Most medieval scholarship arises from an encounter with the surviving texts of the Middle Ages and the documents which convey them. The use of computers to store and analyse these texts has a surprisingly long history. As early as 1949, when the computer was still in its infancy, Roberto Busa began developing an electronic concordance to the works of Thomas Aquinas - the Index Thomisticus. Until quite recently, though, this kind of activity took place at the margins of medieval scholarship, and had little effect on most researchers and students. It is only now that computers are being more widely applied in ways which promote and assist textual scholarship of this kind. Electronic texts are finally coming of age in medieval studies. In the near future, electronic editions will be an essential part of a medievalist's tools for research and study.

ELECTRONIC TEXTS

Strictly speaking, there is no such thing as an "electronic text". There are only patterns of binary digits stored in a computer which, taken together, represent a text. (1) But it is a convenient shorthand to use the term "electronic text" to refer to a computer file or files containing the text of literary and scholarly works, stored in digital form. An electronic text should also be designed to be used by electronic means, usually with a computer or terminal. This distinguishes it from electronic files which are compiled only as part of the process of preparing printed editions, whether in typesetting for texts or in indexing for printed concordances. For the purposes of this paper, an electronic text is also considered to be limited to those texts which are published or distributed in some way for others to use, rather than simply being stored in one person's private computer files.

Electronic texts can be analysed in terms of their use of three essential features: a markup scheme, which tells the computer how to display the text; a delivery mechanism, for conveying the text to the reader or user; and a interpretative mechanism, enabling readers to display and interrogate the text. (2) These can perhaps be thought of by analogy with those features of a printed book which are designed to present the text to the reader. Some of them are structural (tables of contents, chapters, pagination and indexes), while others relate more to the display of the text - like paragraphs, headings, bold and italics. We tend to take these as givens because of their familiarity, but they affect fundamentally the way we read a printed book. The mechanics of electronic texts, while equally fundamental, are still in a largely novel and experimental state.

MARKUP SCHEMES
All computer files need markup or encoding of some kind, in order to be displayed on a screen and manipulated by appropriate programmes. In particular, the formatting of the text and its structure are controlled by its markup. Interpretative and analytical information is also given as markup. Word-processing software like Microsoft Word automatically applies its own kind of encoding to any text created it. But each proprietary brand of software has its own set of codes for marking up the text, and each usually has considerable difficulty in translating to or from another brand. This is a major disadvantage in distributing an electronic text, akin perhaps to publishing a book which can only be read with prescription spectacles from a specific firm.

What electronic texts need, above all, is a generic form of markup and encoding which enables them to be transferred easily between a variety of different kinds of hardware and software. The forms of generic markup which are currently being used for electronic texts can be considered in three groups: ASCII, HTML and SGML. In fact, these categories overlap in various ways, but they offer a convenient way of analysing existing texts and identifying their advantages and disadvantages.

ASCII - the American Standard Code for Information Interchange - is a fundamental definition of the codes used by most computers to store internally such things as letters, numbers and punctuation. The term "ASCII text" is a somewhat ambiguous and misleading one, but generally means a file containing the raw text with only the most basic procedural markup: spaces, carriage returns, punctuation. There is no indication of formatting, like bold or italics, no indentation or justification, and no indication of the structure of the text. ASCII texts can be copied from one computer to another easily. Because there is no special formatting which requires specific software to read it, most brands of proprietary word-processing software can display and manipulate the text. But an ASCII text on its own is of minimal scholarly value. It has no useful way of indicating the structure of the text or any other formatting, nor of distinguishing variants and other editorial matter.

The next level of complexity in encoding electronic texts is represented by HTML, the HyperText Markup Language. This is the standard format used for documents published on the Internet through the World Wide Web. Although they are in ASCII format and are independent of any specific software, HTML files are much more sophisticated. They can embed within themselves the "hypertext" links to other files, enabling the reader to jump to another HTML file stored anywhere in the world. They can refer to images and other kinds of "multimedia" files. If their hypertext structure is well-designed, they can allow browsing by tables of contents as well as the linear reading offered by plain ASCII files. HTML files can also be searched for specific strings of letters and other characters, by various types of searching software or "search engines".

