IEEE Brainwaves

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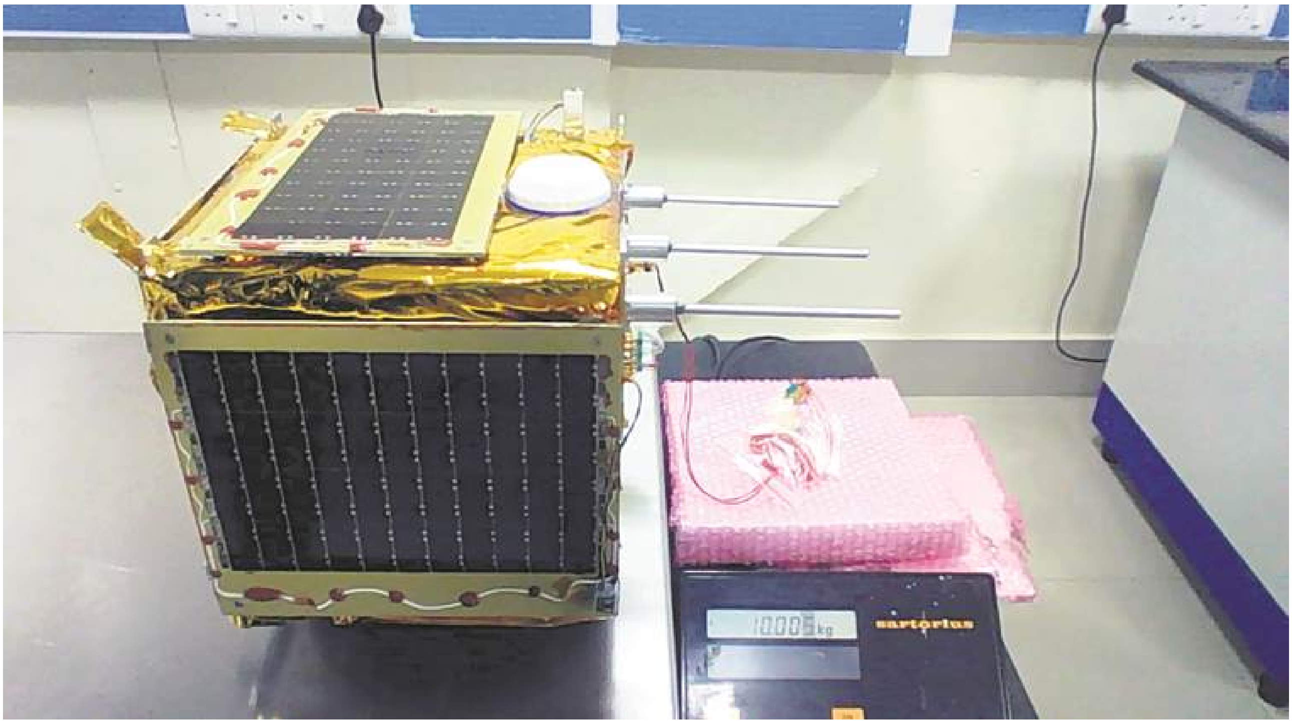
IEEE Brainwaves Feature Events :

Visit to IIT-B for a glance of Pratham Satellite



About the visit: The first Industrial visit by IEEE Brainwaves was to IIT Bombay; which is home to the first student satellite, Pratham. Pratham is an Indian ionospheric research satellite which is being operated by the Indian Institute of Technology, Bombay as part of the Student Satellite Initiative. Its primary mission is to count electrons in the Earth's ionosphere.

The Experience: The visit to Pratham was a small endeavour, with only 40 students. However, the experience was truly enriching for all. The objective of the visit was to give the students a first-hand experience about the satellite and the entire venture from inception. A brief PowerPoint presentation gave the students an overview of the venture. The students were shown a live feed from Pratham. The students were then taken to the labs where all the testing and engineering had been done. This gave the students an insight into the decade long project that has been going on in IIT Bombay. All of this was then followed by a Q&A session. Each question reflected the keen curiosity of the students of DJ Sanghvi. The Q and A session thus marked the end of the IV.

