

# Commodore International

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## Financial News

# Commodore Has Another Record Year

*With sales for the year ended June 30th reaching \$1,267.2 million together with record profits of \$143.8 million and an impressive looking balance sheet the past year has been an outstanding one for Commodore International. Here for all our employees to read we include the shareholders letter of our Chairman Irving Gould and President Marshall Smith, from our Annual report, which probably best describes our activities.*

## To Our Shareholders

*We are pleased to report that in our 26th year of business Commodore's growth rapidly surpassed the billion dollar sales mark. It was also the seventh consecutive year of record sales, net income and earnings per share.*

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### Sales Gain 86%; Net Income Up 63%; Earnings Per Share Rise 63%

For fiscal year ended June 30th, 1984 sales reached \$1,267.2 million, an increase of 86% over fiscal 1983 sales of \$681.2 million. Net income rose 63% to \$143.8 million compared to last fiscal year's record income of \$88.0 million, before extraordinary item. This is \$4.66 per share versus \$2.86 per share in fiscal 1983, representing a gain of 63%.

As an important barometer of our finan-

cial strength, Commodore has for the fifth consecutive year been able to report a return on average shareholders' equity of over 50%, by attaining 55.8% for the last fiscal year.

### Computer Sales

During fiscal 1984 we continued to consolidate and improve upon our position as the world's leading microcomputer producer by selling more microcomputers than any other company. Sales outside of the United States rose to \$607.5 million. This represents 47.9% of our total sales.



# Financial News

Furthermore, European sales of home computers began to show the same kind of dramatic growth which we have been experiencing in North America, and Commodore benefits from a traditionally strong presence in these markets.

The Commodore 64 is the world's top selling microcomputer and continues to gain in strength. This is consistent with Commodore's philosophy to further enhance present products while designing new microcomputers to deliver the best price/performance available to the user. By maintaining this philosophy we are able to solidify our strong position in the sale of home computers. Later in this report you will read of the innovative new computer products that are designed to give us a stronger profile in the sale of business computers starting in calendar year 1985.

## Peripheral Sales

With our extremely large installed base of computers the aftermarket for peripheral device sales is expanding rapidly. This is particularly true of the home computer sector where systems are more typically built up over a period of time. In the 1984 fiscal year our peripheral sales were \$455 million compared to \$125 million in the prior year. This represents 35.9% of our total sales. We are continuing to add to and expand the range of peripherals we offer to our users.

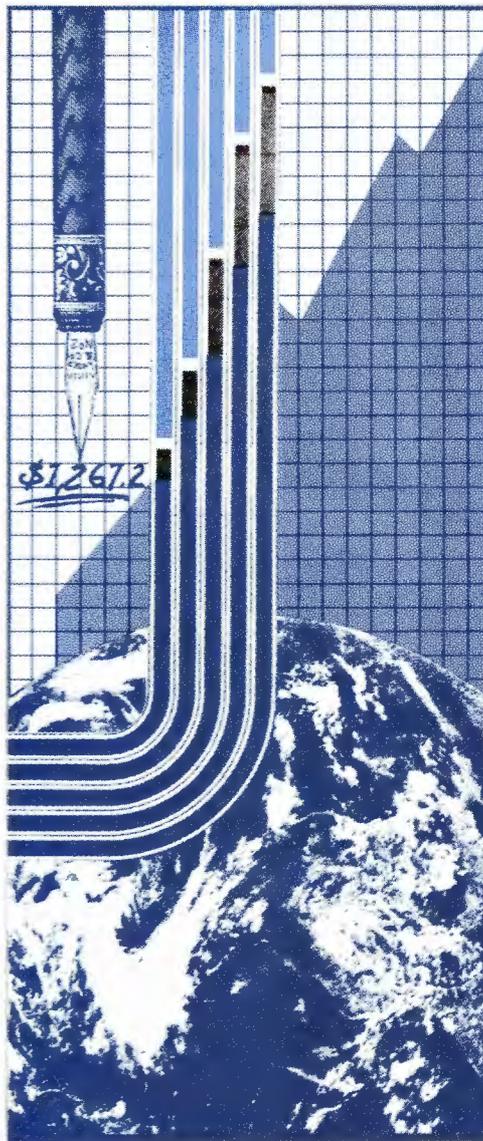
## Software Sales

The establishment of our own software division in fiscal 1983 is now beginning to show results. In the 1984 fiscal year our software sales were \$82 million. We now have a comprehensive range of software titles and are introducing highly innovative products that are emerging as market leaders. We are also setting precedents by introducing a new computer to the market which includes a software package of built-in applications. Our new Commodore Plus/4 is being released with an integrated package of wordprocessing, file management, spreadsheet analysis and graphics.

## Semiconductor Operations

Our considerably expanded semiconductor operations are now exclusively dedicated to meeting our internal demand. During the year we successfully started up our new five inch wafer fabrication line at our Costa Mesa, California facility.

Licensing agreements have also been



reached with other semi-conductor designers for potential production of some of their microprocessors in our semi-conductor manufacturing facilities.

## Financial Indicators

Increased attention to asset management has resulted in a healthy financial condition at fiscal 1984 year end. Our financial ratios all improved over last year, and we feel confident that our financial strength will continue to improve.

Higher asset utilization and profits strengthened our balance sheet considerably at fiscal 1984 year end. The company's net worth grew to \$324 million from \$191 million while total liabilities fell \$68 million. The debt/net worth ratio is the most favorable the company has reported in several years.

Banking institutions in the United States, Canada, England and West Germany recently extended new medium-

term revolving credits to Commodore subsidiaries totaling \$190 million which, in addition to over \$120 million in existing lines of credit worldwide, will give the company the financial flexibility to pursue its growing markets.

## Manufacturing Growth

During the year we have continued to consolidate our production facilities and control centered in Hong Kong. Several changes and new appointments were made in our management structure in the Far East to streamline and strengthen coordination to meet our growing needs. We successfully expanded our Far East operations with an additional facility in Taiwan. In our computer assembly operations we have completed the start up phase of a new 230,000 square feet facility in Britain.

## Technology

Commodore continues to invest heavily in various technologies which support our future product growth and cost competitiveness. During the 1984 fiscal year our expenditure in research and development was \$40.3 million. Shortly after the end of fiscal 1984, we concluded arrangements to acquire Amiga Corporation of Santa Clara, California. Amiga is at the forefront of unique microcomputer design technology which, supported by Commodore's technological, manufacturing and marketing strengths, will enable us to capitalize on new and exciting microcomputer advances.

## Management

Commodore is dedicated to achieving high volume and low-cost products for the markets we serve, under the leadership of strong management to direct our increasing international and diverse operations.

On behalf of the management of Commodore we wish to acknowledge our appreciation for the support of our employees, customers and suppliers and to thank you—our shareholders, for being an integral part of our continuing success. We look forward to another successful year as we begin fiscal 1985.

Marshall F. Smith  
President and  
Chief Executive  
Officer

Irving Gould  
Chairman of The  
Board

September 30, 1984



## Financial Return in Graphic Form

**Net Sales**

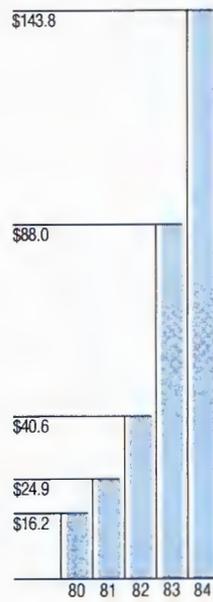
(millions)



**Net Income**

before extraordinary item

(millions)



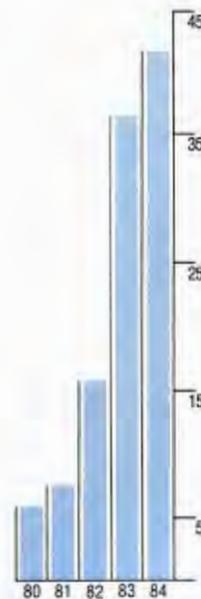
**Earnings Per Share**

before extraordinary item



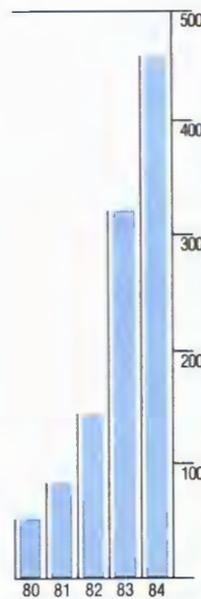
**Research and Development Expenditures**

(millions)



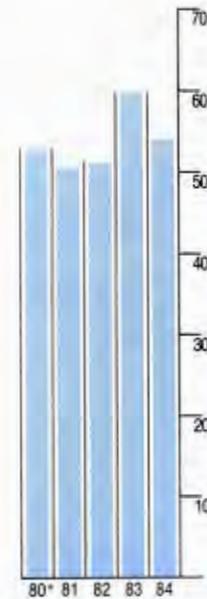
**Gross Profit**

(millions)



**Return on Average Shareholders' Equity\***

\*Excludes credit for reversal of United Kingdom taxes





## PRINCE PHILIP VISITS COMMODORE COMPUTERS



*HRH the Duke of Edinburgh looks with interest at the latest products on show from Commodore UK at the International Garden Festival in Liverpool, England.*

Computers for every level of user is the theme of the colourful Commodore Stand, in the Dome at the International Garden Festival, Liverpool which was recently visited by Queen Elizabeth II's husband Prince Philip seen here in the photograph.

"Growing with Commodore" is a working display of the full range of Commodore equipment, from the VIC-20 introductory home computer to the well-established range of business systems, recently expanded to include the 8296

business computer.

Visitors to the Stand are able to try out the computers which feature programs written for the Festival as well as some of the hundreds of programs on sale from Commodore. The demonstration program answers questions about the Commodore computer 'family', as well as questions about Commodore's Stand at the show: its design, tiling, brickwork and plants, all of which are in keeping with the horticultural theme of the Festival.

