Claude Shannon (1916-2001)

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CLAUDE SHANNON (1916-2001): THANK YOU

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Some researchers of the younger generation are privileged: they have met Claude Elwood Shannon, the founding father of computer chess. In some sense he completed a fine triumvirate over three centuries: Baron Wolfgang von Kempelen (who launched the first ideas on chess-playing automatons in 1769), Charles Babbage (who expressed the idea that the analytical engine could play games, in 1833) and Claude Shannon (who lectured on *Programming a Computer for Playing Chess* in New York, on March 9, 1949). The lecture was published in *Philosophical Magazine* (1950) and is still a source of inspiration. It is self containing and has pointed out the computer-chess research directions for the second half of the last century.

After his retirement as a Professor at MIT, Shannon remained interested in scientific progress and was eager to follow the advancements in computer games at the tournament sides. Together with his wife Mary Shannon he attended as Guest of Honour the third World Computer-Chess Championship in Linz 1980, the sixth World Computer-Chess Championship in Alberta 1989, and the First Computer Olympiad in London 1989.

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For many researchers in Linz 1980 Shannon was founder, head and also front-runner of the computer-chess community, despite Ken Thompson's ingenious BELLE machine. Every day he attended the matches, gave interviews, and exchanged ideas with all persons who recognized him and addressed him. Indeed, he was easily accessible, always friendly and prepared to discuss a variety of topics. There, I learned on his relation with Turing, e.g., their disjoint research on cryptography and secrecy systems. Both worked for Roosevelt and Churchill, but as researchers they were not allowed to cooperate. In the meetings they had, they did not speak on cryptography (even not after the war) and only a little on computer chess. Their main topic was what you could do with a brain and how a brain could be made mechanically.

In 1989, I was honoured that Dr. Shannon was session chair of a conference session in which I had a lecture. In his introduction he stated: "I think man is a machine of a very complex sort." Since Shannon has pointed out many times how to break down complex problems into tractable parts, I then knew for sure that my solved problem (i.e., the conference contribution) was only a small tractable part within his tractable problem parts.

The *ICCA Journal* is happy that we have given Claude Elwood Shannon due credit during his life by a special Shannon issue, viz. *ICCA Journal*, Vol. 12, No. 4 (1989), in which we published an interview with his ideas on the impact of computer-chess research, a written tribute titled *Thank You, Dr. Shannon*, and many photographs, e.g., three with Shannon testing his common equation of juggling. However, even in a Games Journal it is not appropriate to emphasize Shannon's contributions to that field too much, since this man was far greater than our community. A long list of his contributions and publications is available on the web (see Ken Thompson's obituary). Here I would like to single out three landmarks, which clearly distinguish Shannon as one of the giant scientists of the twentiest century.

First, in 1936 only twenty years old, he wrote a master's thesis *A Symbolic Analysis of Relay and Switching Circuits*, in which he showed how Boole's logical symbols could be treated as a series of on or off switches and how binary arithmetic could be carried out by electrical circuits. It was published in 1940 and won the Alfred Noble Prize of the combined engineering societies of the USA. According to H.H. Goldstine (1973): "one of the most important master's theses ever written ... a landmark in that it changed circuit design from an art into a science."

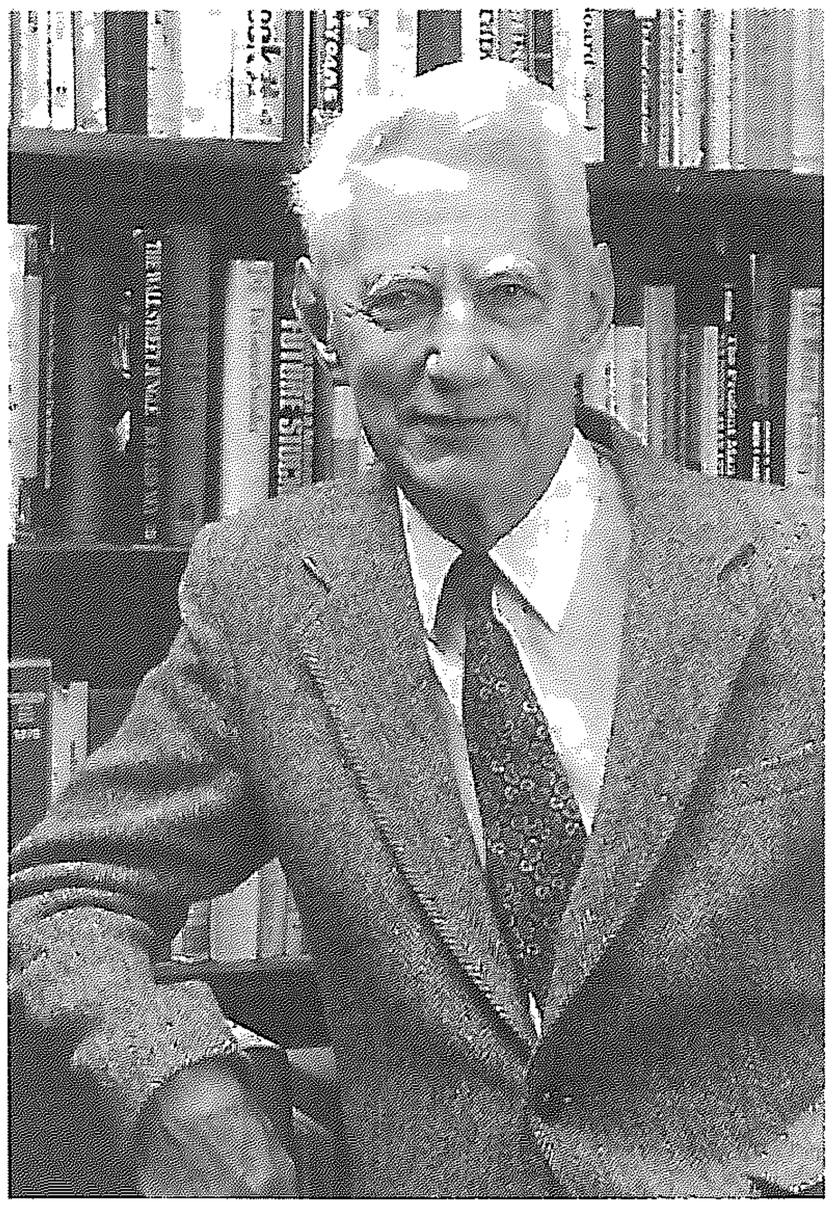

Photo by courtesy of AT & T.

Claude E. Shannon

Second, in 1948 Shannon published *A Mathematical Theory of Communication*, in which he distinguished the message from the medium. He introduced the notion *entropy of information*, and established fundamental limits on the efficiency of communication over noisy channels. Over time, his work became more important by the advent of wireless telephones, high-speed data networks, and Internet.

Third, in the 1950s he successfully investigated many games and did other "frivolous" inventions. We only mention three of the many developments he contributed to: the construction of a mechanical mouse trapped in a maze, the invention of a two-seater version of his unicycle, and the common equation of juggling.

For all these, Shannon received many awards and laurels from institutions and universities all over the world, among them the National Medal of Science in 1966 and the Kyoto Prize in 1985. On behalf of our community we thank Dr. Shannon for all his contributions and Mrs. Shannon for her first-rate support of this giant scientist.