APPLE '82
FIRST NATIONAL CONVENTION & EXHIBITION
JUNE 4, 5 & 6, 1982
The Fulcrum Centre, Slough
Your stand-by-stand guide

Stand 1
Owl Microcomputers, The Meltings, Station Road, Sawbridgeworth, Herts. 0279-723848.

New communications packages for Apple are being shown. Owllet is a combined hardware/software package to CWS which converts the Apple into a Prestel or Viewdata terminal and also can be used as the basis of network systems, while Owlsync is a software package which enables an Apple to emulate the communications protocols of the IBM 3780 or 2780, and to communicate with other types of network computer.

Owl is also featuring other communications concepts based on Apple; the APES professional editing system, which provides sophisticated editing facilities for video/data information providers, and Overview, a local area network viewdata system.

Stand 2
Moore Paragon UK Ltd, Moore House, 75-79 Southwark Street, London. 01-928-9022.

In addition to expert advice on individual requirements Moore Paragon offers a comprehensive supplies package comprising stock and custom-designed input and output forms, magnetic media, forms handling equipment and filing and storage systems to enable small business computer users to maximise their investment.

Also available is a range of forms packages input and output documentation designed and specified between the business user and Moore Paragon to combine all the advantages of custom-printed stationary with preset form layouts. Moore Paragon's free forms design service offers the added benefit of forms that promote a company's image as well as being functional.

Stand 3

CICC are demonstrating their new Apple II Mercury MDOS multi-user system. Mercury, which is installed in a 16K ROM card, has very powerful file handling providing full ISAM and DIRECT filing on either 5½/8½ floppy drives, or on compact discs. The rapid programming in Basic, utilising masking facilities, is standard. Up to 14 users can be linked to a common database, providing incredibly fast access.

A growing number of UK Apple dealers and a number of large multi-nationals and banks are currently installing this highly effective yet cheap multi-user system.

Stand 4

Come and meet... Pete and Pam Computers, the country's largest distributor of Apple related (non-Apple manufactured) products. We carry a range of over 600 items of both hardware and software for Apple and are suppliers to over 95 per cent of the UK's Apple dealers.

We stock fast products for Apple will be available.

London office; 98 Moyer Road, London SW16 GSH. 01-677-2052/7341.

Stand 5
Data and Control Equipment Ltd, Poppy Hill, Moordown, Princess Risborough, Bucks. 0864-43281.

Data and Control Equipment are specialists in business communications and will be demonstrating their powerful facilities for Apple II and Apple III: TelexBox I, Telex Interface. This device allows any Apple system to send Telex messages worldwide. All dialling and answerback checking is automatic and the system can keep trying busy numbers unattended.

772 Telex Punch. This well-established product produces correctly formatted Telex punched tapes from Apple II or III, thus eliminating a most time-consuming operation for busy Telex users.

Stand 6
ConSup, 62 Tritton Road, London S.E. 21 8DE, 01-670-4411.

ConSup is an exciting new company with a policy of supplying value-for-money consumable products for computer users nationwide. It consistently provides a wide product range at low prices for all computer installations, supplying both trade and end-user consumers.

Although the main area of operations is the disc-based microcomputer user, ConSup has recently branched out into the mini and mainframe markets, with the same competitive pricing policy that has gained them a good reputation among micro owners.

ConSup has a thriving mail order business and is in a happy position to deal with all enquiries for discs, listing paper, printer ribbons, library boxes, etc. on their London telephone number.

Stand 7
U-Microcomputers Ltd, Winstanley Industrial Estate, Long Lane, Warrington. 0925-54117.

Top Apple dealer and largest UK manufacturer of Apple peripheral cards. More Apple cards than Apple! New professional standard micronetwork software called V-Net on display.

Stand 8
Caxton Software Publishing Co, 10 Redford Street, Covent Garden, London. 01-379-6502.

Specialising in management aids, production tools and software environment software, Caxton publishes and promotes the work of British software authors. On display at this exhibition is an example of the new Caxton environment.

Othmop, the linear programming system for finding the best practical solution to resource allocation problems. Cardbox - electronic card index software with sophisticated plain English retrieval and reporting facilities (uses the Microsoft Softcard and an 80 column card).

Potential users and dealers are especially welcome. Please ask for a demonstration at our stand.

Stand 9
Community Computers, P.O. Box No 3 Petersfield, Hampshire GU32 2ER. 0303-677-587.

Programmable calculators for the business and educational environment. Kentish holidays and a range of high capacity 5½/8½ floppy disc drives.

The specially designed Datamac Integrated software package featuring the CP/M operating system and the MDBS database will also be displayed. This software has been developed over a period of five years and is particularly aimed at businesses requiring integrated job costing.

The Select CP/M word processing software will be demonstrated and will feature its unique 90 minutes Teach program using an Olivetti ET221 typewriter.

Stand 10
Eicon Research Ltd, Unit 8, Viking Way, Bar Hill, Cambridge, 0554-81825.

Eicon Research are showing new versions of their popular 8½/10½ floppy disc systems. Two features in particular make the new disc systems stand out.

Better software - the CP/M operating system can be booted in addition to Pascal and DOS. There are no "patch programs" using up memory space, and each 1 megabyte disc is treated as a single volume in all three operating systems. These fundamentally important features are all unique to Eicon 8½/10½ systems.

LSI and gate-array technology in the con-
troller. Eicon are among the first manufacturers to eliminate the phase-locked-loop (PLL), the Achilles heel of double-density disc operation. Power consumption is cut by 30% and while fast data throughput is provided by DMA.

On-line capacity is over 2 megabytes, with an impressive back-up capability provided by the removable media.

Stand 12
Phoenix Technology/Hantarex (UK) Ltd, 158 Camberwell Road, London SE5 9EE. 071-639-3943.

An estimator and distributor of an entire range of attractively designed monitors, all manufactured in Europe. Display monitors for both colour and monochrome are available in plastic or metal cases, both of which are ideally suited to business or personal use.

Sizes are from nine and 12 inch for monochrome (both of which are available with white, green or orange phosphors), through to 14 inch colour monitors which in turn are available in three different resolutions, the highest of which has a phosphor dot pitch of 0.31 mm. All monitors are very competitively priced.

Stands 13, 14
Silver Wheel Accessories Limited, Bedhampton Road, Fareham, Hampshire, 0732-723506.

Entering the field for the first time with an entirely unique product is Silver Wheel Accessories Ltd. Last here is a purpose-built computer console designed specifically for the Apple II micro computer. A team of professional developers have worked on operator comfort and office aesthetics. Discs, plugs and flex, all have built-in housing facilities, giving an uncluttered, streamlined dimension to the whole concept.

Another innovation currently under way and to be used in conjunction with the console is the Universal Acoustic Printer Table - the prototypes to have its first showing at the exhibition.

Stand 15

We will be showing for the first time in this country three printers running simultaneously on one Apple II, made possible by the use of the Microbuffer II 16k and 32k Print Buffer Cards.

The new Acclaim microcomputer will be demonstrating how it runs all Apple II software in a truly businesslike way. Fans of CP/M on the Apple or Acclaim will be able to see the Turnkey system which makes CP/M much more user-friendly and applications-oriented.

Stand 16
MC Computers Ltd, Kenley House, Kenley Lane, Kenley, Surrey CR6-6AL.

MC Computers, who specialise in industrial interfaces for microcomputers, are able to offer complete Apple-based systems for data acquisition and control, supplying all hardware peripherals and menu-driven software routines. In addition, a range of plug-in interface cards is available for users with their own Apple computer, supplied with all device handling software on floppy disc.

Also from MCC are the 2016 range of IEEE 488-compatible interface cards for low cost, custom-built solutions to industrial interfacing requirements. Digital and analogue I/O units are complemented by an IEEE 488 bus extender and a serial to IEEE converter.

Stands 17, 18
SBD Software, 15 Jocelyn Road, Richmond TW9 2TY. 01-348-0461.

SBD Software distributes software and
Apple Educational Forum

THE First National Educational Forum, to be held on Friday, June 4, is being organised specifically for the benefit of teacher’s who use, or want to use, Apple computers in the curriculum. Speakers include:

- Bill Broderick: The dissemination of educational software.
- John Gray: General purpose uses of the Apple.
- Dr Gavin Kenny: Effective uses of computer assisted learning.
- Peter Deakin: Employment of the physically handicapped.
- Ray Hayden: Apples in primary education.
- Barry Holmes: New directions for the Apple.

Demonstrations of Apple products and software related to education will take place throughout the day, and visitors are invited to attend the exhibition of Apple suppliers being held at the same time.

The Education Forum opens at 9.30am. More details can be obtained by contacting Bob Senior of Apple (UK) on 0442 48151.

hardware for the Apple microcomputer. We have a wide variety of items and our list is both updated and increases monthly. We import much of our items from the United States and try to cater to the whole range of educational and business software such as word processors, databases and VisiDac, utility software for programming and general business use.

We can also offer you a subscription to Call A.P.P.I.E magazine where you will find a host of ideas and programs. Please stop by and see us.

Stand 19
In the past 18 months TABS (The Accounting Business System) Ltd. has established itself in the forefront of the market dealing in accounting software for microcomputers. One out of seven Apple machines sold in the UK uses TABS software.

TABS modules are individually self-supporting, but are also capable of integration with other modules to satisfy almost any requirement. Product offerings include sales, purchase and nominal ledgers, stock control and payroll, which could be augmented by modules including job costing, fast data entry, sales order processing, mail listing and word processing.

Stand 20
Country Computers Limited, Pipers Road, Park Royal Industrial Estate, Redditch 9 RHU. 0527-29826.
The Acclaim microcomputer is a commercial alternative to the Apple II personal computer, running all Apple software and accepting all Apple hardware add-ons. It is housed in a stylish ergonomically designed cabinet and incorporates a 6 or 12 Mb Winchester, floppy drive and a high quality anti-glare screen.

Its detachable keyboard includes true upper/lower case capability, alpha lock and shift lock and separate numeric keyboard, auto repeat on key holddown, type-ahead buffer and 12 separate programmable function keys. The versatility to switch from the keyboard into either 40/80 column format means that the Acclaim can cater for a wide range of application packages from word processing to VisiDac.