Stack Computer Services, one of Commodore's main Merseyside dealers, is providing information service on the Stand, as well as demonstrating accessories and peripherals for the Commodore range.

The only computer company at the Festival and the only microcomputer manufacturer to have received the Royal Warrant, Commodore was the first to bring a personal computer to the market. A world leader, Commodore has sold more than 1 million computers in the UK alone.

Sixteen Commodore 64 computer systems will also be featured on the Mersey Regional Health Authority Stand in the Arena. Visitors will be able to take a fitness test by providing answers to a special program written for the Festival.

## Computer Games Speed Medical Recovery

In Britain patients recovering from serious head injuries are playing computer games to speed their recovery. Brian Cummins, the neurosurgeon in charge of an experimental scheme at Bristol's Burden Neurological Institute, believes that thousands of people injured in road and sporting accidents could benefit from such activity.

Patients given two or three hours a day of computer games after being discharged from hospital are showing rapid improve-

ments in hand-eye coordination, concentration, memory and reasoning ability.

Cummins said: "When head injury patients are sent home they usually have great difficulty concentrating and tend to spend all day slumped in front of the television, but a rehabilitation programme based on computer games keeps them at it."

The recovery of one 19-year-old patient was accelerated by six months, Cummins believes. Richard Bennett was severely in-

jured in a motorcycle accident last October and was in a coma for more than a month. He then spent two months in a wheelchair. At the end of February he started playing computer games for three hours a day and is now almost fully recovered.

A trust has been set up to buy microcomputers for loan to patients and to hire a psychologist to run the Bristol programme.

## Commodore's Super Blitz Helps Dyslexic Children

Super Blitz, Commodore U.K.'s popular game for the VIC-20 and 64, proves to have a rather special quality: it is helping dyslexic children to overcome their learning disability.

A teacher of dyslexic children has written to Commodore to say that Super Blitz has helped her pupils and her own severely dyslexic son to develop the correct scanning habits associated with reading.

Super Blitz is based on an aircraft bombing mission over an unknown city of skyscrapers in which King Kong is hiding. The player controls the strategic unloading of bombs from the aeroplane, which gets lower each time it passes across the screen. The aim is to destroy the buildings quickly enough to avoid crashing into one. When a building is isolated by the bombing, King Kong appears,

and extra points are scored by bombing him, too.

The program's teaching value is in the movement of the 'plane across the screen. As the child concentrates on following the 'plane from left to right, moving down a space with each pass, he follows the correct tracking for reading and does not suffer from erratic eye motions back to the left.



## UK & General News

### Rudi's VIC 20 Blazes On!

Once a Commodore man, always a Commodore man, would seem to be Rudi Westfold's approach. When a disastrous fire struck his home, one of the casualties in the estimated £12,000 worth of damage was to Rudi's most prized possession—his VIC-20 computer. First it was blackened and half-melted in the blaze, then it was completely swamped with water from the firemen's hoses. In fact, it still bears the tide-marks to prove it! Yet, remarkably, in spite of suffering what no computer was ever designed to suffer, Rudi's VIC-20 is still in perfect working order!

Rudi, from the Isle of Grain, Rochester in Kent, works for the Swiss company, Labaz, selling pharmaceuticals to teach-



**RUDI WESTFOLD SHOWS OFF HIS AMAZING VIC 20 HOME COMPUTER**

*Blackened, melted and swamped with water by the fire brigade, Rudi's amazing home computer is still in perfect working order!*

ing hospitals and works mainly from home. "Since everyone was talking about a personal computer being of help to people like me working from home, I decided to look into the matter," explains Rudi. After four or five weeks of looking at all the personal computers on the market, asking questions, comparing features, trying the keyboards, checking the kinds of programs available, and comparing the prices, Rudi concluded that, "everything

pointed to the Commodore. When independent sources also recommended it, I went ahead and bought the VIC-20."

To say that he was happy with his choice is to state the obvious, because he has already replaced the damaged computer with another VIC-20. He also now has a full range of accessories, including a printer/plotter, a super expander, a data base and word processor, and an 8K expander.

Like most executives, he uses his computer almost entirely for business. His two most important requirements are the ability to obtain instant analysis reports on actual sales versus projected and targeted figures and up-to-date expense records, both personal and business. Rudi also uses his VIC-20 for business correspondence: "I do what so many businessmen do. I prepare a basic letter and then amend it for each of my customers."

Games? "Strangely enough," says Rudi, "when I was looking into personal computers, I was very impressed with the quantity of intelligent games, including those from America, which are available for the Commodore machine, but ironically now that I have one, I don't have that much time to play!"



*In the photograph Mr. Kenneth Baker is seen shaking hands with Howard Stonworth—General Manager of Commodore U.K.*

### Government Welcomes Further Investment By Commodore in the UK

Mr. Kenneth Baker MP, Minister of State for Industry and Information Technology recently welcomed the announcement by Commodore Business Machines that they are expanding their operations in the UK and have established a manufacturing plant at Corby.

Mr. Baker said:

*"The decision by Commodore to expand their operations in the UK and set up a manufacturing plant at Corby shows*

*that Britain has again proved an attractive location for an international company. The project involves an initial investment of some £6 million rising to £20 million. It should immediately create some 600 jobs, with an additional 400 as production increases. This will enable Commodore to produce about 350,000 microcomputers per month.*

*"Regional financial incentives have been used in constructive way to help this project to go ahead in Britain and bring the benefits of a significant number of new jobs for Corby and a welcome addition to our growing information technology related industries."*

### Sales Success For Commodore Computer Business Packs

Following Commodore U.K.'s nationwide launch of the 700 Series Computer Business Pack, over 250 systems were sold to small businesses throughout Britain within days. Now, several months into the scheme sales of the packages continue to boom.

The Computer Business Pack has been specifically devised by Commodore U.K. to help small businessmen overcome many of the problems they face when buying and operating a computer system for the

first time.

Finding the right computer at an affordable price; searching for appropriate programs to set up a database, handle wordprocessing and carry out financial simulations can be a time consuming and expensive task for the businessman.

Starting from as little as £1,400 for a complete working system, Commodore's cost effective solution is the 700 Series Business Pack. It comprises a choice of one of five powerful 700 Series computers,

together with a printer, disk drive, all connecting cables and free business software including Superscript II, a powerful wordprocessing package with spelling checker; Superbase, a comprehensive database program, and Calc Result, a spreadsheet program for dealing with calculations and financial simulations.

The 700 Series Business Pack is available through Commodore's nationwide dealership chain.



## Commodore Supports Canadian Organizations With Promotion Proceeds

TORONTO—Commodore Business Machines Limited recently presented the Canadian Amateur Hockey Association and the Canadian Association for the Mentally Retarded with funds raised through a Commodore-sponsored promotion held in conjunction with the Canadian Motion Picture Distributors Association.

Over \$35,000 was raised by the sale of The Commodore 1984 Movie Poster Calendar and was divided between the two organizations. Richard G. McIntyre, Commodore's National Sales Manager, presented cheques to Jim Gates, CAHA Director and Barry Wymant, nine, of the Scitron-sponsored Commodore team and to Jacques Pelletier, CAMR Acting Executive Vice President and Jeff Oswin of the CAMR Toronto staff.

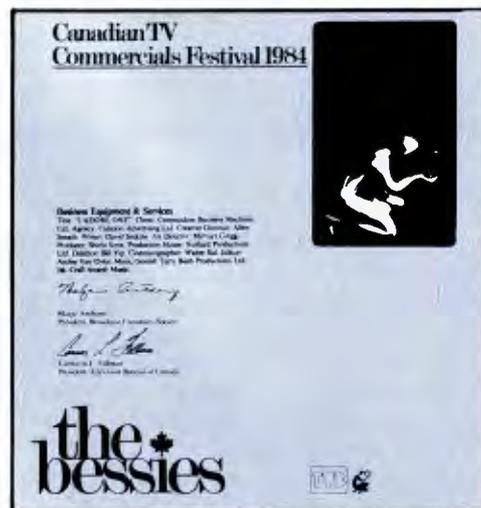
Commodore also supports the CAHA through its national Custom Team Uniform program which annually supplies sweaters and stockings to 500 CAHA teams across Canada.

"The development of the Movie Poster Calendar was an avenue to assist two very worthwhile organizations and is in keeping with Commodore's policy of community involvement and support of organizations which assist youth across the country," said Richard McIntyre, National Sales Manager of Commodore.



Richard McIntyre, National Sales Manager, Commodore Business Machines Limited (second from left) recently presented cheques for financial support to the Canadian Amateur Hockey Association and the Canadian Association for the Mentally Retarded. The funding was raised from the sale of The Commodore 1984 Movie Poster Calendar. Accepting the cheques, which amounted to over \$35,000, were Jim Gates, CAHA Director (L), Jeff Oswin of the CAMR (centre), Jacques Pelletier, Acting Executive Vice President of the CAMR (second from right) and Barry Wymant, a player in the CAHA.

## Advertising Wins A Bessie Award



In Canada our Commodore 64 "I Adore One" commercial has won two awards at the recent Bessie Awards show. Specifically it won the best in its category for "Office Systems and Services" and a "Craft Award" for the music.

The Bessie Awards show is the top commercial festival in Canada featuring all the best work produced over the past year in this country.

We are obviously very pleased and would like to congratulate all who contributed to the development and production of this commercial.



## VIC 20's Interfaced with Million Dollar Hospital System

To the Editor:

I am enclosing some pictures that we took at Emory University Hospital's cardiac cath lab. The computer system we are using to analyze the x-ray system's operation is a Commodore VIC 20.

With all the computers on the market today that we could have used, we found the VIC system to be most useful. Some engineers are a little surprised at what we have interfaced with a million dollar piece of equipment, but I believe the Commodore computers are worth their weight in gold.