Despite this, HTML only makes possible a comparatively low level of encoding for the structure and content of a literary text. HTML files contain little more than some typographical markup and a basic structure of paragraph division. There are, therefore, considerable limitations on the scholarly usefulness of HTML markup.

HTML is, in fact, a fairly simplified application of the principles contained in the international standard
for markup languages (ISO 8879): the Standard Generalized Markup Language or SGML. While SGML
is not in itself a markup scheme, it provides a general framework for markup languages, within which
various schemes or applications can be specified. SGML presumes no particular software or hardware,
and its kind of markup can be expressed in plain ASCII files. It is concerned with descriptive markup
rather than procedural markup, with the formal properties and structure of a text, and with the
relationship between its component parts. It is not concerned with encoding electronic text to show how
it should be printed or displayed on a screen. (4)

The SGML standard sets out a system for describing the component parts of a text, known as elements,
which are marked with a start-tag and an end-tag, normally delimited by angle brackets:

... in his play <title>Romeo and Juliet</title>, <name>Shakespeare</name> illustrates how...  

Here <name> and <title> are tags used to indicate the presence of these components within a text.
Elements can also be given what are called "attributes", to expand the information they provide:

... <name type=personal normal="Shakespeare W">Shakespeare</name> ...  

Here the attribute "type" has the effect of placing the name into an index of personal names, and the
attribute "normal" gives a standardised form of the name to assist with searching the text.

SGML also provides a framework for defining the overall structure of a text. This is usually specified as
a single hierarchy, though there are ways (none entirely satisfactory) of expressing different structures
within the same text. The structure of a specific text is expressed through what is called a Document
Type Definition, or DTD for short. The DTD is a reference file which sets out rules for marking up a
document or class of documents. Among other things, it specifies which elements are permitted, how
often they may occur, the order in which they may occur, and the attributes which may be attached to
each element. A DTD can be thought of as a specific markup language derived from the general
principles of the SGML standard.

For electronic texts in the humanities, a DTD has been developed to cover a wide range of formats and
uses. Known as the TEI (from its origins in a project called the Text Encoding Initiative), it describes
about 400 possible SGML elements. (5) The TEI is modular in approach, with eight basic sets of
elements for particular types of texts: prose, verse, drama, and so on. There are also supplementary sets,
covering such features as editorial apparatus and manuscript transcriptions. The user must choose one
basic set, with any combination of the additional sets. This has been dubbed the "pizza approach", since
different toppings can be chosen to complement the base. The TEI DTD was developed between 1987
and 1994, through the cooperation of fifteen scholarly organisations in Europe and North America. For
those who find the full version too daunting, there are two abbreviated and abridged versions: TEI Lite
and Bare Bones TEI. (6)
The creation of an electronic text requires a local computer with sufficient processing power to handle the size of the files involved. This has been given a considerable boost by the increasing availability of ever larger storage capacity at ever smaller cost. It is now possible to buy personal computers with one gigabyte (a thousand million bytes) of memory for around $3,000. This situation was all but unimaginable in the 1980s. The result is that texts in the humanities, which are often quite large, even without images attached, can now be processed relatively easily and inexpensively on comparatively small machines. Similar advantages have flowed into the publishing and distribution process. Very large texts can now be distributed on CD-ROM and used on personal computers.

The other major development has been the prodigious growth, over the last three years, of computer networks, both local and international. This is rapidly revolutionizing the way in which electronic texts are published and distributed. It is now relatively easy to make an electronic text available over the Internet to thousands of computer networks and millions of computers in most countries. This is largely because of the development of the World Wide Web, which provides a simple but powerful integrative framework for linking millions of files in computers around the world. The Web is based on HTML encoding and on "client-server" architecture. Instead of having to log in to a distant computer and stay connected to it, a Web user employs client software like Netscape to instruct a remote "server" computer to transmit its files and display them on the local computer's screen. This approach can be applied over a local network within a university as well as over the Internet.