IEEE Spectrum Article :

The Surprising Story of the First Microprocessors

You thought it started with the Intel 4004, but the tale is more complicated

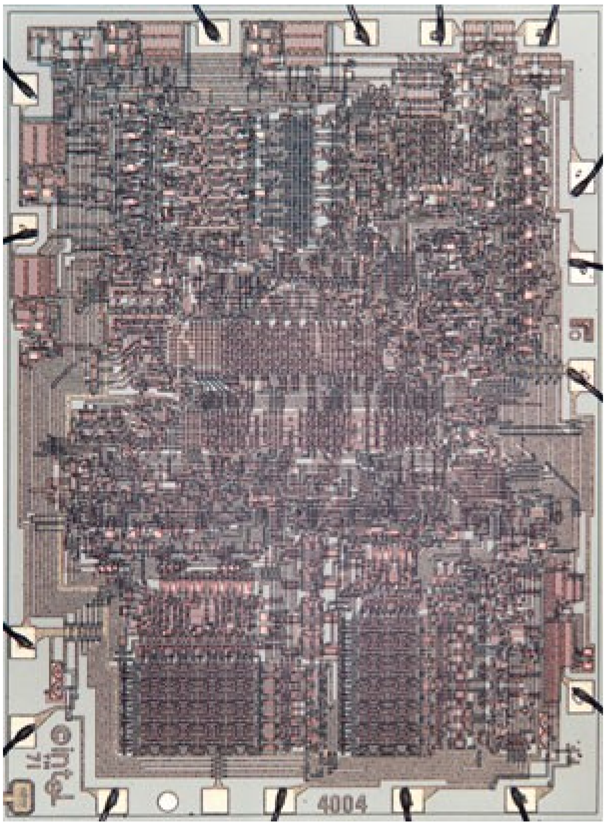


Illustration 1: The Die is Cast: Intel's 4-bit 4004 chip is widely regarded as the world's first microprocessor. But it was not without rivals for that title.

Transistors, the electronic amplifiers and switches found at the heart of everything from pocket radios to warehouse-size supercomputers, were invented in 1947. Early devices were of a type called bipolar transistors, which are still in use. By the 1960s, engineers had figured out how to combine multiple bipolar transistors into single integrated circuits. But because of the complex structure of these transistors, an integrated circuit could contain only a small number of them. So although a minicomputer built from bipolar integrated circuits was much smaller than earlier computers, it still required multiple boards with hundreds of chips.

In 1960, a new type of transistor was demonstrated: the metal-oxide-semiconductor (MOS) transistor. At first this technology wasn't all that promising. These transistors were slower, less reliable, and more expensive than their bipolar counterparts. But by 1964, integrated circuits based on MOS transistors boasted higher densities and lower manufacturing costs than those of the bipolar competition. Integrated circuits continued to increase in complexity, as described by Moore's Law, but now MOS technology took the lead.

By the end of the 1960s, a single MOS integrated circuit could contain 100 or more logic gates, each containing multiple transistors, making the technology particularly attractive for building computers. These chips with their many components were given the label LSI, for large-scale integration.

Engineers recognized that the increasing density of MOS transistors would eventually allow a complete computer processor to be put on a single chip. But because MOS transistors were slower than bipolar ones, a computer based on MOS chips made sense only when relatively low performance was required or when the apparatus had to be small and lightweight—such as for data terminals, calculators, or avionics. So those were the kinds of computing applications that ushered in the microprocessor revolution.

Most engineers today are under the impression that the start of that revolution began in 1971 with Intel's 4-bit 4004 and was immediately and logically followed by the company's 8-bit 8008 chip. In fact, the story of the birth of the microprocessor is far richer and more surprising. In particular, some newly uncovered documents illuminate how a long-forgotten chip—Texas Instruments' TMX 1795—beat the Intel 8008 to become the first 8-bit microprocessor, only to slip into obscurity.

What opened the door for the first microprocessors, then, was the application of MOS integrated circuits to computing. The first computer to be fashioned out of MOS-LSI chips was something called the D200, created in 1967 by Autonetics, a division of North American Aviation, located in Anaheim, Calif.

This compact, 24-bit general-purpose computer was designed for aviation and navigation. Its central processing unit was built from 24 MOS chips and benefitted from a design technique called four-phase logic, which used four separate clock signals, each with a different on-off pattern, or phase, to drive changes in the states of the transistors, allowing the circuitry to be substantially simplified. Weighing only a few kilograms, the computer was used for guidance on the Poseidon submarine-launched ballistic missile and for fuel management on the B-1 bomber. It was even considered for the space shuttle.

The D200 was followed shortly by another avionics computer that contained three CPUs and used in total 28 chips: the Central Air Data Computer, built by Garrett AiResearch (now part of Honeywell). The computer, a flight-control system designed for the F-14 fighter, used the MP944 MOS-LSI chipset, which Garrett AiResearch developed between 1968 and 1970. The 20-bit computer processed information from sensors and generated outputs for instrumentation and aircraft control.

The architecture of the F-14 computer was unusual. It had three functional units operating in parallel: one for multiplication, one for division, and one for special logic functions (which included clamping a value between upper and lower limits).

Each functional unit was composed of several different kinds of MOS chips, such as a read-only memory (ROM) chip, which contained the data that determined how the unit would operate; a data-steering chip; various arithmetic chips; and a RAM chip for temporary storage.

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