

Editorial

V Rajaraman, Editor

Are two people collaborating more productive than a single person working alone? The answer is not an unqualified ‘yes’. It depends on several factors. The collaborators must have complementary skills, must be compatible and be capable of resolving debates which result from honest differences of opinions leading to a more creative solution. Edwin Land, the inventor of Polaroid camera, is reported to have said “politeness is the poison of collaboration”. There have been several famous pairs in science and engineering whose combined effort has led to important discoveries and inventions. In science we have the famous pairs: Watson and Crick, Pierre and Marie Curie, Yang and Lee, to mention a few. In engineering we have Wright Brothers, Hewlett and Packard, Larry Page and Sergey Brin (who collaborated to create Google) among others. Dennis Ritchie, who this issue of *Resonance* honours, paired with Ken Thompson to design and implement the widely-used operating system UNIX. Their famous collaboration lasted for ten years while they were both working at Bell Telephone Laboratories in USA. AT&T Bell Laboratories gave them freedom to pursue their research and development on UNIX even though AT&T was not in the business of designing and selling computers.



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The Turing Award which is the highest recognition given to computer scientists was given jointly to Ken Thompson and Dennis Ritchie in 1983 for their work on designing and implementing UNIX. In his Turing Award acceptance lecture titled ‘Reflections on Trusting Trust’, Ken Thompson comments on his collaboration with Dennis Ritchie as follows: “That brings me to Dennis Ritchie. Our collaboration has been a thing of beauty. In the ten years that we have worked together, I can recall only one case of mis-coordination of work. On that occasion, I discovered that we had written the same 20 line assembly language program. I compared the sources and was astounded to find that they matched character-for-character. The result of our work together has been far greater than the work that we each contributed”. A high level machine independent programming language called C was designed by Dennis Ritchie specifically to write UNIX. This made UNIX portable leading to its wide adoption. An article on C past, present and future by R Bhaskar appears in this issue. Pramod Chandra P Bhatt has written an article giving the genesis and design features of UNIX.



As usual we have a rich fare of other articles. Dagla and co-authors have written an article on plant tissue culture. Chandan Saha and Suchandra Chakraborty discuss dissymmetry and asymmetry in chemical literature. Ranjit Konkar describes spherical aberration in concave mirrors. The series *Darshana Jolts* by V V Raman continues, and a research news on substrate channeling has been contributed by Danish Khan. We also have a Classics article which is the Turing Award Lecture given by Dennis Ritchie.

That brings us to Alan Mathieson Turing, a genius mathematician, whose birth centenary is being celebrated all over the world this year. (July 1987 issue of *Resonance* featured Alan Turing). Turing is famous for several seminal contributions. He formally defined algorithm and devised an abstract model of a computer in mid-30s. During World War II he designed a machine to break the German Enigma cipher. Breaking the cipher allowed the British and American Navies to locate German submarines in the Atlantic and destroy them. He defined a test to determine whether a computer can be called 'intelligent'. He wrote "A computer would deserve to be called intelligent if it could deceive a human into believing that it is intelligent". He predicted in 1950 that in 30 years we would be able to design such a computer. We are not yet there but almost there. In 1997 the IBM computer Deep Blue beat Gary Kasparov, the then world chess champion. Deep Blue won by enumerating millions of possible moves to determine the best move by 'bull work' (see article by Anjaneyulu in *Resonance*, July 1997). A much more remarkable feat was IBM Watson beating in 2011 the human champion in a game called Jeopardy! The game Jeopardy! televised in USA involves framing a question given an answer. For example if a clue is "1947 India" the question a player would frame is "When did India become Independent?". Framing questions from clues given by the game coordinator requires not only vast general knowledge on history, literature, the arts, current events, pop culture, science, sports, geography, etc., but also analyzing natural language and even decoding puns. The computer did it by deep linguistic analysis combined with a vast database of 'knowledge'. One cannot yet say whether a computer is intelligent but the champion Jeopardy! player Ken Jennings who was beaten by IBM Watson wrote "I, for one welcome our new computer overlords".