Delivering electronic texts across the World Wide Web has quickly become the most common method of publication and distribution for non-commercial texts. For commercially-produced texts, CD-ROM has been the usual delivery mechanism, though many larger universities in the United States have increasingly preferred to acquire texts on magnetic tape for local networking. Commercial publishers are now beginning to move towards direct publication over the Web. At the end of 1996, Chadwyck-Healey Ltd, well-known for their electronic literary texts, launched Literature Online (Lion for short), advertised as "the home of English and American literature on the World Wide Web". This is a clear endorsement of the Web as a delivery mechanism, and is likely to mark a major step in the demise of CD-ROMs as a means for publishing electronic texts in the humanities.

INTERPRETATIVE MECHANISMS

Electronic texts can only be used with suitable software to interpret them. There are various possibilities for displaying and interrogating texts, corresponding roughly to the three generic categories of markup. Proprietary word-processing software like Word and Word Perfect can be used to display ASCII files. HTML files require client software for the World Wide Web, like Netscape, Mosaic or Lynx. None of these offers much in the way of a capacity to interrogate and interpret an electronic text, rather than simply displaying it. For that, sophisticated textual analysis software is required, whether resident on a CD-ROM with the text, running across a local network, or used indirectly through the World Wide Web. The best of this software is designed specifically to handle files which have been marked up with an SGML DTD, and offers the ability to browse the text in various ways and to search it with a range of
A good example of this SGML-based software is DynaText, which is used on many CD-ROM publications. DynaText handles files which conform to an SGML DTD, and allows the user to browse through hierarchical tables of contents to reach a specific place in the full text. It also enables the user to put complex and sophisticated queries directly to the text, by making use of the structural markup in the text. DynaText can also be "translated" into HTML, using a closely related product called DynaWeb. This makes it possible to use a Web client like Netscape to display and search the text in a way which, if it lacks some of the features of straight DynaText, is nevertheless much more sophisticated than ordinary HTML. A similar product, OpenText, can be used for local networking of electronic texts and is integral to Chadwyck-Healey's Lion service on the Web.

MEDIEVAL TEXTS WITH LIMITED ENCODING

Although there are dozens of medieval texts available in electronic form, they vary greatly in their quality and usefulness. The best criterion for assessing their value is the format in which they have been encoded, for this determines how they can be analysed and manipulated. At present, most of the available texts are either ASCII files or HTML files.

There are several well-known projects which are making basic ASCII texts available over the Internet, among them the Online Book Initiative, Project Gutenberg, and Wiretap. While they offer a wide range of different kinds of material, from the works of Plato to the speeches of President Clinton, there is little from the medieval period. Perhaps the best starting-point is the Wiretap site, which draws on the work of the other projects, as well as providing texts of its own. Wiretap offers a translation of Beowulf taken from the Harvard Classics edition of 1910, and a version of the Canterbury Tales of unspecified provenance. Texts of this kind have no scholarly validity and have provoked considerable criticism, founded mainly on their lack of provenance but also on their lack of markup.

These ASCII texts can be read on a screen, or printed off, or captured for use with word-processing software. It is also possible to search them in a rudimentary way, looking for a specific string of characters. A search for "close", for example, would find occurrences of words like "disclosed", "closest" and so on. But ASCII texts in the public domain rarely have any guarantee of accuracy, let alone any critical apparatus or context. They are basic raw material only, and need to be handled with care.

The HTML texts in medieval studies on the Internet are of somewhat greater interest. A good example is the collection produced by James O'Donnell at the University of Pennsylvania. It includes classical and early medieval texts in both Latin and English, such as Augustine's Confessions and De dialectica, the De consolatione philosophiae of Boethius, and the grammatical works of Donatus (Ars maior and Ars minor).

While this is a worthwhile attempt to make such texts readily available in electronic form, it does have
important limitations. It is not always made clear which sources have been used for O'Donnell's editions. The files are not usually segmented, though some are very long - an English translation of Aristotle's De anima, for instance, fills 137 continuous screens. At least William Schipper's HTML version of Raban Maur's monumental treatise De rebus naturis has separate files for each of its 22 chapters. While the texts can be printed, or downloaded to a word-processor, or searched for a specific string of characters, there is little else that can be done with them.

