

Please look at the cards on the table. Which of these things have you used? Please tell the class more. For example:

"When I was younger, I used to go to the dentist. The dentist's office had Pac-Man in it, for the children to play. I would play Pac-Man while waiting for my appointment, or afterwards, when I was waiting for my mom to pay and schedule another appointment."

Now flip the cards over. What do you notice?

### ***The Story of the Intel 8080 and the Z80***

By Charles Henry Wetzel

In a computer, the "processor" is like the brain of the computer. In the 1940s and 1950s, processors were made of thousands of vacuum tubes, so computers were gigantic and expensive and usually only governments, militaries, or large companies could afford them. There were only a few hundred computers worldwide.

Later, with transistors instead of vacuum tubes, computers became smaller. Some companies and universities could afford a computer, but computers were still very expensive and large.

Finally, scientists learned how to put many, many tiny transistors on a piece of silicon. This is called a "microchip." A processor that is a microchip is called a "microprocessor."

The first microprocessor that a person could buy easily was the 4004. It was made by an American company, Intel; Intel was working together with a Japanese company, called Busicom (a company that made calculators). Ted Hoff (an American) and Federico Faggin (an Italian-American dual citizen) designed the

logic. Masatoshi Shima (Japanese), from Busicom, took their logic and figured out how to make it into transistors. They finished making the 4004 in 1971. It was used in Busicom's calculator. The Intel 4004 was a very simple microprocessor. It had only 2,300 transistors, so it was only suitable for calculators, not regular computers. Still, it was an important first step.

Who was Masatoshi Shima? Well, he was born in Shizuoka in 1943. He studied biochemistry in university, but there were not very many good jobs in biochemistry, so he worked for Busicom instead, a company that made calculators.

The Intel company wanted to work on a more powerful microprocessor. Again, Federico Faggin and Masatoshi Shima worked together to create this microprocessor. They created the 8080 in 1974. The 8080 was much more powerful; it had 6,000 transistors. It was not just for calculators; it could be used in many things! It was in the first personal computer, the Altair 8800 (1975). It was also in Space Invaders (1978).

Federico Faggin and Masatoshi Shima were so successful, they decided to start their own company! This company was called Zilog. The two men (and some other people, as well) wanted to create a microprocessor that would be inexpensive and compatible with the Intel 8080. This new microprocessor would be called the "Z80." The Z80 had 8,500 transistors. It was released in 1976. It became faster and more powerful than the Intel 8080, but it could "speak the same language" (assembly language) as the Intel 8080, so Intel 8080 software could run on the Z80, too. This meant that even though the Z80 was a new microprocessor, there were already many programs that people could use on it.

In 2019, many people use "operating systems" such as Windows, iOS (on iPhone and iPad), and Android. Back in the 1970s and 1980s, one of the most popular operating systems was called

“CP/M.” It was originally for the Intel 8080. Because the Z80 could “speak the same language” as the Intel 8080, that meant the Z80 could also run CP/M, so the Z80 became popular very quickly.

The Z80 became extremely popular. In fact, my English student, Ryuichi Sunama, used to be a Z80 programmer!

The Z80 was the microprocessor in Pac-Man (1980), the Japanese personal computer MSX (1983), the Nintendo Game Boy (1989), and the Texas Instruments graphing calculators, such as the TI-83 Plus, which I used from middle school to college.

Maybe you are wondering, "What happened to Masatoshi Shima?" Well, he moved back to Japan in 1980, working for Intel, again. He then became a professor at Aizu University, retiring in 2004. At the time of this writing, he is still around.

And what about Zilog and the Z80? What happened to them? Well, many devices still have a Z80 in them. For example, if a police officer stops your car and asks to test your breath for alcohol, he might use a breathalyzer with a Z80 in it. There might be a Z80 in your printer, fax machine, or other device. The Texas Instruments TI-84 Plus CE calculator (2015) uses a very powerful Z80 called an eZ80.

In the technology world, things change very quickly, but now, in 2019, many of us still use Z80s. It was invented in 1976, but over 42 years later, many devices still have them! Maybe some things in technology do not change so quickly!

Do you have an Intel computer at home? If so, your computer can probably still understand the language of the Intel 8080, even though that language was invented over 44 years ago!

## Sources:

- Wikipedia
- <https://www.computerhistory.org/fellowawards/hall/masatoshi-shima/>
- <https://www.computerhistory.org/fellowawards/hall/federico-faggin/>