

Ivor Catt

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Ivor Catt (born 1935) is a British electronics engineer known principally for his alternative theories of electromagnetism. He received B.A. degree from Cambridge University, and has won two major product awards for his innovative computer chip designs (see *Life and career* section below).

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Life and career

Ivor Catt was born in England and grew up on an RAF airbase in Singapore ^[1], which he left along with his mother just before the invasion. He did his National Service stationed in Germany. He won a scholarship to read mathematics at Trinity College, Cambridge University, but transferred to engineering. Catt inspired the design of the world's first wafer-scale integration product, a 160 MB solid state memory in 1988, that won Sinclair's spin-off, Anamartic, the 'Product of the Year Award' from the U.S. journals *Electronic Design* [1] (http://www.ivorcatt.org/image/icrew2003jun_Picture2.jpg) (on 26 October 1989) and *Electronic Products* [2] (<http://www.ivorcatt.com/3ew.htm>) (in January 1990), after Sir Clive Sinclair's offshoot computer company, Anamartic, invested £16 million.

Ivor is currently critically ill and has been in intensive care since 6 October 2007 [3] (http://en.wikipedia.org/wiki/Talk:Ivor_Catt#Health_scare).

Catt's views on electromagnetism

Catt argues that much of mainstream electromagnetism is wrong: Catt does not admit the existence of electric charge as a fundamental entity and he claims that all charge is composed of trapped Heaviside energy current. He argues that capacitance and inductance are fictional, being artifacts of transmission-line effects in the devices; that displacement current is not needed to explain capacitor operation. As opposed to normal electric current (flow of charge), Catt uses energy current to describe most effects.

Catt illustrates this with the **Catt anomaly**. When a step electromagnetic wave travels from left to right in a parallel twin-conductor transmission line, he asks, "Where does the charge on the bottom (return) conductor come from?" He does not answer that question, but states that simply asking the question proves that conventional electrodynamics must be false. The subtext of his argument here seems to be that charge from the conductors is not necessary for the transmission of EM waves in transmission lines. The electric field carrying the energy precedes and causes subsequent electron drift current, but the field is not itself charge, but rather Heaviside "energy current", light speed electromagnetic energy.

Catt's views on digital logic

Catt has a long-standing dispute about "exclusive or" in Boolean algebra. He has noted that "and", "or", "exclusive-or" (and their inverses) are the six functions out of the 16 possible functions of two Boolean inputs for which $A \text{ op } B$ is the same as $B \text{ op } A$. Catt calls this "symmetric", and complains that Boolean algebra deals with "and" and "or" and ignores "ex-or". He appears to have been arguing this since his IC design days, when he apparently failed to convince his boss of the business case for having an XOR function in the product range. (De Morgan's laws state that a "positive-logic AND" is a "negative-logic OR" and vice versa.)

Current status of Catt's ideas

Catt's paper 'Crosstalk (Noise) in Digital Systems,' in *IEEE Trans. on Elect. Comp.*, vol. EC-16 (Dec 1967) pp. 749-58 [4] (http://ieeexplore.ieee.org/xpl/freeabs_all.jsp?arnumber=4039191) has so far received 36 scholarly citations [5] (<http://scholar.google.com/scholar?hl=en&lr=&cites=7347728401648293569>) because it uniquely makes correct predictions of the maximum possible amount of crosstalk (mutual inductance) between adjacent circuits, while two other popular papers written by Ivor Catt received 57 [6] (<http://scholar.google.com/scholar?hl=en&lr=&cites=15905607118324963335>) and 21 [7] (<http://scholar.google.com/scholar?hl=en&lr=&cites=13335691372789325884>) scholarly citations, respectively.

The view of Catt's ideas by mainstream physicists is that his earlier work on digital logic circuits is of value, but his later ideas about electromagnetism are incorrect. This status is reflected in Catt's absence from standard undergraduate and graduate textbooks on electrodynamics [8] (http://en.wikipedia.org/wiki/Ivor_Catt#cite_note-1), quantum mechanics [9] (http://en.wikipedia.org/wiki/Ivor_Catt#cite_note-2), materials science, or solid-state physics. However, Ivor Catt proved that the later ideas in electromagnetism are simply based on the earlier ones:

I entered the computer industry when I joined Ferranti (now ICL) in West Gorton, Manchester, in 1959. I worked on the SIRIUS computer. When the memory was increased from 1,000 words to a maximum of 10,000 words in increments of 3,000 by the addition of three free-standing cabinets, there was trouble when the logic signals from the central processor to free-standing cabinets were all crowded together in a cableform 3 yards long. ... Sirius was the first transistorised machine, and mutual inductance would not have been significant in previous thermionic valve machines...In 1964 I went to Motorola to research into the problem of interconnecting very fast (1 ns) logic gates ... we delivered a working partially populated prototype high speed memory of 64 words, 8 bits/word, 20 ns access time. ... I developed theories to use in my work, which are outlined in my IEEE Dec 1967 article (EC-16, n6) ... In late 1975, Dr David Walton became acquainted ... I said that a high capacitance capacitor was merely a low capacitance capacitor with more added. Walton then suggested a capacitor was a transmission line. Malcolm Davidson ... said that an RC waveform should be ... built up from little steps, illustrating the validity of the transmission line model for a capacitor [charging/discharging]. (This model was published in Wireless World in Dec 78.) - 'Electromagnetic Theory Volume 2', Ivor Catt, St Albans, 1980, pp. 207-15.