Stand 21
We will be demonstrating a full range of Apple, MSX, peripherals and software. On show will be software from Software Publishing Corporation including MPS, MPS Report and MPS Graph (the latest addition to the MPS line). Also the hardware - our personal computer is currently the best-selling software package in the USA, challenging VisiDac for the pole position.

The popular Format 80 professional word processing package will also be demonstrated, along with Fax Pacer 1*, the new personal tax code computing package. Both products have been designed for ease of use and offer the user dramatic productivity improvement.

Stand 22
Haigh and Hockland Books, The Precinct Centre, 1 Carlton Street, Manchester M13 9QA. 061-273-4156.
It was in Manchester that programmed computing and programming was first conceived and constructed. They were known as the "Manchester machine." The close association between computers and Manchester continues to this day, and Haigh and Hockland, as a specialist source for computer books and software, are at the hub of where the research goes on. Few booksellers anywhere carry a comparable range and depth of stock on computer subjects. Write in for your copy of 'What’s New in Computer Books' and 'Personal Computer Books and Software'. These catalogues keep you up to date on the literature and are sent on request free of charge. You can order books from Haigh and Hockland no matter where you live. They can nearly always be supplied from stock by return.

Stand 23
RAM Computer Services, 15-17 North Parade, Bradford. 0274-51156.
RAM Computer Services, an Apple national accounts support dealer, will be featuring two of their latest software developments for Apple computers. Firstly the highly acclaimed and already successful FMS fully integrated financial ledger system on Apple II and a newly released future advanced version for Apple III called FMS-Plus.

Secondly they will be showing a new medical computer system for general practitioners called Medico which has also been developed for Apple III. Both systems utilise the Profile hard disc system for which RAM now offer a new cost effective and attractive back-up system. Dealer enquiries are welcome.

Stand 24
Anadex Ltd, Weaver House, Station Road, Hock, Basingstoke, Hampshire. 025672-3401.
Anadex shows its first word processor printer, the WP-6000, and the new ‘A’ series of dot matrix printers at the show, all of which are now available to the UK and European computer market. The WP-6000 printing in correspondence quality mode, and the new DP-9620A, offering high print throughput for continuous operation at 1200 bps, linear reproduction of vdu graphics plus the low operating noise level of 55 dBA.

Also on display is the new beautifully quiet DP-9520A, an alphanumeric printer series with 2.7k standard buffer. All ‘A’ series printers utilise new acoustically designed covers to provide low operating noise levels and high data throughput.

Stand 25
Jarman Systems Ltd, 6A Dolphin Square, Tring, Herts. 044-282-6841.
Jarman Systems will be showing their advanced Pascal-based accounting systems. These integrated systems are designed to be simple to operate and yet provide sophisticated accounting functions and full audit trails. The software is available in two modules. Sales accounting, invoicing, purchase accounting, costing, nominal ledger with cash book and budgetary control, stock-recording and payroll. The software is distributed through a network of carefully chosen dealers who will be able to give you a full analysis of your requirements and provide effective after-sales service.

Stand 26
Blyth Computers Ltd, Heathside Farm, Ken newn, Halesworth, Suffolk. 050-270-565.
East Anglia's leading Apple dealer have installed more micros than any other dealer. Blyth are committed to the full support concept of Apple UK.

Stand 27
Dynatech, a Guernsey-based division of the Dynatech Corporation, are demonstrating CORP, a powerful database, printed reports, forms and menu generator for a 48k Apple II Plus with the same power as Apple's drives.

Manufactured in Guernsey and distributed worldwide by Microsystems Limited, CORP is very reliable and user-friendly. Once the programs have been generated the user with some knowledge of Applesoft can customise them even further by modifying or inserting program lines or sub-routines.

Microsystems also run holiday computer training courses in Guernsey where all the family can learn something about the world of microcomputers.

Stand 28
BFI Electronics Ltd, 516 Walton Road, West Molesey, Surrey KT8 0OF. 01-941-4066.
BFI Electronics, the major UK distributor for the Verbatim Datatape range of flexible magnetic media, will be exhibiting flexible discs, mini discs, cassettes, cartridges, storage and data communication devices.

Of major interest to the microcomputer users will be the latest disc drive cleaning kits forming part of the Verbatim Datatape product range. The entire Datatape range, which will be on show, incorporates many advanced design benefits which make them the most reliable currently available.

Stand visitors will also be able to see a range of storage units to store flexible discs and BFI representatives will be on hand to discuss the Verbatim products.

Stand 29
Spider Software, 98 Avondale Road, South Croydon, Surrey. 01-680-0267.
Spider Software will be exhibiting a wide range of packaged software including games, utilities, word processing packages and graphics utilities. Their new database management package 'Access' will be on permanent display, and the authors will be available to answer questions concerning the system.

Stand 30, 31
Keen Computers Ltd, 5 Gipsy Street, London EC1. 01-236-5862.
Leaders in microcomputer networking technology, Keen Computers offer an extensive range of microcomputer multi-user networks and software with Apple II and Apple III. Available with Apple II is the Omnitel
network using the Corvus hard disc drive linking up to 64 different microcomputers or peripherals into a fast, low cost, local network.

**Stand 32**
*Computopia Ltd, 30 Lake Street, Leighton Buzzard, Beds. 0525-376600.*

Computopia Ltd are showing a range of quality add-ons for Apple, covering the Micro-Sci range of discs for Apple II/III and buffered I/O interfaces. Computopia also specialise in customised technical software.

**Stand 33**
*Software Rental Bank, 58 North Street, Leighton Buzzard, Beds LU7 7EN. 0908-53491.*

The Software Rental Bank give members access to over £30,000 worth of original software products on a short term rental basis. Rental is free to members who decide to buy a rented package.

For the first time Apple users can try out a wide range of software packages at length, without any obligation to purchase. Our software listing includes many exciting and controversial new releases as well as “blue chip” packages such as business-planning aids, word processors, accounting systems, utilities and firmware. You may join the Software Rental Bank at the exhibition.

**Stand 34**
*Data Supplies, Braids House, Templewood Lane, Farnham Common, Slough. 02814-2239.*

Data Supplies are Apple’s local dealer in Slough and provide a level-one sales and service to a broad band of users, commercial and government, throughout East Berkshire and the surrounding areas. As well as appearing on Apple’s list of specialist dealers in the fields of education and medical applications, Data Supplies has built up an enviable reputation in the field of communications. Not only have they interfaced the Apple to many of the other popular microcomputers but they have carved out a special niche in the field of communications with ICL host mainframes. If you require advice on getting your Apple to communicate with ICL mainframes 1900 or 2900, working under DME George III or VNE/B, get in touch with ICL specialists Data Supplies. Their communications. Think Data Supplies... the Apple dealer worth a second thought.

**Stand 35**

DNCS, suppliers of all forms of computer accessories, magnetic media and computer furniture will be exhibiting a range of products in conjunction with our associate company Umbra Software Ltd. On display will be ODP external floppy disc drive, a new Apple III Profile back-up system, colour monitors and other Apple peripherals. The stand is also promoting the new Micro-Sci range of discs for Apple II/III and buffered I/O interfaces. DNCS will also exhibit their Apple and IBM compatible network using the Corvus hard disc drive linking up to 64 different microcomputers or peripherals into a fast, low cost, local network.

**Stand 36**
*Independent Computing Engineering, 16/18 Littleton Road, Ashford, Middlesex. 07842-47271.*

ICE will be showing the latest version of their 51'Winchester Subsystem, the WDS200 series, incorporating the new, higher-capacity Rodime drives up to 21 Megabyte capacity, housed in an attractive, low-line cabinet in Apple-compatible colour.

The Winchester is also attachable to the IBM personal computer, Superbrain S1000 bus and most Z 80 based micros. Backup for the ICE Winchester will be demonstrated with the ICE Tape Streamer, available for both Apple II and Apple III Profile, allowing security backup of 20 Megabytes per removable 5'1/4 tape cartridge.

The new 5'1/4 floppy disc cartridge drive is also offered as alternative backup, with 8 Megabytes of removable capacity.

**Stand 37**

MicroExstat, a data base of company financial information, comes on a set of floppy discs for use initially with the Apple II. It is a product of Extel Statistical Services, a leading supplier of information to the City and to industry.

MicroExstat covers some 1,500 British companies and more are being added. It is updated every month. It comes complete with a sophisticated analytical system, also on floppy disc, to enable the user to integrate the data to maximum advantage. MicroExstat is being demonstrated on stand 37. Why not pay us a visit—NOW.

**Stand 38**
*Microoil, 36 Elm Road, Windsor, Berks. 07635-68809.*

Microoil is a young company based in Windsor specialising in computer-aided learning products with a difference in that the courses have a deliberate slant towards business applications. This is reflected in the company’s first product, Hands-On Cia-Cobol Programming which teaches the most commonly used business programming language, Cobol, in the most effective manner—by using it.

The courses have found a ready market in the personal computer and processing departments of large organisations, in smaller organisations, commercial training establishments, schools and colleges. A visitor to the Microoil stand will be given the opportunity to try THE method of learning THE business programming language.

**Stand 39**
*Instrumentation Design and Electronic Applications Ltd, 11 Wye Estate, High Wycombe Road, Buckingham. 0494-207071.*

If you have found difficulty in connecting your Apple to other equipment you will be pleased to know that one of the exhibitors has experience of computer systems including Apples with special purpose hardware and software.

IDEA is an Apple OEM dealer with the capability for design, development, production and support of electronic projects. This includes interfaces to non-electronic technology. IDEA expects to exhibit a system for pathogenic bacteria research as well as other examples of their electronics expertise.

**Stands 40, 41, 42, 43**
*Symbiotic Computer Systems, 85/87 Station Road, West Croydon. 01-650-8606.*

The SyMBfile hard disc subsystem is a complete 5'1/4 inch Winchester system for the Apple II. The system comprises the Seagate ST500 hard disc controller, power supply and interface. The SyMBfile supports DOS 3.3 Apple Pascal and CP/M, different operating systems may be mixed on the same drive. Unique features of the system include an autobooting interface card and a back up system allowing easy back up within the hard disc or on to external storage media.

Symbiotic Computer Systems also present the SyMBstore, an 8Mb 5'1/4 floppy drive for the Apple II. A cartridge containing five single sided floppies is inserted into the drive which then automatically selects the appropriate disc. The system may be used as a stand alone drive or as a backup to a hard disc.

