

The opposition's closing remarks

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These kinds of debates are doomed from the very beginning because of the absence of a common definition of what criteria are used to define an event, process or invention as "the most significant": a tacit assumption that everybody knows what yardsticks to use is obviously not good enough. I tried to remedy this absence by offering such a definition, namely making the greatest difference (preferably a positive one) in the lives of the largest number of people. Unassailable logic would demand that sticking to this definition would yield a number of possibilities that easily outrank computing.

The list might start with that great accomplishment of feeding 7 billion people, a feat made possible by a combination of plant breeding, agronomic advances and, arguably, above all by the Haber-Bosch process of making inexpensive nitrogen fertilisers. And it might also include (as I suggested, following the horse-before-the-cart logic) all those cumulative advances in generation and distribution of electricity: after all, without them there would no way to energise all those computing wonders (but reliable and plentiful electricity supply is now so often taken as a given that it does not merit even a glancing acknowledgment). Antibiotics are obviously another key candidate: their invention and the first few decades of their mass production had nothing to do with any electronic computing as they became, and continue to be, saviours of hundreds of millions lives. To ask what is more significant when a child has acute pneumonia—amoxicillin or a laptop—is to expose the frivolity of the comparison: first things first.

But, of course, logic usually does not enter these contrived debates: to a large extent they are actually not debates at all but merely exchanges of preconceived missives. Another way to capture this irreconcilability is Oliver Morton's rather accurate caricature of the two opposites in this case, one being about the present and one about the future. On this account I plead, eagerly, guilty: as a historian of technical advances I have been always impressed no less by continuities (just recall that electronic computing is still utterly dependent on electricity generated overwhelmingly by machines whose fundamentals have not changed since the 1880s) and cumulative advances than by purported miracles that will, unlike all previous inventions, amplify our minds.

Mr Morton rightly points out that this is not a watertight argument: "the book and the library, surely, amplify the human mind, as does the mental discipline of mathematics, which flourished as an immaterial technology for millennia before its embodiment in logic circuits last century." More could be adduced in the opposite direction: today's two single largest participatory activities predicated on the availability of inexpensive electronic computing are tweeting and texting. Hundreds of millions of people do it daily and an average American teenager now sends 3,000-5,000 such missives a month. This is surely not an amplification of human minds—rather a mindless puerile addiction with (as is so well known from communication studies) the quality of messages inversely proportional to their staggering quantity.

Finally, Mr Morton was curious to know if I agree with Peter Cochrane's claim that the affluence now enjoyed by a billion or so well-off people could be "spread to the near 7 billion now alive without a global network of automated manufacture and computerised logistics". I do not. My

latest book is "Two Primer Movers of Globalization: The History and Impact of Diesel Engines and Gas Turbines" (MIT Press, September 2010) and so I am familiar with the great feats of modern computerised logistics—but as a biologist and a historian I also know that other developmental paths are possible. And in this case they are not even so difficult to conceive.

After all, global trade now includes massive amounts of truly ridiculous exchanges and it could be roughly halved by not trading in virtually identical products. All garlic could be perfectly well grown in America (as it was until fairly recently) and not imported from China, and all the cars Germans need could be made in Germany and not imported from Japan or Spain. To think that our current global trade, with its enormous environmental impacts and its deep social dislocation, is the most desirable or the only conceivable arrangement would be to display an unusual obtuseness of mind. To repeat: caring, equitable and reasonably affluent societies are perfectly imaginable without electronic computing—but not without adequate food and widely available good primary health care.