Advanced Computer Architecture

Discussion topic: fundamental limits

Feynmann: plenty of room at the bottom

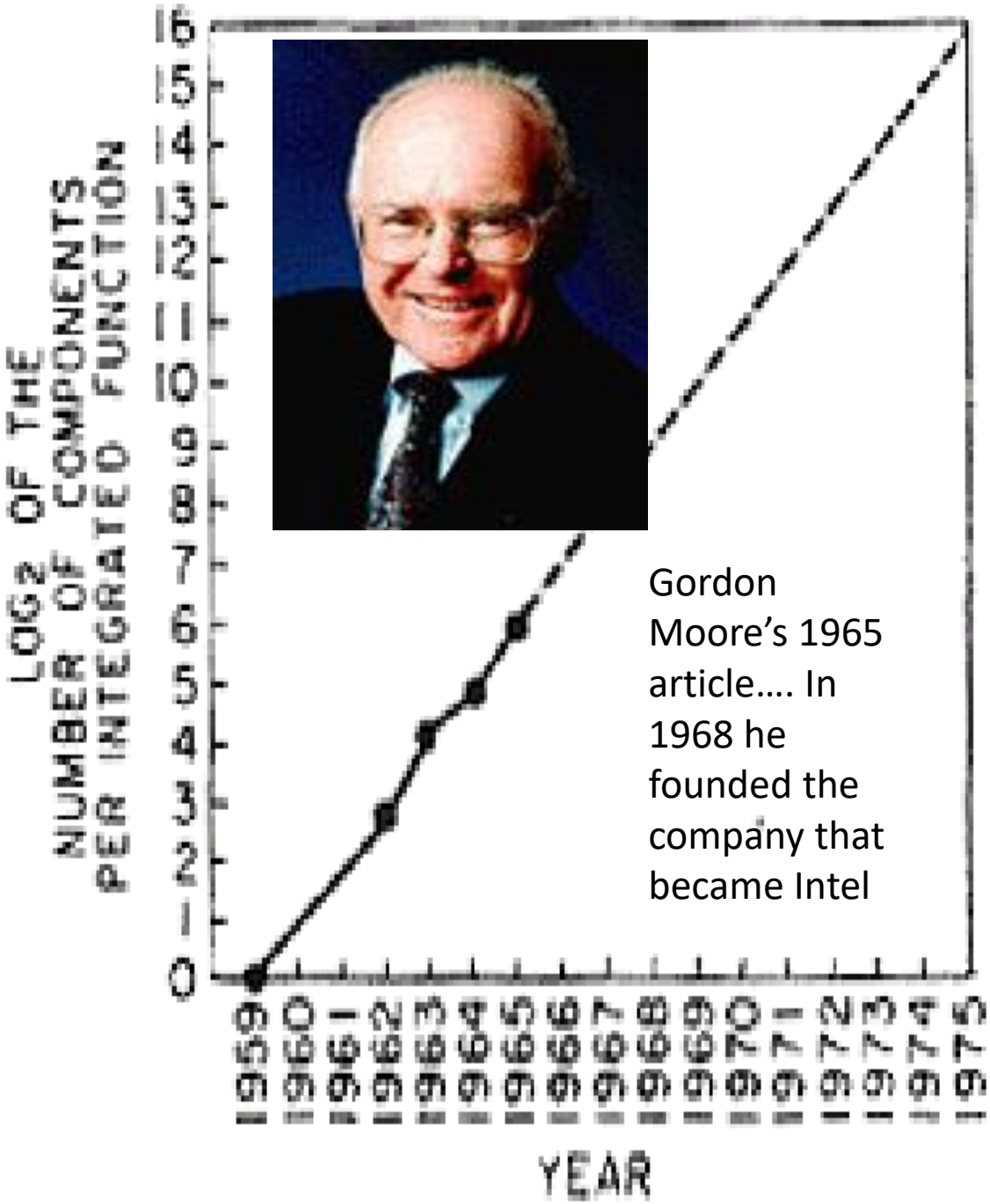
..... **Miniaturizing the computer**

I don't know how to do this on a small scale in a practical way, but I do know that computing machines are very large; they fill rooms. Why can't we make them very small, make them of little wires, little elements—and by little, I mean little. For instance, the wires should be 10 or 100 atoms in diameter, and the circuits should be a few thousand angstroms across.

.....