**Stand 44**
*A.P. Systems, 90-100 Brighton Road, Surbiton, Surrey. 01-339-1257.*

Having been involved from the start in the development of the Personal Computer Database with Enterprise Systems, we are going to be selling and advising on communications equipment and software to access this and other systems. Subscribers to the Enterprise System come through us.

The Orbitera range of software, Pascal based and 80 column, will be demonstrated on our stand. Developed by Ormskirk Computer...
Services and built round the Ormbea Database, this software is rapidly gaining a reputation for sophistication and flexibility. Ormbea software runs on 8-bit, 16-bit and hard

**Stand 45**

**Enterprise Systems Group, Thameside Computer Centre, Ferry Works, Summer Road, Thames Ditton, Surrey. 01-398-8445.**

Based at Thameside Computer Centre, Thames Ditton, Enterprise is able to offer networking and turnkey facilities to organisations requiring full in-house database access, using microcomputers as communications terminals, as well as having 1,000 telephone lines for access to a main database.

Enterprise Systems are making their computing facilities available on a subscription service to personal computer users, who want to access bulletin boards, software databases of codes and general information. Enterprise are also setting up professional databases for national or local institutions and organisations, accessible in the first instance by Apple computers.

**Stand 46**

**Robocom, Ground Floor CIL Building, Goodwin Street, London N4. 01-836-1072.**

“A revolutionary breakthrough in low cost microcomputer graphics” is how the Press have described the Bit Stik interactive graphic systems. It is the first in a new generation of find-tune computer graphic controllers which combined with powerful software programs eliminates the time and patience-consuming inputting of instructions via a keyboard.

Designed and produced by the North London Robotics research and development company, Robocom Ltd, this new user-friendly hardware/software package enables Apple II users to create multi colour graphics, technical drawings, circuit diagrams, text, etc quickly and simply with the minimum of computer knowhow and at very low cost.

**Stand 48**

**The Computer Bookshop, 30 Lincoln Road, Otton, Birmingham B27 6PA. 021-707-7544.**

The Computer Bookshop is a wholesale distribution company set up to supply books to the retail microcomputer market, and offer a wide range of books covering most of the popular machines. On display will be our full range of Apple-related books, plus some general titles.

**Stand 49**

**Ferrari Software Ltd, Hayden House, 5/6 Mill Mead, Guildford, Surrey. 0483-6017.**

Ferrari Software are approved dealers in ISM software products MatheMagic and GraphMagic. They also offer the very latest games packages as available in the USA. MatheMagic is a number processing package, a menu driven system that anyone can easily master – the indispensable tool for business people, educators, students, engineers and the practical home owner. Anyone in fact, who needs to calculate anything from finance to the most sophisticated mathematics.

GraphMagic provides graphic interpretation of numeric data, displayed in line, pie and bar graphs. This product is available as a stand alone package and can interpret both Mathemagic and Visiscalc data. For all age groups, the games packages are exceptionally interesting and varied.

**Stand 52**

**INMAC (UK) Ltd, 18 Goddard Road, Astmoor Industrial Estate, Runcorn, Cheshire. 0829 Instruments specialise in the sale of the laboratory data processing equipment to scientists and engineers (91 per cent of sales in 1981) all over the UK and abroad. They are worldwide distributors of IC’s ‘REXAGAN’ system which links Apple and other microcomputers to scientific instruments and engineering processes.”

**Stand 53**

**ICI Petrochemicals Division, PO Box 90, Wilton, Middlesbrough, Cleveland TS6 8JE. 0642-455522.**

“REXAGAN” is a simple but powerful interface system which links microcomputers to laboratory and process instruments for data acquisition and process control. It was designed by ICI to meet the varying needs of its own scientists and engineers.

“REXAGAN” is a versatile and flexible aid for education at all levels from schools to universities. It comes complete with assembly and programming instructions in a well illustrated manual to be used by junior technicians and senior scientists alike.

**Stand 54**

**Dyson Instruments Ltd, Sunderland House, Station Road, Hetton, Houghton-le-Spring, Tyne and Wear DH5 0AT. 0783-260452.**

Dyson Instruments specialise in the sale of laboratory data processing equipment to scientists and engineers (91 per cent of sales in 1981) all over the UK and abroad. They are worldwide distributors of IC’s “REXAGAN” system which links Apple and other microcomputers to scientific instruments and engineering processes.

“REXAGAN” is a powerful system for data acquisition and process control, yet is extremely simple to use and comes with a very comprehensive manual with full assembly and programming instructions. Working models displaying the simplicity and power of “REXAGAN” will be on show. Distributor enquiries are invited. Full colour brochures are available.

**Stands 56, 57**

**Hal Computers Ltd, Invincible Road, Fareham, Hants. 02392-17171.**

As part of their 1982 dealer plan Hal Computers will be demonstrating their 10 Megabyte Winchester sub-system for Apple II. This system can be correspondingly useful and the ten options include the new Amlyn 8-Megabyte floppy drive or the quarter back streaming tape drive. They should not be missed.

The system can run a combination of CP/M, Basic or Pascal. Also on the stand will be various Apple add-ons such as the Stride Drive, which adds a new level of sophistication to the basic software, and a digital thermometer which will be of great interest to those of you who have agricultural or food processing applications.

As Dysan’s key agent for the UK, Hal offer a four hour turn around on disc orders, quantity discounts for up to one quarter million discs and serious dealer schemes.

**Stand 58**

**Mass Micros, Welton House, Brownfields, Welwyn Garden City, Herts. 07073-31436.**

Mass Micros offer complete support to businesses using microcomputers in management, commerce, science or industry, professional advice, training and fast delivery ensure effective purchases, while maintenance schemes, including loan machines and telephone software support give unparalleled security. After sales service includes advice of new developments.

Mass Micros was founded by professional engineers with experience of hardware and software in high technology. Finding solutions for major corporations taught them how to help you. Products include Apple II and Apple III, Pet and Superbrain, hard disc storage, peripherals, printers, plotters, modems, media, telephone software, and unique Calcomp driver modified as Visiscalc interface.

**Stand 59**

**Datarite Terminals Ltd, Caledare House, 144 High Road, Chadwell Heath, Essex. 01-590-1155.**

The availability of low-priced word processing programmes for the Apple has meant a great deal to the Apple user. Datarite, based on their own Olivetti Praxis electronic typewriter, the T/Printer 35 not only offers excellent print quality at an affordable price, but also gives the user the advantage that it can be used as a typewriter when not needed for computer printing. This versatility is just one of the great advantages of interfacing modern electronic typewriters to computers. As well as the T/Printer 35, Datarite are also showing computer print/typewriter units based on IBM, Olivetti and Olympia office typewriters.
## Convention timetable

### Saturday 5th June

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<td>Thames Room</td>
<td>Opening Session</td>
<td>Dave King (Apple UK)</td>
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<td>1100-1115</td>
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<td>Coffee</td>
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<td>1115-1245</td>
<td>Thames Room</td>
<td>Supercharging the Apple</td>
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### Sunday 6th June

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<td>Planet Theatre</td>
<td>Apples in Medicine</td>
<td>Dr Gordon Jameson, Dr. Cliff Doust</td>
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<td>1100-1115</td>
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<td>Coffee</td>
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<td>1115-1245</td>
<td>Thames Room</td>
<td>Graphics Displayed</td>
<td>Alan Norman, Peter Bailey</td>
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<td>Planet Theatre</td>
<td>Computers in Management Education</td>
<td>David Sutton</td>
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<td>1245-1400</td>
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<td>Lunch</td>
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<td>1400-1530</td>
<td>Thames Room</td>
<td>Hardware Panel</td>
<td>Steve Alsop, Mike Gurr, Lawrence Payne, Geoff Reiss</td>
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<td>Planet Theatre</td>
<td>Commercial Applications</td>
<td>David Jarman</td>
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<td>Thames Room</td>
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<td>Planet Theatre</td>
<td>Software Panel</td>
<td>Dr Austin Tate, Mike Hardwick, Roy Stringer</td>
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This timetable is provisional and subject to alteration.
Who's who

Speakers at the convention are:

DAVID SUTTON worked for 12 years in the British aerospace industry in the course of which he graduated with an honours degree in chemistry from the University of Manchester. At the time of leaving the aircraft industry his duties included project management, process development and shop floor trouble shooting. Following a two-year period in the Manchester Business School he graduated as a Master of Business Administration.

The MBA course at Manchester models itself on that at Harvard and is noted for its more practical approach, with greater emphasis on live case studies and projects. It included a two-week module on computer applications in management, modelling of business systems and creative problem solving techniques.

Currently he created the System Six Consultancy, whose clients now include BP (UK) Ltd, Ciba Geigy (UK) Ltd, the Hotel and Catering Industries Training Board, the Royal Institute of British Architects, the Bioscience Association and many others.

Presentation. A discussion of the various ways of using computers in education, and will draw on models of trainer/class interaction and the learning process in general to develop a scheme to help people evaluate the potential of computers in their own spheres.

DR AUSTIN TATE is a computer scientist and has performed research in artificial intelligence and data base systems. He was project manager of a design and implementation team to produce a Fortran interface to ICL's Integrated Data Management System (IDMS). He now heads a microcomputer consultancy and systems management team at the Regional Computing Centre, and is a leading member of the USUS Pascal Users Group.

Presentation. In conjunction with Dr Tony Addyman, Dr Tate will be outlining the Apple Pascal System, which is based on the UCSD p-system, and will discuss the advantages of the Pascal language and the options available to Apple users in this regard.

MICHAEL GURR has been in computing since 1957. Following a first-class honours degree in engineering from London University and postgraduate work in computer technology, he spent a short time in the Navy as an Instructor Lieutenant before moving into the aircraft industry, working for Short Bros and Hawker Aircraft, where he was involved in early jet engine testing.

Michael was responsible for starting the Swansea University Computing Centre in 1962, and entered the stock market as a DP manager in 1967. With BOC Ltd in 1972, he pioneered the "user build it yourself" approach to customer support, and at a data processing company. His own company, Michael Gurr Associates, was established soon after and since then he has been involved in the production of numerous paper systems, and his disabilities have been a regular speaker at conferences and shows, here and in America.

His involvement with microcomputers started four years ago with a desire to design large data bases in a logical manner instead of the ad hoc techniques then in use.

