Micro Chips

that shook the world

A vision for a traveling exhibit
featuring *IEEE Spectrum*'s Chip Hall of Fame

A collaboration of

IEEE Spectrum

IEEE Global MUSEUM
Presented by IEEE History Center

UPLAND EXHIBITS

MICROCHIPS THAT SHOOK THE WORLD

Contents

INTRODU

The Big Idea

A highly mobile, interactive exhibit from the IEEE Global Museum to explain why microchips were designed and engineered, and the roles they play in electronic technology.

The IEEE *Microchips that Shook the World* Exhibit

Many people are aware that integrated circuits are essential components in electronic devices of all types, but few can guess what they do or how they were invented. Building on the digital Chip Hall of Fame created by *IEEE Spectrum* magazine, the goal of the *Microchips that Shook the World* exhibit is to explain why chips were designed and engineered, and to open up the rich world of rivalries, gambits, and grand designs hidden behind the black plastic and metal contacts.

Every microchip has a story. The ubiquitous FM radio chip that launched a thousand gadgets in the 1980s because one Philips manager went rogue. The humble 555 timer chip—designed by hand fifty years ago, yet still in mass production. The chip designed for home computers that wound up in orbit around Jupiter. *Microchips that Shook the World* will connect opaque names like Z80, 6502, and ARM1 to products visitors will remember or recognize, such as a favorite home computer or video game console from the 1980s, up to the GPS-enabled smartphones we all carry today.

We will frame the human stories behind individual chips' development within an integrated-circuit origin story. This will relate how engineers dropped their initial opposition to ICs as they recognized how they could eliminate human error in computer manufacturing. The benefits of miniaturization were felt later.

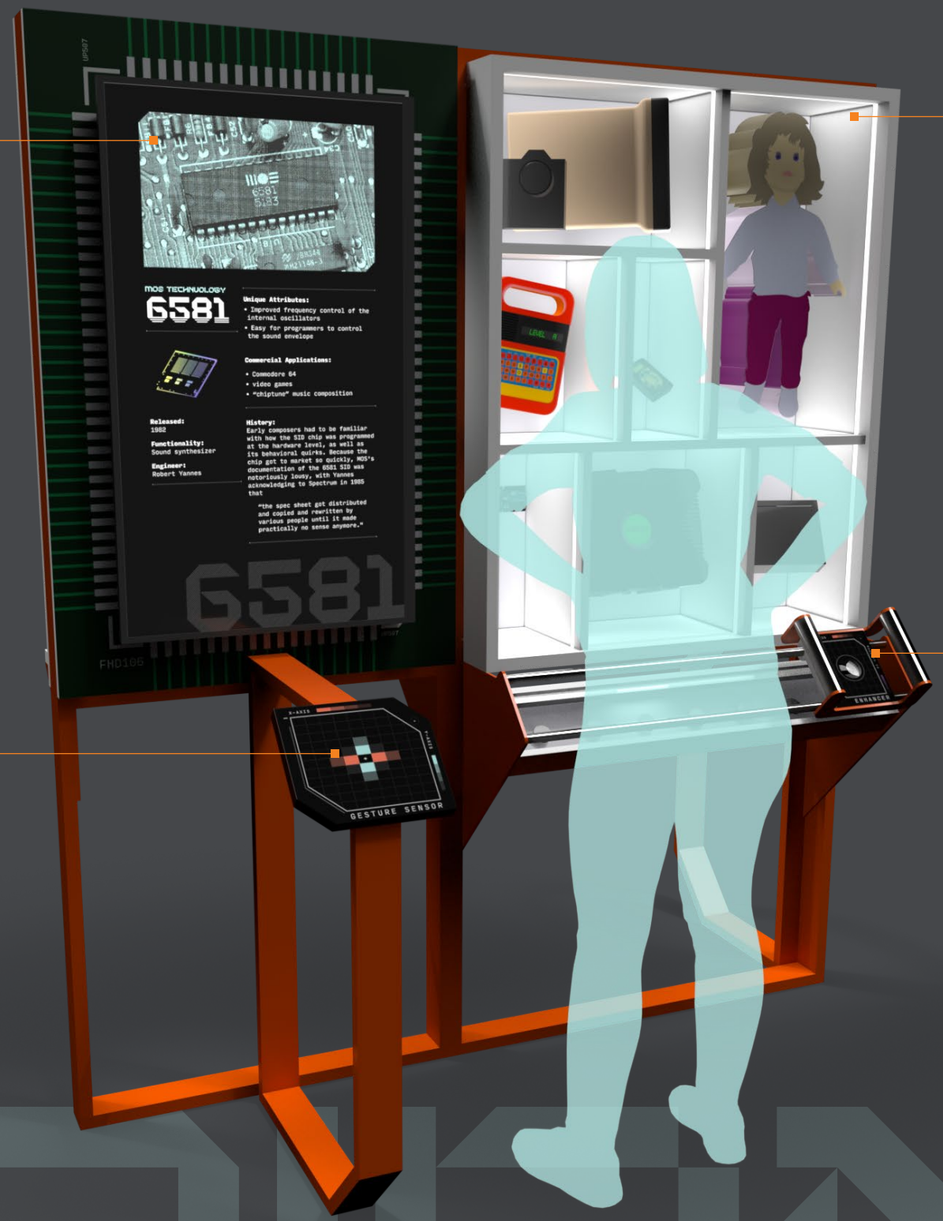
The compact size and versatility of the exhibit will minimize costs. Its interactive nature, along with the chips and other artifacts on display, will convey a compelling impression of the vital and varied roles played by ICs in our technological society, such as signal processing, audio engineering, telecoms, and more.

