

In an overall evaluation, IR Simulator would seem much less useful than NMR Simulator. The declining use of dispersive infrared spectrometers makes the program increasingly obsolete. Coupling this with the lack of available permutations of the instrumental parameters makes for a somewhat uninteresting program to use. NMR Simulator, however, is a program that is very topical. It would even seem feasible to use the program in a teaching environment in which a 60-MHz spectrometer other than the Varian EM360 is in use. Instruction in the principles of operation of the EM360 would still be useful to students, even if another instrument is to be used in the laboratory.

For future versions of NMR Simulator, it would be helpful

to include two enhancements. First, instrument controls involved in tuning the spectrometer could be implemented. This enhancement would provide students with a more complete experience with the spectrometer. Second, the documentation could be expanded to include more examples. For instance, the use of the  $R_f$  power and filter settings could be explored with a demonstrated example.

In summary, NMR Simulator is judged potentially very valuable in an educational setting. With the aid of a mouse, the program is readily used and should prove valuable in teaching students to use an NMR spectrometer. IR Simulator, by comparison, works adequately, but is judged less useful overall.

## Microsoft Word, Version 4.0

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Microsoft Word, Version 4.0, is the latest version of Microsoft's general-purpose word processor for use in the MS-DOS and Apple Macintosh microcomputer environments. I evaluated the MS-DOS version of the program, implementing it on both IBM PC-AT and Leading Edge Model D computers. Both computers were equipped with hard-disk drives and 640 kB of RAM. The software was supplied on six 5- $\frac{1}{4}$ -in. diskettes, although 3- $\frac{1}{2}$ -in. program diskettes are available. A minimum of 256 kB of RAM is required for executing Word. Most common displays and display adapters are supported by the program, including all IBM PS/2 displays and adapters. The use of the Microsoft Mouse is also fully supported.

**Documentation and Setup.** The Word documentation is supplied in three separate volumes: a user's guide, a reference manual, and a printer manual. In addition, plastic keyboard templates are provided that detail the uses for function and keypad keys. Unlike many current software vendors, Microsoft has produced a set of manuals that will withstand much wear and tear. The user's guide is a sturdy D-ring binder, while the other two manuals are produced as equally sturdy spiral-bound books. Overall, the documentation is extremely well organized and lucid. Effective use is made of a two-color format. The index to the user's guide is very complete, making it very easy to refer to individual topics.

Word is configured through the execution of a setup program that is easy to use and foolproof. The user must then select a strategy for learning to use Word to produce documents. A tutorial program, Learning Word, is provided that contains a series of interactive "lessons" that allow a user to step through both basic and advanced editing operations. In my opinion, the experienced computer user will find Learning Word to be annoyingly simplistic in its presentation. The most efficient way to learn to use Word is to type in a short document and then step through the user's guide, chapter by chapter, performing operations as they are described. Through this approach, the entire program can be surveyed in several hours.

**Basic Program Operation.** Word has two modes: an edit mode, in which text is actively being entered or edited, and a menu mode, in which program or document parameters are set. The <Esc> key or mouse button is used to toggle between modes.

The document being entered is displayed on either a text or graphics screen, depending on the current setting of a

function key toggle. This assumes, of course, that a graphics display and display adapter are in use. On the graphics screen, special character formats (e.g., subscripts, superscripts, or italics) appear as they would on the printed document. Scrolling the graphics screen is significantly slower than scrolling the text screen, however. The graphics screen is most useful for performing a quick check on the correctness of entered character formats.

On either screen, a choice of two document displays is provided. The normal display formats paragraphs in such a manner that no lines extend horizontally past the column limit on the display. The actual formatting of the document depends on the printer font selected, however. Through a function key toggle, the actual display, termed the "printer display", can be obtained on the screen.

Document editing is performed via a set of basic editing operations initiated by striking either function keys or keys on the numeric keypad. Both sets of keys have four operation levels, accessed as either the key alone or the key in combination with the <Shift>, <Ctrl>, or <Alt> keys. Alternatively, the mouse can be used to perform the same operations. In this regard, the choice between the use of the mouse or the keyboard to control the program is purely one of user preference. Word was written with both types of usage in mind.

A full range of capabilities is provided for moving through the document. Keys are provided for moving to the next sentence, the previous sentence, the next paragraph, the previous paragraph, etc. Deletions are performed by selecting text and then striking the <Del> key. Several keys are provided for selecting text around the current cursor position. The deleted text is normally written to a scratch buffer. Block moves thus involve selecting text, deleting the text to the scratch buffer, moving the cursor to the insertion point for the text, and striking the <Ins> key. This inserts the text currently in the scratch buffer.

