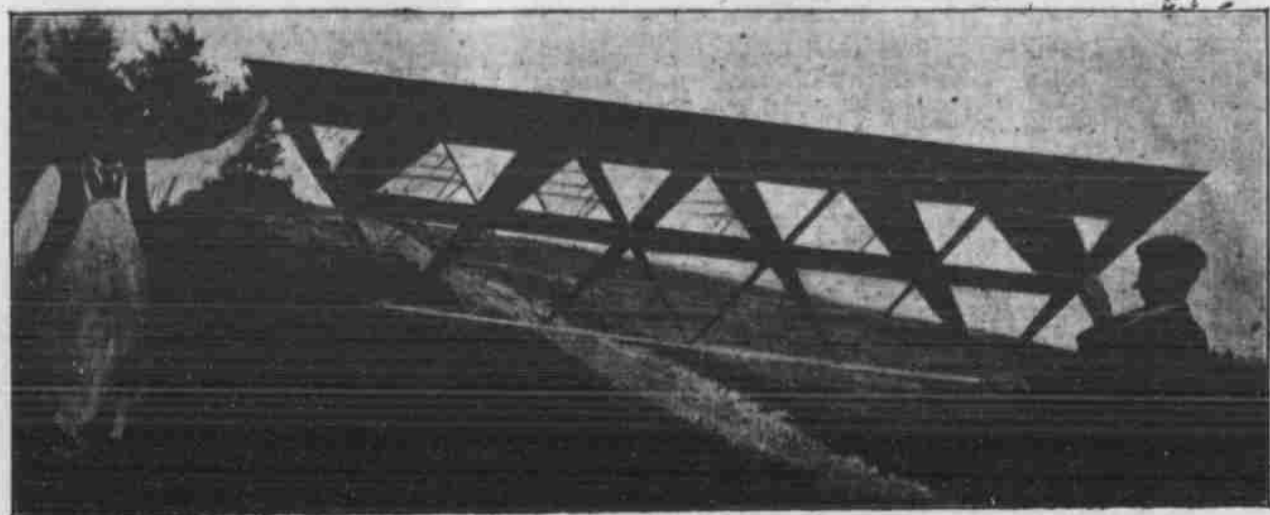
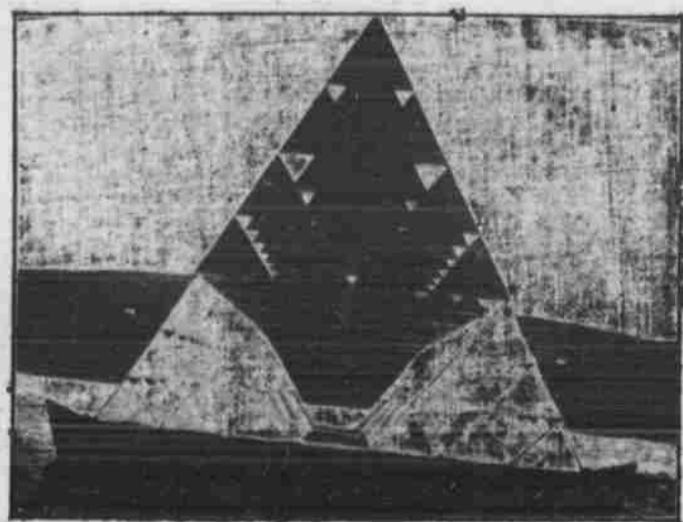


# Alexander Graham Bell in 1904



THIS KITE ROSE TO A HEIGHT OF HALF A MILE ABOVE GROUND AND WAS STEADY AS A TABLE TOP, WITH A TREMENDOUS FULL. IT IS MADE OF TETRAHEDRAL CELLS, BUT IS H-SHAPED.—Photo Copyright, 1903, by Gilbert H. Grosvenor.



THIS KITE FLIES WITH A CARRYING POWER OF 6000 POUNDS. IT COULD EASILY CARRY AN ENGINE AND A MAN. IT FLEW STEADILY AT A GREAT HEIGHT, ALTHOUGH THE RAIN WAS POURING.—Photo Copyright, 1903, by Gilbert H. Grosvenor.

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WASHINGTON, D. C., June 2.—Special Correspondence to The Bee.—"Call upon me at my house at any time tomorrow night, between 10 and 4 o'clock in the morning, and the later the better."

These were the words of Dr. Alexander Graham Bell. I had asked him when we could best meet for a good long chat about the telephone and his recent experiments in the field of aerial navigation, and this was the answer. Dr. Bell's favorite working time is at night, and his mind is at its brightest from midnight on. He is then free from interruption, and can give up his soul to the scientific experiments and inventions which form his life work. He never goes to bed until after 4 a. m., his usual sleeping hours being from 4 until 11. The afternoon is devoted to social and business engagements, and the night alone to reading and work.

