History/Science Project Q&A
Martin Cooper

What was your motivation for inventing the cell phone? Was it an accident or something that you purposely set out to do?

Although many inventions are created accidentally, the cell phone was invented very deliberately and over a long period of time. The motivation for inventing the phone in 1973 was that ATT had invented a concept called cellular communications. We at Motorola thought this was a very good idea, but then ATT suggested that the cellular communications that people needed was "car telephones". We vigorously disputed that conclusion. We knew that people didn't want to talk to cars, or to houses, or to offices; they want to talk to other people. To demonstrate this, we invented the first portable cellular telephone so that we could prove to the world that our idea of personal communications was correct. What we believed was that the telephone number should be a person rather than a location.

Did anyone else help you with the invention?

Of course! There were many people involved in inventing that first telephone. It started with the people who created all of the specialized parts that made the phone work. A crew of industrial design people at Motorola actually ran a contest to determine what the best design was for the appearance of the telephone. The engineers who put the parts together were very skilled and the best in the industry. There was a great deal of hard work by many people to make the invention of the cellular telephone a reality. My contribution was only to think of the original idea and to pull together all of Motorola's wonderful resources to make all of this happen.

How long did it take you to develop a working model of the cell phone?

The actual project to put a phone together took a little over three months. Many years were required to anticipate the need for various elements of this antenna. The dream of a portable phone had been in our minds for a long time before the first phone was invented. So, for example, when we needed a special antenna on the cell phone to meet the needs of the high frequencies that were involved, our people had been working on such an antenna for two years, and it was ready just when we needed it. The same is true for the integrated circuits and other parts that were needed for this telephone.

Are there any interesting/funny anecdotes/stories in your time as an inventor that you want to share?

The design of the first cell phone was the result of a contest among 5 different industrial designers at Motorola (none of whom reported to me). I picked the simplest one (whose basic design survived for almost 15 years), the others were no unlike some of the most modern cell phone designs. The design was tiny, but the engineers who built the electronics had to squeeze hundreds of parts into the phone so it grew 5 times bigger and much heavier.

What was it that made your company win the race? What snapped into place that put you ahead of the competition?

It was a combination of the vision (people are mobile; communications for people have to be wireless), the technology (integrated circuits, frequency synthesizers, antenna, packaging techniques, etc., all dedicated to making radios smaller, lighter, and with lower current drain), and the passion that drove us to take on the largest company in the world.

How did Joel Engel and his company feel about this?

A combination of irritation at anyone who had the temerity to challenge Bell Labs, reluctant admiration of our marketing ability in doing so, and pity, for this little company, Motorola, who were found to fail.

What was it like making that first phone call in New York City? Did you have doubts?

The call that we made in New York City was really the first public telephone call. Clearly, we had tested the phone in the laboratory many, many times, and we knew that it was going to work. Of course, we always have doubts when something very new is attempted, but the important thing is that we really believed in the basic concept. That concept is that people are fundamentally mobile and communications to them has to be wireless. It does not make sense for a person to be leashed to a wall or to their call if they want make a phone call. So the most important thing we did back in 1973 was to prove that a telephone number should not be a location like a house or a business but rather that telephone number should represent a person.

How old were you when you made this first phone call to Bell Labs?

I was 44 years old.

Did you ever think that cell phones would be as advanced as they are today?

There are well over a billion cellular telephones in the world today. That is to say, every person in 5 over the entire world owns a cellular telephone. Our vision back in 1973 was that someday everybody would have their own personal telephone. On the other hand, when the first portable cellular telephones were sold in 1983, they cost $4,000. Not many people could afford these phones. We never would have predicted that in only 20 years or so that phones would be provided free to people if they only pay their monthly bill, as is the case today.

If you're referring to the size of the telephone, you know that the first telephone weighed 2 ½ pounds (40 oz.). The smallest modern phones weigh a tenth of that and are much, much smaller.

We always believed that cell phones would become very small but there is no way we could have predicted that a cell phone would include a powerful computer, a camera, an MP3 player, games, and other capabilities.

How has communication changed in the past thirty years?

The concept of distance has disappeared. There is no longer any difference between a "long distance" telephone call and one to the house next store. Thirty years ago it could cost $10 or more to call Japan; today I make that phone call for a few pennies a minute. The second important thing is what I mentioned previously, and that is that when you call your friends who have cellular phones, you expect a person to answer and not a location. This is a huge difference. Within the next 10 years it will be very unusual for people to make personal calls on a land-line telephone, and most people will not even have land-line telephones in their homes except to perform other functions like receiving broadband internet signals or television signals.

Do you think being able to communicate so freely and easily is always a good thing?

For every advancement in technology that affects people, there are always negative consequences. Of course, it can be annoying to be so readily

accessible, and for that purpose, every cell phone has an on/off switch. The choice of whether we want to be accessible or not is that of the subscriber; no one forces you to answer a cellular telephone call. As is true with every advance in technology, people have to learn how to use the advancements properly. Some people may allow new technologies like free communications to change their lives in adverse ways, but with time, people will learn to take advantage of all benefits of free communications, and society will be much better off. Communications today improve our productivity, make us safer, help us learn new things, and even entertain us by allowing us to play games and access information. It's hard to imagine why any of those things are not good.

What do you think about the future of cell phone technology?

Cell phones are going to move in two major directions. For personal voice communications you can expect a cell phone to get so small that you will be able to put a cell phone in your ear; and perhaps, in the not too distant future, cell phone will be embedded under your skin so that it is with you always and is powered by energy from your body; you won't have to remember to charge your battery – ever. After all, who needs to dial if you can verbally tell your telephone who you want to speak to and your phone has the intelligence to find that person. The other directions in which cellular telephony is moving will give us much more bandwidth so that we can hook up our computers to the internet but without being leashed to a wall or a desk while we are doing it.