Visit the online Chip Hall of Fame on the *IEEE Spectrum* website.

spectrum.ieee.org/special-reports/chip-hall-of-fame/

Front

Digital content on 43″ screen: text, images and media that build on Chip Hall of Fame online articles.



AirGesture input provides a novel–but–intuitive way to navigate content.

Objects representing the microchips' product applications. Each object illuminated individually when related content displayed onscreen.

Individual chips displayed with a sliding magnifying glass for closer inspection. Each chip illuminated individually when related content displayed on screen.

DESIGN

Space available for further development. Ideas include:

- Enlarged tactile model of a microprocessor die or a single planar transistor.
- Visualization of Instructions Per Second.
- Chart comparing processing power of various chips.
- Interactive chip in which people manually control the electronic operations to better understand how microprocessors function.

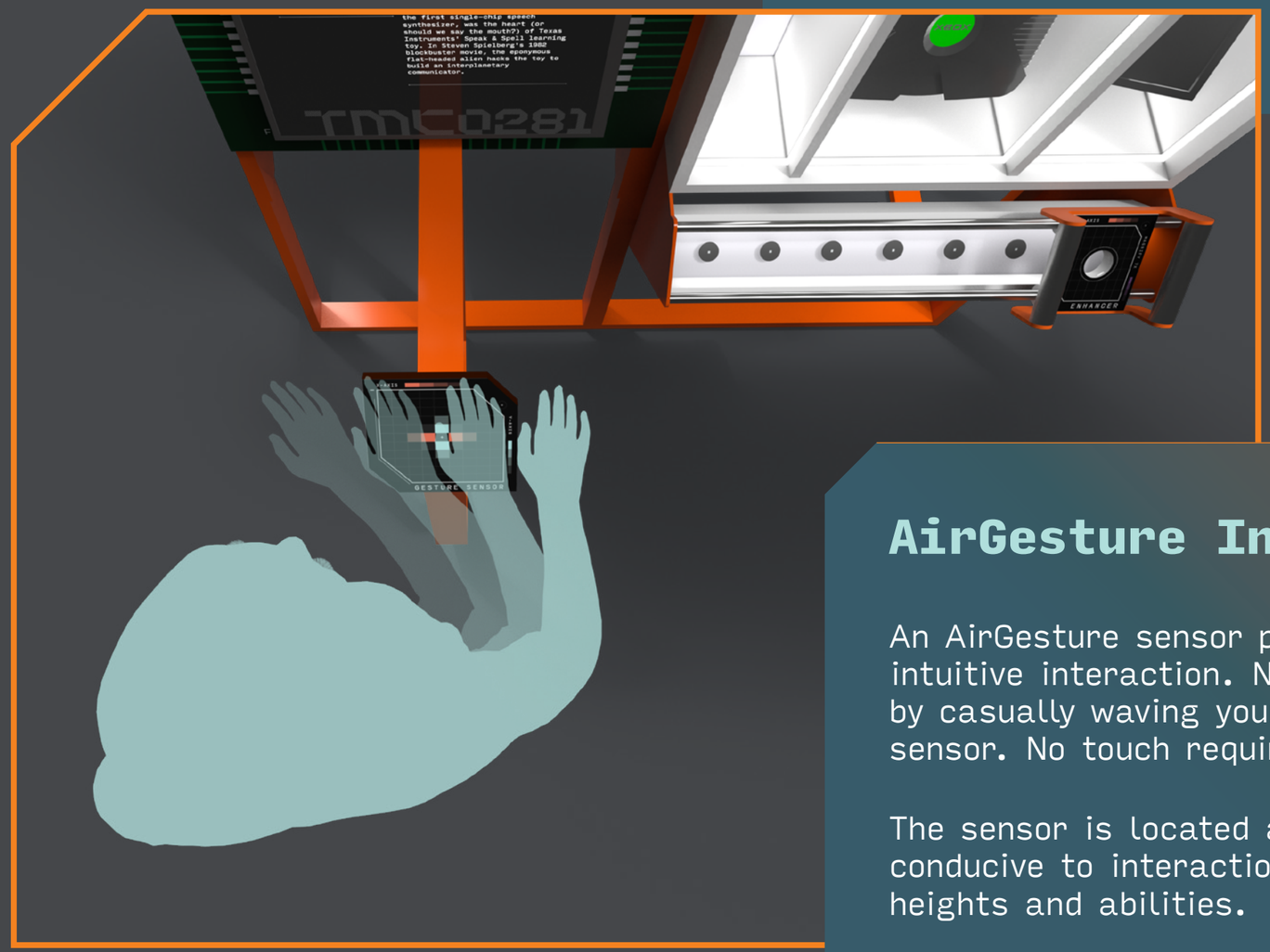
Focus on the 6502 “superhero chip” renowned for its varied applications.