These have been the habits of a lifetime, and they are excellent ones if Dr. Bell's health may be considered a test. He is now 57 years of age and is in his physical and intellectual prime. Tall and well formed, with a great head fastened by a strong neck to broad, full shoulders, he is one of the finest looking as well as one of the most active of the men who are doing great things in the world today. The telephone was first patented in 1876. Since then he has made many other important inventions, and has done so much for science that he has been granted the highest honors by the chief scientific societies of Europe, including the Volta prize of 50,000 francs, given by the French government to the few whose inventions are deemed of the greatest good to humanity. It takes imagination to invent, and Dr. Bell has this faculty to a remarkable degree. His vision, based upon the great scientific knowledge, is wider than that of the ordinary thinker, and his creative mind is always searching out and suggesting new things. This was evident throughout our conversation, of which I can repeat only a part.

The talk covered a wide range, now personal, now scientific, and now almost prophetic as to the possibilities of the future. It jumped from Japan to Nova Scotia and from Washington to London; from the use of a dead man's ear in telephonic experiments to oratorical and musical exhibitions over the telephone and graphophone; and from electricity to helium and radium and the navigation of the air.

In our conversation about electricity I asked Dr. Bell whether his scientific knowledge of that force had not aided him in the invention of the telephone.

"Not at all," he replied. "When I began my experiments upon the telephone I had no scientific knowledge of electricity. I knew practically nothing about it; and had it been otherwise I could never have made the discoveries which culminated in my success. I don't believe any electrician could have invented the telephone."

"Why not?" I asked. "Because the elements which we now think essential to the telephonic transmission of sound are such that the electrician of that day would not have believed in their practical application. The ideas which brought forth the telephone would not have come to me, and had they done so I would have at once discarded them as foolish and impractical."

"But did not electricity have much to do with the first telephone?"

"Not a great deal," was the reply. "We had two electro-magnets, one at each end of the wire. These were all that were used in the first instruments, and we transmitted sound with them almost as well as we do now. The batteries and other electrical machinery have been the outgrowth of other necessities in the practical working of the invention rather than in the pure transmission of the human voice. That part of the instrument, which you now put to your ear, was at first used to speak into; and the diaphragm, as it is, was made for speaking, not for hearing. A piece of iron or steel would do just as well for the purpose for which it is now



ALEXANDER GRAHAM BELL.—From a Recent Photo.

used. We had at first two such mouthpieces, one held at the ear and the other to speak into. While listening the receiver often puts one of these at each ear to better the transmission. The batteries were necessitated for calling the subscribers. We had to have call bells, which were originally rung with a crank, as is done in some of the old 'phones today. These bells necessitated an electric battery for every instrument, and other things have added electrical machinery which was entirely unknown at the start."

"Cannot you give me the autobiography of the telephone, Dr. Bell?" I asked.

"I will give you some of it at least," was the reply. "The invention was born, I may say, in my long study of sound in connection with the human voice. I might perhaps say that its birthplace dated still farther back. My father's life was devoted to the study of vocal sounds. He was an authority on voice culture, and also the inventor of visible speech, an alphabet in which the actions of the organs of the mouth in producing speech are symbolized. By this invention the sounds of any language may be expressed, and by it a large number of deaf people are taught to speak. Even back of that, my grandfather was a student of sound. He was an orator well versed in elocution and voice culture, so that if there is anything in hereditary the germ of the telephone may have come from my grandfather."

"Please carry the autobiography down into your own life," said I.

"As I think of it in that way, I can mark several interesting stages which now seem to point to the telephone," said Dr. Bell. "I have told you, in the past, how father once offered myself and my brothers prizes if we could invent any kind of a machine that would talk. This was after he had taken us to see a speaking automaton. I did invent a mouthpiece of rubber and other material that would say mamma and cry like a baby. Another stage might be marked by my ambition to be a singer and a musical composer. I had a good voice, and, just before reaching manhood, I was devoting myself to its training with that life work in view. This led me to the further study of the voice and the transmission of sound. That ambition was given up on account of my health, and for the same reason father brought me to Canada, where we purchased a farm. This migration now seems almost providential in the life of the invention, for I am sure had I remained in England I never should have made it. The intellectual atmosphere of Great Britain is too cold and conservative

to incite great discoveries, whereas that of this country is stimulating and friendly to all new things. Our patent system is also far more encouraging."

"Well, to continue my story," Dr. Bell went on, "I found the Canada farm just what I needed. The change and the out-of-door life soon made a new man of me, and father, in the meantime, having again taken up his studies of the teaching of the deaf, I became interested in that and was made professor of vocal physiology in the Boston university."