But I would like to discuss, just for amusement, that there are other possibilities. Why can't we manufacture these small computers somewhat like we manufacture the big ones? Why can't we drill holes, cut things, solder things, stamp things out, mold different shapes all at an infinitesimal level? What are the limitations as to how small a thing has to be before you can no longer mold it?

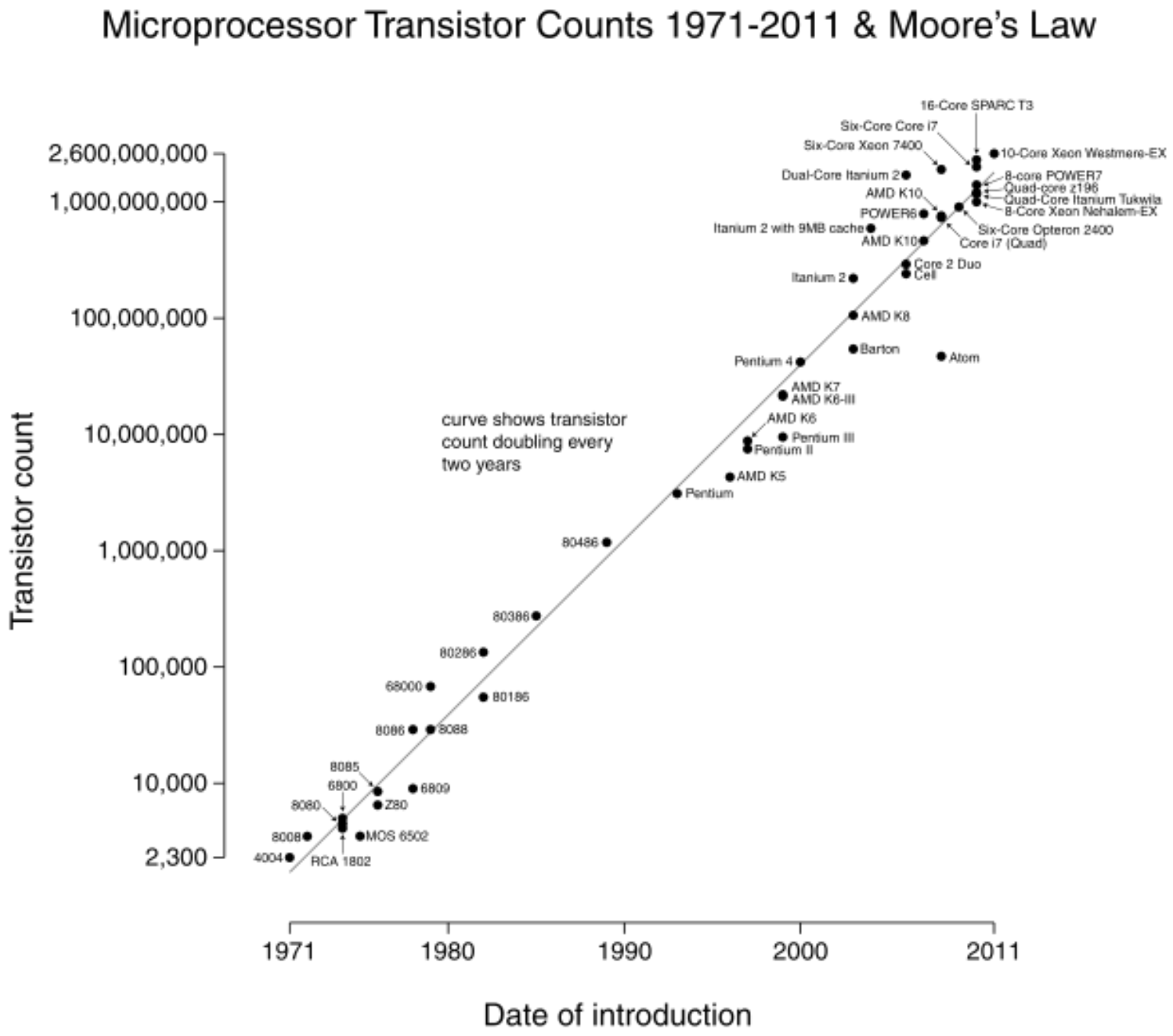
December 1959



Gordon Moore's 1965 article…. In 1968 he founded the company that became Intel

"With unit cost falling as the number of components per circuit rises, by 1975 economics may dictate squeezing as many as 65,000 components on a single silicon chip" Gordon Moore, 1965

Cramming more components onto integrated circuits, Electronics, volume 38, number 8, April 19, 1965, pp.114 ff.