I would also like to say we have had great support from the local Commodore store, A&S Software, in Atlanta.

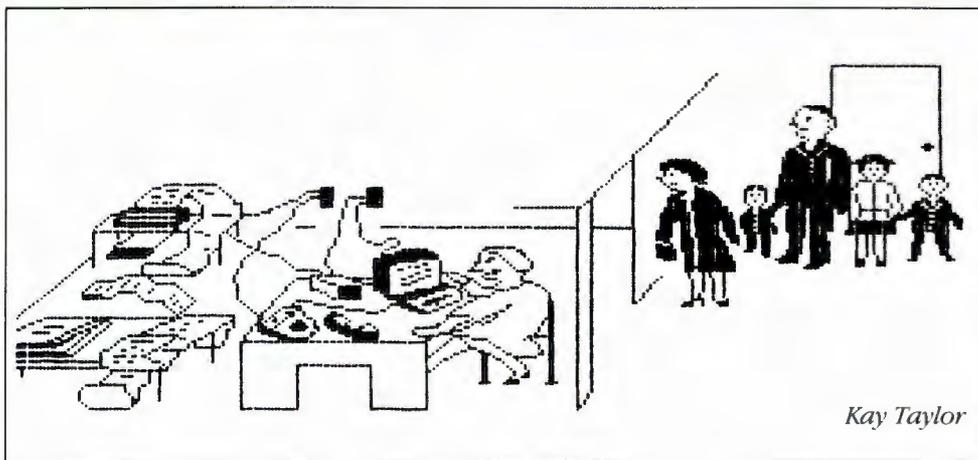
In the future we plan to interface more Commodore computers with our cath labs. And we are looking forward to seeing the new products in the future.

William C. Latimer  
President, Latco, Inc., Kennesaw, Georgia



*A VIC 20 analyzes the x-ray system's operation at Emory University Hospital in Georgia.*

## Commodore International Announces New United States Credit Facilities for \$125,000,000



*Kay Taylor*

*Mother . . . what do you mean you can't go to the movies with us because your new modem microchip has just bypassed the Telex mainframe and you're online with the White House!*

Commodore International Limited has announced that its U.S. subsidiary (Commodore Business Machines, Inc.) has signed a \$125,000,000 credit facility with seven (7) banks led by Manufacturers Hanover Trust and Continental Illinois Bank. The agreement provides for \$100,000,000 in a revolving/term credit which matures July 1, 1989 and \$25,000,000 in additional lines of credit.

The loan will provide funds for working capital needs and provide for continued growth in the U.S. market.

Commodore International Limited now has available worldwide credit facilities in excess of \$300,000,000. This includes \$168,000,000 in long term commitments from consortiums of banks in England, Germany, Canada and the previously mentioned U.S. Agreement.



### Alexander M. Haig, Jr. Joins Commodore International Board

General Alexander M. Haig, Jr., former U.S. Secretary of State, has joined the Board of Directors of Commodore International Ltd.

In announcing General Haig's associ-

ation with Commodore, Mr. Gould said, "We are delighted that General Haig has agreed to join the board of Commodore. Our company is particularly oriented to the international market, and his experi-



ence and reputation will be very helpful to us."

In addition to serving as a director of Commodore, General Haig has also been retained as a consultant to the company.

General Haig commented, "Commodore has set an example for other international companies over its 25 years of existence, in providing excellent value to consumers while keeping costs down and developing a consistent flow of new products. I look forward to being associated with this pioneering company, as it builds on its strong leadership position in the microcomputer world market."

Prior to serving as President Reagan's first Secretary of State, General Haig was president and chief operating officer of United Technologies Corporation. He is currently chairman of United Technologies' European and Asian Advisory Councils and a director of Metro Goldwyn Mayer-United Artist Entertainment Company, MGM/UA Home Entertainment Group, Allegheny International and Leisure Technology, Inc. He also was a member of President Reagan's Commission on Strategic Forces (Scowcroft Commission).

General Haig, a 1947 graduate of the U.S. Military Academy at West Point, served under President Richard M. Nixon as Deputy Assistant to the President for National Security Affairs, and later as White House Chief of Staff (1973-74). He was appointed by President Gerald R. Ford as Supreme Allied Commander, Europe, a position he held from 1974 until 1979, when he retired from active military service.

General Haig, 59, holds a Masters Degree in International Relations from Georgetown University, has attended Columbia University's Graduate School in Business and holds a number of honorary degrees from both U.S. and overseas universities.

### Bob Gleadow Appointed Chief Operating Officer of Far East

Bob Gleadow, a 35 year old Commodore veteran of 10 years, has been appointed by President Marshall F. Smith as Chief Operating Officer for the Far East. This key function has now consolidated a number of major Far East operations under a single coordinated management. Bob will function out of Hong Kong as his major base where he now lives with his family. During his ten years with Commodore Bob has a particularly broad experience of production, finance and marketing. Prior to moving to Hong Kong a couple of years ago, Bob had held several major positions

with Commodore including that of General Manager of the UK company where he originally started with Commodore. Bob has also been involved in much of the running of our extensive European operations. This streamlining of management functions should benefit our operations in this area. A new General Manager of our Japanese operations, Mikio Izumi has been recruited from Mitsumi Electronics and will be working closely with Bob Gleadow. We wish them both every success.



## John Kelly Named Controller



Mr. Kelly had been vice president, finance, for Commodore Business Machines Inc., the U.S. sales subsidiary of Commo-

dore, for one and a half years before assuming his new position with the parent company. "John is an extremely experienced controller," said Mr. Marshall Smith, "and his familiarity with two of our most important markets, the U.S. and Canada, is a strong asset."

In describing his new post, Mr. Kelly said, "One of the key factors behind the remarkable growth of Commodore has been its extremely stringent financial controls. This is particularly important in the mass market, where maintaining high volume depends on our ability to balance an acceptable margin for retailers with outstanding value of the computer-buying public. This becomes even more complex when you are a market leader in as many

countries as Commodore is now."

Mr. Kelly, 47 years old, has had a varied and distinguished career to date in the field of finance. He has held the positions of vice president, finance, at Massey Ferguson, Inc.; senior vice president and comptroller at The Bank of Montreal, Canada's second largest bank; and vice president, finance, at Nedco Ltd., a subsidiary of Northern Telecom Limited in Canada. Immediately prior to joining Commodore, he spent four years as vice president and general manager of the distribution division of Russel, Burdsall & Ward, a major U.S. industrial fastener company.

A native of Philadelphia, Mr. Kelly graduated from La Salle College in 1961. He is married with five children.

## Commodore Appoints Donald Greenbaum Treasurer

Mr. Greenbaum brings to Commodore more than ten years of experience in the corporate banking division of Manufacturers Hanover Trust company, which he left as vice president. At Manufacturers Hanover, Mr. Greenbaum had responsibility for lending to the microcomputer industry, as well as airline, pharmaceutical and consumer product companies.

When asked about his reasons for joining Commodore, Mr. Greenbaum said, "I have been associated with Commodore's top management for over seven years and I have very high expectations for the com-



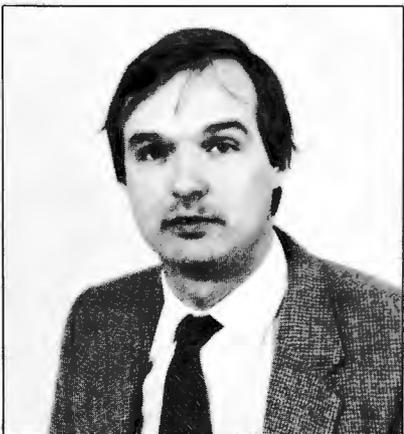
pany, based on my observations during that time. Commodore already has itself in the number one position in the worldwide home computer market, and part of my job will be to help maintain that success."

Mr. Greenbaum holds a BA in Economics from Rutgers University, and an MBA from Baruch College. He was Adjunct Professor in the Finance Department of Pace University from 1980-82.

Mr. Greenbaum is married with two children, and lives in Westfield, New Jersey.

## Commodore Names

## Adam Chowaniec Vice President, Technology



Adam Chowaniec has been appointed vice president of technology at Commodore International Limited.

In this position, Dr. Chowaniec will be responsible for the international microcomputer company's engineering operations, reporting directly to Mr. Smith. Dr. Chowaniec, who joined Commodore in May 1983, had been director of semiconductor development.

Dr. Chowaniec came to Commodore from Northern Telecom, where he was manager of LSI design for the silicon components group. He is a pioneer in the design and applications of large scale and very large scale integrated silicon microcircuits, and in the development of sophisticated computer-aided design and manufacturing (CAD/CAM) techniques for this purpose.

"We are extremely fortunate to have a man of Adam's caliber and reputation,"

said Marshall Smith, President of Commodore. "Commodore already has a strong reputation in the semiconductor field with landmark products like the 6500 series microprocessor. Our strength as an integrated manufacturer requires us to remain at the forefront of this technology."

A native of Leeds, England, Dr. Chowaniec holds a B.Eng degree and PhD from Sheffield University, and an MSc in electronic engineering from Queens University, Kingston, Ontario.

Dr. Chowaniec is the author of a large number of papers and articles in the field of electronic engineering, and has two patent applications pending.

He is married with two children, and lives in Berwyn, Pennsylvania.



## SPEECH SYNTHESIS

### Making Computers Talk

**Human Speech Production:** Many of the techniques used in adding voice to computers depend on an understanding of human speech production so its a good idea to start with a brief review of how you and I create speech everyday as we communicate with one another. The three major parts of the human speech mechanism include the lungs, the vocal cords and the vocal cavity.