An interesting comparison of the value of HTML and ASCII versions is afforded by various Internet editions of Dante's works. The Latin text of the Epistle to Cangrande is available in an ASCII version prepared by James Marchand of the University of Illinois. Its provenance is extremely dubious, since it is described as having been "scanned from an old typescript". Marchand describes it as "meant only as a convenient reading text" which "should not be preferred to any available critical edition". Apart from downloading the file and using it as somewhat unreliable raw material for further editorial work, it is difficult to see what use can be made of this version.

There is also an HTML version of the Divina Commedia available from an Italian site. This is marginally more useful, in that it can be searched by keyword as well as browsed. But no indication is given of the printed edition which has been used to supply the text.

The most useful Internet version of Dante, however, is the Dartmouth Dante Project, directed by Robert Hollander. It consists of a database containing the text of the Divina Commedia and 46 commentaries on it from 1322 to 1982. The complete database can be searched for specific words or various combinations of words, using the BRS/Search software. Nevertheless, the Dartmouth Dante has its weaknesses: the text cannot be browsed, the searching software is somewhat difficult to use, and the texts appear to be in ASCII format only. Nor is it clear which edition of Dante has been used.

MEDIEVAL TEXTS WITH SOPHISTICATED ENCODING

Only with the next generation of texts, those encoded in accordance with the TEI or a similar kind of sophisticated markup, does the real potential of electronic texts in medieval studies begin to become apparent. There is now a growing body of texts of this type, both of commercial origin and in the public domain.

A good example of the latter group is the collection of Middle English texts produced by the University of Virginia Library. Among them are Everyman, Sir Gawain and the Green Knight, Pearl, Piers Plowman, the works of Chaucer, and the Towneley and York mystery plays. These texts are taken from identified printed editions, and have been marked up to retain many of their typographical features, as well as chapter divisions and pagination. Illustrations are often present, linked to the appropriate place in the text. The Virginia corpus follows the TEI as its encoding standard. Users at the University of Virginia can search the texts with the OpenText software, while users over the Internet can search for one or two words or phrases, either in a single text or across the whole corpus. For Internet users, the texts are converted to HTML "on the fly" and a table of contents is generated from the TEI encoding.
On the commercial side, the most ambitious electronic text is the version of the abbe Migne's 221-volume Patrologia Latina published by the English company Chadwyck-Healey. (18) The Patrologia Latina Database (PLD) can be bought on CD-ROM combined with a form of the DynaText software, or on magnetic tape without the software. An SGML DTD (though not the TEI) is used for marking up the database. As well as the text of thousands of patristic and medieval Latin works, the PLD also includes the critical apparatus and diagrams from the printed volumes. The benefits of being able to search the whole of such a large corpus instantly are obvious.

The significant weakness in this edition arises from the decision to reissue the entire Migne collection in unaltered form. The only concession to the scholarship of the last 140 years is the addition of a code to each text, to indicate whether the author attribution given by Migne is queried or changed in subsequent reference works. Otherwise, no emendations have been made. The mainly seventeenth- and eighteenth-century editions reprinted by Migne are reproduced in full, together with their critical apparatus and annotations. So, while the sophisticated markup and searching capabilities of the PLD are of great value, the results of any search must still be checked further against later scholarship and better editions.

An electronic version of many of these better editions is in fact available, in the form of the CETEDOC Library of Christian Latin Texts published on CD-ROM by Brepols. (19) It contains all the volumes published up to 1994 in the Series Latina and Continuatio Medievalis of the Corpus Christianorum, supplemented by texts from other major series: Corpus Scriptorum Ecclesiasticorum Latinorum, Sources chrétiennes, and even the Patrologia Latina. The Vulgate is also included, from the 1975 edition by Bonifatius Fischer. While this collection is less comprehensive than the PLD, it offers far more authoritative texts. The CETEDOC database is not in an SGML format, however, and uses instead a system of dividing the texts into sententiae. It comes with its own analytical software, which is directed mainly to searching for specified formae within the database or a defined subset of it.

