The microcomputer revolution changed our lives…the way we live, work and almost everything we do. Has it made our lives better? Well, yes and no -- it depends on how you measure the effect and what "better" really means to you. If better is a simpler life, then we would be better off without microcomputers; but then we would not have the thousands of gadgets we like/love: cell phones; I-pods; websites with blogs and e-commerce; modern medicine; automatic kitchen appliances; GPS navigation devices in our cars… and the list just goes on and on… it is endless.

There are thousands of interesting stories and people that make up this early history of microcomputing. I will relay a very few "history making" or "milestone" events, dates, people and products (*See document named "Bibliography" which accompanies this history):

1837: The microprocessor (like many ideas and products) was developed without any concept that it would be the next big thing in the technology (electrical/electronic/digital) revolution. It all started September 2, 1837, when Samuel Morse sent the first letters in the form of "Morse Code" a distance of 1700 feet over copper wire.

1968: Dr. M. E. Ted Holf designed the microprocessor "integrated circuit" in 1968. Intel Corporation used this primitive microprocessor to design a special electronic calculator for Busicom, a Japanese company. Intel soon realized that the possible uses of a microprocessor chip could be very big, and they purchased the rights from the Japanese company.

1971: In 1971, Intel made the first "commercially available" microprocessor integrated circuit - the 4004 4 bit processor. Almost no one had any idea what to do with this new product; however, in about three years, it was obvious that this was the start of something really big.

1974: Many folks were trying to design useful products with the microprocessor integrated circuit, but nothing appeared for the general public and all the geeks wanted an affordable computer they could have and call their very own.

--Jonathan (Jon) Titus, a graduate student at Virginia Tech, was one who wanted to have his own computer… so he designed and built his own. Jon called his computer the "Mark 8" because the microprocessor he used was the Intel 8008. Electronics magazines were looking for the next "killer article" and they knew a "How to build your own computer" would big a hit. Jon published the construction plans in Radio Electronics magazine in the 1974 --July, August and September issues.

Dr. Jon Titus designed built and published his "How To Build Your Own Computer" article in Radio Electronics July 1974. This construction article was the very first one and his computer was the start of the personal computer revolution. His own computer, shown on the cover, is now on display in the American History Museum in Washington, DC.

The construction manual was too long to put in the magazine and many thousands of those were sold separately for $5 each. The integrated circuit cards used to build the computer were made and sold, but the builder had to purchase all the electronic components on his own. This was difficult, and as a result, only several hundred computers were built by very serious hobby folks and engineers. Jon is credited as the first to make it possible to build and have your very own "home computer". This computer inspired the first computer user groups and newsletters were written for hobbyists interested in building a computer—like today's blogging and computer forums—but, it was many years before the internet. Some of these meetings were the start of other ideas that made it big.

1975: Popular Electronics magazine (a competitor of Radio Electronics magazine), not to be outdone by the "Mark 8" article, shifted into fast mode and managed to have an article 6 months later (January 1975). The Altair 8800 computer was the cover story for the January issue. The development of the Altair 8800 (by Ed Roberts) and the commercial products that resulted are the subject of several books.

The Altair 8800 came to market 6 months after the first computer - the Mark- 8 . The Altair came as a complete kit with all the parts and a cabinet. This computer was really popular with the hobbyist and computer geeks. Ed Roberts expected to sell about 500, but had 4000 orders the first month. The personal computer revolution really went into "fast mode".

--The Altair 8800 is considered the first home computer that was available commercially as a "complete package"-- with all the parts ready to build-- for only $399. That was an unbelievable price at the time because the "8080" microprocessor chip that was used cost $375-- so how did Ed Roberts accomplish this magic? He made a deal to purchase "cosmetic reject" integrated circuits from Intel for $75 that would normally not be sold though they still worked electronically. The Altair 8800 had no software and was not useful unless you had some good skills. These skillful folks were called "Hackers" – with plenty of hacking they could make the computer do a useful task.

Ed Roberts thought he could possibly sell 400 Altair computers. His little company was deluged with 5000 orders the first month! The personal computer revolution was in high gear for the serious hobbyist! The demand was so intense that dozens of folks camped out for days at the front door of the Altair company just to get one early. Ed tried his best, and was successful for several years, but he could never get ahead of the cash requirements to develop, inventory and sell his computers. He got tired and frustrated and finally sold out for a reported one million dollars, and then went on to complete his

dream of becoming a medical doctor. He is still practicing medicine in New Mexico. The Altair soon became a "has been" and is now a highly desired, collectable part of microcomputer history. Altair alumni collectors groups have started showing up, with the aging "Hackers" bragging about old times, and even Ed Roberts showing up at some of these events!