### Human Speech

In the human generation of speech sounds, air is forced from the lungs past the vocal cords and through the vocal cavity. The force of the lungs determines the final amplitude, or loudness of the speech. When the vocal cords vibrate, they interrupt the air stream entering the vocal cavity and this adds the "buzzing" sound present in most speech sounds. For a demonstration of this place your hand on your voice box or "adam's apple" in your throat and say the word "voice", stretching out the vowel sound as much as you can. You will be able to feel the vibration of the vocal cords. Note that you can easily change the vibration rate or pitch of your voice. The vowel sounds of English are examples of what is called "voiced" speech. But not all speech is "voiced". You may

have noticed that in the word "voice", you didn't feel any vibrations at the end of the word where the "s" sound occurred. In this kind of sound the vocal cords don't vibrate and they are called "voiceless" or "unvoiced" sounds.

The unvoiced sounds in speech are produced when air is forced past relaxed vocal cords. Usually, the actual sound of unvoiced speech is generated by forcing air through a constriction in the vocal tract which produces audible turbulence. You can feel the turbulence in the front of the mouth by saying a long "s" or "sh" sound. Any speech sound can be classified as voiced if the vocal cords are vibrating and unvoiced if the vocal cords are not vibrating.

The vocal cavity extends from the lips back to the vocal cords. This is the most complicated part of the system because depending on the shape of the vocal tract, certain frequency components of the speech signal are emphasized or attenuated. Musical instruments do the same thing and we change the frequencies that are emphasized (these are called resonances) by an instrument by moving fingers over different holes in a flute or clarinet or by opening and closing different paths in a trumpet. We change the resonances of our vocal tract by moving

our tongue, jaw or by opening and closing a connection to the nasal cavity by moving the velum.

**Speech Synthesis with Mathematics:** The complete mathematical representation of the effect of the vocal tract on the breath stream pushed from the lungs and past the vocal cords has its basis in the physical laws describing the propagation of sound waves in a tube of varying cross-sectional area. The full description is quite complex but with suitable simplifying assumptions, an approximate solutions can be generated.

The basis for one such solution to the speech modeling problem is shown in figure 1. It illustrates the basic two-source model used in the Commodore Speech Module to generate speech. The two different excitation signals are fed to a switch that connects one of them at a time to the vocal tract model. In this way, the system can generate voiced or unvoiced sounds. The vocal tract model is a small processor that performs a large number of multiplications and additions on the input signal to simulate the effect of the vocal tract on real excitation signals. The result is a signal that is perceived by our ears as being very close to natural speech.

Figure 1 also shows the parameters that must be defined to specify an artificial speech signal. Once a set of these parameters is specified, a constant steady state sound can be generated. Speech, however, consists of rapidly varying sounds and in order to use the model to generate speech-like sounds, the parameters must be rapidly varied. For example, at a voicing transition, the position of the voicing switch much be changed. Also, since the frequency content of speech signals is constantly changing, the parameters defining vocal tract shape must be frequently changed. At stops, such as the "p" and "d" sounds, the amplitude parameter must be quickly changed.

When the parameters shown in figure 1 are carefully determined, the resulting speech signal sounds quite natural and is highly intelligible.

### Commodore Speech Module

The parameters listed in figure 1 include amplitude, pitch, and several vocal tract parameters. Usually these parameters are updated at a 20 millisecond rate, although the Commodore Speech Module allows the user to choose from several update periods. If the same parameters are fed to the module at different rates, the speed of the resulting speech is changed. The effect is not the same, however, as

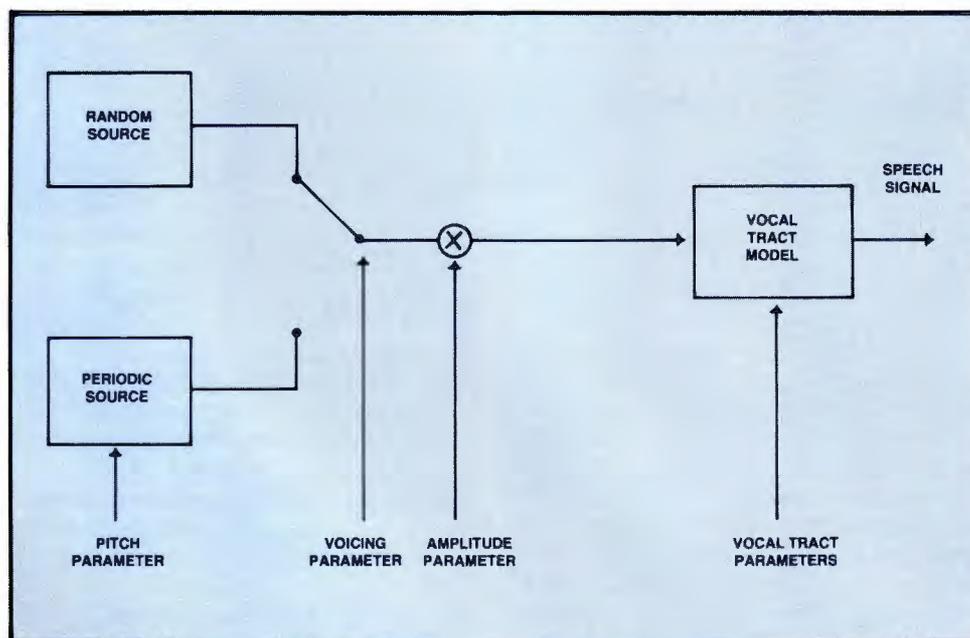


Figure 1—The basic speech synthesis model showing the control parameters



# Technology News

changing the speed of a tape recorder or a phonograph since the pitch of the voice is not changed. Instead, the words themselves appear to be spoken faster or slower.

**Coding:** A complete set of speech parameters is usually called a frame. Frames may be stored in RAM or ROM and then directly fed to the Speech Module. The Module accepts two frame lengths: a 12 byte frame, and a 6 byte frame. The longer 12 byte frame allows a more accurate representation of the speech parameters but requires more memory to store the data. In either the 12 or 6 byte frame mode, the Module does a simple decoding of the data stream in hardware to recover the desired parameters.

It is also possible for the CPU in the 64 to decode data using special purpose software contained in the speech module. Several schemes have been developed at Commodore for decoding data from even lower data rates than can be achieved using the decoding provided in hardware. Speech parameter decoding software has been provided in the Module for the most attractive technique. In this approach, a 12 byte frame is generated from a greatly compressed representation. The advantage is that even less data is required to generate the speech while maintaining good speech quality. The disadvantage is that a small part of the CPU time is required to decode the data.

## Talking Software

Commodore has developed the capability to collect, analyze and then to code speech data for preprogrammed software applications. Using this facility, speech data was developed for the internal Magic Voice vocabulary, and for applications such as the "A Bee C's," the "Counting Bee," and the other early educational talking cartridges. Incidentally, the techniques for effectively including voice output in educational software are also under development.

**Text-To-Speech:** One of the interesting capabilities available with the Magic Voice speech module is "text-to-speech." This is when you type in whatever you want and the computer speaks it. Unfortunately, there are some problems with this. For one thing, when you type "wind," the computer doesn't know if you mean the air or what you do to a watch. Lots of other examples are common in English. Also, so many words in English have irregular spellings that it takes a very big computer program or table to consider each

exception to a rule. Hence, only the largest computer programs can translate most English text to speech. Even you or I occasionally come across a word we can't pronounce.

An even more serious problem concerns the addition of prosodics to the speech signal. The prosodics are the pitch and inflection that allow us to detect emotion and sometimes meaning in speech. What we are really asking for is a computer program that can do interpretive reading, and to do such a thing requires not only a very

good understanding of linguistics, but also artificial intelligence (AI). AI is a very young field that is just now beginning to be applied in microcomputer systems. As the techniques in this field become better understood, we can expect the prosodics of text-to-speech systems to improve.

Commodore will be offering software this year that will enable you to generate speech from any text that you type into the 64. The "Voice Lab" cartridge will allow you to write talking programs in BASIC using the "SAY" command.

## High-Tech Glossary

**Bi-polar transistor** A transistor formed by sandwiching either a negatively doped region between two positively doped areas, or vice versa.

**CAD (computer-aided design)** Used as a tool in designing integrated circuits. Information about past circuits, stored in a data base, is combined with data about the function of new chips to enable the CAD system to design a new circuit.

**Chip** The nickname for an integrated circuit formed on a tiny piece of semiconductor material.

**Diffusion furnace** A high-temperature furnace used in making chips. It diffuses dopants into silicon wafers, which transforms the silicon into a semiconductor material.

**DIP (dual in-line package)** The protective packaging, resembling a caterpillar with stubby metal legs, that houses a chip. It is usually made of plastic but can also be ceramic.

**Doping** The process of selectively introducing impurities (called dopants) such as phosphorus, boron or arsenic into a pure material like silicon or germanium to create a semiconductor.

**IC (integrated circuit)** A group of inseparably connected circuit elements formed on and within a single substrate, usually silicon.

**Ion Implantation** A very precise method of introducing impurities into silicon to create a semiconductor material. Single ions of dopants are shot into the silicon under carefully controlled conditions.

**LSI (large-scale integration)** Generally applied to integrated circuits containing 40,000 + transistors.

**Microprocessor** An integrated circuit designed to carry out commands and do calculations.

**MOSFET (metal oxide semiconductor field-effect transistor)** A transistor formed by creating islands of negative and positive silicon connected by a channel of silicon

dioxide, over which a layer of metal is deposited.

**Photomask** Used as part of the photographic process in making chips. It protects (masks) the areas that should not be exposed to light, so those areas can later be etched.

**Planar process** A commonly used method for creating integrated circuits. A layer of silicon dioxide is formed on the surface of a silicon wafer and is then photolithographically patterned to permit the introduction of dopants.

**Plasma etching** A process in chip making. After a wafer has gone through photolithography certain areas are etched using an excited chemical vapor called a plasma.

**Reticle** A picture in negative of one layer of a circuit. Reticles at MOS Technology, Inc. are created on glass coated with photosensitive emulsion and are usually ten times the final size of the circuit.