Perhaps the most important feature of electronic editions like PLD or CETEDOC is that they reproduce a single text of each work, from a modern or relatively modern edition. In this sense, their only advantage - albeit a significant one - is the power to search the whole text or group of texts in what is usually a detailed and sophisticated way. But a further generation of electronic editions is now starting to appear, which go beyond this approach. They offer, not a single text, but a variety of manifestations of the text, in both transcriptions and images.

Editions like these are, for the most part, still in progress and cannot yet be used and evaluated in their final form. But several projects with medieval texts are well worth examining, to see what they reveal of the principles and goals of this type of work. An interesting example is the edition of Le Chevalier de la Charette by Chrétien de Troyes, which is currently being developed at Princeton University. (20) This has three related parts: an electronic version of the standard printed edition, with search indices and grammatical information; transcriptions of the eight surviving manuscripts of the text; and digitised images of these manuscripts. The transcriptions follow the manuscripts closely, preserving word spacing
and punctuation, and indicating abbreviations, illuminated letters, and marginal and interlinear glosses. Rhetorical features are also marked in the transcription. The Text Encoding Initiative is used as the standard for marking up the transcriptions.

A similar approach is promised for Hoyt Duggan's electronic edition of the B text of Piers Plowman (21). Eight of the seventeen surviving manuscripts of this text will be fully transcribed, accompanied by digitised facsimiles of them. By electronic collation of these eight manuscripts, a corpus of variants will then be produced, from which the archetype of the B text will be constructed. Where Duggan and his four co-editors disagree about a reading in the archetype, the problem will be presented in full with all the relevant evidence, rather than being resolved by compromise. Once the archetype has been reconstructed, the next stage will be a critical edition of the B text, aimed at reflecting Langland's final intentions. For this edition, all the readings in all the manuscripts and early printed editions will be considered, along with previous textual criticism.

A very different kind of edition can be seen in Kevin Kiernan's Electronic Beowulf Project. (22) This bypasses text files altogether, and concentrates instead on constructing a database of digital photographs or image. The Electronic Beowulf contains colour images of each page of the single surviving manuscript of Beowulf, as well as images of Thorkelin's eighteenth-century transcriptions of it and his edition of 1815. In addition, there are hundreds of fibre-optic readings of hidden letters and ultraviolet readings of erased letters.

Kiernan faces two significant obstacles in publishing this archive. The first is to choose suitable software to link all related images to enable users to find their way around the database. After considerable effort in trying to devise his own software, Kiernan is now working with World Wide Web browsers like Netscape, though he envisages publication on CD-ROM rather than the Internet because of the huge amount of data involved. The second difficulty is that there is no way to encode and search for specific data within an image file. It can only be looked at like a photograph. The development of an "image-encoding initiative" is still a long way off.

Of all these electronic editions, the most ambitious is the Canterbury Tales Project, which is being directed by Peter Robinson at De Montfort University. (23) Its aim is to gather and analyse every piece of relevant information in every one of the surviving pre-1500 witnesses to the text, manuscript or print. This will involve transcribing no less than 25,000 pages containing six million words. So far, the project has completed its work on the Wife of Bath's Prologue, published on CD-ROM early in 1996. (24) This edition takes as the Hengwrt manuscript, lightly emended, as its base text. But it also includes transcriptions of all the other 58 witnesses to the Wife of Bath's Prologue. The reader can go from any of the 6,000 words in the base text to see what readings the witnesses have. It is also possible to see the full transcription of each witness, and to see images of each page of each witness. Any glosses in the manuscript are linked by hypertext links to the appropriate part of the text. A more unusual feature is a spelling database for each witness, which lists all the occurrences of individual words, regularised and grouped under headwords or lemmata. From this, it is possible to call up a list of every occurrence of a word, and to go to its place in the transcription of the witness. There is also a second spelling database which contains the 300,000 spellings in all 58 witnesses.
The Canterbury Tales Project uses an SGML markup scheme to encode its transcriptions and spelling databases, and the DynaText software to present the work. The choice of CD-ROM as the format for publication, rather than the Internet, is perhaps the result of its commercial publication by Cambridge University Press. But the size and complexity of the data involved appear to demand more sophisticated software for viewing and searching than is possible with Web browsers like Netscape. It will be interesting to see whether subsequent parts of this remarkable project can be published over the Internet.