Presentation. Michael Gurr will be looking at the use of data bases on microcomputers, defining standards for their effective use and talking about some of the systems currently available.

JEFF BARRINGER is a science graduate in electronic engineering from Lancaster Polytechnic and has spent some time with GEC (Telecommunications). He has gained early experience in computer design and communications.

Since then he has spent a number of years involved in digital processor design and a similar period subsequently in assembler and machine code programming.

For the past six years he has been responsible for providing marketing and sales support with MC Computers, one of the foremost companies involved in industrial applications on the Apple and other microcomputers.

Presentation. Jeff will be explaining the problems involved in interfacing microcomputers to industrial devices and how they are overcome, and will be presenting applications of Apple in industry.

ASIDE from an MA in biochemistry, a D.Phil. in psychology and current musical studies at University College London, DR DAVID ELLIS is a musician who just happens to have got hooked on computers.

Armed with a less than brilliant music diploma, he launched himself into writing and playing classical music but now finds himself most preoccupied with doing the same for film, TV and rock music.

He writes on the subject of computer music and electronic music in general for a wide variety of magazines, including Electronics and Music Maker, Personal Computer World, Electronics and Computing, and, of course, Windfall.

Current and future projects include an LP for release in the autumn, a couple of film scores and passing his finals.

Presentation. General chaos! Actually, a sort of vaguely chronological perspective to composing, recording and playing music, with the role of the computer in all three thrown in for dessert.

David would like to thank the following companies for the assistance they have given in providing assistance to enable him to speak up his talk with plenty of demonstrations: Casio Electronics Co, Cif Products (Electronics), Cricket Computer Co, Englund Digital Co, Passport Designs, Personal Computers, Scenic Sounds, Syco Systems and Syntao Co.

MARTIN WEST is a B.Sc Tech(Hons.) graduate in physics, an M.Sc. in physics on microphone calibration and a PhD in physics on acoustic waveguides.

Much of the research undertaken by Martin in the field of acoustics include sound absorption and room acoustics, opera plan office acoustics, speech synthesis by rule, speech perception in infants and the perception of distorted speech.

He is currently engaged in research work at the Acoustics Laboratory of Salford University.

Presentation. A short historical view and examination of the acoustics of human speech, and5 ready phonemes which will be demonstrated, using a spectral analysis and reconstruction program. Other demonstrations will include Fx variation, develop rule synthesis, voktor rule synthesis and Texas Instruments text-speech program.

PETER HEWITT is the marketing manager for MicroFocus, developers of CisCobol as a language for microcomputers, who recently won the Queens Award for industry in connection with their work.

He was recently appointed a member of the BBC Microcomputer Computer Weekly. Peter's first involvement with computers was as a Cobol programmer on IBM mainframes, and he also worked for some years in systems engineering with computer hardware and software.

Presentation. The relevance of Cobol as a business program development language for microcomputers, demonstrated by the use of CisCobol, and a demonstration of visual programming tools developed by MicroFocus - Animator, Forms-2 and SlideShow, which show the capabilities of the language.

DR GAVIN KENNY will be assisted in his presentation by Dr Carol Schmullion of Glasgow Royal Infirmary and Dr Barry Clark of Western Infirmary, Glasgow.

Dr Kenny is a lecturer in anaesthesia at Glasgow Royal Infirmary, and has made extensive use of microcomputers for education and management, especially in operating theatres and intensive care units.

Dr Schmullion, who is a research fellow in the department of anaesthesia, has been involved in the application of microcomputers to teaching and self study for qualified doctors.

Dr Clark, who lectures in biochemistry, has developed a number of programs dealing with the tuition of biochemistry, many of which involve the use of graphical displays.

Presentation. The application of microcomputers in a learning environment, with the introduction of the concepts of self-assessment using computer assisted learning.

GENE FINKLER is an American who lives in France and works in Geneva for British Petroleum Chemicals. He has a degree in accounting from the University of New Orleans, a degree in management from the Graduate School in New York and a master's degree in finance from the Graduate School of Business, New York University.

Gene, who is a member of CDP, the Data Processing Management Association, has worked for a number of major institutions in America and Europe. They include the First National City (Citibank), Sanzor Pharmaceutical, Universal Oil Products, Manufacturers Hanover Trust, the Public National Bank and the Diebold Group, ICL and his present company, BP Chemicals (Suisea).

Presentation. A look at the processor used on the Apple and a discussion on some of the ways of speeding it up, using alternative microprocessors, a look at Access Memory cards being looked at include The Mill, Metacard and the Aristocard.

PETER BAILEY, who will be assisted with his presentation by Robert Welsh, will be discussing an involvement of designing signs for the leisure market. He has been involved with Robotics Development leading to a specialisation in graphics and mathematical modelling.

Robert Welsh is a graphic designer who, since leaving Liverpool College of Art and Design (B.A. Graphics Communication) has worked on many projects as a graphic designer audio video engineer leading to an interest in the use of microcomputers in the use of electronic drawing systems.

Presentation. A close look at the use of graphics in the following areas - facilitating the creative design process, generating display sequences for video recording, graphic display of business data, developing the commercial and educational use of graphics for rapidly building complex designed, special applications-circuit board design, technical drawing and education.

PETER BRAMELD has been employed at the University of Manchester Institute of Science and Technology for a number of years as an experimental officer, carrying out research into the application of microcomputers to colour physics andingle phoneme. He is also
chairman of the North West Apple User Group and technical editor to Windfall.

In these two connections he has been responsible for raising the telephone throughput of UMIST by at least 50 per cent, and has established a good reputation in education establishments in Manchester for his assistance in solving Apple problems. Peter is a consultant to a variety of multinational concerns.

Presentation. Peter Brameld is presenting one half of the section on supercharging the Apple with Gene Finkler. Peter’s section will deal with the methods of speeding up the Apple through pure programming techniques or using Compilers.

AFTER leaving Manchester University with a B.Sc honours degree in liberal studies in science, ALAN NORMAN entered marketing where he became involved in 1977 in the marketing of solids for the presentation of business information. He worked as a marketing executive with De La Rue for a number of years, and as a marketing manager with Taylor Woodrow. He joined Myriad Audio Visual, who have pioneered the development of computerized information systems in Europe, as marketing director after having associated with them for a brief period as a consultant.

Presentation. In conjunction with Peter Bailey of Rocom, Alan Norman will be demonstrating the efficient use of presenting graphics, once they have been created, by turning screen displays into high quality slides, to be used as professional marketing or presentation aids.

DAVID JARMAN is the managing director of Jarman Systems, the Herts-based microcomputer software company. He has had wide experience of computer systems in Plessey, Honeywell and Microsense Computer Systems. David is now principally involved in product development, specializing in management accounting.

David, who has a B.Sc (Eng) in electronic engineering from Liverpool University, and a Certificate of Advanced Studies in Computer Science from Brunel University, will be assisted in his presentation by Harold Norcross, who is a director of a number of companies, and is a business counsellor for a number of major business and financial institutions.

Presentation. A practical look at the total aspect of management accounting, explaining the reasons and methods of using computerized systems to the best possible effect, and to maximise the efficiency of the business.

MIKE GARDNER is a physics graduate from Cambridge University, who has worked in Post Office Telecommunications for a number of years, being involved during the last two years in a number of technical research projects, including Vax, Data General, and Wollaston Packard, university mainframes and time sharing services. He will be assisted in his presentation by Dr Cliff Doust of Whittington Hospital, London.

Mike is a principal physicist in the Medical Physics Department at Whittington Hospital, where a number of projects have been underway for the last two years on the Apple, dealing with ultra-sound and medical diathermy.

Presentation. Dr Gordon Jameson will be giving an overall view of the state of medical computing, with particular reference to the Apple. Dr Doust will be talking about and demonstrating the production of animated diagrams to produce a film about the result of ultra-sound scans, and also showing a program which analyses and specifies diet requirements from a medical point of view.

Joining in the hardware/software panel are:

STEPHEN ALSOP is an electronics design engineer, computer engineer and programmer. He formed DMS Electronics nine years ago, and supplies main government, educational and industrial users with specialised systems based on microcomputers.

Stephen has several patents and designs in industrial electronics, including colour and monochrome specialised colour systems and D/A units for the Apple and has developed systems for Barcode reading and printing.

He has also been involved in the design and installation of many interesting process control and machine analysis control systems using the Apple.

LAURENCE PAYNE is a qualified accountant who was engaged in public practice for more than 25 years. In connection with his work with public companies and small businesses he developed considerable experience in system design and consultancy.

Realising the enormous potential of the computer, particularly in business systems, he founded Computech as a separate operation in 1986. Originally providing a wide range of computer services, Computech eventually specialised on micros with Laurence designing, programming and implementing one of the earliest database systems on a dual floppy micro in 1976.

When the Apple was launched, Laurence realised its potential for small businesses and wrote one of the first of a new breed of commercial packages for micros, introducing new concepts in design to ease the use of such systems for non-computer personnel.

Since then Computech has developed its expertise in a number of other areas, including the manufacture of a range of interface cards (the Diplomat series), Laurence has also been responsible for the development of a multiplexer of unique concept, providing the switching and sharing of resources between diverse peripherals and processors. Laurence has developed a wide range of experience in interfacing peripherals and software from different manufacturers and runs specialised training courses and demonstration seminars with a high technical content.

MICHAEL HARDWICK has spent the past 14 years programming, with time off to take in a couple of degrees. He is the co-author of Format-80, which is one of the foremost word processing packages, written in machine code.

He has also written several utility programs and is a specialist in copy protection and assembly language.

He is now a director of Elite Software Company, a consultancy specialising in software.

JEFF REISS has spent 12 years specialising in project management, and the past four in project management by microcomputer.

He is the managing director of Construction Programming Services in Bradford, who are the authors of Apple Project Manager, the only British software package to be sold by Apple in America in the Special Delivery Software collection.

Jeff has been working with Apple III since its initial launch as part of the APM development program.

He has done post-graduate work on microcomputers in project management, and is speaking at the World Congress on Project Management at Copenhagen in September in connection with his work.

ROY STRINGER is a founder member of the North West Apple Computer Club, and a regular contributor to Windfall magazine, where his Apple tips have saved hours of frustration for Apple users. He works for U-Microcomputers and has gained an enviable reputation for his helpful assistance in sorting out software problems. Roy will be answering questions on Applesoft.
Make your next decision an Apple computer
Go for Apple...