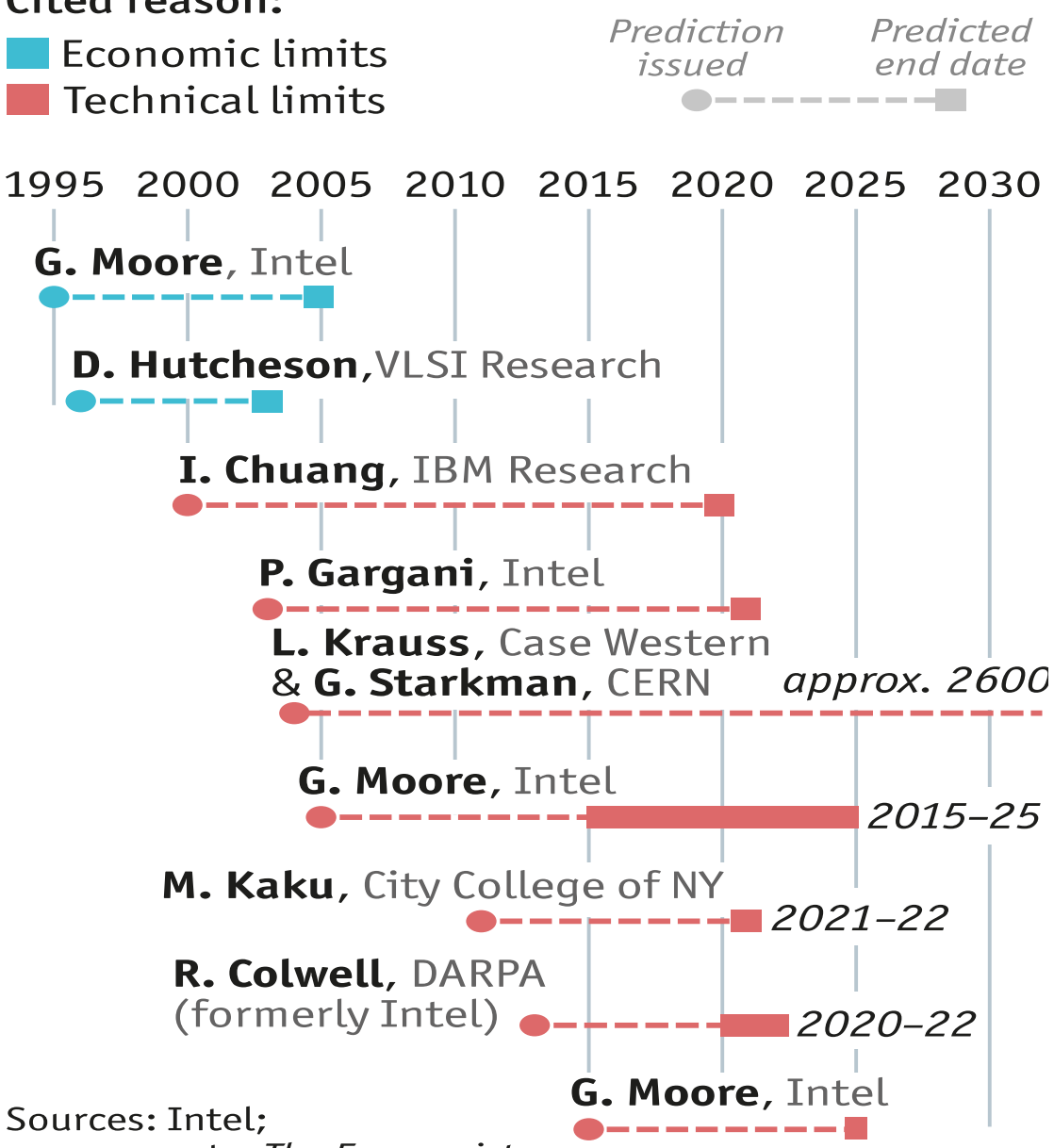
http://en.wikipedia.org/wiki/File:Transistor_Count_and_Moore%27s_Law_-_2011.svg

Limits

- Historically, computer architecture has been limited severely by what we could build
- All exponential growth processes come to end
- At the limit of Moore's Law, computer architecture will be limited by the fundamental physics of computation
- What will change?

Faith no Moore

Selected predictions for the end of Moore's law



Sources: Intel; press reports; *The Economist*

http://www.economist.com/technology-quarterly/2016-03-12/after-moores-law