is a necessity, and software tools have to include suitable graphics capabilities. Use of an existing computer-assisted project developed by someone else is of course less financially burdensome, but in the final analysis, it is probably going to be difficult for most scholars to support development of a new computer-assisted project unless they are independently wealthy or can attract significant support in the form of research grants or private sector funding.

The greatest cost for most scholars who embark on development of a computer-assisted research project, however, will surely be the drain on their time. Most humanities scholars have little or no research funding even to hire a student to enter texts into the computer, let alone to engage a professional programmer. Scholars who become interested in computer-assisted research soon find in any event that very few computer professionals are interested in or adept at the kinds of things scholars in the humanities want to accomplish, and so they either abandon their projects or drift into developing their own software. As a result, they begin to invest very large quantities of their time in software development: learning one or more programming languages; mastering a number of different kinds of

computers and different software; entering texts into a computer, or scanning pictures, or training a graduate research assistant to perform those chores. All these tasks can eat into one's time to a huge extent, which can have serious implications for the careers of those scholars who are 'bitten by the computer bug'. I am sure we all know someone of whom it has been said, "What a shame about Professor X! He could have been a first-rate scholar, but he got sidetracked into computers and now he spends all his time fiddling with hardware instead of working on his research."

Not only can tinkering with hardware become a compulsive habit for some, but the temptation to write software is seductive. Programming is often more immediately satisfying and intellectually less taxing than writing scholarly articles, since the work itself, while difficult and complex at times, is far less abstract than scholarly research, and a finished computer program can be put into operation at once, whereas an article can take months or even years to get into print. The result, for many scholars, is to succumb to the urge to devote ever-increasing quantities of time to their programming.

Most scholars who have not tackled computer programming will have little or no conception of just how much time it can consume. The urge to tinker and to perfect is part of the problem, but simply managing to write software that works as intended can be an enormously time-consuming and frustrating process. The authors of a 1992 article in *Scientific American* offer a cogent summary of many reasons why bug-free software is in practice impossible to write (Littlewood and Strigini). Among the factors they adduce is one which will be familiar to anyone who has tried to write software, which is that merely correcting one bug can frequently introduce new and potentially more serious ones which will take even more time to locate and fix. I recently spent the better part of two days attempting to locate, understand and deal with a software fault in my emblem software which turned out to be caused by an undocumented problem in a commercial software product, as I eventually discovered when I called the manufacturer. This problem was located by a colleague who was testing my software, and had never cropped up before simply because the circumstances which caused it to appear could not occur on my own computer. In attempting to cure the problem, I managed to make some changes to the software which interfered with features which until then had worked perfectly, necessitating even more work to fix these subsidiary problems. Needless to say, the time consumed by dealing with the problem would have been more profitably spent on actually thinking about and writing about emblem books,

and I would have been happy as well not to have to make an expensive phone call to California. This is merely one very small example of something which happens constantly to any scholar involved in work of this sort. The computer, in short, can be a huge drain on your time, rather than a labor-saving device.

While spending a great deal of time programming is probably a less harmful addiction than spending large quantities of one's disposable income on, say, gambling at the racetrack, or illegal drugs, time expended on software creation must be taken from something else. Normally it will be drawn from research time which could have been spent thinking, reading or writing: this, as I have just said, is not only frustrating and irritating, but hazardous to one's career. There is a danger, however, that time needed for writing software will simply be skimmed from time one might otherwise have spent with one's family or friends. How many spouses of scholars who are also involved in humanities computing have asked "Aren't you ever going to come to bed, dear?" over and over only to hear the unvarying reply, "I'm just going to get rid of this one last bug...". There is always, alas, "one last bug" to deal with, and insisting on dealing with it at all costs can have disastrous results on one's private life.

There can be costs to one's health, as well. After a number of years spent staring fixedly into a computer screen, I am uncomfortably aware that my eyesight, never first-rate, is now worse than it was. How much of that deterioration is simply the inevitable result of ageing, and how much can be attributed to computer use, I do not know; but the possibility must be considered that computers have caused at least some of it. Other strains and stresses on one's physical well-being are certainly attributable to too much computer use: neck and back pain from long hours spent at a cramped keyboard, carpal tunnel syndrome or other less acute but still bothersome hand and wrist pain from too much typing or too much repeated mouse use, for example. To put it bluntly, too much computer use is almost certainly a very bad thing for one's health.

Having painted this gloomy picture, however, I hasten to add that I am still a convinced and fervent devotee of computer-assisted humanities research. Many if not all of the costs which I have described can be greatly curtailed by collaborative work, and there is no denying that the computer has brought and will bring to scholars in our field powers and abilities whose nature we can still only partially appreciate. Few of even the most traditionally minded scholars in the humanities who have used word processors would be willing to return to a typewriter. What computers have not yet meant for most of us, though, is a change in the ways in which we actually do things, and in the ways in which we actually

look at our work: in other words, the introduction of the computer into the lives of scholars in the humanities has not altered our research paradigm in any fundamental way. Most scholars in the humanities still unabashedly use their computers as a kind of marvelous and strangely powerful typewriter: its screen displays text which has been entered and can be edited, and that is all. Until we can free ourselves from the constrictive limits imposed by this “typewriter metaphor”, the use of computers in our work will be very far indeed from achieving the kinds of results which it ought to achieve.