**Semiconductor** A material that is less of a conductor than copper but more of a conductor than glass, whose electrical properties can be altered to suit specific needs.

**Silicon** An element used in pure crystal form as the base material for many kinds of integrated circuits.

**SINCAP** The final protective coating on a wafer. Composed of silicon nitride, it prevents damage to the microscopic circuits.

**Solid state** Electrical functions carried out in a solid medium.

**Transistor** A semiconductor device that acts as either an amplifier or current switch.

**VLSI (very large-scale integration)** Integrated circuits that contain as many as 100,000 transistors and up.

**Wafer** A thin disk of semiconductor material, usually about five inches in diameter, on which hundreds of identical chips are fabricated.

**Yield** The percentage of usable chips produced by the wafer fabrication process.



# Editorial

## THE MEASURE OF SUCCESS

There are many ways in which success can be measured not least in an exciting growth market like that of microcomputers and consumer electronics. We often talk about market share and growth and in any of these areas Commodore's performance is impressive. However a recent survey done in ELECTRONIC BUSINESS magazine in the USA got me thinking about what our best performance of the last year has been . . . more later.

The survey was made on the top 200 companies in the field of electronics over the past five years from a financial point of view. The survey covered some pretty well known companies such as IBM, Wang, Apple, ITT, Exxon, Texas Instruments and SmithKline Beckman. The results of the survey are included on this page. As can be seen out of the 200 largest companies Commodore International was ranked in first or

second position in all the four major categories researched. An amazing record of consistent performance in a supposedly volatile market. It is not one that has always been so consistently reflected by everyone involved in Wall Street who have at times reacted to the latest rumours and gossip reported in the more emotional areas of the newspapers.

On looking through our Annual Report this year the factor that can easily be overlooked but in fact perhaps represents Commodore International's most impressive performance is our balance sheet. Despite tremendous growth in what has until recently been a very competitive industry Commodore International looks in its best ever financial shape. During the last year the company's net worth grew to \$324 million from \$191 million and the debt to net worth ratio was the most

favorable the company has reported in several years. A further \$190 million of new medium term credits was added to over \$120 million in existing lines of credit worldwide.

As our President and Chairman have put it "this gives the company the security and freedom to pursue our growing markets". This is perhaps our most impressive performance and one "measure of success" which we will be happy to be judged by as we progress through the years ahead.



Kit Spencer  
Vice President  
Commodore  
Electronics  
Sassoon House  
P.O. Box N10256  
Nassau, Bahamas

## Largest Companies In Electronics Industry

### 5-YEAR REVENUE GROWTH RATE

	Percent per year	Rank
<b>Top 10</b>		
Tandem	76.7%	84
Commodore International	68.5%	73
ROLM	58.5%	78
Cray	58.1%	149
CPT	54.7%	135
Paradyne	51.8%	129
Wang Laboratories	50.7%	29
Computervision	47.6%	89
SCI Systems	47.4%	102
Docutel/Olivetti	45.6%	132
<b>Bottom 5</b>		
ITT	-1.5%	4
Cincinnati Milacron	-2.5%	171
LTV	-2.7%	189
AMF	-5.9%	144
Gould	-6.7%	39

### RETURN ON INVESTMENT

	Percent	Rank
<b>Top 10</b>		
Commodore	30.7%	73
Dysan	23.4%	130
Aydin	23.3%	159
Micom Systems	22.7%	190
SmithKline Beckman	22.1%	72
E-Systems	21.9%	65
Tandy	21.8%	22
IBM	20.6%	1
EG&G	20.2%	118
Diebold	19.6%	115
<b>Bottom 5</b>		
Centronics	-8.9%	152
Docutel/Olivetti	-10.8%	132
Texas Instruments	-10.2%	10
Warner Communications	-26.5%	45
Kratos	-32.3%	182

### 5-YEAR NET INCOME GROWTH RATE

	Percent per year	Rank
<b>Top 10</b>		
Commodore International	91.8%	73
Tandem	70.3%	84
Computervision	63.9%	89
Cray Research	58.6%	149
ROLM	58.0%	78
Wang Laboratories	57.7%	29
CPT	54.7%	135
Computer Consoles	53.1%	199
Watkins Johnson	52.2%	139
SCI Systems	47.8%	102
<b>Bottom 5</b>		
Bally	-30.4%	120
AT&T Technologies	-32.4%	2
Scientific-Atlanta	-40.7%	94
AMF	-40.9%	144
Management Assistance	-69.3%	92

### RETURN ON EQUITY

	Percent	Rank
<b>Top 10</b>		
Transitron Electronics	64.1%	186
Commodore International	46.1%	73
Lockheed	31.0%	53
Dysan	27.2%	130
Aydin	25.4%	159
Ford Motor	25.1%	30
Tandy	24.8%	22
SmithKline Beckman	23.6%	72
IBM	23.6%	1
Technicom International	23.5%	169
<b>Bottom 5</b>		
Centronics	-12.7%	152
Docutel/Olivetti	-20.1%	132
Savin	-18.2%	117
LTV	-20.5%	189
Warner Communications	-43.5%	45

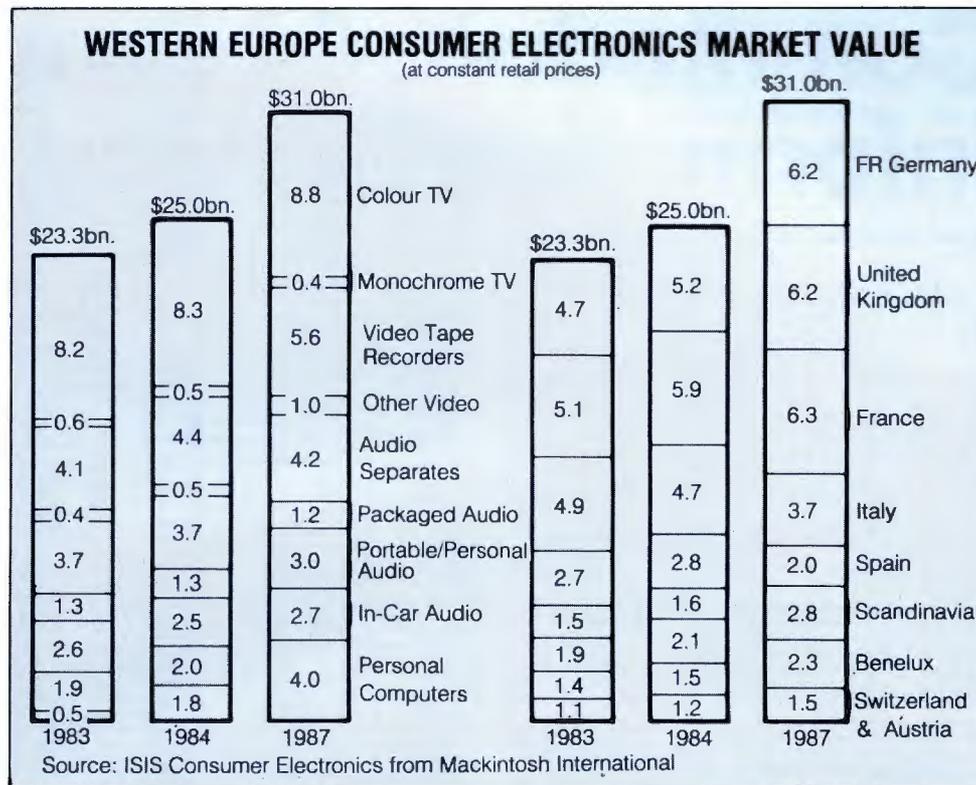


## Western European Consumer Electronics Markets

The market research firm Mackintosh International recently published some interesting figures on the European consumer electronics markets in *The Financial Times*. The figures are reproduced here.

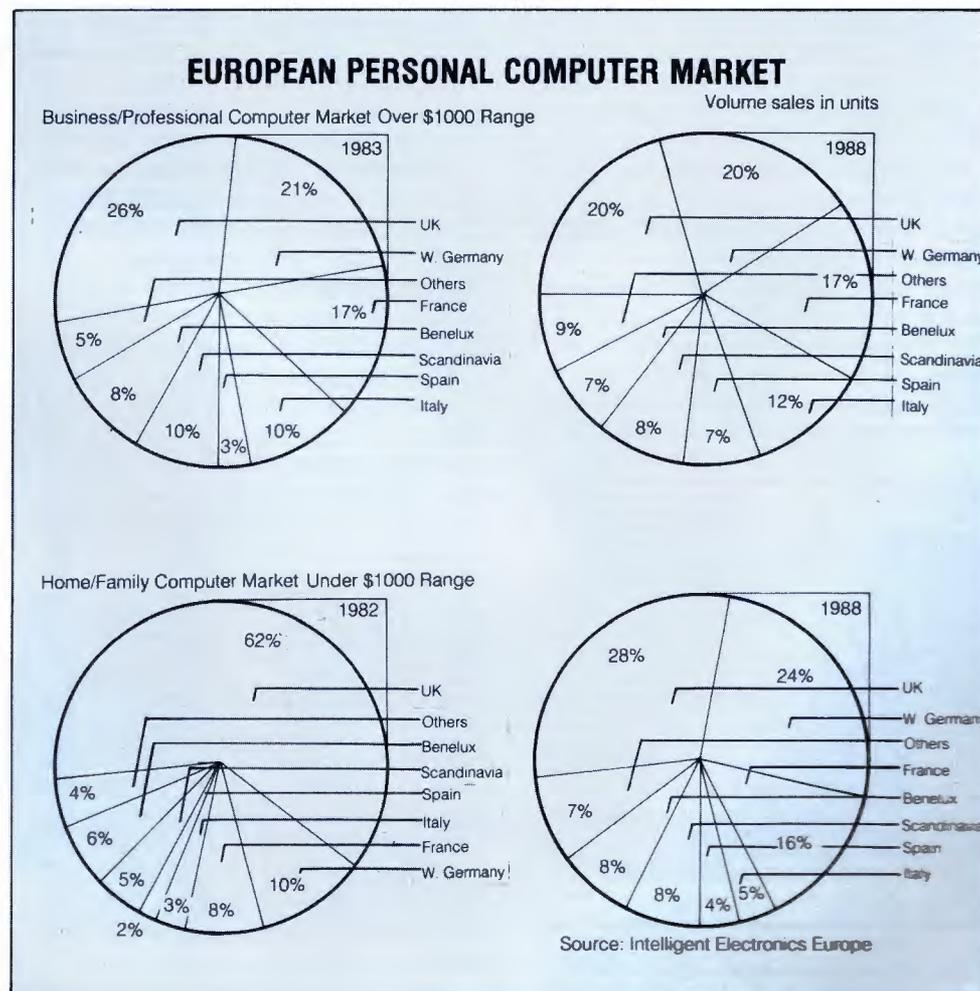
As can be seen the market for personal computers is forecast to grow from \$0.5 billion in 1983 to \$1.8 billion in 1984 and to \$4.0 billion by 1987 (prices are at retail value). As can be seen by 1987 the computer market is forecast to be almost half the value of the color T.V. market and has the highest growth rate of any category.