When you become the owner of an Apple Computer, you'll find out why 200,000 other people throughout the World have gone for Apple.

Apples are in business everywhere - in professional and managerial fields, blossoming, sharpening professional expertise and giving all types of business a competitive edge in an increasingly competitive business world.

For general business...

Imagine you own an Apple desktop microcomputer. Within a very short time you will have immediate access to a wide variety of business programs - to solve your accounting problems, to monitor cash flow and help your overall planning policy. It is in areas such as these that has made Apple the professional's choice, working for you from the start without the need for intensive professional training or experience. Apple has a standard typewriter keyboard, therefore just add the Apple Writer program and turn your System into a useful 'word processor'.

For financial planning...

Programs such as VisiCalc, Apple Plot and Desktop Plan ensure you have help with forecasting and budgeting under the influence of many changing variables. The presentation of data in the form of graphs and charts can be changed at the touch of a button to show different results.

What you need...

The typical Apple Computer Business System, as pictured here, consists of an Apple II computer processor with 48K of RAM (random access memory to store your data whilst in operation), two mini-floppy disc drives (for your programs), a high-resolution video monitor and printer to suit your particular needs. All this costs only £2400* and gives you a truly comprehensive business computer system capable of fulfilling most requirements.

Apple has the widest range of accessories available for any computer which means that it can grow to suit your developing requirements whether you need more computing power or wish to benefit from the graphics, colour, sound, musical or language capabilities.

Every Apple Dealer will be pleased to give you details, and to show you how an Apple can help you and your business, there are over 450 Apple Dealers throughout the Country - so help is never far away. You will find their names, addresses and telephone numbers on the back cover.

Get an Apple now, and put yourself in the picture.

The professional's choice...

As well as general business and accounting programs, there are also hundreds of others to support many different sections of industry, professional groups and scientific applications including architecture, agriculture, building and construction concerns, estate agencies, farmers, the legal and medical professions, personnel bureaux, retail management and stock control. In fact almost everywhere information needs recording, processing, displaying and printing.

All this means that your Apple will be a thoroughly versatile piece of equipment, growing with you as your business grows, but ready to help you right from the moment that your Apple is installed.

The Apple II is a completely assembled and tested computer system. It includes a typewriter style keyboard with high-efficiency switching power supply, ROM-resident Apple Soft extended basic interpreter, auto-start ROM, disassembler, AC power cord, reference manuals and the Applesoft Tutorial Manual that makes it simple for those who wish to really get to grips with their Apple.

Every Apple comes with a One-Year Warranty as standard and there's the option of renewing this with Apple's Extended Warranty Plan.

*Recommended retail price, correct at time of going to press.
and the unique VisiCalc Program...

By investing only £125* as 50,000 other Apple Computer users have done, you could make life easy for yourself or anyone who works with numbers. VisiCalc will help you solve your many numerical problems.

MANAGERS plan budgets, compare actual results to budgeted forecasts, and modify projections faster than ever before. VisiCalc is the most powerful and easy-to-use projection tool ever developed.

FINANCIAL ANALYSTS quickly determine rate-of-return under varying assumptions using the built-in net present value functions. VisiCalc will also compute financial ratios, and predict tax consequences.

ACCOUNTANTS develop financial statements and pro formas, making changes and comparisons easily with VisiCalc's 'What if...' recalculation feature.

ENGINEERS AND SCIENTISTS appreciate VisiCalc's transcendental notation, and features like eleven-digit precision in numerical calculation.

TO MARKETING MANAGERS, VisiCalc is the answer to every forecasting and budgeting need. They refine assumptions-commission rates, sales costs, advertising expenditures, leads, sales closing percentage - and watch the effect on the bottom line...and for larger planning tasks - ask to see Micro Modeller.

FOR AS LITTLE AS £1,700* YOU CAN HAVE AN APPLE SYSTEM THAT CAN UTILISE THE VISICLC PROGRAM.

Apple prints ...

Centronics 737 Printer

The Centronics 737 is a versatile, low-cost printer offering proportionally-spaced upper and lower case characters in a high-density dot matrix. The Centronics will print 80 characters per second.

It provides print quality suitable for text processing and letterheads, plus the application flexibility required for data processing. The 737 will print on fanfold or roll paper, has underlining capability and the bi-directional stepper motor allows single sheets to be fed up and down as well as making the printer remarkably quiet in operation.

Price £424 excluding VAT and carriage.

Silentype Printer

- From Apple, the inexpensive and portable Silentype will sit neatly on your desk top and print thermal high-resolution graphics at 60 dots per inch, upper and lower case at 40 characters per second and 80 characters per line - almost silently!

Investing in a Silentype enables you to eliminate the loading or writing of a program to print a screen configuration, because you can dump any high-resolution screen image directly to the printer.

Price £349 excluding VAT and carriage.

Qume Sprint 5/45 RO Daisywheel Printer

The Qume is generally accepted as the printer of choice for high-quality printouts at speeds of up to 45 characters per second. 70 printable typefaces can be obtained and the Qume has more commands available than competitive machines.

In no time at all it will reproduce circular letters, memos and customer communications of all types, each individually "typed" one after another.

Special features of the Qume include plotting, graphics, formulae printing capability. Proportional and incremental spacing are also available.

Price £1,640 excluding VAT and carriage.

Paper Tiger Printers (Complete with Graphics Option)

The popular range of Paper Tiger impact printers provides real versatility from 3 models, the TG445 basic printer, the TG460 with its excellent print quality or the TG360 which has a 15" wide full size listing paper.

This well established range of printers includes full 96 character paper and lower case set, from 8 software-selectable character sizes, parallel and serial interfaces, multiple copy capability, stepper motor driven tractor feed from 1,75 up to 15 inches according to the model. Tigers can print at up to 120 characters per second at both 80 and 132 columns width.

All printers require connector cables and by the addition of software full graphics capability can be obtained.

Price: TG445 £575 TG460 £795 TG360 £995 excluding VAT and carriage.
Then go for...

one of the variety of business and financial planning packages available as standard through Apple dealers.

Vlasak 'Integrated' Systems
Vlasak Computer Systems are specialists in integrated business software covering many areas of accounting and sales administration. Vlasak’s payroll program is probably the most widely installed microcomputer system in the Country.

As the manufacturer of the Megastor, Vlasak are able to supply software for both 5¼" and 8" floppy disc drives which allow greater data storage.

Vlasak programs are available through all Apple Dealers.

Systematics 'Controller' Packages
Systematics International have developed two important program packages for Apple users.
The Financial Controller and the Stock Controller are both written in Pascal language, giving more disc space and faster processing than is possible with programs written in Basic. The Financial Controller covers most business accounting functions and is available as a complete suite of business ledgers or as separate modules priced at £250. The Stock Controller also costs £250 and can link to the Financial Controller if required.

These programs are available through over 50 Apple Dealers nationwide.

Jarman 'Tailored Systems'
Jarman Systems offer a range of general business programs for Apple II. These are available as standard packages, or adapted to meet the individual requirements of Directors and Managers in many different areas of business. The programs are written in Pascal to mainframe standards for faster processing and increased data storage. Many accountancy and stock control routines are covered to free managerial time for more creative tasks.

Padmede 'Business Series'
Padmede Computer Services have developed a series of programs for the Apple II based on a thorough knowledge of business applications and their long-standing relationship with Apple.

These systems are in use with many professional firms and have developed a reputation for reliability among end-users and the 170 Apple Dealers who have supplied them.

Each program can be run individually and a number will link together by a bridge program. They cover many general business applications including contract drawing, quotation and estimating systems.

TABS 'Modular System'
The 14 integrated modular systems which TABS offer cover many business applications including word processing. Each of the modules may be purchased individually and can be tailored to suit particular requirements.

All programs run on Apple Computers with two disc drives or alternatively 8" floppy discs can be added for extra data storage.

The system is available at only £99 per module from over 150 Apple Dealers.

Local Computer Network – Zynar
The linking of microcomputers in the Local Network provides an effective and economic means of facilitating the flow of information. Committee of users can either work alone, in small groups or at departmental level.

The sharing and pooling of work and information is totally consistent with the way organisations work. The Local Network facilitates the rational organisational use of personal computing. The founders of Zynar have extensive experience in the development of advanced microcomputer concepts and have been responsible for several world-famous products. Zynar’s first product – Local Microcomputer Network – offers unequal cost performance and is indicative of the computer’s future direction.

To find out more about Apple Computers and the many hundreds of business and specialist application packages please contact any one of 450+ Apple Dealers throughout the UK. You’ll find their names, addresses and telephone numbers on the back cover.
Who says so?
The decision makers...

...like Sir Freddie Laker
Chairman and Managing Director

'I believe that in today's competitive world managers should be aware of more of the detail to enable them to make the right decisions quickly.

Much of this information is either financial or statistical and thus the Apple personal microcomputer is ideal for presenting and working on the essential data which affects the performance of a company or department.'
MICRO MODELLER gives the Apple II main-frame power at micro costs.

"Fantastic Value"
Wiggins Teape
Basingstoke

"Multi-level consolidations
easily handled by
MicroModeller"
Westland Helicopters
Yeovil

Widely acclaimed as the most advanced financial planning tool yet released, MicroModeller is a complete alternative to costly time-sharing services. If you have been put off by high bureau charges, but want to use a financial planning program, MicroModeller on Apple is the answer.

For further information contact:
Intelligence (UK) Limited
30 Lingfield Road
Wimbledon Village
London SW19 4PU
Telephone 01-947 9846/7

MicroModeller is used by management for:

- Management Reporting
- Cash Flow Forecasting
- Short-Term Planning
- Merger & Acquisition Analysis
- Investment Analysis
- Budgetting
- Multi-Level consolidations
- Currency Conversions
- Computer Slides
- Computer Graphics
- Strategic Planning

Recommended retail price £425.00 excluding VAT and carriage.
The Apple Macintosh Computer
Apple established itself as one of the leading innovators in personal computing technology a year ago by introducing the Lisa, a synthesis and extension of human-interface technology that has since been widely imitated. Now the company has strengthened that reputation with a new machine, the Macintosh (above). In terms of technological sophistication and probable effect on the marketplace, the Macintosh will outdistance the Lisa as much as the Lisa has outdistanced its predecessors.