Several examples of products using the 6502 such as Tamagotchi and pacemaker.

Commodore 64 highlight: could be an interactive C64, an “exploded” C64 or modified C64 with a clear shell to view interior electronics.

Digital Content + Physical Objects

Content on the screen will contextualize artifacts in the case. Each microchip and object will be illuminated individually when related content is accessed onscreen.



AirGesture Interaction

An AirGesture sensor provides accessible and intuitive interaction. Navigate the onscreen content by casually waving your hand or holding it over the sensor. No touch required!

The sensor is located at a height and angle conducive to interaction by people of varying heights and abilities.


UPS07
TEXAS INSTRUMENTS
TMC0281
Unique Attributes:
• Used a technique called linear predictive coding; the sound emerges from a combination of buzzing, hissing, and popping
Commercial Applications:
• Atari arcade games
• Chrysler K-cars
Manufacturer:
Texas Instruments
Category:
Amplifiers and Audio
Year:
1978
History:
If it weren't for the TMC0281, E.T. would've never been able to "phone home." That's because the TMC0281, the first single-chip speech synthesizer, was the heart (or should we say the mouth?) of Texas Instruments' Speak & Spell learning toy. In Steven Spielberg's 1982 blockbuster movie, the eponymous flat-headed alien hacks the toy to build an interplanetary communicator.
TMC0281
FHD106
UPS07
LEVEL A
GESTURE SENSOR
X-AXIS
ENHANCER

Exhibit in a Box

The aim of the IEEE Global Museum “Exhibit in a Box” program is to create engaging, interactive and compact exhibits that can travel easily to a variety of locations. Each exhibit in a box will pair a single or small group of key artifacts with engaging interactive content to produce a self-contained educational experience in the history of electrotechnology. The “box” refers to the capability of packing the exhibit straightforwardly into a compact crate that can be unpacked to create an attractive, interactive exhibit.

The *Microchips that Shook the World* exhibit will fit into a crate on a standard shipping pallet that can easily be transported.

Each venue will be responsible for setting up and tearing down the exhibit. So instructions will be included that require minimal training.

