

Over the wall ...

Alan Maley
considers our
relationship with
computers.

We live in a networked world, assailed by an almost infinite quantity of information, which is expanding at such an exponential rate that we have no chance of keeping up. This, we are told, is a major gear-shift in human history, as we move from the print era to the information era. We are both the beneficiaries and the slaves of this unbounded access to information. Yet how much do we actually know or understand about how this came about, how it functions and what it is doing to us?

In this article, I review two books which give us slightly different takes on these questions. One is short and packed with factual information to remind us of what computers are and how they have developed so far over their short life-span. The other is long and complex, tracing the history of ideas which have brought humankind to this point in its history. In future articles, I shall review some other books which take a more critical view of current developments.

The Computer: A Very Short Introduction

In just 129 pages, Darrell Ince's book attempts to cover most of the developments in the computer, from the lumbering giants of the 1960s with their limited memories to the miniaturised versions with vastly larger memories that we are familiar with today. It begins with an overview of what a computer is – a device for storing, processing and retrieving large amounts of data quickly – and with an explanation of the internet and software. Chapter 2, *The Small Computer*, describes the way computers have increased in memory size and processing speed and decreased in size and cost as they have moved from electric valves and transistors to silicon chips. In Chapter 3, *The Ubiquitous Computer*, we are reminded that computers are now everywhere as a result of miniaturisation and ruggedness, which means they can be installed virtually anywhere. SATNAVS, mobile phones, surveillance cameras, banking, barcodes and a host of other devices which employ computer technology are simply 'there' in our world, and we are largely unaware of them. The chapter also looks at RFID (Radio Frequency Identification) and its implications for privacy, and at global

computing of weather, geology and geography. Chapter 4, *The Global Computer*, discusses the use of super-computers and networked systems to solve 'wicked' problems, such as the Human Genome Project. Chapter 5, *The Insecure Computer*, describes the viruses, Trojan horses, worms and other nasties which can attack computers. There is also a useful section on computer crime and how to avoid it. Chapter 6, *The Disruptive Computer*, discusses the effects computers have had on book and music publishing, newspapers and advertising. The rise of open-source software and the emergence of 'citizen journalism' is also mentioned here. Digital photography, which has largely replaced the traditional camera, raises some questions of reliability and trust, given the ease with which images can be manipulated on a computer. The chapter ends with a discussion of e-readers and the future of the book. Chapter 7, *The Cloud Computer*, looks at large data banks, both closed, such as Amazon, and open, such as Wikipedia. It presents the concept of cloud computing: a collection of hundreds of millions of computers embedded in a virtual 'cloud'. There is also an interesting discussion of two-way communication such as *Facebook* and *YouTube*. It concludes with



some implications for computer translation of natural languages. Chapter 8, *The Next Chapter*, describes some of the possible developments in functional languages, neural computers, Quantum computers and the DNA computer. It ends by drawing attention to some of the negative consequences of current trends, not least being *'that those technologies which were once free and open have eventually become centralised and closed as a result of commercial pressures'*.

The Information: A History, a Theory, a Flood

James Gleick gives such a wide-ranging account of the evolution of our understanding of what information is that it is not possible to discuss it here in detail. The starting point for modern information processing is 1948, when transistors were invented and when Shannon defined the *bit* as the fundamental unit of measuring information.

The book then looks back at the revolution brought about by the invention of the alphabet and writing systems, enabling us to store information for the first time. It goes on to describe the attempts to capture language through dictionaries and thesauruses, then moves to the work of Charles Babbage, who in the 19th century invented the first real computer – The Analytical Engine – though it was never built at the time, and of his collaborator, Ada Lovelace, who designed the first computer program.

Gleick then describes the development of the telegraph, first as a physical then an electrical system for transmitting information, and of Morse code as an abstract form of information. This was the first instance of a message being dissociated from its physical substance. This leads to discussion of codes, and Boolean symbolic language. (Interestingly, it turns out that a binary code was first described by Wilkins in 1641! But it was too far ahead of its time and was forgotten for 400 years.)

The book goes on to describe how the telephone further revolutionised communication. In the meantime, Shannon's work on binary arithmetic came together with logic circuits to make possible the first working computers. By the 1950s there was an extraordinary convergence of work from many disciplines: Turing's mathematical and coding work, Shannon and Weaver's *A Mathematical Theory of Communication*, Wiener's work in cybernetics – even psychology got a boost from information theory. And the leading proponents were asking the question which has haunted the field ever since: *'Can machines think?'*

The technical details of the discussion of the notion of entropy lost me at this point, but I felt in good company as the experts themselves seemed not to understand entropy either! The focus then shifts to biology and work in genetics, leading up to Watson and Crick's discovery of genetic coding in the double helix. This leads into a discussion of Dawkins's work on the meme, the way that ideas spread, and the role language plays in this transmission. There is much further discussion of randomness and the role it plays in information theory. It turns out to be very difficult to generate a truly random number, partly because humans are prone to see patterns in everything – including random numbers!



The concluding chapters are especially interesting as they examine the human urge since the Great Library of Alexandria to catalogue everything in the universe – most powerfully exemplified by the branching network of information contained in Wikipedia. This raises the issue of info-glut and how we can possibly deal with an exponential growth of information. As T S Eliot said: *'Where is the wisdom we have lost in knowledge? Where is the knowledge we have lost in information?'* The book ends on an optimistic note, quoting H G Wells: *'We do not want dictators, we do not want oligarchic parties or class rule. We want a widespread world intelligence, conscious of itself'*; and with some interesting things to say about language as *'not a thing of definite certainty but infinite possibility'*.

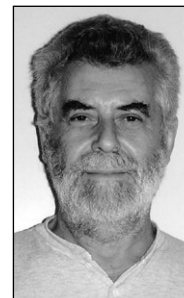
The book is fascinating for its range of historical anecdote and literary, as well as scientific, reference. From the point of view

of creativity theory, it shows how humans have groped their way towards new discoveries and inventions, only half-conscious of what they were doing; how some inventions came too early to be implemented for want of the resources yet to be invented, like Babbage's computer, which depended on cumbersome gears and steam power; and how personal genius combined with group interaction to find solutions. It is the personal narratives, as well as the intellectual discoveries, which make this a truly memorable and significant book.



Nowadays, virtually everyone is familiar with a whole range of computing devices and applications. We take them for granted – even those of us who are digital non-natives – and quickly learn how to press the right button. These two books remind us of what lies behind the easy access to information we now manipulate automatically, but largely without understanding. **ETp**

Gleick, J *The Information: A History, a Theory, a Flood* Fourth Estate 2011
Ince, D *The Computer: A Very Short Introduction* OUP 2011



Alan Maley has worked in the area of ELT for over 40 years in Yugoslavia, Ghana, Italy, France, China, India, the UK, Singapore and Thailand. Since 2003 he has been a freelance writer and consultant. He has published over 30 books and numerous articles, and was, until recently, Series Editor of the *Oxford Resource Books for Teachers*.

yelamoo@yahoo.co.uk

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helena.gomm@pavpub.com

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