

## Donald W. Davies

*Born June 7, 1924, Treorchy, Wales; worked on the Pilot AGE, one of the first operational stored-program computers, and later was responsible for the concept of packets in network communication.*



*Education:* BS (Honors), physics, Imperial College, London University, 1943; BS (Honors), mathematics, Imperial College, London University, 1946.

*Professional Experience:* National Physical Laboratory, 1947-1984; private consultant, 1984-present.

*Honors and Awards:* John Player Award, British Computer Society, 1974; distinguished fellow, British Computer Society, 1975; John von Neumann Award, John von Neumann Society, Budapest, 1983; DSc (Hon.), Salford University, 1983; Commander of the British Empire (CBE), 1983; fellow, Royal Society, 1987.

Donald Davies graduated in physics with first-class honors from Imperial College, University of London, 1943, at the age of 19. Thereafter his wartime work was mainly related to the application of numerical mathematics to fluid flow and diffusion problems on an industrial scale. In 1947 he graduated from Imperial College with a second first-class honors degree in mathematics.

After his second graduation he joined the team of scientists at the National Physical Laboratory, which built the ACE Pilot Model, then the fastest of the three pioneer digital computers in the UK. He designed the input/output equipment, and the arithmetic and logic units. He used the computer, among other applications, to simulate road traffic control and to optimize the settings of controllers, and to simulate warning and escape systems in coal mines.

From 1955 to 1965 he was a project leader for a number of research projects at NPL. He played a leading role in the design of the full-scale ACE computer. His projects included such diverse topics as machine translation from Russian into English, and the development of the Cryotron, an early superconducting logic and storage device. His interest and involvement with the commercial application of computers began during this period when he led a group investigating the choice of magnetic characters for checks for the London Clearing Banks.

Davies was the first project leader of the Advanced Computer Technology Project for the UK Ministry of Technology—a precursor of the 1980s Alvey Project. Among its successes were the ICL Distributed Array Processor (DAP) and the Context Addressable File Store (CAFS).

In 1965 Davies pioneered new concepts for computer communications in a form to which he gave the name “packet switching.” He introduced this concept to the UK Post Office (at that time the equivalent of a PTT) in 1966 and to the CCITT and the US Advanced Research Projects Agency (ARPA) in 1967. The design of the ARPA network (ArpaNet) was entirely changed to adopt this technique.

In 1966 Davies became head of the computer science division of NPL. He initiated research in data communications at NPL including the building of a packet switched local network (completed in 1971), and simulation studies of flow control, congestion, and routing in networks. He wrote and lectured widely to promote the concept of a data communication system with well-defined interfaces and protocols. At CCITT, on behalf of the UK Post Office, he helped to formulate some of the X recommendations for data communication services.

Other research of the computer science division at this time was in pattern and speech recognition, CAD in architecture, human factors, and office systems that used the local network.

In 1978 he was given an “individual merit” post as deputy chief scientific officer, allowing him to lead a research group without the management tasks of a division. He chose as his specialty the security of data in networks. The group developed the application of cryptographic methods to the practical needs of network security, especially the use of asymmetric (public key) cryptography. Consulting work under contract to financial institutions and others provided the practical experience.

Since leaving NPL in 1984, Davies has provided consultancy to financial institutions on high value payment systems (SWIFT and CHAPS), ATMs, and EFT/POS. He has advised suppliers and users of secure systems of many kinds, including mobile telephone and direct broadcast satellites.

## **BIBLIOGRAPHY**

### **Biographical**

Campbell-Kelly, Martin, “Data Communications at the National Physical Laboratory (1965-1975),” *Ann. Hist. Comp.*, Vol. 9, No. 3/4, 1988, pp. 221-248.

### **Significant Publications**

Davies, D. W., “A Theory of Chess and Noughts and Crosses,”<sup>1</sup> *Penguin Science News*, Vol. 16, 1950, pp. 40-64.

Davies, D. W., “Sorting Data on an Electronic Computer,” *Proc. Inst. Elect. Eng.*, Vol. 103, No. 1, 1956, pp. 87-93.

Davies, D. W., “Switching Functions of Three Variables,” *Trans. Inst. Radio Eng.*, Vol. 6, No. 4, 1957, pp. 265-275.

Davies, D. W., “A Communication Network for Computers and Their Remote Peripheral Devices,” *Proc. Post Office/Industry joint Symp. on Pulse Code Modulation Transmission and Switching Systems*, Brighton, UK, 1967.

Davies, D. W., and D. L. A. Barber, *Communication Networks for Computers*, John Wiley, London, 1973.

Davies, D. W., K. A. Bartlett, R. A. Scantlebury, and P. T. Wilkinson, “A Digital Communication Network for Computers Giving Rapid Response at Remote Terminals,” *Proc. ACM Symp. Operating System Principles*, ACM, New York, 1967.

Davies, D.W., and W.L. Price, *Security for Computer Networks*, John Wiley, Chichester, U& 1984.

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<sup>1</sup> Known in the US as “Tic Tac Toe.”

## **UPDATES**

Portrait added (MRW, 2012).