The opposition's opening remarks

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This is a preposterous claim, one that ignores many fundamental realities of modern civilisation and that could be made and defended only by those who have fallen into that badly mistaken definitional hole from the bottom of which "technology" appears only as something having to do with electrons, transistors, microchips and the surrounding apparatus of hardware and software—and who have never thought that "technology" may be also about breeding high-yielding crops and making sure that billions of people have enough to eat. Computing is not the only set of technical advances that is, repeatedly and wrongly, seen as a leading candidate for the most significant innovation or breakthrough of the past century: public opinion surveys also elicit "nuclear energy" or "space flight" as worthy candidates.

But if "most significant" means what it should on this planet dominated by a single species—that is, making the greatest difference (preferably a positive one) in the lives of the largest number of people—then none of the above qualifies for the top spot, indeed none of them should rank even among the top five. First things first: even the techies who now spend their lives glued to glowing screens or twiddling their thumbs over their BlackBerrys have to eat. At the beginning of the 20th century there were 1.6 billion people, by its end the total had reached 6 billion, now it is nearly 7 billion. This growth has been the most fundamental determinant of all key social, economic and political developments, driving large-scale urbanisation, enabling mass industrial production and resulting in mass consumption—and it has called for an unprecedented amount of food.

In 1900 less than a third of the world population, some 500m people, had enough to eat; now, even if we believe the FAO's official (and probably exaggerated) estimates, about 15% are malnourished, which means that 6 billion people are adequately (or excessively) fed. What has been the single most important technical advance that has made such a large population possible? Many innovations had to come together, from better diesel engines for tractors and combines (their diffusion began before the second world war) to the introduction of new short-stalked high-yielding varieties of rice and wheat and of hybrid corn thanks to relatively straightforward but enormously rewarding classical plant breeding techniques. None of these advances were conceived and introduced with any help from any computers (hybrid corn began to appear during the 1930s; hybrid rice and wheat were released by the early 1960s). But going to the very roots of the success (no pun intended), even the best cultivars would not produce high yields if they did not have an adequate supply of nitrogen, the most important plant macronutrient.

Traditional agricultures could supply only inadequate amounts of it by laborious recycling of organic matter. In 1909 Fritz Haber discovered how to synthesise ammonia by catalytically combining elemental hydrogen with air-derived nitrogen, and a mere four years later Carl Bosch turned that lab-bench proof into a large-scale industrial production process. Even if we were to recycle every scrap of organic matter that could be realistically collected, we could never get enough nitrogen to support 7 billion people, some 85% of them on adequate diets, a third of them on diets that are too generous. I have calculated that by 2000 about 40% of humanity was alive because the proteins in their bodies were formed by digesting food whose nitrogen came from the Haber-Bosch synthesis of ammonia. In China—now by far the world's largest user of synthetic fertilisers and whose average per head food energy supply is higher than Japan's—that share is now more like 70%.

Affluent and well-functioning societies are perfectly possible without any or with only marginally present electronic computing; indeed, we had them in America until the late 1950s and in most of Europe and Japan until the early 1970s. But such societies are unthinkable with shortened life spans, large-scale malnutrition and recurrent famines. Technical advances that put paid to all of those were the Haber-Bosch synthesis of ammonia and the introduction of high-yielding crop varieties that could take advantage of that abundant nitrogen supply. Life, after all, is fundamentally a matter of organised proteins, not of more transistors packed ever more densely on a small piece of silicon.

The search for the "most significant technological advance" has other solutions. An obvious one is to approach the widely touted supremacy of computing from a simple horse-and-cart point of view: we must then conclude immediately that the gradual improvements in the two dominant generators of electricity (invented before 1900) and the introduction of the third key option (gas turbine) during the 1930s represent a more important set of technical advances than does electronic computing. Steam turbines in large coal-fired and nuclear power stations, hydro turbines in massive dams and nimbly operating gas turbines generate all but a tiny share (accounted for by wind turbines and PV cells) of the world's electricity, without whose incessant and highly reliable supply there is no computing. Electricity produced as inefficiently, as expensively, as unreliably and in such limited quantities as it was in 1900 could not even begin to energise the global computing of 2000.

We could try a simpler tack, refuting the claim of the most significant advance by asking a multiple question: "Are we now significantly healthier, better educated, happier and living more dignified lives as a result of electronic computing?" Obviously no—but the answers are resoundingly positive for all children who now have enough to eat.