Interactives and the Origin of Chips

Digital interactives that address the past, present, and future of chips will contextualize the artifacts on display and enhance the user experience. Ideas for digital interactives include:

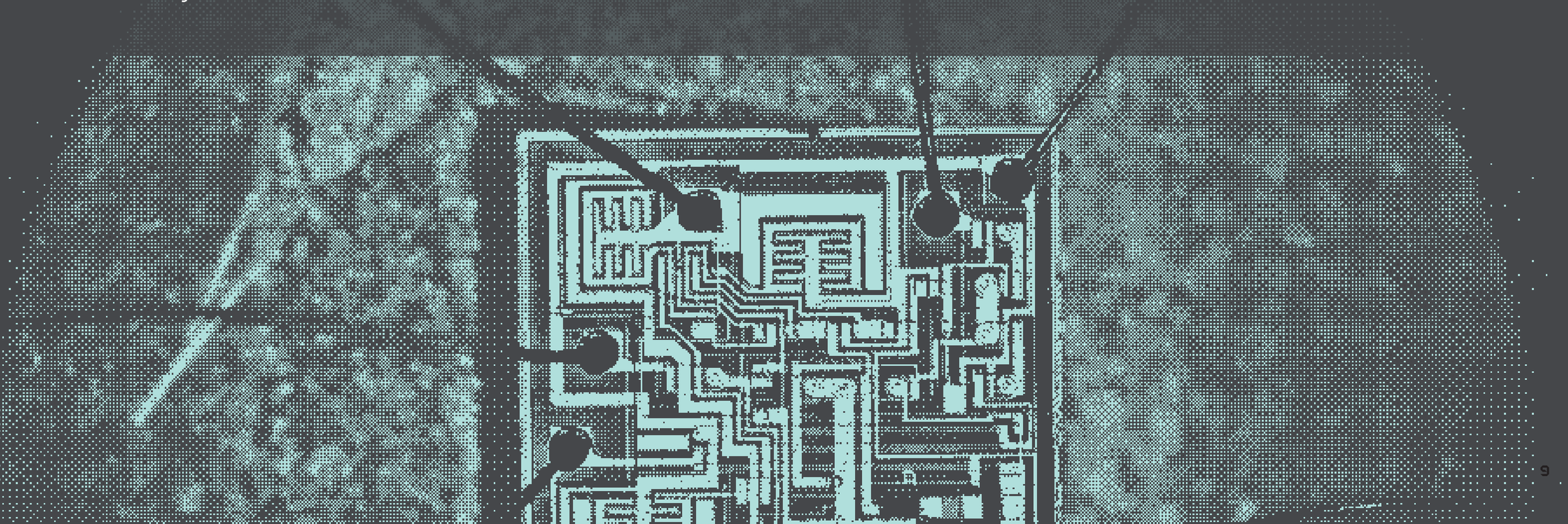
- **Video explainer** of how chips work that introduces visitors to key components and concepts, like transistors, silicon wafers, and logic gates.

- **Interactive map** of how chips are made that reveals their global geography of raw materials, design and intellectual property, equipment, manufacturing, and assembly.

- **Interactive timeline** that builds a picture of why chips were invented, how they became a commercial product, and how chip design has evolved—from hand drawing to electronic design to AI.

- **“Chips by numbers” animation** featuring, for example, price per transistor, transistors per CPU, and number of transistors manufactured over time, with a special explainer for Moore’s Law.

- **“Talking heads” segment** on where chips are going based on interviews and oral histories with industry leaders.



