WSJ.com THE WALL STREET JOURNAL. ONLINE

PORTALS
By LEE GOMES

Even an Intel Founder Can Still Be Impressed By Technology's Pace

October 10, 2007; Page B1

For a man whose name is so intimately linked with everything that is remarkable about modern technology, Gordon Moore is as flummoxed by all of it as the rest of us.

Cellphones have more features than he can possibly use. Terabyte-size disk drives that can fit in your hand are a "miracle." And he finds it "utterly amazing" that Google can return so many search results so quickly.

"I am continually surprised by what people can do with these things," he says.

Considering the source, that's a bit like Newton saying he can't believe how quickly apples fall from trees. Mr. Moore is the author of Moore's Law, a formula he came up with in the 1960s while a founding employee of Intel to predict the way computer chips would double in capacity every year or so.

While computer chips would have improved just as quickly without Mr. Moore, he is linked in most minds with their progress. And that progress has been taken for granted for so long that Silicon Valley perpetually frets about a time when it might stop being true.

Mr. Moore, 78 years old and retired from Intel, discussed all this in an interview last week, during festivities marking the 50th anniversary of the founding of Fairchild Semiconductor, arguably the first tech start-up and the precursor to Intel.

Outside of his law, Mr. Moore isn't as well-known as other Intel luminaries, such as Bob Noyce or Andy Grove. That's in large part due to his demeanor. Mr. Moore has none of Mr. Noyce's patrician bearing or the mercurial Mr. Grove's love of the spotlight. Instead, he looks and acts like an old-fashioned neighborhood pharmacist, unassuming and ready with a smile.

Few pharmacists, though, are billionaires.

In discussing the great run of Moore's Law, its author said the world has been lucky that no law of physics so far has stood in the way of it being true.

It didn't always look like we were going to be so lucky. At one point during the 1970s, Intel brought out a new, more-compact generation of memory chips. At first, they worked fine. But customers began reporting that the chips would occasionally and randomly "forget" a bit of information.

No one at Intel, though, could consistently reproduce the failures. Mr. Moore thought it might be the work of cosmic rays, but that was ruled out when the chips kept failing even after being encased in bricks. "It was driving us nuts," he recalled. Maybe one of Mother Nature's undiscovered rules had it in for Moore's Law.

Then one day, on a whim, an Intel engineer and amateur mineralogist put a small piece of uranium next to a memory chip. The entire chip was erased. Mystery solved.

The bits inside a memory chip had become so small that they could be damaged by a single alpha particle, which uranium chips famously send out by the gazillions.

It turned out that some of the casing materials used to make the memory chip also randomly decayed and sent out alpha particles, though vastly less frequently than uranium. That accounted for the sporadic errors. Design changes were made and Moore's Law survived, in what was probably the first time in industrial history that an entire assembly line was shut down by a single subatomic particle.

Actually, many today say that Moore's Law has run its course. Big chips like the Pentium produce so much heat that Intel worries more about improving energy efficiency than performance. Mr. Moore admits that the limitations of power consumption caught him, as well as the industry, by surprise.

These days, Mr. Moore spends his days with his wife at their house on Hawaii's Big Island. Most people would consider it a life of well-earned gentlemanly leisure, though Mr. Moore said, "I suppose I just fritter the time away." With some of his vast wealth from Intel, he started a nonprofit trust, the Gordon and Betty Moore Foundation.

The story of Fairchild that Mr. Moore was helping to commemorate is well-known in Silicon Valley. William Shockley, an AT&T researcher, invented the transistor in the late 1940s and then started his own company to commercialize it. He recruited eight young engineers, Mr. Moore included. Mr. Shockley, though, was considered something of a Capt. Queeg, and in despair the Traitorous Eight left to start their own company, Fairchild. Intel grew from that a few years later.

While Mr. Moore isn't the sort to speak ill of anyone, least of all the dead, he says Mr. Shockley was as bad as the history books suggest. Once, when a secretary accidentally ripped her blouse on a sharp edge in a door, Ms. Shockley got it in his mind that the accident had been a deliberate act and ordered lie detector tests for everyone.

It's hard to avoid asking Mr. Moore if he has ever come across another boss as unpleasant as Mr. Shockley. Many Intel alumni, for example, grumble about Mr. Grove. Mr. Moore laughs off the comparison.

"The only people who had trouble with Andy were those who didn't see him very often," he says. "Shockley was psychotic; Andy was just demanding."

Write to Lee Gomes at lee.gomes@wsj.com