The Macintosh arrives, finally, after a history of colorful rumors. It will cost from $1995 to $2495, weighs 22.7 pounds, and improves on the mouse/window-desktop technology started by the impressive but expensive Lisa computer. A system with printer and disk drive costs about $900 more, but even at that price, the Macintosh is worth waiting for.

The Macintosh at Work
Before we look at the Macintosh (or Mac) in more detail, let's look at how it works. When you turn the Mac on, its screen tells you to insert a 3½ inch Sony floppy disk. When you do that, the Macintosh puts a disk icon on the screen along with the disk's name. As with the Lisa computer, you first select an object, then choose a menu item that works on the object. Say, for example, we choose the disk by moving the cursor to the disk icon and clicking the mouse button once (figure 1a). The disk "opens up," showing a window containing icons, each one of which corresponds to an item on the disk. To start using the Mac Paint program, we select the Mac Paint icon and choose the menu item "open," as shown in figure 1b. (We also could have opened Mac Paint by double-clicking on the icon.)

What follows is a brief example of how the Mac Paint program works. When we open the program, we get the screen of figure 1c. The large blank area is a window onto the drawing area, the boxes on the left are tools, the boxes on the bottom row are patterns, and the lines in the corner are selections for the current line width. By selecting the "open oval" tool and the thickest line width, we can draw empty ovals with thick borders (figure 1d). By selecting the "paint bucket" tool and the "diagonal bricks" pattern, we can fill the oval with that texture (figure 1e). The "eraser" tool lets us erase part of the image (figure 1f); for finer control, we can give the PAT BITS command (figure 1g), which allows us to erase or paint on a pixel-by-pixel basis. When we are finished with our image and select the QUIT command, the program displays an alert box that asks if we want to save our changes (figure 1h).

Foundations of Macintosh Design
The Macintosh computer is built on three cornerstone ideas: second-generation Lisa technology, reliability and low cost through simplicity, and maximum synergy between hardware and software. Each of these ideas contributes significantly to the uniqueness of the Mac's design.

Second-Generation Lisa Technology
Without question, the strongest influence on the Mac is that of the Apple Lisa computer, which proved the viability of certain concepts in a commercial product: the graphics/mouse orientation, the desktop metaphor, the data-as-concrete-object metaphor, and the shared user interface between programs. The Mac has inherited these concepts; for further details on them, see my article, "The Lisa Computer System" (February 1983 BYTE, page 33).

Four differences between the Lisa and the Mac make the latter a second-generation computer. First, the Mac runs at a higher clock speed: 385 MHz (compared to the Lisa's 5 MHz). Second, the Mac, which has a smaller amount of memory to work with than the Lisa, uses its memory more efficiently because its programs and subroutines are coded in 68000 assembly language (as opposed to the Lisa, which uses less efficient 68000 machine-language programs that are compiled from high-level Pascal source code). Third, the Macintosh eliminates add-on peripherals and uses instead a high-speed serial bus that implements what Apple calls "virtual slots." (I will talk about this in greater detail below.)

Reliability and Low Cost through Simplicity
Although the Macintosh costs approximately one-third the price of a Lisa, the Mac has much more than one-third of the Lisa's power. The idea of reliability through simplicity not only makes the Macintosh possible at a relatively low price but also produces a machine that has a reliability normally associated with much simpler computers.

One component of the Mac's simplicity is its low chip count—it contains about 50 ICs (integrated circuits), which decreases its physical size and price and increases its reliability. Mac reduces its chip count by combining the functions of many standard chips into eight programmable-logic arrays (PLAs).

The Macintosh has only two circuit boards, one that holds all its analog circuitry and one that holds all its digital circuitry (see photos 2a and 2b). By partitioning its functions and reducing the number of connectors (by decreasing the number of boards to be connected), the designers have made the Mac both more reliable and less expensive. They carried this philosophy farther by eliminating hardware slots; you add peripherals to a Mac through its two high-speed serial ports.
The Macintosh was designed to reduce (or, in the case of the digital board, eliminate) the number of places in which hardware must be fine-tuned during assembly. In some cases, the designers eliminated the need for adjustment through clever circuit design, which also means there’s one less thing to go wrong with the computer once it is in the owner’s hands. In other cases, Apple eliminated fine-tuning by requiring a vendor of externally manufactured subassemblies to tune the part before delivery; for example, the video-dis-
play tube and yoke are delivered pre-adjusted, and the Sony 3½-inch disk drive is delivered tested and with several Apple-specified modifications.

Maximum Synergy between Hardware and Software

The Macintosh's hardware and software were optimized for maximum performance. This means that the hardware and software evolved over a period of time in a process of mutual give and take. For example, the pixels displayed on the Mac's video display are square (not rectangular, as in other computers); this greatly simplifies the software that draws squares and circles, scales text and graphics, and prints screen images.

Hardware

The main unit of the Macintosh consists of eight parts: two circuit boards, a cable to connect them, a metal chassis, a 3½-inch disk drive, a video-display tube with yoke, and a plastic front bezel and rear housing (see photos 3a and 3b). An external mouse and keyboard make for a total of 10 parts. The main unit takes up an amazingly small 10-inch by 10-inch area (it is 13½ inches high). True, the keyboard and mouse take up more area than that, but the footprint of the main unit is considerably smaller than that of comparable computers. The Mac is also pleasantly compact and light; an entire Mac system in an optional padded satchel weighs 25.6 pounds (less than many transportable computers) and can be carried onto an airplane.

Figure 2 shows a block diagram of the Macintosh hardware; for more details, see the "Macintosh System Architecture" text box. For now, let's look at the machine's major subassemblies:

Processor: The Macintosh uses a Motorola 68000 processor running at 7.83 MHz.

Video display: The Mac has a 9-inch monitor that displays a non-interlaced image at 60.15 Hz. The resolution of the video image is 80 pixels per inch, so the overall screen is 512 by 342 pixels.

ROM: The Mac uses two 256K-bit ROMs configured as 64K bytes of memory. The ROM (read-only memory) contains most of the Mac's operating system and a "toolbox" of optimized 68000 user interface related routines (see the text box "The User
Interface Toolbox" for more detail).
The ROM is always accessed at full speed, 783 MHz.

RAM: The Mac has 128K bytes of memory; at some point (Apple says by the end of 1984), this will be expandable to 512K bytes (by substituting 256K-bit dynamic RAM (random-access read/write memory) chips for the 64K-bit chips currently being used). The screen display uses 21,888 bytes and is drawn using this memory and DMA (direct memory access) circuitry. Apple has an undisclosed proprietary technique for phase-locking the 68000 to less expensive memory, which lowers the product cost without sacrificing the speed of memory access.

When the Mac is drawing a horizontal line of the video display, the 68000 and the video DMA circuitry alternate (interleave) their accesses to the RAM address and data lines. Since these two can never access RAM simultaneously, the 68000 can never produce hatching or other glitches in the video display by accessing RAM at the wrong time. Because of this interleaving, the 68000 accesses RAM at 3.92 MHz, half of the full 783 MHz rate, during the display of a horizontal line of the screen. This is done in the following way: the DMA circuitry puts a word from RAM into the video shift register; while the register is sending out those 16 bits serially to the screen, the 68000 uses RAM for its own purposes; then the cycle begins again with the DMA circuitry.

When the video display is doing a horizontal or vertical retrace, however, the 68000 gets exclusive use of the RAM at its full speed, 783 MHz. This has a significant effect on the average speed of RAM access. Out of the 45 μs (microseconds) for each horizontal display line, over 12 μs (about 27 percent of the time) are occupied by horizontal retrace. Of these 12 μs, about 0.5 μs is used to send data to the sound and disk-speed circuitry, while the rest is available to the 68000. Furthermore, out of the 16,626 ms (milliseconds) used to draw each complete screen, 1.258 ms (about 7.6 percent of the time) are devoted to vertical retrace. Of this, about 14 μs are used for sound and disk-speed control (representing the control work done at the end of the equivalent of 28 unused horizontal lines of video), leaving more than 1.244 ms for the 68000 to access RAM at full speed.

To summarize, the ROM is always accessed at 783 MHz, regardless of screen display. The RAM is accessed at 3.92 MHz during screen display and at 783 MHz otherwise. The average speed of the system is around 6 MHz.

One memory area of interest is the sound buffer. Along with associated hardware, this buffer enables you to create four channels of arbitrary sound while using no more than 50 percent of the 68000's computing power. The 68000 performs look-up operations every 44 μs on up to four 256-byte waveform tables; the result of these lookups is placed in a 370-byte sound buffer, from which the sound hardware fetches 1 byte every 44 μs to deliver to an 8-bit digital-to-analog circuit (DAC). An internal VIA (versatile interface adapter) can also be used to generate a single square-wave tone while using an insignificant part of the 68000's computing power.

Mass storage: The Macintosh uses a custom version of the Sony 3½-inch disk and drive (see photo 4). The drive can store 400K bytes on a single-sided 3½-inch disk; the Mac is designed to be able to use double-sided drives to get 800K bytes per disk, an option that Apple may pursue at a later date. The standard Sony 3½-inch disk (used to date by Hewlett-Packard and other vendors) puts 70 tracks of data at 135 tpi (tracks per inch) onto each disk. At Apple's urging, Sony now makes the drive in another model that has 80 tracks of data at 135 tpi. As a comparison, the Hewlett-Packard HP 150 uses the 70-track version and conventional sectoring to get 270K bytes per single-sided disk.

In addition to the change to 80 tpi, Apple contracted Sony to modify the
drive in several other ways. Two changes allow the Sony drive to mimic the behavior of the Lisa “twiggy” drives (which were originally chosen for use in the Mac): disk ejection under software control and variable disk-rotation speed. The first change allows the Mac to ensure that a disk is correctly updated before it is surrendered to the user (that is, you can’t take a disk out of the drive until the Mac software permits it). The second change enables the Mac to record onto the disk at a constant linear density (which means you can put more data on the outermost tracks), as opposed to the constant radial density approach most computers use (which puts the same amount of data on each track regardless of position).