"All this work, you see, was along the line of sound and sound transmission. Then another stage appeared which connected my vocal studies with the machinery of the telephone. I became interested in multiplex telegraphy, and tried to make an invention by which several messages could be simultaneously sent on one wire by using the musical scale with signals of different pitch. We employed a series of reeds as sounding instruments in these experiments, connecting them by means of a wire. One day one of the reeds accidentally struck the diaphragm at one end of the wire, and its vibration was seen on the diaphragm at the other end. If that sound could be transmitted, why not other sounds? The thought was one of the suggestions which resulted in the telephone. Later I had the wire conducted from one of the top rooms of the house to the electrical workshop in the basement, and speaking into the diaphragm was heard by Mr. Watson, my assistant, below. I tried to get him to reply, but could not hear him. He came in a little later, much excited, and I asked him why he did not answer. He said he had tried to. I then went down and took his place, but I could not distinguish his words. I can only explain this by the fact that my trained voice was more easily heard than his untrained one, and that his hearing, sharpened by the necessities of a noisy workshop, was better than mine. This experiment, however, showed me that the telephone could be made a success, and I at once applied for my patents."

"How did your friends view the invention?"

"The most of them laughed at it," said Dr. Bell. "They considered it a toy at best, and, even, after it was proved a success in the transmission of sound, some told me I was foolish to devote myself to a thing that could never be of practical value, while I had a chance of making a fortune if I kept at my work in multiplex telegraphy."

"Did you have much trouble in protecting your invention?"

"Yes," replied Dr. Bell. "As soon as its practical advantages were understood, claims to a prior invention of the same thing sprang up on all sides. Half a dozen electricians came forth, each announcing himself as the original inventor, and claims and interferences were filed against my patent. One newspaper report alleged that I had paid an examiner of the patent office \$100 to illegally secure my patent, and a mark was made on the hall floor of the Interior department, where it was said the clerk stood when he made the alleged bargain with me. The story seems all the more ridiculous now when I remember how scarce \$100 bills were with me in those days."

"How could you reply to such attacks?" I asked.

"That was one of the worst features of the trouble," said Dr. Bell. "I was instructed by my lawyers not to say anything about my invention, to bear all such attacks without comment, and to let the battle of its originality be fought out in the courts. The result is that I have never told the story of the telephone and its invention. The last time I made any public utterance on the subject was in a lecture I delivered in London in 1877, now more than twenty-six years ago."

"But will you not write it some day?" I asked.

"Possibly I shall," said Dr. Bell, "but not until my life reaches its reminiscent stage. I am now so much occupied with the present and the possibilities of the fu-

ture that the past seems far behind me."

"Has the telephone reached its perfection?"

"By no means," was the reply. "It is still in its infancy as an instrument for the transmission of sound and in the extent of its use. Its business and mechanical arrangements are still clumsy and unwieldy. The telephone industry is one of the few which cost more to handle at wholesale than at retail. What I mean is that it now costs enormously more in proportion to run a large telephone business than a small one. Suppose you are one of 100 families connected with a telephone exchange. You and each of the rest will each have ninety-nine other families to talk with, and it will require a certain number of operators to conduct your conversations." Now, suppose the patrons of the exchange be doubled. Each family will now have, instead of ninety-nine families, 199 to talk to, and the possible number of conversations of every one in the exchange has been multiplied, not by two, but by 100; for every one has 100 families more to talk to. This requires a proportionate number of new operators, and makes the big business very expensive, necessitating the finest machinery at the exchanges. A single switchboard for instance in the central office of New York costs \$75,000.

"In the improvement of the telephone," continued Dr. Bell, "in the telephone of the future I look for all this business to be done automatically. Instead of a single wire there will be a little cable of wires connecting each house with the central exchange, and it will be possible for ten wires to do the work that a thousand do now. There may be a system by which the subscriber can move certain buttons and call up whom he pleases. The calls will be automatic, causing the idle wires among those in the cable to automatically come into use, and when the conversation is over the disconnection will be automatically made. If this can be accomplished it will do away with the vast army of telephone operators, and so reduce the expenses that the poorest man cannot afford to be without his telephone."

"Will sound transmission be also improved?"

"Yes; we now have the wire loaded with several unnecessary processes or attachments. These will be gradually eliminated and each wire will have but one work to do and it will do its work better."

"How about telephoning without wires?"

"I think that will come some day," replied Dr. Bell. "Indeed, I have done such telephoning. Through my invention of the photophone I have also been able to send sounds upon rays of light. The sound-carrying medium is of the same nature as the electrical medium, and it may be that we shall some day send sounds through the air with the rapidity of light transmission. You know what is being done in wireless telegraphy. Some day we may have wireless telephony as well."

"Then you evidently think we have not come to the end of the inventive age?"

"No. Indeed, it is difficult to say how near we are to its beginning. We are discovering new forces and new principles every day. We did much in the nineteenth century, but here, at the dawn of the twentieth, we have an entirely new field opened up by the discovery of radium, and that discovery the work of a woman. We have several new forces—so new that we do not yet know what they are nor how they may change the life and work of the world. We have radium, helium, thorium and other wonderful things. By liquid air we have frozen some of these rays into a liquid, and have, as it were, bottled up the rays of the sun and also of these powerful, and, until now, altogether unknown forces. Indeed, we are daily more and more surprised at how little we know, and we cannot but think that the greatest treasures of nature are yet to be discovered."

"How about the air and its navigation, Dr. Bell?"

"That is one of the most interesting fields

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