In the future, we'll be able to use our computer wherever we are, but also to play games, transfer pictures, listen to music and many, many other things – all through the wonders of wireless technology.

What are you developing at the moment in relation to wireless and cell phone technology?

The most important of the wireless technologies that will make this successful is the concept of smart antennas, and that is what ArrayComm is doing today. The internet has to be delivered to people wirelessly. Computers, PDA's, games, cameras, music players, and medical devices will all be wirelessly connected. The smart antennas that ArrayComm developed make radio signals more robust and calls a lot less expensive. We also developed a broadband wireless system called iBurst that brings ubiquitous service to people throughout a territory. iBurst is now deployed in Sydney

and three other Australian cities. You can learn more about ArrayComm by looking at our web site www.arraycomm.com. You can learn more about me and cellular technology at http://www.nytimes.com under the Learning category.

Have you had any other jobs?

I was in the U.S. Navy for 4 years as a submarine officer, spent a year in one company and then 29 years working for Motorola. Since 1982, I have been starting and running companies, all in the wireless communications business. You can read about my latest company on the Internet at www.arraycomm.com.

Where did you serve when you were in the Navy?

I was in the Korean conflict on a destroyer (U.S.S. Cony) where, among others, I received a presidential unit citation medal from president Singhman Rhee of Korea. I went to submarine school in New London, graduated 2nd in the class and was rewarded with service in Hawaii on the U.S.S. Tang, one of the most modern subs at that time.

Why did you leave Motorola and start up ArrayComm?

I left Motorola in 1983 to start, with two partners (one of whom is now my wife), a new company that built software and billing systems for the new cellular industry that began in October of 1983. The company was very successful and was sold in 1986. At that time my wife and I started some other business; and ArrayComm was formed in 1992.

Can you tell me a little more about how ArrayComm came to be & where the name came from?

ArrayComm originated with the ideas of some very talented professionals at Stanford University who came up with an entirely new way of using antennas to send and receive signals from radios. They approached me, and asked me to help them. I agreed to spend perhaps a day or two a month. Within a few months I realized how important this new technology was to the future of personal communications, and I started working 24 hours a day, 7 days a week on ArrayComm.

In order to develop the ideas behind the antenna technology – we call the technology “smart antennas” - a great deal of work had to be done. First, we had to raise lots money so that we could hire the engineers and create all of the new inventions necessary to make smart antennas work. ArrayComm now has over 420 patents and applications for patents. We then had to do lots of marketing and trials, and actually develop different pieces of equipment to prove that our technology could work. The name ArrayComm is really short for Array Communications. Whereas most radios use a single antenna to send and receive signals from the radio, ArrayComm’s smart antennas use a group of antennas, as few as four or as many as 12, in an “array.” It is this array that makes it possible for smart antennas to work. It is not the antennas that are the important part of smart antennas; it is the “smart.” It takes huge amounts of computer processing to make each smart antenna do the things it is intended to do. There were no computers powerful enough in 1992 to do what we wanted to do in real time. We had to simulate our results. Of course, today there are very powerful computers that cost very little, and that is why our company is extending its technology into countries throughout the world. ArrayComm's technology is now serving tens of millions of subscribers in China, Japan, and elsewhere.

What school did you go to and did you like it there?

The university I attended is the Illinois Institute of Technology located in Chicago. I received a bachelor’s degree in 1950, a master’s degree in 1957, and was awarded an honorary doctorate in 2004. IIT is a fine engineering school that also has schools of architecture, design, and law. I serve on IIT's Board of Trustees.

I attended Lawson Elementary School and Crane Technical High school, both in Chicago.

Did you always want to invent?

I have invented things as long as I can remember. When I was eight years old, I conceived of a train that traveled in a vacuum, magnetically levitated over the roadway to eliminate all friction. Magnetic propulsion is just now becoming practical. But thinking of an idea is not "inventing". You have to know how to make the idea work and how to build it to call it an invention. That's why education is so important.

Have you invented anything besides the cell phone?

I have been granted eight other patents besides the cellular phone. They are all in the wireless field, although one has to do with using fuel cells to operate a cellular phone.

My wife, Arlene Harris, is also an inventor and a very successful entrepreneur.

Were there any particular people or events in your childhood that inspired you?

Of course, my parents (whom I didn't really appreciate until I was in my twenties). Mother was a dynamo. Two high school teachers remain in my memory, Mr. Kinney (home room and wood shop) and Miss Corrigan (English). Kinney was demanding (a perfectionist) but was very kind beneath a tough veneer. Corrigan appreciated and encouraged my voracious reading.

Do you have any advice for budding inventors?

It's good to let your mind run free, to think of new ideas, new ways of doing things, to day dream. But an inventor needs a foundation of science, of engineering, of education to make these dreams come true. An inventor needs imagination AND practical knowledge.

What were your parents' names? Do you have any brothers or sisters? Children/Grandchildren?

Mother - Mary. Father - Arthur. Brother – Will, who is 3 years younger. Two children (one of each) and four grandchildren (3 girls and 1 boy)

When and where were you born?

I was born in Chicago on December 26, 1928.

What kind of cell phone do you have now?

Actually, I try to always have the latest cell phone and use several routinely. My primary desire used to be to own the smallest and lightest handset. Now I use a Motorola "Droid" to get a feel for the latest PDAs and the Jitterbug (the simplest phone around, which my wife invented). I find that the camera and other ancillary functions are gimmicks and of very little use to me, but I'm sure there are others that find them useful. My vision is that each person is different from every other person and should be able to have a phone that meets his or her needs. But I try every new and interesting phone that is introduced so, by the time you read this, I'll have a different one.