Last year the United Kingdom was the single biggest market just ahead of France and Germany. However by 1987 they are all forecast to be of almost equal value with Italy the next largest.



## The European Personal Computer Market

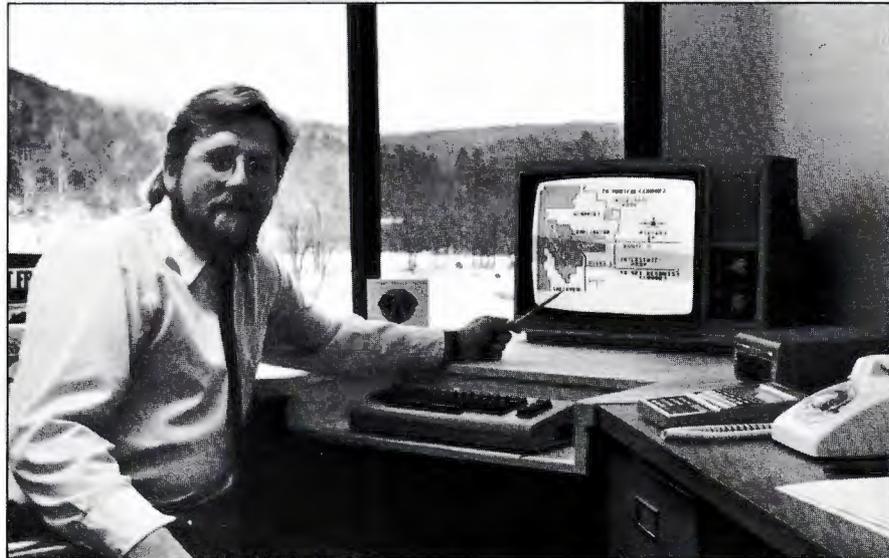
As an interesting comparison another survey was also published in *The Financial Times* on the European Personal Computer market. This time the source was a company called Intelligent Electronics. While the survey revealed similar general figures the United Kingdom was given a particularly large share of the Home market in 1982. As this survey was based on units and not value this would have reflected a bias at that time for the very low cost Sinclair machines that originated in that market.





## Commodore 64 Provides TV Information Service By Radio

*In the state of Vermont, in the town of Montpelier, a radio station called WNCS, 96.7 FM, broadcasts contemporary adult rock music 24 hours a day. But hidden inside that signal is a most unusual subscription television channel, providing maps, entertainment, news and weather reports—all generated on a Commodore 64.*



John Eddy broadcasts maps of the Vermont resort areas as one of his company's services.

The name of the company doing this is GRAIL, an acronym for Greater Resort Area Information Link. The resort areas covered by the system presently include Stowe, Sugarbush and the surrounding towns. The basic concept behind the service is to provide information on weather conditions, things to do and places to visit within the viewing and listening area of the person using the system.

A television in any room of a hotel or condominium that has subscribed to the service can receive the GRAIL on channel 4. When that channel is tuned in, the nor-

mal WNCS radio programs are received as well as the maps, text and graphics of the GRAIL transmission. For the person staying in one of these rooms, the GRAIL acts as a radio station, a 24-hour weather and skiing condition station and guide to entertainment and attractions in the area.

### The Service

One of the other features of this service that makes it "viewer friendly" is the fact that it can be updated almost instantly. According to John Eddy, President of the GRAIL Corporation, the company was updating the system twice a day this past winter—once in the early morning and once late in the afternoon. He imagines that this will decrease to once a day in the summer, under normal circumstances. But if something warrants an additional update, it is easily implemented.

The service, as it is currently set up, contains 40 screens of information. Of this number, 22 are devoted to resort area information and entertainment. The remaining 18 pages are advertising. The policy of the GRAIL is to accept no advertising for hotels, condos or other lodging. As John explains, everyone watching the service is already staying at some lodging facility, and allowing competitive advertisers would create conflict within the system.

Two sections of the system are called "Night Life" and "Vermont—The Extra-Ordinary State". Night Life contains information on movies, bands, concerts, plays and any other special events. The Vermont section contains information on covered bridges, waterfalls, barns and other places of interest.

### How It All Began

The idea behind the GRAIL was born during the Winter of 1981. John Eddy, who also owns Mad River Video, explained the conception of the GRAIL system to me in a telephone conversation. Part of John's work with Mad River Video included delivering prerecorded movies to various homes and condominiums. Whenever he delivered a movie to a room occupied by visitors, he was inevitably asked "What's the weather supposed to be like tomorrow?" and "Have you heard how the skiing conditions are today?"

Being an entrepreneur, John immediately recognized the potential for a subscription information service that would answer these questions for people. Looking around the rooms he visited, he tried to envision a way to get that information into those rooms. After ruling out the telephone, the front door (mail or carrier delivery) and the chimney, he noticed the television. The idea of using the television



The GRAIL gives Vermont visitors up-to-date weather information.



# Application News

seemed the most promising way to supply information to the rooms, but it also presented some difficult problems.

During the summer of 1982, after mulling over the basic scheme, John teamed up with Howard Ginsberg, a broadcast engineer and president of Communications Engineering, Inc., in Essex Junction, Vermont. As they discussed the various problems, two seemingly incompatible solutions emerged. The first was the idea of using a personal computer to design and digitalize the information, and the second was the concept of broadcasting that information through an FM radio station.

The technology was already available to broadcast a subscription audio signal through an FM station. This is called SCA and is used by a number of "store music" companies. The combination of this technology and personal computers, however, had not yet been tried out—especially the transmission of a video rather than audio signal.

The search was on for a computer and system software that could handle the text and graphic screens required and was still priced low enough for the application. John says that during this search he was actually thrown out of two computer stores amid cries of, "It can't be done!" After considering a number of computers, they finally made the decision to use the Commodore 64 throughout the system. John says he had talked to engineers and computer hackers and everyone seemed to agree that the Commodore 64 offered the best graphics, memory capability and price for this application. Now it was time for the program.

After confirming that there was no commercially available software for this application, John enlisted the services of fourteen year-old Wilson Snyder of South Burlington, Vermont. Starting in the fall of 1983 and working diligently on the program for almost three months, Wilson created the complete software package. It allowed formatting of screens and the contents contained on them, included a telecommunications package to convert the screens into streams of data which could be sent through a modem, and was run entirely on a timing schedule. After working with this software for many months now, John has begun referring to Wilson as the "Chopin of Computers".

The next step in the process was to find an FM radio station that would lease the SCA frequency to the GRAIL. It was also important for this radio station to be centrally located between the large resort

areas and have a powerful enough signal to reach them. With these criteria and a list of stations in the central Vermont area, the selection of the radio station was simply a matter of deduction. The station that was chosen (and accepted) was WNCS, 96.7 FM, in Montpelier.

The final (and continuing) step was to find resorts, hotels and condominiums that recognized the benefits of this system and would subscribe. This turned out to be one of the easier aspects of the project. In fact, before the system was even powered up, over 500 rooms in central Vermont were signed up for the service.

Then on Friday, December 16, 1983, two years after the initial conception, the Commodore 64 at the GRAIL was turned on, the telephone line to WNCS was connected, the SCA at the station started transmitting and the service came alive.

## System Description

The GRAIL system uses a combination of telecommunication and radio communications to accomplish its ends. This is a unique application of a Commodore 64, used in conjunction with standard radio broadcasting techniques. The modem provides the necessary interface between the digital and analog worlds. Here is a brief description of the entire system and its various components.

The entire information content of the GRAIL originates within a Commodore 64, located in Warren, Vermont. This computer is running the GRAIL system software that controls the information being displayed at any given moment, along with the timing between individual screens. An additional function of this program is to handle the telecommunications routines that actually transmit the data.

Each screen of data is sent through a modem and telephone wires to the FM radio station WNCS in Montpelier. Depend-

ing on which particular screen of data is active, the system can be sending anything from simple text to full color screen graphics. This capability was made possible as part of the custom programming created by Wilson Snyder.

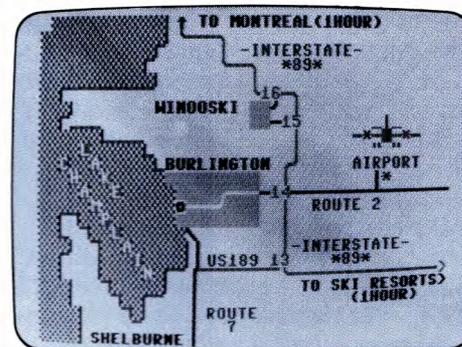
A device called an SCA encoder/transmitter at the radio station receives the data from the telephone line. This piece of equipment is part of what makes this system so unique. An SCA encoder takes an audio input, such as that from a telephone line, and changes it into a radio (SCA) signal of a very specific frequency (67 KHz). The transmitter part of the SCA simply relays the radio signal to the main FM transmitter. The FM transmitter multiplexes the SCA signal with the FM radio signal and the resultant signal is then broadcast throughout the normal FM reception area. For WNCS this includes both the Stowe and Sugarbush resorts as well as the cities of Montpelier and Burlington.