1975: Bill Gates, an unknown student at Harvard, was fascinated with computers. He was "really hooked" on creating computer software code and finding what he could do with computers while in high school. He, too, dreamed of the day he could have his very own computer. He knew it was possible as soon as Intel introduced the first microprocessor chip in 1971. While in college, he tried to interest numerous companies in making a computer using the new microprocessor technology. He was not successful. But, when the January 1975 issue of Popular Electronics came out with the "Altair 8800", he knew it was his big opportunity. He left Harvard and moved to Albuquerque, NM--- the home of Ed Roberts and the Altair. He made a deal with Ed to write software called Basic to run on the Altair. Bill and his partner, Paul Allen, lived in a motel and worked night and day; after about 4 weeks, they had a program of sorts called "Tiny Basic". Gates and Allen did not create Basic; only the software which would allow Basic to run on the Altair 8800.

--The Tiny Basic was sold to users of the Altair; however, one official version would result in dozens of bootleg or pirated copies --- this was the start of what is still a very serious problem. Bill wrote an angry letter to the users of the Altair, which did not help much, so he obtained the full rights to his software back from Ed Roberts and started his own company "Microsoft". I will return to Bill Gates later -- he really was a genius at protecting his software and intellectual property.

1976: I told you that the Mark 8 movement started microcomputer clubs and user groups. One of the participants in these types of clubs was Steve Wozniak, who was designing calculators for the Hewlett Packard company. Steve, or "Woz" as he is known, had the idea to use the microprocessor chip to build a very efficient home computer -- and he built one of his own. He tried to interest Hewlett Packard in the idea of a small or personal computer based on his design . The management did not see any commercial use for such a computer and signed off all the rights to Woz for his own use. Woz was really a brilliant designer and his computer was so much more efficient than the Altair or anything else that was being suggested at that time. He teamed up with Steve Jobs and they started producing the Apple 1 in a Silicon Valley garage. To sell the Apple 1 they attended the newly formed computer clubs in the San Francisco, California area. Woz showed his computer to folks at these meetings and the two Steves started to sell the Apple 1 as a single board for $666.66. The computer did not have a case, power supply, keyboard or display, and the user had to do a lot of work to have an operating system. It did come with a software program called Basic --- this was written by Woz and was original code (not the Basic Bill Gates had created for the Altair). Woz also wrote software to store and retrieve programs on an audio cassette recorder. He was a master at creating neat designs that were useful and optimized, using very little memory and/or integrated circuitry.

The Apple 1, designed by Steve Wozniak, was just a board with no power supply, keyboard or display. The owner had to get all these items together and put them in a case to have a reasonable operating computer. This was much too complicated for almost everyone. Because only the most dedicated hobbyist made the time and effort only 200 Apple 1's were built. Steve Wozniak realized the limitations of the Apple 1 and designed the Apple 2 before all the Apple 1's were sold out. Only about 25 or so of the Apple 1's are in circulation, making it the most collectable microcomputer in existence.

--The Apple 1 did require the owner to put in lots of effort to make a working computer—the board was complete, but the user had to purchase a transformer, keyboard and display, plus put it in a cabinet or case. It was very clear to Woz and his partner Steve Jobs that they did not have a product that would be a commercial success. Woz immediately started the design of the Apple 2. The Apple 2 was a complete "plug and play" with cabinet, keyboard, display and Basic loaded, ready to operate. Only about 200 of the Apple 1 computers were sold and, to keep the users from being mad at Apple for shifting all support to the Apple 2, the Apple 1 could be traded for an Apple 2. As a result of the trade-in, it is believed that only 25 or so original Apple 1 computers are still in circulation, making it the most rare and valuable collectable item of the personal computer revolution.

The history of the Apple company and the two Steves is, of course, very interesting and very complex. There were hundreds of computer company startups and Apple is one of the few still in business (most of the companies lasted a few months or, maybe, a year or two). Hundreds of absolutely intriguing stories about Wozniak and Jobs have been written -- like the time when Stan Veit was offered 10 % ownership of Apple for only $10,000 and turned it down. As a result, Steve Jobs had to sell his beloved Volkswagon microbus and Woz had to sell his HP calculators to purchase parts to build the Apple 1 (See references for additional reading – fascinating stories & history, which accompany this document).

1977: The "plug and play" computers were first available in 1977 (a real milestone year) for a buying public hungry for a working "home computer" they could afford. There were 3 computers available in 1977 -- Apple 2, Radio Shack TRS -80 Model 1, and the Commodore PET 2001.