The Macintosh’s drive rotates under software control between 390 and 60 rpm (revolutions per minute) and transfers data at the rate of 489.6K bits per second (bits as recorded on the disk, not decoded data bits). Most computers use a disk-controller chip instead of the processor to control the drive. The Mac (like the Apple II) uses its processor to directly control the drive. Because the Macintosh can control more disk-related parameters than the Apple II (the variable motor speed, for example), Macintosh owners will be treated to an even greater wealth of copy-protection schemes than Apple II owners enjoy. Also, the Macintosh drive uses modified group code recording to encode data onto the disk. This technique, invented by Steve Wozniak for use with the Apple II, encodes 6 bits of data into an eight-transition group that is recorded onto the disk surface.

**Keyboard:** The keyboard has 58 keys; the left Shift key is split on the international version of the Macintosh, giving it a total of 59 keys. The keyboard includes Return, Caps Lock, and Shift keys in their usual places, two Option keys, and a cloverleaf command key (see photo 5). Combinations of the Shift, Caps Lock, and Option keys give each key up to six meanings: the command key acts as a modifier and is often used with a letter key as the keyboard substitute for a mouse-selected menu item. The keyboard contains an 8021 microprocessor and is connected to the main system by a four-wire bidirectional serial connection. The keyboard is on both ends use the same kind of square modular plug found in most telephones.

**Mouse:** The Mac’s one-button mechanical mouse, about the size of a pack of cigarettes, is essentially the same as the Lisa’s; it differs only in the shape of the plastic housing. The mouse is used to position the cursor on the screen; when you slide the mouse over a horizontal surface, the cursor moves in the same direction on the screen.

**Serial bus:** The Macintosh’s serial bus is very important because it is the way that most future peripherals (except the 3½-inch disk drive and the keypad) will connect to the computer. The bus can run in two modes: with an external clock, it can transfer data at up to 1 megabit per second; with internal clocking (which embeds clock bits in the data stream itself), it can transfer data at up to 230.4K bits per second. The latter scheme will be used to connect most peripherals, which need only a low to medium data-transfer rate, to the Macintosh in a passive daisy-chained line. This scheme implements what the Mac’s designers call “virtual slots.”

Virtual slots have several advantages over conventional hardware peripheral slots. They reduce the potential problems inherent in any added mechanical connection (a serial interface connector has fewer pins than a typical interface board). They reduce RFI (radio-frequency interference) by keeping the main box leakproof and allowing easy, inexpensive shielding of the serial line. By deciding that peripherals will supply their own power, the Macintosh designers were able to streamline the power supply of the main box without worrying about the power needs of unspecified future peripherals. Finally, virtual slots eliminate the need of peripheral cards to insert themselves somewhere in the computer’s memory map; the unchanging memory map creates a known, unchanging system architecture that all software designers can be assured of, regardless of the peripherals connected.

The virtual-slot scheme is both practical and elegant; it offers a simple, standard way to connect unspecified future peripherals. The 230.4K bit-per-second data-transfer rate is high enough to meet the needs of most peripherals—printers, modems, plotters, music synthesizers, and so on. However, one class of add-on card will not work using this scheme: processor cards like the Microsoft Softcard, which allow a computer to run another processor’s software. Such cards require full access to the data and address lines and will not work via a serial “virtual slot.” As a result, despite some rumors to the contrary, the Macintosh will never use IBM PC- or MS-DOS-based software.

**Power supply:** Apple designed two power supplies for the Macintosh. The first one uses a 60-watt switching power supply similar to one used in the Apple II family; it can operate on 85 to 135 V AC at either 50 or 60 Hz. For technical reasons, use of this power supply would have delayed
the introduction of the machine, so Apple designed and produced a simpler nonswitching power supply (105 to 130 V AC, 60 Hz) for initial use in the first U.S. models of the Macintosh. The first switching power supply will be used later in the year for the international model and possibly for the U.S. model.

The supply was designed to drive two twicky disks; when the design was changed to include two 3¼-inch disks instead, the supply had a sizable margin of unused power.

**System Software**

As stated before, the Macintosh contains 64K bytes of ROM accessed at 783 MHz. The ROM contains most of the Mac operating system and a set of optimized 68000 routines called the Macintosh User-Interface Toolbox. The operating-system software interacts at the lowest level with the hardware; it includes such things as device drivers and memory- and file-management routines. The toolbox contains various routines that let you manipulate windows, text, the mouse, pull-down menus, desk accessories, dialogue boxes, fonts, and other aspects of the Mac user interface. These are high-level routines that perform the details of such complicated operations with minimum programming on the application designer’s part. For example, the window-management routines take care of correctly redrawing the display when a window is moved or changed. For more details, see the text box “The User-Interface Toolbox.”

The designers intend for you to access all ROM routines indirectly via the 68000 “line 1010 unimplemented” instructions, which receive their addresses from a table in RAM; this table can be changed to point to other routines, thereby allowing future versions of Mac software to patch the inevitable bugs that will be found in the Mac ROM. Because the application drives the ROM routines (instead of the other way around), the Macintosh is an “open” system whose behavior is completely determined by the contents of the disk inserted into it—that is, software designers can use the ROM routines to create a “standard” Macintosh application, or they can write their own code to create an application that behaves the way they want it to.

Although the designers of the Macintosh have a general philosophy of allowing only one application program to be open at a time, they have included in the main menu a collection of short, useful programs that can run without forcing you to end your current program. Apple calls these programs **desk accessories**. Many of the accessories are simply conveniences—the clock accessory, for example, shows you the current date and time—but a very powerful accessory is called the **scrapbook**. Ordinarily, you can cut and paste data from one document to another by cutting the data into the clipboard, loading the new document, and pasting the data; this process would be tedious if you had several items of the same type to cut and paste. The scrapbook is a sequence of data items—text or graphics—that can be stored or recalled together, thus minimizing the number of document changes and allowing you to recall often-used data items easily. The scrapbook is actually implemented as a disk file; as a result, it tends to be rather large.

System software reacts to all peripherals on an asynchronous basis—peripherals compete for the attention of the 68000 by sending it interrupts, which the 68000 services according to the level of the interrupt. This keeps the 68000 from being tied exclusively to a peripheral—for example, to the 3¼-inch disk drive waiting to get up to its full speed—when it could be doing something more useful. The Mac’s designers have managed to do this even with high-speed peripherals that usually require the full attention of a processor. For example, disk and serial-port routines have been dovetailed to permit the use of both peripherals at the same time.

**Disk Reliability**

Reliability was one of the main reasons that Apple decided to use the 3¼-inch Sony disk drive instead of the 5¼-inch twicky drive. (A pro-
jected shortage of twiggy drives was another reason.) Apple is expecting the Macintosh to be the first real consumer-oriented computer and it sees the magnetic medium as being more likely to fail than the electronics. The Sony 3½-inch disk is better suited to the consumer environment. The drive can hold an acceptable amount of storage per disk and the small disk, with its rigid shell and normally closed access window, is less likely to suffer from bad handling than a conventional 5¼-inch floppy disk. In addition, the magnetic medium is connected to a steel hub that the drive mates with and rotates. This is an improvement over 5¼-inch floppy-disk drives, which clamp the Mylar edge of the center hole. The 3½-inch disk hub is designed to get accurate enough disk-head placement to make a data density of 135 tracks per inch possible.

The data on the disk is encoded in a way that enables the Macintosh to recover from some disk medium or disk file errors. The file directory is duplicated in a normal disk file (which can be used if, for some reason, the directory is damaged). Also, each block of data on the disk includes a 12-byte identifier that gives the file number, sequence-within-file number, and date/time stamp for the data in the rest of that block; this can be used in many situations to recover most or all of the data on the disk.

Applications and Languages

Neither application software nor a language is included in the basic Macintosh package. However, a two-program set will be available for $195; both programs require the recently introduced Imagewriter printer to print things out. The first program is MacPaint, the drawing program we looked at earlier. Created in house by Apple, MacPaint is limited to drawings that will fit on one 8½- by 11-inch page. MacPaint is unlike the Lisa drawing program (Lisa Draw) in that it manipulates the drawing on a bit-by-bit level (a Lisa Draw drawing is stored as a collection of elementary objects—circles, text, boxes, etc.). This representation makes some things, such as arbitrary erasures, easier on the Mac and other things, such as deleting a single object within the drawing, harder.

The second program in the set is MacWrite (figure 3), which was created out of house for Apple and can handle documents up to 10 single-spaced or 20 double-spaced pages. Like Lisa Write, MacWrite can handle multiple fonts and sizes as well as variations achieved by adding any combination of five modifiers—underline, bold, italic, outline, and shadow.

Apple Macintosh Pascal, Assembler/Debugger, BASIC, and Logo will cost $99 each; the first two will be available during the second quarter of 1984, and the other two will follow in the third quarter. The Logo is from LCS/1, which developed Apple II Logo. Both the BASIC and Pascal compile on a line-by-line basis into an intermediate pseudo-code, which gives them the speed of compiled languages while retaining the interactive nature of interpreted languages. Both languages use separate windows for program source code and output, and both can be debugged on a line-by-line basis. Both have graphics and mouse commands that call on the toolbox routines in ROM, and both use floating-point arithmetic routines (in RAM) that meet the IEEE-754 floating-point standard.

Mac Pascal, which was created out of house, is interesting in that it is the only Pascal I know of that can be executed interactively. Another nice feature is its syntax checker, an item that can be called from its “Run” menu. This menu item is often handy for finding those petty syntax errors to which Pascal code is prone.

Mac BASIC was created in house by Donn Denman, who worked on Apple III Business BASIC. An interactive, multitasking BASIC, it can ex-

Figure 3: The MacWrite word-processing program.
execute multiple copies of the same program or multiple programs simultaneously; each program and each running task has its own window.

Other Apple programs announced for delivery in 1984 include Mac Terminal (which emulates the DEC VT-52 and VT-100 and Teletype ASR33 terminals—available first quarter, $99). Also planned are Mac Draw (an object-oriented drawing program) and Mac Project (a scheduling and project-management program). These are both Macintosh versions of two Lisa application programs; each costs $125 and will be available in the third quarter of 1984.
Third-Party Software

Apple has not spent all its energy trying to write all the software that the Macintosh needs. Instead, it has created two exemplary Macintosh packages and gone to third-party software developers to get them to create the bulk of available Macintosh software. Apple estimates that by the time you read this, the Mac will be in the hands of more than 100 software vendors.