The Canterbury Tales Project is of great significance because it embodies and illustrates many of the desirable features of the "ideal" electronic edition of a medieval text. It contains transcriptions of the surviving manuscripts, and allows the user to compare the readings of all the witnesses and to see the whole text of any one witness on its own. The witnesses are also represented by photographic images of them, converted to digital form. The transcriptions and images are accompanied by an appropriate critical apparatus, and a database for normalising word-forms is also included. The edition follows the SGML markup standard and is structured in such a way as to make full use of the capabilities of sophisticated software for browsing, searching and analysing the text.

EVALUATING ELECTRONIC TEXTS

There are several important obstacles and difficulties to be tackled in making effective use of electronic texts. Computers of a certain size and cost, with suitable software and appropriate connections to the networks, are essential, for a start. There is a significant amount of learning required from the user, particularly if sophisticated encoding systems are to be used to their full extent. The size and complexity of some texts, with their parallel transcriptions and multiple images, can be overwhelming and disorienting. Printed editions can be more easily grasped as a unified whole.

Several of the wider questions about handling electronic texts are far from being resolved. Most importantly, perhaps, how can these electronic editions be properly stored and preserved for future use? The media on which they are recorded are inherently more impermanent than books and other printed materials. The lifespan of CD-ROMs is far from assured, and the associated software and computer machinery have a history of rapid obsolescence. Nor is the continued effective functioning of the Internet a matter of certainty. One possible model for storage and preservation is offered by the Oxford Text Archive, which has existed for twenty years as a repository for electronic texts and is now a National Service Provider for the Arts and Humanities Data Service in Britain. (25) The OTA's role might be likened to a national library for such texts, offering reasonable prospects for their long-term preservation.

As well as raising uncertainties about their permanence and preservation, electronic texts present a challenge to their cataloguers. Existing rules and methods for cataloguing and documenting printed materials are only partly applicable. A more promising approach involves the use of the document header prescribed by the Text Encoding Initiative, which precedes the text itself with information about the title, author and compiler of the text, its distributor and publisher, and the source or copy text on
which it is based. These headers can be distributed and published separately from their texts, or loaded into conventional catalogues or databases, using suitable conversion programmes. (26)

The scholarly validity of an electronic text is critical to its acceptance. It is important for electronic editions to be reviewed in the appropriate forums, and for them to be recognised by the compilers of "performance indicators" for academic researchers as a valid form of scholarly publication. Developing suitable criteria for assessing electronic publications is an increasingly urgent requirement.

Even though electronic editions raise difficulties and important questions of this kind, there are clear reasons why they have their own value and importance. They offer significant advantages which printed editions usually cannot provide. The first and most obvious is that large texts and corpora of texts can be searched instantaneously. The electronic Patrologia Latina has the power to identify all occurrences of a specific word or phrase, in all 221 printed volumes simultaneously. With sophisticated software and detailed encoding, a variety of complicated questions can be put to large texts, and the results displayed almost immediately. This goes well beyond even the most elaborate printed concordances or indexes.

A second major advantage is that images or digital photographs of manuscripts can be directly linked to modern critical texts or transcriptions. The electronic Piers Plowman and the Canterbury Tales Project use this feature to good effect. In printed editions, a similar effect can only be achieved in a limited way and at considerable cost. Electronic editions can provide images of very high quality at a comparatively low cost, with a variety of links to files containing the equivalent. Similarly, a wide variety of ancillary material can be associated with the text. This includes notes, commentaries, scholarly papers, other related texts and images, and so on. Once again, printed editions cannot match the greater flexibility and lower cost of the electronic approach for this kind of editorial apparatus.

Electronic editions are easier to expand, correct and update than their printed equivalents. With some software, it is possible for readers to add their own private notes, or to keep a record of places they have visited within the edition. It is also possible to construct Internet editions so as to allow other scholars to add their own comments and notes which can then be Incorporated into a continually growing body of material.