-- Introduced in 1977: the Apple 2. The Apple Computer company turned out to be the most important company of the 1977 plug and play companies because of its longevity. Apple is still a leading company supplying some really innovative computers, and other products, today. Apple sold the Apple 2 with many upgraded versions for over 10 years. Steve Wozniak left the company in February 1985 (he was, of course, financially secure and able) to pursue other interests. An interesting note in his book, "IWOZ"-- Wozniak discloses that he has to this day continued on the payroll of the Apple Company, and he occasionally represents then at events (See his book "IWoz" at end of this article for details of his interesting life, during and after Apple). Steve Jobs was CEO of Apple for

many years but, due to eventual disagreements with his board members, was voted out. Some years later, he was asked to come back and try to rescue the company, which was in a downward spiral. As we all know, he was successful, and the company is enjoying some really popular times now. Products like the I-pods and I-phone, as well as a very good line up of computers, keeps Apple in the limelight for their great "technology gadgets".

-- Radio Shack had a great advantage with the thousands of Radio Shack stores. The TRS-80 Model 1 (1977) was the first in a long line of Radio Shack computers and, even though it was housed in a flimsy plastic case, it was very popular and many million were sold in a few years. It was used at home, office, and in schools amongst all grade levels--from grade school to advanced engineering and computer science courses. Many were used in industry for engineering and control applications. Radio Shack was in the business of selling their own brand of computers for many years, and some of their designs were very good. They did end up with IBM clones, however; they eventually gave up and now sell only other standard brands of computers and compete with all mass marketers for sales.

--Jack Tramiel created Commodore and made it a very popular series of microcomputers, The PET 2001 was the first of the popular computer series. The 2001 did not sell in large numbers and more desirable models soon followed. The 2001 did come with the Basic program loaded into memory, keyboard and display -- all in one, self-contained desk top unit-- the keyboard was small and used calculator keys often refered to as Chiclet keys because they looked like the little squares of Chiclet chewing gum. Later models were much improved. Many students learned about computers in the late 70's and early 80's on Commodore models like VIC 20, C64, C128 and several that had color graphics. They were sold by the millions; however, Commodore eventually lost out to the IBM Personal Computer.

--During the first 10 years of the microcomputer revolution (1971 to 1981), perhaps as many as 600 start-up companies tried to make it big in the business. A few of the start-ups did very well for some number of years, but nearly all of them have now gone to reside in "data heaven", now only memories. Some of those companies whose names you may remember: Imsai, South West Technical Products, Cromemco, Sphere, Ohio Scientific, Atari, Osborne, Heath Kit, Victor Graphics, T.I. 99/A, Bill Godbout…and hundreds of other dogs and dinosaurs . Some were good products but just did not make the grade with computer geeks.

1981: It was a real race to see who could build a better or more popular computer that the average person could use. IBM introduced the Personal Computer in 1981. This was a whole new venture, and a nontraditional approach to design and product introduction for IBM.

--When the IBM PC came to market, many corporate folks purchased it simply because it had the IBM name. There were many microcomputer companies doing well at that time, and the long range impact of the IBM PC was completely underestimated. The process, and individuals involved in bringing the PC to market, is most interesting and many books have been written about the IBM PC beginnings.

Prior to 1980, IBM spent four years using the normal IBM culture to build a computer called the Dyamaster. It should have been named simply the "Disaster" instead of Dyamaster. A man named Bill Lowe put together a team in July 1980 to work with the code name "Acorn" -- an IBM Microcomputer. Management made an excellent decision to send Bill Lowe and his group to Boca Raton, Florida and to do the product design independent of corporate interference. It was an entrepreneurial group with one goal who designed the product which, for the first time, used a non-proprietary computer chip. In fact, any product or service commercially available that would result in a product "ready for market" in one year could be used. It was decided to use the new Intel 16 bit microprocessor chip (IBM is still using Intel microprocessor chips as their main source of integrated circuits, 27 years after the PC was created). Bill Lowe and his group knew operating software could not be produced in time at IBM, so the search went out for a source. Operating software called CP/M was used by most microcomputers at that time and the IBM secret team went exploring to find out if they could buy the rights to CP/M. The group was a little naïve and thought Microsoft was the supplier of CP/M.

A call was made to Bill Gates at Microsoft, and Bill kindly told the callers his company (Microsoft was really small in 1980 with only 50 employees) did not have the CP/M software. He also told them that it was a product of Digital Research owned by Gary Kildall and gave them Gary's phone number. I suspect that was the last time Bill Gates ever gave out a competitor's phone number!! Microsoft had some really nice versions of the software called Basic (Remember-- Bill Gates had started supplying Basic in 1975 for the Altair designed by Ed Roberts) The IBM team knew that every computer on the market had Basic and it was readily available. What they wanted was an operating system to run the computer and do all the internal computer housekeeping, plus make sure the computer could load and execute any software program.