Developing and Launching the Exhibit

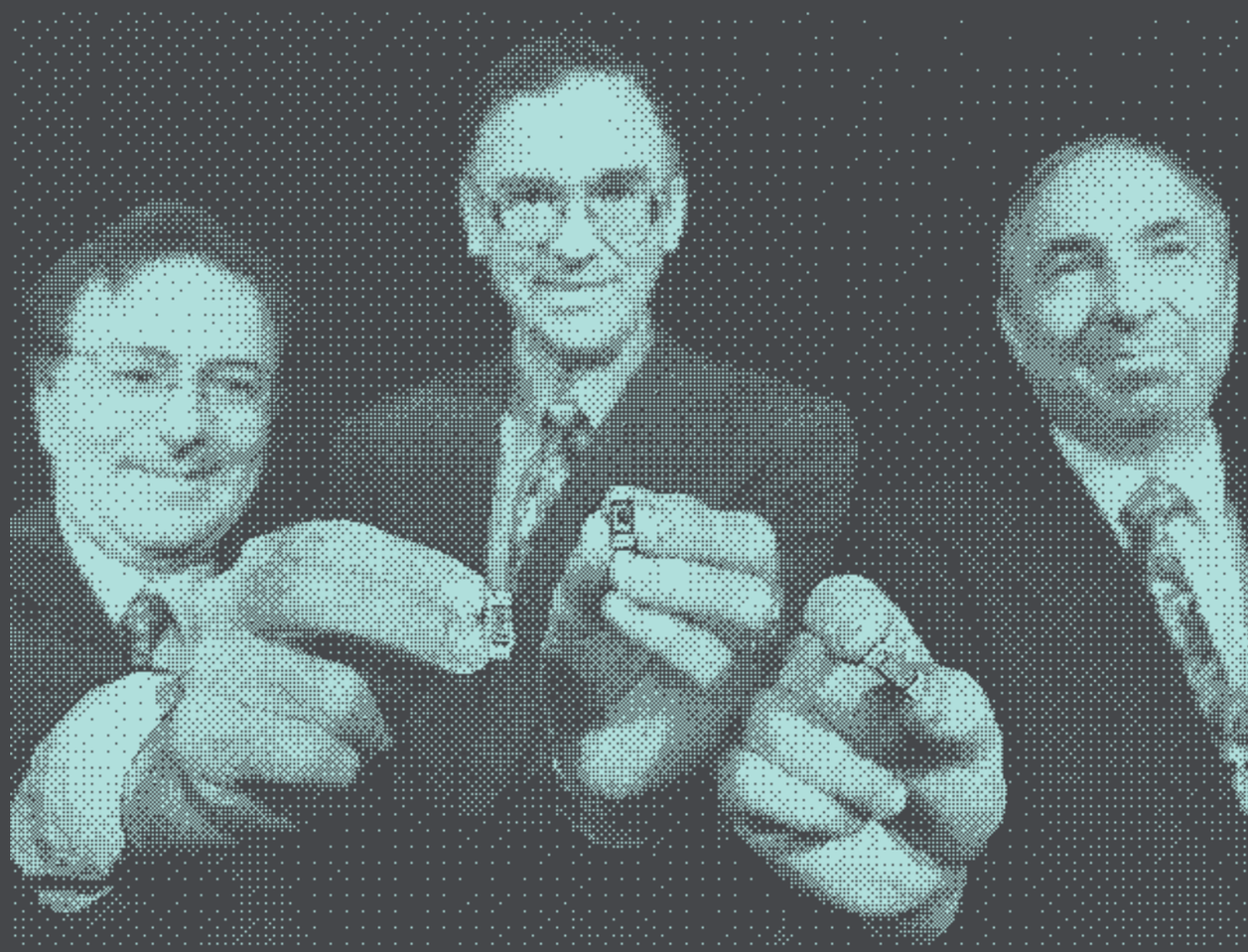
The project is divided into three phases. Phase 1 is fully funded. It consists of the design, realization, and launch of *Microchips that Shook the World* followed by three years of touring across North America. The exhibit will reach public audiences in museums and libraries, and IEEE members at IEEE conferences and meetings, including those hosted by the IEEE Societies sponsoring the exhibit.

- The exhibit will launch in mid-2025.
- It will travel between 12 and 18 locations until 2028.
- The typical public installation will be 2–3 months long.

In addition, *IEEE Spectrum* will induct two new microchips into its online Chip Hall of Fame and create a dedicated website page for the exhibit.

We are now seeking support for phase 2. It consists of touring the exhibit throughout Europe on a similar basis between mid-2026 and 2029. This will involve building a second version of *Microchips that Shook the World* and developing additional exhibit content tailored to European audiences.

Phase 3 would bring a third version of the exhibit to the Asia/ Pacific region between 2027 and 2030. We are not seeking support for phase 3 at this time.



Credits

Children around Commodore 64 photo: Karl Staedele/Picture Alliance/Getty Images
Treatment by Upland.

MOS Technology 6581: Christian Taube/Wikipedia.
Treatment by Upland.

Arduino Uno photo by Harrison Broadbent

Diamond Rio PMP300 photo: Eirik Solheim

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Intel 4004 engineers photo: Paul Sakuma/Ap
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A MESSAGE FROM UPLAND EXHIBITS

Thank You!

We are grateful for the opportunity to collaborate with *IEEE Spectrum* and The IEEE Global Museum to envision *Microchips that Shook the World*. We are excited about both the content its potential for a unique educational experience, and we look forward to continued collaboration to develop, design, and build the exhibit.

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EXHIBITS