If a resort or condominium has subscribed to the GRAIL, they will be equipped with an SCA receiver. The SCA receiver strips the SCA signal off the radio broadcast and sends it to a receiver Commodore 64. A special program within this 64 translates the data from the SCA back into screens of text or graphics. The output of the receiver 64 is connected to all the televisions in the rooms of the resort or condominium. A television in any room which is turned onto channel 4 will see the GRAIL screens displayed, with full graphics and color.

An additional benefit of using Commodore 64s in this system is in the ability to use the normal radio broadcast, as well as the GRAIL screens. The regular radio signal is combined with the special video signal, so the radio station broadcast can also be received through the television at the same time. In fact, John claims that the quality of the radio station signal is much better than he had anticipated.

## A Last Few Words

The use of Commodore 64s in this application is only one of the many possible ways that personal computers can be used on the leading edge of technology, in fields as diverse as radio, music, dance and weather predicting. It should be an encouragement to computer "watchers" to see that a small group of people can still bring innovation to the mass-market world of computers. It is somehow satisfying to know that the application of personal computers is not limited just to updating old technologies, but is just as well suited for the creation of new ones. C



The system's maps help visitors plan their day.



# VIDEOTEX 64 Package Can Transmit Hi-Res Graphics

Commodore's new VIDEOTEX 64 software package for the COMMODORE 64 combines two trends in the micro-computer industry—graphics and telecommunications. With VIDEOTEX 64, you can create business graphics or other pictures in high resolution color and combine them with text before transmitting them easily over regular phone lines, using a VICMODEM, to other VIDEOTEX 64 users.

Featuring single keystroke switching between interactive text and graphics functions, or between color and monochrome, you create "pages" of information, which can be displayed, saved and recalled from disk, sent and received by modem, edited or printed.

VIDEOTEX 64 features the latest in communications technology. Instead of the traditional ASCII protocol, it uses the new NAPLPS protocol, which has much greater power to create and transmit graphics. VIDEOTEX 64 is simple to use, with just a few menu screens, and users can get on-line help at any time without it interfering with what they are doing.

The business possibilities of VIDEOTEX 64 are enormous. For example, users can make slide shows automatically. Real estate brokers, interior designers, graphic artists and advertising executives are just a few of the numerous professionals who could benefit from the power of VIDEOTEX 64.



*The Commodore Booth at The Consumer Electronics Show where the VIDEOTEX 64 software package was first shown.*

The new package was demonstrated to the trade for the first time at the Consumer Electronics Show in Chicago. Also shown at the Commodore booth was Commodore's other extremely powerful telecommunications tool, EASYCOMM 64. This disk-based terminal emulator runs on the COMMODORE 64. It allows users to transfer messages from electronic bulletin boards and programs in CompuServe's large library to and from their own computer's memory and even directly to disk.

EASYCOMM 64 has been described as one of the most powerful and easy-to-use terminal programs ever developed for

home computers. Using CompuServe's exclusive "B" protocol it offers:

- 100 per cent error detection and correction
- A complete 32K RAM buffer which can capture data from a host system for immediate use or for disk storage for later use
- Printer support, capable of capturing data at 120 characters per second
- 10 programmable function keys to give ID or other frequently-used commands
- Color graphics and cursor positioning

## Marvel® Comics® Superhero Favorites Come Alive

Commodore has entered the spine-tingling world of Super Hero adventure after signing with the Marvel Comics Group and Adventure International to produce and distribute six software programs featuring dynamic comic book favorites, including the HULK™ and SPIDERMAN™. Marvel's new series, called QUEST-

PROBE™ is a unique comic book adventure series, showcasing a different Super Hero in every issue. Unlike any other comic book series, each QUESTPROBE will have a corresponding computer software program, which continues the adventures of the Marvel Super Heroes™. Marvel's own artists have used the sophisticated graphics capabilities of the COMMODORE 64 to make the characters come alive as the player tries to escape the grips of evil!

The original concepts and creative direction behind Marvel's QUESTPROBE were developed by Scott Adams, founder of Adventure International and a pioneer of text adventure games on micro-computers.

Marvel plans to distribute between 11

and 13 million of each comic book that will tie in with the Commodore computer games. The first game of the series—The HULK—is scheduled for Fall release. The series will run on the COMMODORE 64 and the COMMODORE PLUS/4 computers.

Commodore expects the combined marketing pull of the Commodore and Marvel names will help make this series a real success. Children have always enjoyed reading Marvel comic books, and now they can be part of the adventures using their own home computers, as their favorite comic book characters come alive on these graphic adventure programs.

Other Commodore recreational software introduced at the Consumer Electronics Show was SATAN'S HOLLOW and SOLAR FOX.



Get Ready to Read with BJ The Bear  
*BJ the Bear, star of the popular range of educational programs for the Commodore 64, meets one of his creators, Dr. Richard Riding, Lecturer in Educational Psychology at Birmingham University.*

## GET READY TO READ WITH BJ THE BEAR

"Get Ready to Read", the first in a comprehensive suite of educational programs, featuring "BJ the Bear", is now available from Commodore UK for use on the Commodore 64.

Written by Dr. Richard Riding, Lecturer in Educational Psychology at the University of Birmingham in England, and Mrs. Lillian Simmons, Headmistress at Moons Moat Nursery and First School in Redditch, Worcs, the program is available on cassette or disk and is accompanied by a "BJ the Bear" book and a parents and teachers' manual.

Other programs in the series will include "Get Ready to Think" and "Get Ready for Numbers." The "Get Ready" programs will be followed by "Start to . . ." and "Continue to . . ." for the same subjects but at increasingly advanced levels.

The "Get Ready" programs are designed to introduce children of three-to-five years

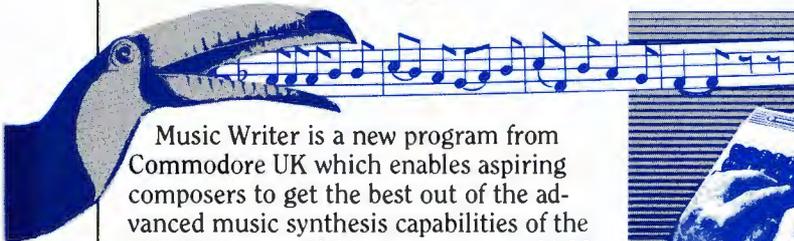
of age to the initial stages of reading.

The A4 size, full colour "BJ the Bear" book is divided into four levels, each containing a different story about BJ, and is designed to be read to the child in order to prepare him for the learning activities of the program, all of which relate to the Bear's adventures. The book also contains simple pictures to match with letters of the alphabet, a guide to the forming of letters of the alphabet, and join-the-dots and colouring pages. A smiling BJ appears on the screen when the child has made the correct decision, and a frowning BJ appears when the child is incorrect.

The manual, which includes a set of progress charts, instructs the parent or teacher on how to prepare for teaching, how to use the programs, how to guide the child through the program, and how to grade their performance.

"Get Ready to Read" is available from Commodore UK at £12.99.

## Making Music With Commodore



Music Writer is a new program from Commodore UK which enables aspiring composers to get the best out of the advanced music synthesis capabilities of the VIC-20. Now available on cassette at £4.99 for the VIC-20 with 8K or 16K expansion, Music Writer allows the user to compose a tune and play it back in various forms.

The software converts the VIC-20 keyboard into a piano keyboard, with a staff appearing on screen, on which the notes of the tune are reproduced. Up to three different voices can be used in the composition, each represented on screen by a different colour.

When the tune is complete, it can be saved on tape and played back with different special effects. For example, by using different voices, or a combination of all three, the tune can be given a richer quality. The user can also change the tempo of the composition or, if desired, produce a much smoother sound by using the program's special legato mode.

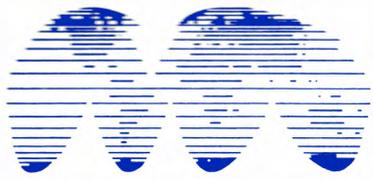


Music Writer on the VIC-20 is complemented by Music Composer, available on ROM Cartridge for the COMMODORE 64 at £9.99. Music Composer allows the 64 owner to compose his or her own music; at the touch of a key the computer keyboard is transformed into a piano keyboard. When the tune has been composed, it can be saved on tape and played back, with the music depicted on screen in either black and white or colour.

Now the tune can be changed and manipulated to give a wide variety of different effects: it can be played in the style of any 3 of 9 instruments, each of which can be pitched in different crochets and quavers.

Other special effects include:

- **Attack/Decay**—allowing the user to adjust the length of time it takes for a note to either reach full volume or fade
- **Waveform**—determining the tonal quality of the sound produced by an 'instrument'
- **Filtering**—giving a choice of which harmonic frequencies, single or combined, are to be heard
- **Vibrato**—a rapid variation in pitch which adds warmth and strength to the sound



## JUST IMAGINE Makes Creative Writing Fun For Kids



Commodore Software has released JUST IMAGINE, the newest program in its educational software line. This innovative program is designed to help children combine visual and verbal skills to create an animated story on the COMMODORE 64.

The program allows you to choose from nine exotic settings (a jungle, the moon, a barnyard, or midtown Manhattan, for example). Country settings can be seen in summer or winter, others by day or night. You then pick from a selection of 50 static characters and objects to put into the setting (a gorilla, cowboy, circus bear, taxi cab, a damsel in distress—as many as you like). After that you can choose three characters who can be made to move around the picture under control of a joystick as you develop the “plot”.

