

# Beyond Moore's Law: The incredible Progress of Computing

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In the year 1965 Gordon Moore published a paper stating, that the number of transistors on a chip would double every 12 months, a figure later revised to 18 months. For 40 years, the computing capacity grows at this exponential rate. Many times declared dead, Moore's law is well and is expected to be valid for years to come.

If we look at a related measure, namely the number of computing operations 1000\$ will buy, then we see an exponential growth taking place over the whole of the last century and spanning 5 technologies from Hollerith machines over relays, vacuum tubes, discrete transistors to integrated circuits. Clearly, some more fundamental law is fuelling the computing industry. Computing deals with nonmaterial symbols that can be represented by many different technologies. Each technology has an exponential law and will be replaced by a succeeding one once at its limit.

In this talk, we will argue, that Moore's law will continue for a long time. A back of the envelope calculation will yield that our children will have the computing capacity of the human brain in their notebook computers.

What will this mean for the applications possible with such machines? Unlike the hardware, the application paradigms do not progress steadily, nor do they show an exponential growth in power. We see new application epochs approximately every 10 years. Scientific computing, ledger and payroll, manufacturing and airlines and personal computing are examples of such epochs. We argue, that we are at dawn of a new era: *lifestyle computing* and we predict bionic computing as the mega trend in 10 years to come.

Computer graphics is a key technology for the lifestyle computing epoch. We look at the recent progress in computer graphics hardware, where the Moore constant is not 18 months but more closely 12. We stand at the beginning of photo real real-time actors and will discuss, that the key question in the next years is not photorealism, but rather making the behavior of virtual actors more credible.

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