The IBM team called on Digital Research and set up and appointment to meet with the owner Gary Kildall. When they arrived in their white stiff shirts and ties Gary had taken the day off to fly his private plane. – This is a good lesson – live up to your commitments and don't be rude, it may cost you $10 or 20 billion. The IBM team did meet with Dorothy Kildall, but she would not sign a nondisclosure agreement. The team left Digital Research without any discussion and did not ever consider returning.

The whole IBM plan for project "Acorn" was get reliable suppliers quickly. This resulted in another call to Microsoft and a meeting to see if Bill Gates could help with a software operating system…one of the few times Bill Gates and his partner Paul Allen put on a necktie for a meeting. Gates and Allen signed the IBM nondisclosure agreements. These disclosure agreements were very one-sided, saying IBM could use and talk about anything given to them, but Gates and Allen must not use any of the information from

IBM. The IBM team told Gates and Allen, "…Don't tell us anything you don't want others to know". Bill was only 25 years old at the time, but he was very smart about the whole idea of nondisclosure and just kept quiet. He did not tell the IBM folks anything, unless it was a help to Microsoft.

The IBM group asked Microsoft to supply Basic and implored them to help in supplying the operating system software. Of course, Gate's answer was "yes", even though he did not have such a system. Gates and Allen were familiar with the Seattle Computer Company which had an operating system called DOS (Disk Operating System). They felt DOS would satisfy IBM if they could obtain the rights to it. Having just signed a one-sided agreement with IBM, they did not disclose any plans about how they could fill their needs. Gates and Allen went to the Seattle Computer Company and purchased the full rights to DOS for $50,000. It was a major financial commitment for Microsoft at that time. The purchase of DOS from the Seattle Computer Company resulted in the well-known IBM-DOS of the 80's (I mentioned earlier that Bill Gates was really good about protecting his future income possibilities and intellectual property rights--he kept the rights to sell any software he provided IBM to his own customers). This brilliance by Microsoft made the company what it is today, and Bill Gates is possibly the wealthiest person in the world. Today, almost every computer in the world runs Microsoft programs. Just a side note—It is nice that Bill and his wife are now giving away a very large share of their wealth for good causes around the world and Gates' friend Warren Buffet has given $17 billion or so to the Gates foundation, making the Bill and Melinda Gates Foundation one of the largest in the world. A large portion of the funds go toward the education of youth and providing medical assistance worldwide.

Bill Gates did make a strong suggestion that IBM not use an 8 bit microprocessor chip, as they had intended, but the newer and more powerful Intel 16 bit processor. The IBM team, wisely, heeded this suggestion.

The IBM PC was sold with Microsoft Basic, IBM-DOS, two spreadsheet programs and a word processor. It was an instant success and all other computers became almost immediately obsolete. 1981 meant the end for all but a very few computer companies. Even today, nearly every computer is an IBM compatible. The Apple Computer Company has a very small share of the market using their Apple- generated software.

The historic period of 1971 to 1981 is filled with thousands and thousands of stories and dreams of those who hoped to make it big in the computer business. Some did, and many others made more than just a good living during those times. I hope to write more about some of these folks and events.

* See document named "Bibliography" which accompanies this history.

***Bibliography:**

The publications listed here equal fascinating reading with interesting detail about the microcomputer revolution. Many of these were published in the 90's, but multiple copies are still available on Amazon.com (prior to e-marketing, it would have been a real task to locate all of these. Now, you just do a search on the book title or check Amazon.com. You can have your order on the way in less than one minute!).

1. Accidental Empires by Robert Cringely, 1992, Harper Business 1993, ISBN 0-88730-621-7. *This one is my favorite.

2. Heroes of the Computer Revolution—Hackers by Steven Levy, 1984 (must be good my copy is 10th printing 1994), Dell Publishing, ISBN 0-385-31210-5. *This one covers much of the whole computer revolution as well as microcomputers.

3. History of the Personal Computer by Stan Veit, 1993, WorldComm Press, ISBN 1-56664-030-X. *This is more of a personal story of Stan Veit, but does include the history of many of the important microcomputer companies. Stan was early in the microcomputer business with the first microcomputer store on the East Coast.

4. IWoz by Steve Wozniak, 2006, W.W. Norton & Company, ISBN 13: 978-0-393-06143-7 . *Very interesting personal history of Steve Wozniak.

5. Video: Triumph of the Nerds- An Irreverent History of the PC Industry, by Robert Cringley, 1996, Ambrose Video publishing, Inc. *If you don't like to read, buy this interesting documentary that was shown on public TV in the 90's. It is well done. Produced and written by Robert Cringley – Same author as book 1 in my list. Robert does a good job and includes many interesting stories about folks like Bill Gates, Steve Jobs, Steve Wozniak, Ed Roberts… really, all the important people and computers of the microcomputer revolution.