By using the built-in word processor, you write the story about the world that you have just created. Then with the touch of a key, you animate the scene and your story unfolds, complete with sound effects. JUST IMAGINE encourages you to do just that—imagine a story in pictures,

imagine it in words—and bring it all to life.

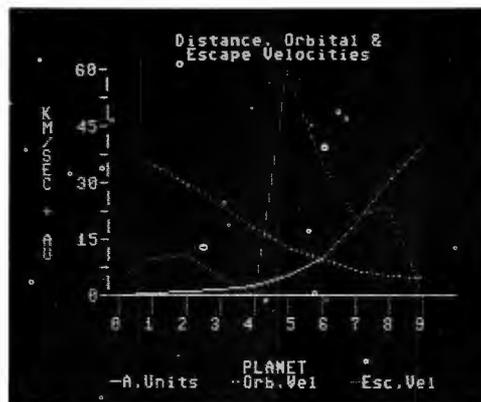
Developed with increasing levels of complexity to appeal to children ages 4-14, JUST IMAGINE encourages spontaneity as well as logic, individual and group effort, and visual as well as verbal skills. Built-in sound effects match the setting and the sophisticated and colorful graphics bring the words to life in a way that will encourage kids of all ages to keep going back for more. When program segments are loading, a selection from 3,000 educational “Fun Facts” appears on the screen.

Commodore recognizes that word processing alone does not provide the creative stimulus to write, and we feel that we've hit on the right combination with JUST IMAGINE by offering a software package that allows a child to pick a picture, enhance it, even animate it and to also write about it.

JUST IMAGINE will run on the COMMODORE 64 computer.

## POWERFUL BUSINESS GRAPHICS WITH B/GRAPH

Commodore has packed power into its new software program, B/GRAPH, power that can easily be channelled into creating colorful 3-dimensional charts, graphs, pie charts, histograms and other graphics for any business or home computer user. B/GRAPH is a professional yet simple-to-use charting and statistical analysis program for the COMMODORE 64, designed to instantly compute and convert any raw data into a graphic representation. Once the information has been input, B/GRAPH produces high-quality graphs, ideal for comparing sales figures, producing regressions and correlations of data values, and performing almost any function available from much more expensive business graphics programs.



B/GRAPH is an effective tool for business presentations or seminars, and special features of this productivity software

program include simple screen color control, multiple graphs and grid overlays, automatic labelling and a menu-driven display structure. Each graph can include up to three “factors” with as many as 100 data points. These graphs can be printed on the COMMODORE MPS 803 printer.

B/GRAPH comes with comprehensive professionally-written documentation and a complete tutorial on graphing, charting and statistics to help new users learn how to take advantage of the many features the program offers.

This unique piece of professional software is so easy to use, it enables business professionals and home users to turn any statistical information into exquisite, three-dimensional graphs.

## Waterloo Products For Commodore 64

Waterloo University is Canada's leading university in computer sciences and has for some time been closely associated with Commodore International. Indeed the SUPERPET and the languages that work on it were first developed there. Now The Watcom group, originating out of Waterloo University, have become involved with the COMMODORE 64. The re-

sult is two new computer languages.

The first of these is Watcom Pascal. This is a full function Pascal conforming to both ANSI and ISO draft standards and extended to support COMMODORE 64 features such as sprites, sound synthesizer and color and bit-map graphics. The documentation accompanying the Watcom Pascal explains the language and is designed to be either a self-teaching tool or a textbook for a study course.

The second product Waterloo Struc-

tured Basic extends the normal Basic system on the COMMODORE 64 to include structured programming statements. These extensions are useful in teaching proper programming methodology using the Basic language. The COMMODORE 64 version is similar to the implementation used since 1980 on their language for the PET. The product is again accompanied by a teaching manual. These products should prove of particular interest to the Educational communities around the world.



*Here we reproduce the product section from our current Annual report on our computer range at the present time.*

# Commodore Products: Computers

Computers are at the heart of Commodore's range of products. As the market has grown, so has Commodore's product line grown to meet the differing needs of its users.

## Home and Personal Computers

In the home computer sector, the Commodore 64 has received acclaim in leading computer magazines as "The Home Computer Of The Year." During the 1984 fiscal year the Commodore 64 also became the top selling microcomputer in the world. As we enter fiscal 1985, we look forward to continued success. The Commodore 16 and Plus/4 will be introduced in time for the 1984 Fall and Christmas selling seasons.

The Commodore 16 is an entry level machine priced extremely competitively in relation to its performance. The Commodore Plus/4 has a similar performance capacity to the proven Commodore 64 but with a strong emphasis on productivity. Although the retail price will be above that of the Commodore 64, it will be sold complete with an integrated package of four productivity programs. These can be instantly called at the press of a key to perform word processing, spreadsheet calculations, database management and graphics. Both of these new computers are compatible with the same range of major peripherals already being sold with the Commodore 64.

## Educational Computers

The Commodore 64 continues to be extremely successful in schools. It is complemented by a new introduction, the Educator 64, completely compatible with all C-64 software.

In Germany, where we sell an estimated 40% of school microcomputers, a special version called the Commodore 4064 has been introduced and is selling well. Commodore intends to continue developing this market, and we believe several of our newly introduced products will be very successful in the educational market.

## Business Computers

Our business computer sales in the last year have been primarily concentrated outside of the United States. The mainstays of our product range have been the traditional CBM 8032 and 8096 models. The latter range has been upgraded with the introduction of the new CBM 8296 which includes integral dual disk drives. Because of the large installed base of its predecessors and the extensive local language software available, the CBM 8296 has been well received in Europe.

During the last year we further developed a strong range of business computers for introduction in 1985. These include an IBM compatible machine with 256K RAM,

expandable to 640K RAM. With Commodore's cost-effective production it is anticipated that we can become a key supplier to the IBM compatible market.

We also are developing a UNIX® compatible machine which we introduced at the Hannover Show in West Germany this year. The machine is multi-user and multi-tasking with 16 bit architecture at an advanced level and will use a Commodore developed interface Computer Universal Shell (CUSH). These new business machines will be introduced into distribution starting in 1985 and will considerably strengthen our overall offerings in this sector of the microcomputer market.

Unix is a trademark of AT&T.

Commodore, CBM and VIC are trademarks of Commodore International Limited.





## Exhibition News



# Stars Twinkle At Commodore International Show

*Aerial View over part of the recent Commodore Fifth International Computer Show held in London.*

The Fifth International Commodore Computer Show, held in London, England in June, was an outstanding success, endorsing Commodore's position in Britain as Number One in the world of micro-computers. Just under 16,000 people packed into the Novotel Hotel over the three days of the Show, the showcase event of the year for Commodore UK.

This year's Exhibition was made particularly special by a number of well-known celebrities who went along to play the latest games and meet the public. World-famous racing driver Stirling Moss was there with his wife and son to demonstrate his prowess at 'Le Mans', while the renowned astronomer, Patrick Moore, gave everyone a few tips on his astronomy program for the COMMODORE 64.

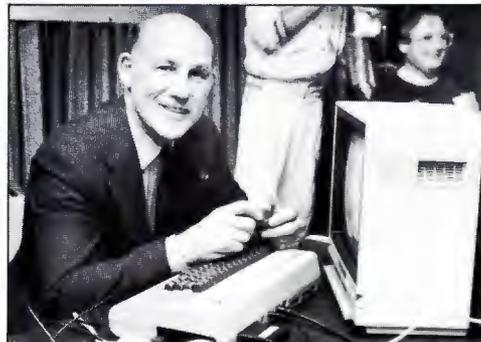
Playing 'International Soccer' (now the top-selling software game in Britain) were superstar footballer George Best and Stevie Wickes from leading London soccer club, Queen's Park Rangers. Meanwhile, three leading personalities from Britain's top Breakfast TV show, Anne Diamond, Wincie Willis and Chris Biggins, gave a stunning performance on Commodore's pinball game.



*Peter Hucker, Goalkeeper with English soccer team Queens Park Rangers, takes on a bystander and one of the UK's best selling games, International Soccer.*



*Patrick Moore, well known presenter of the BBC programme "The Sky at Night" presents a copy of his Astronomy program to a competition winner at the Show.*



*Stirling Moss, world famous racing driver, getting hands-on experience of Le Mans at the Commodore Show. He takes on Chris Biggins (in background), well known TV personality from such programs as "Surprise Surprise" and "Good Morning Britain".*



*The new Commodore Plus Four home computer which was previewed at the Fifth International Commodore Computer Show.*



*Wincie Willis, TVAM's zany weather lady plays 'Basketball' with T.J., the 6'1" American professional player from the Sperring Solent Stars!*

There were even a couple of champion basketball players on hand (one of them a staggering 6 feet 10 ins tall!) to demonstrate a new program about to be launched in Britain—'International Basketball'.

Radio Luxembourg, one of Europe's top radio stations, ran live shows throughout the exhibition, with guest personalities, competitions and even a team of very British bodypoppers!

On the product front, the new COMMODORE 16 and COMMODORE PLUS/4 were both previewed at the Show, alongside the much-talked-about COMMODORE PC and COMMODORE Z8000 business computers. Over 90 members of the press turned up on a hot and sticky morning for a Press Conference which opened the Show and gave them a chance to see the new machines for the first time.

And the verdict? One leading journalist was heard to comment that the COMMODORE 16 looks set to take the low-priced end of the market by storm and the COMMODORE PLUS/4 is already being compared to the Apple IIE and IBM PC.

Among the many other attractions at the Show were: a display of some of the entries in the Commodore International Computer Art Challenge; live demonstrations of CompuNet, the remote database for Commodore users which is due to be launched in September; and over 100 exhibitors showing the very latest business and recreational software and peripherals for Commodore computers.

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