Catt also claimed disastrous consequences of censorship in his article *Electronics World* September 2003 issue, 'EMC - A Fatally Flawed Discipline' pages 44-52:

... during the Falklands War, the British warship HMS Sheffield had to switch off its radar looking for incoming missiles ... This is why it did not see incoming Exocet missiles, and you know the rest. How was it that after decades of pouring money into the EMC community, this could happen ... that community has gone into limbo, sucking in money but evading the real problems, like watching for missiles while you talk to HQ.

Catt's work on the internet as a means to combat censorship, 1978-89

Catt's work has received extensive coverage and debate in the *Wireless World* and *Electronics World* journal (in every single issue from December 1978 to September 1988), also see [10] (<http://www.ivorcatt.com/3ew.htm>). The *New Scientist* on 19 February 1989 published the fact that Catt proposed an electronic internet to share ideas and circumvent bigoted censorship [11] (<http://www.newscientist.com/article/mg12416924.800-forum-on-the-importance-of-being-creative--innovativethinkers-should-be-allowed-to-come-to-the-fore-.html>):

Creative thinkers are by their nature often isolated, their ideas either ignored or rejected, or sometimes simply taken up without any acknowledgment. But what if they could make contact with each other? That was the idea of Ivor Catt, an innovative thinker whose own immense ability in electronics has all too often been too far ahead of conventional ideas to be appreciated: significantly, Catt is beginning to get some high-level backing from companies who see the possibility of major breakthroughs from his work ('Wafers herald new era for computing', New Scientist, 25 February 1989).

Catt argues that as bodies of knowledge grow, they become stronger in keeping out any new items of knowledge that appear to question the fundamental base of the established knowledge and its practitioners. To assist the propagation of new ideas, he proposes the creation of an electronic information-sharing network.

In March 1989, the month after that article with Catt's idea was published by *New Scientist*, Tim Berners-Lee responded by writing a paper called *Information Management: A Proposal* in order 'to persuade CERN management that a global hypertext system was in CERN's interests. Note that the only name I had for it at this time was "Mesh" -- I decided on "World Wide Web" when writing the code in 1990.' [12] (<http://www.newscientist.com/article/mg12416924.800-forum-on-the-importance-of-being-creative--innovativethinkers-should-be-allowed-to-come-to-the-fore-.html>)

Catt actually began his investigations into the need for an internet and search engines in his 1978 article, 'The Rise and Fall of Bodies of Knowledge', *The Information Scientist*, 12 (4) December 1978, pp. 137-144 [13] (<http://www.electromagnetism.demon.co.uk/ipub002a.htm>):

Communication nets should be able to adjust rapidly to new communication developments and opportunities. ... I myself am setting up at least three nets - one being on electromagnetic theory, a subject totally suppressed by the journals. Another net that I shall start will be a net giving advice on what nets exist. Net design can be expected to improve rapidly during the first ten years or so after their inception, and it is important that improvements in their structure are widely communicated as they are received.

Articles

- Catt, I. "The Rise and Fall of Bodies of Knowledge", *The Information Scientist*, 12 (4) December 1978, pp. 137-144 [14] (<http://www.electromagnetism.demon.co.uk/ipub002a.htm>)
- Catt, I., Davidson, M., Walton, D.S., "Displacement current", *Wireless World*, December 1978
- Catt, I., Davidson, M., Walton, D.S., "The history of displacement current," *Wireless World*, March 1979
- Cook, Nigel, "Air traffic control: how many more air disasters?", *Electronics World*, January 2003, pp. 12-17 [15] (<http://www.ivorcatt.co.uk/>)
- Firth, Howard, "Forum: On the importance of being creative - Innovative thinkers should be allowed to come to the fore", *New Scientist*, 25 November 1989 [16] (<http://www.newscientist.com/article/mg12416924.800-forum-on-the-importance-of-being-creative--innovativethinkers-should-be-allowed-to-come-to-the-fore-.html>)

Conference papers

- "A Difficulty in Electromagnetic Theory," by Dr Arnold Lynch and Mr Ivor Catt Presented to, and Published by, the Institution of Electrical Engineers, Professional Group D7 (History of Technology), 26th Weekend Meeting, 10-12 July 1998, University of East Anglia, publication HEE/26 [17] (http://www.iee.org/oncomms/pn/history/hot_conf_index.pdf)
- I. Catt, 'Crosstalk (Noise) in Digital Systems,' in *IEEE Trans. on Elect. Comp.*, vol. EC-16 (Dec 1967) pp. 749-58 [18] (http://ieeexplore.ieee.org/xpl/freeabs_all.jsp?arnumber=4039191).

References

1. ^ <http://www.ivorcatt.com/2951.htm> , accessed 1 August 2007

External links

- Ivor Catt's latest website, with 1970s books and articles (<http://www.ivorcatt.org/>)
- Ivor Catt's earlier website (<http://www.ivorcatt.com/>)
- Dr. Neil McEwan's explanation of "Catt anomaly" (<http://www.ivorcatt.com/2813.htm>)
- The Catt Anomaly (<http://www.electromagnetism.demon.co.uk/catanoi.htm/>)
- Air Traffic Control report (<http://www.ivorcatt.com/3ew.htm>)
- putative error in Maxwell's equations (<http://feynman137.tripod.com/>) corrected (with minor reference to Catt's work)
- Nigel Cook discussion of Maxwell, Heaviside and Catt theory (<http://www.wbabin.net/physics/cook.htm>)

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