One advantage of computer-assisted textual study is simply the ease with which one’s results can be checked by other scholars. Once a text is entered into the computer and checked for accuracy, it can be disseminated very easily and cheaply to all interested scholars in the same area. The signal advantage of such a procedure is that everyone will be talking about the same thing — if necessary, interesting textual variants can readily be incorporated into the corpus, which remains ‘fixed’ and stable in a sense that traditional corpora for literary study rarely if ever are, especially when one is working on old books.

In the case of iconographic studies, where access to the visual image is paramount, the computer offers advantages which are similar to those enjoyed by textual scholars: the ability to store and search large quantities of material very quickly, for example. There are certain difficulties connected with image storage in computers, though, which make computer use for iconographic study rather a different proposition: in particular, the amount of storage space required for large images, especially those in color, has made the use of large numbers of images impractical for scholars equipped only with a personal computer, which until recently were not powerful enough in any event to manipulate large color images satisfactorily. This roadblock is rapidly disappearing, however, as computers become ever more powerful and as the cost of disk space (whether magnetic, optical or CD-ROM) continues to dwindle.

My enthusiasm for computer-assisted research has not led me to believe, however, that any computerized database will in the short or medium term be viewed by many of us as a satisfactory alternative to consultation of the original material, or even as an acceptable substitute for a good photographic reproduction. There are a number of reasons why this should be so. To begin with, the resolution of even the best computer screens is currently more than an order of magnitude less than that of a good printed or photographic reproduction: for this reason alone, even the most painstaking computerized reproduction of visual

material will give results which would be entirely unsatisfactory for many purposes. As well, the dimensions of most computer screens preclude reproduction of many original visual artifacts in anything approaching their original dimensions, though the ability of the computer to enlarge visual material at will does allow us to present some very small originals at a size larger than life, so to speak. Bibliographers and conservators, whose raw material is of necessity the physical object, whether book or picture, will almost certainly find a computerized reproduction essentially useless. In the case of material originally in color, it must be said that computerized reproductions, even in the case of machines able to reproduce 24-bit color (in other words over 16,000,000 color gradations in all), simply cannot accurately duplicate the original hues. This is an intrinsic problem with any reproduction process which relies on transmitted rather than reflected light, but it is greatly exacerbated in the case of computers by the fact that no two manufacturers use exactly the same processes and materials, and that no two screens from the same manufacturer are likely to have exactly the same color calibration.

Nonetheless, these technical drawbacks are not outweighed, in my view, by the extraordinary advantages to be derived from a very large visual database; let us suppose, then, that we decide to go ahead with a large-scale collective project. Before we actually set out to create our new database, we face a number of fundamental and crucial decisions. The first question to be posed by many scholars is that of what corpus will be selected for reproduction. In the case of much purely iconographic material, the corpus is relatively self-selecting in the sense that each object is truly unique in a very real way. In the case of books, though, the situation is very different. Emblem scholars, while in agreement that many books formerly identified as emblem books are not in fact emblem books, have been unable to reach consensus on the exact composition of the emblem corpus. It now seems clear that many books contain emblematic material without being actual collections of emblems; is it worthwhile or indeed interesting to reproduce an entire book merely to show the context of the few scattered emblems or fragments of emblematic material it may contain? Do we need to reproduce every edition of Alciato's emblems? Most scholars would probably say we do. Do we need to reproduce every translation as well? Every edition of every translation? Every state of every edition? Every copy of every state of every edition? Surely not, for not only will the sheer volume of such material overwhelm all but the largest computer disks for some time to come, but the usefulness of exhaustive reproduction is wholly insufficient to justify it. In practice, then, we are likely to find that in many

cases the corpus to be selected for inclusion even in the most comprehensive project is likely to have its boundaries delineated by material whose interest only marginally justifies the cost and effort required to include it; in other words, the corpus is almost certain to be self-limiting.

I believe for this reason that the most fundamental decision faced by iconographic scholars, and one which has to be faced regardless of whether computers are to be used in the work, is that concerning the kind of information which is to be recorded: whether the data base, in other words, will contain reproductions of the raw material itself (whether visual or textual) or merely information about the raw material. In other words, scholars have constantly to decide whether they require a copy of the original material to be always available, or whether they can content themselves with a more or less exhaustive textual description or summary of the data to serve as an aide-mémoire. Scholars who opt for the former solution often face very onerous expenditures for duplication and reproduction of material by photographic, microphotographic or xerographic means. Duplicated material is in any event frequently bulky to transport and to store and cumbersome to consult. The use of a computer data base once again can obviate many of these difficulties: once the material has been scanned and stored on disk, it is permanently available for consultation, and can also very readily be indexed in order to facilitate localization of a given image within seconds. Scholars working in all areas of the humanities now face a common dilemma, which is whether or not to attempt to acquire and maintain a fully digitized version of whatever raw material is the object of their research: our colleagues who work on novels, for instance, have for some time been able readily to have the full text of their favorite author's works continuously available for computer analysis, if they can afford the time and money needed to enter and check the texts and to purchase the software needed to perform textual analysis. Scholars working with visual material are at last in a similar position, though as recently as a few years ago, it would quite simply have been wildly impractical, for both technological and financial reasons, even to suggest something like a comprehensive visual data base of emblem books, for example.

