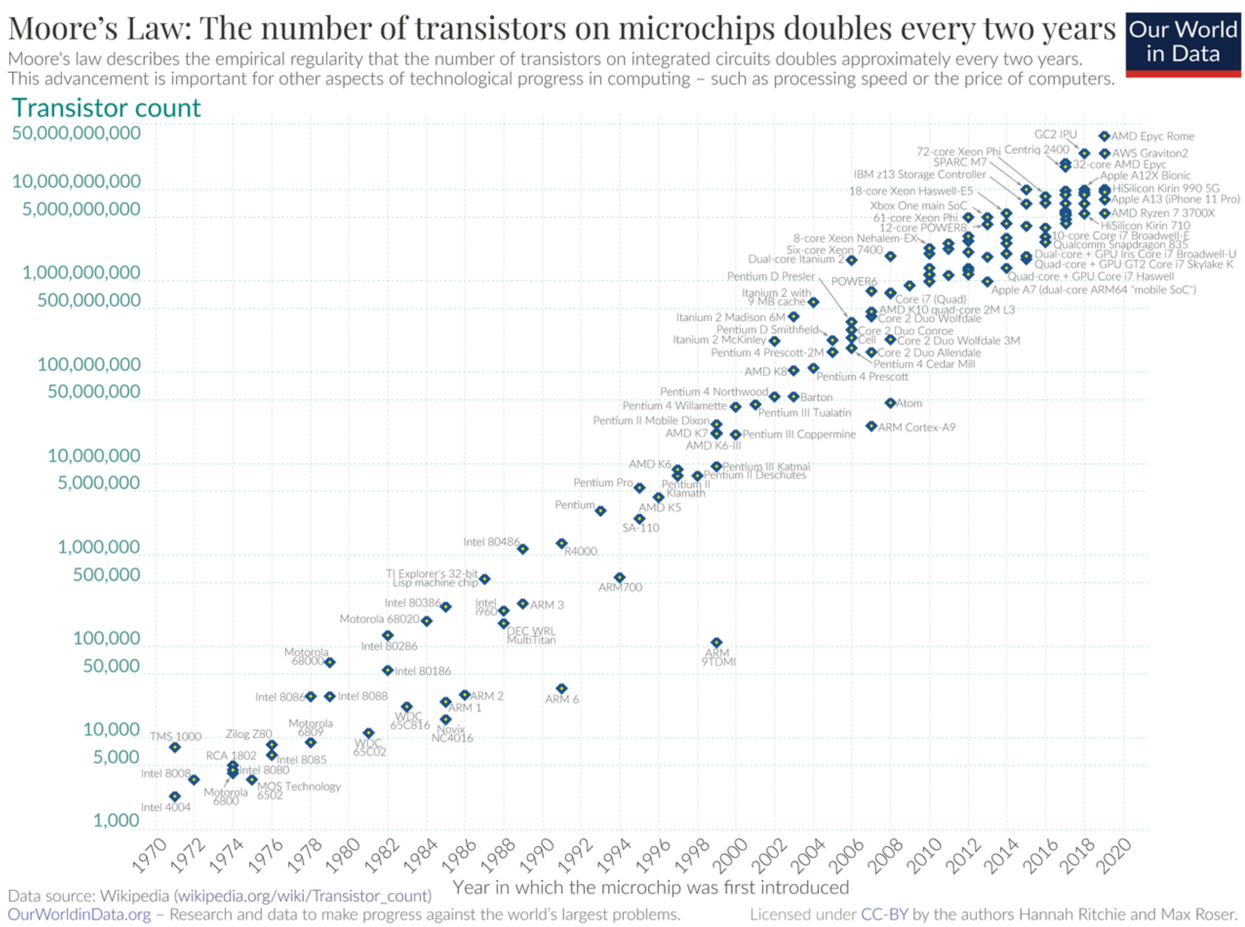
What is Moore's Law?
Gordon Moore, founder of Fairchild Semiconductors and later Intel, argued that integrated circuits (ICs) would double in complexity every two years. In layman's terms, this means that things like CPUs and hard disks will be twice as fast and half their predecessors size approximately every two years.

To provide some context, integrated circuits are electronic circuits that are compacted onto a small chip, which contains transistors, resistors, and capacitors. These chips have become ubiquitous and are found in virtually all electronic devices, from smartphones and laptops to cars and medical equipment.

The graph below illustrates how the number of transistors on a microchip has increased over time. For example, the Intel 404, released in 1971, had 2,300 transistors and was a 4-bit CPU. In contrast, the Intel 8080, released in 1974, had nearly twice as many transistors and was an 8-bit CPU. Today, we can surpass 10 billion transistors on a single microchip.



Why is it relevant?

There are many reasons why Moore's Law is relevant. For one thing, the cost of ICs has decreased over time, making them more accessible. This is because the increasing number of transistors is not only relevant to computers and televisions but also other things that utilize them, including factory machinery, vehicles, and anything that uses sensors.

Where are we today in comparison?

One of the most significant examples of Moore's Law is in the development of computers and television sets. We have reached a point where the change in image quality (television) and the speed of programs are indistinguishable to the naked eye. However, the rate by which the number of transistors increases over time is not the reason for the impending end of Moore's Law.

In recent years, microchip manufacturers and other industry experts have begun to argue that we are nearing a plateau when it comes to the rate by which the number of transistors on a given microchip increases. Their argument relies on two factors:

1. **The speed of light**: Since bits are modeled by electrons traveling through transistors, they cannot surpass the speed of light.

2. **The cost of electricity**: The faster a microchip processes information, the more energy it uses. Due to global warming and other factors, we are starting to face an electricity shortage, which further limits the potential for growth.

Both of these factors ultimately lead us towards Heisenberg's uncertainty principle, which states that there is a "fundamental limit to how precisely we can know certain pairs of physical properties of a particle." As such, when discussing more advanced/modern chips, such as GPUs, we are moving towards more of a quantum computing idea.

As electronic devices continue to become smaller and more complex, they are approaching a fundamental limit in their ability to process information due to quantum effects. One of the most well-known quantum effects is called quantum tunneling, which occurs when electrons can pass through potential barriers that they should not be able to cross based on classical physics. This can lead to issues in the reliability and performance of electronic devices as the behavior of individual electrons becomes more difficult to predict and control. Another quantum effect that can impact electronic devices is called quantum entanglement, where particles become linked in a way that their properties are dependent on each other, regardless of the distance between them. As the size of electronic components continues to shrink, these and other quantum effects will become more significant and may require new approaches to designing and manufacturing electronic devices.

The end of Moore's law has significant implications for the future of technology. One potential consequence is that the rate of improvement of computing power may slow down or even come to a halt. This could have a major impact on various industries, such as artificial intelligence and data processing, that rely heavily on the continued improvement of computing power. On the other hand, the end of Moore's law could also lead to new innovations in computing, such as the development of new materials or technologies that can overcome the limitations of traditional silicon-based microchips. In any case, the end of Moore's law is likely to be a major turning point in the history of computing and technology.

References:

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