At the time this was written, some software developers had made commitments to market Macintosh software. Microsoft Multiplan and BASIC will be available at the Mac's introduction; Microsoft File, Chart, and Word will be available by mid-February. Lotus is working on converting its popular 1-2-3 spreadsheet program. Software Publishing Corporation will have its PFS File and PFS Report programs available sometime in April.

Optional Hardware

The Macintosh uses Apple's new $495 dot-matrix Imagewriter printer, the only printer that is supported by the current print driver within the Macintosh. To get its level of graphics and text quality (see listings 3a through 1c), the Imagewriter usually stays in a graphics mode that prints a single column of dots for every byte sent to it by the Mac. However, the Imagewriter can print text in three modes: a high-resolution mode (listing 1b), a medium-resolution mode (listing 1c), and a draft mode that uses the printer's built-in character set for quick text-only printing. (I found I prefer the medium—over the high-resolution text.) Although the Imagewriter could hardly be called fast, it is not unacceptably slow, and it is considerably faster than the Apple Dot-Matrix Printer running under the Lisa computer's parallel port.

Two other pieces of hardware are an external disk drive (at $395, available during the first quarter) and a numeric keypad ($99, at introduction). The external disk drive connects to the main unit via a dedicated "second disk" connector in back. When the keypad is connected, the keyboard line runs from the Mac, through the keypad, and into the keyboard itself. Another product, announced but not scheduled, is external hardware that will give the Mac IBM 3270 emulation capability.

Documentation and Training

In its ads, Apple is stressing the necessity of going to a Macintosh dealer and trying the computer out. Once you have bought it, though, you will probably be learning how to use the Mac on your own. Apple will help you in this process by providing you with a cassette/disk combination. You boot up the 3½-inch disk tutorial and listen to the interactive lesson provided on the cassette. (Of course, you have to have a cassette player.) Although I have not seen the cassette/tutorial disk program, I think it will work well; text-only tutorial programs are fine, but many buyers of the Mac will benefit from the warmth of a human voice teaching them.

I saw final-draft copies of only two Macintosh product documents. Explore MacPaint is a booklet (about 25 pages) that teaches you about MacPaint by showing you what it does. It is very easy to read because it has more pictures in it than text. MacWrite is much longer and looks more like conventional documentation. It is sensibly divided into three sections: "Learning MacWrite" (a do-by-example tutorial that shows you most of the features of the program), "Using MacWrite" (a "cookbook" showing how to accomplish many common tasks), and "Reference." All in all, the documentation should be quite good.

Service

The Macintosh has no user-serviceable parts. Unlike the Lisa computer, the Mac is not meant to be opened by the user; you are expected to return your Mac to an authorized Apple service center for repair. The Mac comes with Apple's standard 90-day parts-and-labor warranty. You can also buy a one-year maintenance contract. According to Apple, other service plans will be available, including options for large-volume purchasers of the Macintosh.

Caveats

I wrote this article after two days of meetings with various members of the Macintosh staff, studying preliminary Mac documentation, making numerous phone calls to Apple, and working for several days (over a period of weeks) with a Macintosh computer. I used several final-draft versions of MacWrite and MacPaint, though I occasionally found operating-system features that "crashed" the system or weren't yet implemented. Apple was still making minor changes to both software and pricing when this was written.

Commentary

There is a lot to like about the Macintosh; it is a superb example of what American technology can do when given the chance. The simple, compact, economical design, the virtual slots, and the enhanced performance of 128K bytes of memory because of the 64K-byte ROM code are all important innovations done well.

I'm glad that Apple decided to go with a Sony 3½-inch disk (as compared to the Lisa 1, which needs special, expensive, hard-to-get twiggy floppy disks). However, I am disappointed that both Apple and Hewlett-Packard have used nonstandard formats that are incompatible with each other. It would have been nice to start the widespread use of the Sony microfloppy with a standard disk format, but the incentive to sacrifice standardization for performance is one of the drawbacks of a competitive industry.

I also feel strongly that the basic Macintosh package should include two disk drives. With a one-drive system, it will take at least eight disk swaps to back up a 3½-inch disk. How many people (especially novices) will go to this trouble, and how many will suffer when they don't? (I am not alone in feeling this way; the first thing two BYTE editors said when they first saw the Macintosh was, "Only one disk drive? You've got to be kidding!"") After numerous disk swaps when trying to load MacPaint from one disk and a drawing from another, I am convinced that most users will eventually buy the second disk drive.

At the time this was written, Apple was committed to a totally unbundled pricing of the Macintosh—that is, the basic Macintosh package (at $1995 to $2495) includes the main unit, the keyboard, the mouse, necessary cables, a tutorial disk, and a disk containing the operating system. Everything else—MacWrite, MacPrint, all languages, the Imagewriter printer, and the second disk drive—is priced separately. Since manufacturers want to claim the lowest possible price for their products, unbundling is common (IBM, for example, introduced the IBM PC with a low-end model, 16K bytes of memory, and a cassette port for $1265). True, the low-end Macintosh
is far more complete than most manufacturers' low-end products, but Apple has taken unbundling farther than any other microcomputer vendor—no one has sold a computer without BASIC (or some other language) in years.

A usable Macintosh system with MacWrite, MacDraw, a programming language, and the Imagewriter printer costs from $2589 to $3189; a second disk drive will add another $935. Apple would be wise to make this package available at a discounted package price, just as it now does for the Apple Ile. Apple contends that the Macintosh will become a home machine because office users will take it home a few times and like it enough to buy themselves one for their personal use. However, the Mac is still too expensive to penetrate the home market significantly; that will be left to less expensive machines, such as the Commodore 64, the IBM PCjr, the Apple II family, and the Coleco Adam.

Finally, I have to point out that, although Apple's advertisements call the Macintosh a 32-bit system, its MC68000 processor is generally regarded as a 16-bit processor (the limiting factor is its inability to deal with multiplicands greater than 16 bits). This is no different from the vendors of some other 68000-based microcomputers, but I hate to see Apple hyping a machine that easily stands on its own merits.

Conclusions

Exactly a year ago, in a product description of the Apple Lisa computer, I said, "Technology, while expensive to create, is much cheaper to distribute. Apple knows this machine is expensive, and is also not unaware that most people would be incredibly interested in a similar but less expensive machine. We'll see what happens."

Now we have seen what has happened, and it is rather impressive. The Lisa computer was important because it was the first commercial product to use the mouse-window-desktop environment. The Macintosh is equally important because it makes that same environment very affordable. It is also important because it is a second-generation design that, in several areas, improves on the original.

The Macintosh will have three important effects. First, like the Lisa, it will be imitated but not copied. In the year since the Lisa was announced, dozens of hardware and software companies have announced products that duplicate part of the Lisa user environment—the mouse, the windows, the integrated software. Some, like Microsoft's mouse-based series of packages and Visicorp's Visi On, have tried to mimic that environment on a smaller, less expensive machine (the IBM PC) with only partial success.

In a similar way, companies will be out to imitate the Macintosh, but their attempts will be less successful. Those companies that try to imitate the Mac on other platforms will have trouble matching its price/performance combination. So far, attempts to imitate the Lisa by enhancing an existing computer (usually an IBM PC) have been given the benefit of the doubt because they are less expensive than the Lisa; attempts to imitate the Macintosh will now have a harder time because the Mac with software is about as cheap as the husk hardware alone.

The only other way to match the Mac would be to design an entirely new system that would be comparably priced. This will probably not be attempted; only a few corporations have the ability to duplicate Apple's design and manufacturing effort, and still fewer will make such a large financial commitment. (Apple is the only American company that does not live under the tyranny of next quarter's profits; if any company tries to duplicate Apple's effort, it will probably be a Japanese one.) Those that try will find it hard to create similar technology that competes with the Macintosh in size and price; Apple is confident that a number of its components and manufacturing techniques will be difficult to copy. Even though Apple has suffered from carbon-copy Apple II machines, it does not expect to have the same thing happen with the Macintosh.

Second, the Macintosh will secure the place of the Sony 3½-inch disk as the magnetic medium of choice for the next generation of personal computers. I was disappointed when I first saw that the Mac used the 3½-inch disk—"Another disk format to contend with," I thought, "and you can't use disks from the Lisa." You will be able to use Mac disks with the new Lisa 2; see "Apple Announces the Lisa 2," on page 84.) Once I had heard Apple's line of reasoning, though, I had to agree with its choice. Hewlett-Packard's HP 150 is the only other major computer to use the Sony 3½-inch disk to date; Apple's use of it will tip the scales in Sony's favor, and other manufacturers will follow.

Third, the Macintosh will increase Apple's reputation in the market; in fact, to some people Apple will be as synonymous with the phrase "personal computer" as IBM is synonymous with "computer." The Mac will compete with IBM's PC, not its cheaper sibling, the IBM PCjr. Many business users will stay with the "safest" IBM PC. However, people new to computing and those who are maverick enough to see the value and promise of the Mac will favor it. The Mac will delay IBM's domination of the personal computer market.

Overall, the Macintosh is a very important machine that, in my opinion, replaces the Lisa as the most important development in computers in the last five years. The Macintosh brings us one step closer to the ideal of computer as appliance. We're not there yet—at least, not until the next set of improvements (which, in this industry, we may see fairly soon). Who knows who the next innovator will be?"
At a Glance

Name
Macintosh

Dimensions
9.75 by 9.75 by 13.5 inches

Weight
Main unit, keyboard and mouse—22.7 lbs.

Power Requirements
105–130 V AC, 60 Hz (U.S. model): 85–135 V AC, 50/60 Hz (international model)

Memory
128K bytes of RAM, 64K bytes of ROM

Standard Configuration
Main unit with 128K bytes of RAM, 64K bytes of ROM, integral Sony 3½-inch disk drive, 9-inch video monitor, two serial ports; external mechanical mouse; external keyboard

Mass Storage
One Sony 3½-inch disk drive; 3½-inch disk holds 400K bytes and is encased in a rigid plastic housing

Video Display
9-inch monitor, noninterlaced 60.15 Hz image, 512- by 342-pixel resolution

Pointing Device
Mechanical mouse

Keyboard
Detached keyboard; 58 keys (59 in international version); autorepeat; two key rollover

Hardware Options
Second disk drive, keypad, Imagewriter printer, security kit (for chaining computer to table)

Software Options
MacPaint (drawing program), MacWrite (a simple word processor), Mac BASIC, Mac Pascal, others (see text)
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