In connection with this question, nothing has occurred to alter my original opinion of computer data bases of emblem book and other visual material: I still strongly believe that a computerized visual data base rather than a textual description, however complete, will provide scholars with a far more satisfactory research tool. As scholars working on the *Index Emblematicus* and the *Index of*

Christian Art have found, no two individuals will describe the same image in the same way, and two descriptions separated in time will differ as well, because of changes in method, in descriptive vocabulary and in perceptions of visual material. It therefore makes far more sense, whenever possible, to furnish the visual material itself to scholars.

If we are to reproduce pictorial material which now exists in book form (rather than as isolated images, as in the case of the *Index of Christian Art*, say), a further choice immediately presents itself. We must decide whether we wish to reproduce the information in book form or to fragment it, whether to group images by artist, by theme, by period or in some other way. The latter solution will be recognizable as that adopted by Henckel and Schöne in their monumental printed compendium of European emblems; the former is the one I chose in my own work. There are, I believe, very good reasons not to fragment our visual material any more than we need to, and once again the speed of the computer makes it unnecessary to do so, always provided that the software used allows us to sort and present the material as we choose, rather than being limited to a single form of presentation. This is why my emblem stacks include the ability to create a so-called 'working stack', in which users can group copies of emblems selected from any book in the collection.

It will be now be apparent that I am a firm believer in reproduction of the material in something approaching its original form as closely as possible. Given that this is so, one might reasonably wonder whether we might not simply scan our chosen corpus in its entirety and reproduce it as it is, to create something like the computerized analogue of a microfilm. There are good reasons not to content ourselves with such a passive and static data base, however. One obvious one is that some visual material includes textual data. This is the case for emblem books, but it is also true of many other kinds of iconographic material: Byzantine sacred iconography is an obvious case in point. Scanned text, as far as the computer is concerned, is not text but part of the image unless it has been converted to text by text-recognition software, and therefore it offers none of the advantages of computer text: it cannot be indexed, searched, compiled as a text file, exported to a word-processing program or another database, exchanged with other scholars and so on. Here again I think the choice is clear: we must have access to the texts themselves in order to take advantage of the many possibilities which the computer affords: this in turn means that the texts must be entered into the computer as text, usually by typing them because they are not often readable by text recognition

software; as we have seen, this in turn entails either the expenditure of a large amount of precious time, or the hiring of an assistant for secretarial purposes.

What features might the ideal computerized iconographic data base offer its users? Aside from the obvious benefits of integral visual and textual reproduction, and in addition to certain obvious gains in speed, memory and power, computers are beginning to offer scholars advantages previously unthinkable. Imagine, for example, a computerized edition of Michael Maier's *Atalanta fugiens*, that exquisite book, which would enable scholars not only to see color reproductions of the illustrations, not only to read and search the text and its translation into the language of their choice, but to hear for themselves the very melodies whose score Maier includes! There is no technological reason why such an edition could not easily be prepared now, and the fact that we can have access to dynamic versions of the documents which interest us, I think, means that we should not be satisfied with a static visual database. A hypermedia visual database, offering the capability to link pictures one to another, to make notes and associate them with images, to use the computer to gather together interesting groups of images for deeper study, to perform keyword searches on the images according to criteria which we ourselves specify: all these things are an absolute requirement in any future undertaking of this sort.

A number of subsidiary issues of a practical nature must also be treated in any consideration of a scholarly visual database project. Just as I have argued that any future visual database should be conceived first and foremost as dynamic and hypertextual, I would also plead at each stage of the process in favor of making any such database accessible in whole or in part to as many interested scholars as possible: in other words, it should not be considered something which only an institution would purchase and use. This has a number of consequences which are far from trivial. It means, for instance, that the cost must be kept reasonable, or individuals simply will not purchase it; this almost certainly imposes a modular design. It means that the software must be simple to operate, or even individuals who purchase it simply will not use it. It means that the software must run on readily available, reasonably priced computer hardware, and not on vastly expensive workstations. In practice, then, I think we should be thinking in terms of collections to be distributed on CD-ROM or optical disks, using software which will run on PCs and Macintoshes with a minimum of conversion.

I strongly believe, on the basis of my own experience, that intelligently conceived and implemented hypermedia visual databases have the potential to

revolutionize the study of iconographic material. For that potential to be fully realized, however, it is imperative not only that scholars with experience and ability in computer-assisted visual studies collaborate with one another to design the most useful research tools possible, but that they take into account the talents and wishes of colleagues who before now have shown little or no interest in computer-assisted research. Any database which goes unused is *ipso facto* useless — let us do our best to ensure that we create not just computerized research tools, but accessible and standard reference works which no scholar would dream of being without.

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