Finally, electronic editions like the Canterbury Tales Project offer a much more flexible approach to the whole question of editing medieval texts. If, as Tanselle argues, "editing ancient texts and editing modern ones are not simply related fields; they are essentially the same field", it is true nevertheless that medieval texts pose some unique problems for their editors. (27) This is the result, in part, of the often fragmentary nature of the surviving evidence, but also of the very different understanding of authorship and "publication" in the medieval context. Derek Pearsall, referring to the Canterbury Tales and Piers Plowman, speaks of the "tyranny of the critical edition" which imposes a single, but mythical text on a complex reality of multiple texts reflecting different stages of the author's intentions. (28) He suggests that "facsimiles, or at least seratim transcripts, of single manuscripts" would be more authentic than a "sterilised" critical edition. Tanselle, however, offers the opposite, orthodox view: "in such cases one must decide which version of a work one wishes to edit, for no one critical text can reflect these multiple
As long ago as 1986, Peter Shillingsburg suggested that electronic texts might offer a way out of this impasse. (30) As the Canterbury Tales CD-ROM demonstrates, variant texts can be stacked for both individual and simultaneous viewing. The multiple intentions of the author, and of subsequent readers, can be presented in parallel. No copy-text or best-text is necessary. The reader can construct a personal critical edition from the range of materials provided. David Greetham likens these "fragmented, spliced, versioned, polysemous texts" to the Centre Pompidou in Paris with all its structural elements exposed, or to a giant Meccano set. (31)

Does this inevitably mean, as Shillingsburg asks, the replacement of a critical edition by nothing more than an array of documentary transcripts? Does it also mean that electronic editions must be postmodernist, open-ended and "reader-driven"? The answer seems to be that it depends on the editor of the electronic edition. It is perfectly possible to have both a critical edition and a documentary one as part of the same computerised package, as Duggan's "diplomatic-critical" Piers Plowman aims to do. (32) It certainly seems to be true that open-ended postmodernist editions need to use the electronic form to achieve the flexibility they require. But it does not necessarily follow from this that all electronic texts must be postmodernist. Electronic texts reflect, rather than resolve, pre-existing debates over the nature of scholarly editing. But they appear to offer the editor far more flexibility in presenting an edition of a medieval text than is possible within the confines of the printed page.

CONCLUSION

Electronic texts of medieval works have existed for a surprisingly long time, at least in the context of the short history of the computer. But only in the last two or three years has their real potential become apparent. The acceptance of SGML and the TEI as the standard for markup and encoding, the development of software like DynaText and OpenText for the publication and analysis of texts, the rapid growth of the Internet and the World Wide Web, and the availability of comparatively cheap computer storage are all crucial factors which have converged to make sophisticated electronic texts possible.

Editions like Peter Robinson's Canterbury Tales and Hoyt Duggan's Piers Plowman are beginning to demonstrate what can be done with medieval texts in this new medium. Electronic texts are not designed for continuous reading of the work, but they provide a sophisticated concordance to it. They can also document and link all the variants found in the manuscripts, both as transcripts and as images. Notes and commentaries and other ancillary material can be linked to the text in a variety of ways. All these features can be made available over local and international computer networks.

Electronic texts undoubtedly increase the choices available to editors and extend significantly the boundaries of what is possible in a scholarly edition. Above all, they reaffirm the centrality of the text in medieval studies, and help to redefine the scholarly encounter with the text which is at the heart of the medievalist's work.

2. Methods for creating electronic texts are beyond the scope of this paper.


7. The first service of this type in Australasia was launched by The University of Western Australia Library in November 1996.

8. <http://lion.chadwyck.co.uk>


14. <gopher://ccat.sas.upenn.edu:70/>


16. <gopher://gopher.dartmouth.edu/1/AnonFTP/pub/Dante>

17. <http://etext.lib.virginia.edu/mideng.browse.html>


20. <www.princeton.edu/~lancelot/>


25. <http://sable.ox.ac.uk/ota/>. For the Arts and Humanities Data Service, see: <http://www.kcl.ac.uk/projects/ahds/top.html>.


29. Tanselle, G. Thomas, "Recent Editorial Discussion and the Central Questions of Editing", Studies in


32. Duggan, "The electronic Piers Plowman B."