Overall, the editing capabilities are complete. My major criticism of this aspect of the program, however, focuses on the requirement for constant movement of the fingers away from the home keys. For example, deletion of the current line is performed by striking <Shift> <F9> <Del>. For such a commonly performed operation, this requires both hands to leave the home keys. For the most common editing operations (e.g., deleting current line, deleting current word, moving cursor to the next word), it would be very useful to have key codes based on the <Ctrl> key and one of the keys within easy

reach of the home keys. These capabilities can be obtained to an extent through the provision in Word for writing user macros. Keystrokes can be stored and assigned a key code of the type suggested above. Once defined, the macros are stored on disk. Unfortunately, Word does not appear to save space in memory for more than one macro. A disk access is required each time a different macro is used. This slows down execution of the macros to the degree that performing the individual keystrokes is more efficient if the macro is short.

When menu mode is entered, the user has a choice of 16 menu selections. A menu is selected by striking the key corresponding to the first letter of the menu or by moving a highlight over the desired command label and striking the <Enter> key. The mouse can also be used to perform the latter operation. Most menus have submenus that are offered once the main menu has been selected.

Menus are available for changing the format of the document, the printing options, and the display characteristics. In addition, operations such as copying blocks and search-and-replace are controlled by menus. Program control operations such as saving documents to disk and exiting the program are also menu-driven.

**Advanced Capabilities.** Word has most of the advanced capabilities that have become common with modern general-purpose word processors. For example, a spell-checker and thesaurus are provided. Both seem to work well, although the lack of technical terms in the spelling dictionary forces the user to begin compiling a specialized dictionary immediately.

Capabilities are provided for integrating spreadsheets from Lotus 1-2-3, Microsoft Excel, or Microsoft Multiplan directly into a Word document. Graphics print files produced by any program can also be integrated into Word documents.

Rudimentary math and sorting operations are also provided. The sorting utility works quite nicely on tables, as it allows the sort to be based on entries in only one column in the table, with entries in the other columns being carried along.

Basic capabilities are present for generating outlines, tables of contents, and a document index. Unlike some word processors, however, no automatic tools are available for helping to generate index entries. The individual entries must be chosen by the user and an identifying code must be inserted in the document.

One of the most useful advanced features is the provision for splitting the display screen into multiple windows. Either different parts of the same document or different documents can be displayed in the individual windows. Text can be moved between windows easily. This greatly simplifies cut-and-paste operations between documents and between sections of single documents.

**Formating and Printing.** One characteristic that distinguishes Microsoft Word from many other word processors is the extreme flexibility available for formating documents.

Printers with multiple character fonts are becoming increasingly prevalent. Given these enhanced printing capabilities, Word allows complete flexibility in the use of multiple character fonts within a document. Each character has a set of associated specifications that include a font type and size. In addition, each paragraph has a similar set of specifications that allows different indention settings and paragraph line spacings. Multiple columns of text are also supported.

The flexibility described above can be annoyance when only simple formatting operations are desired. For this reason, Word provides the capability for defining and storing general format specifications. These formats are stored in "style sheets" and can be easily retrieved and applied to some or all parts of a document.

Word supports an impressive number of printers, including most currently available laser printers. When the initial Word setup program is executed, one or more printer data files can be selected. A default printer is established, along with one or more alternate printers. The printer data files appear to include information about all available fonts on the supported printers, including most available font cartridges for laser printers. Standard print options for controlling page numbering, range of pages printed, continuous-feed printing, and the like are included. Background printing is an option, allowing other editing work to be performed while a document is printed.

**Conclusions.** Microsoft Word is a mature, well-designed program for general-purpose word processing. It contains all of the standard and advanced features that one would expect from such a program. The program does not attempt to be a scientific word processor, however, and thus contains no special features in this regard.

Word executes quickly and scrolls the text screen rapidly. The Word documentation is well-written and well-packaged. The primary design advantage of the program is its great flexibility in document formating and printing. This makes Word particularly suited to long documents or documents with multiple formating constructs (e.g., instruction manuals). Its primary design disadvantage stems from the use of function and keypad keys for performing all editing operations. For common editing functions, this requires the fingers to move too often from the home keys. This disadvantage primarily affects users who prefer not to use a mouse, as mouse users must continually switch hands anyway between the mouse and keyboard.

Overall, I would recommend Word highly to a microcomputer user selecting a new word processor. For a current user of another word processor, I would recommend consideration of changing to Word if great formating flexibility is desired and the current word processor in use does not provide this flexibility.