

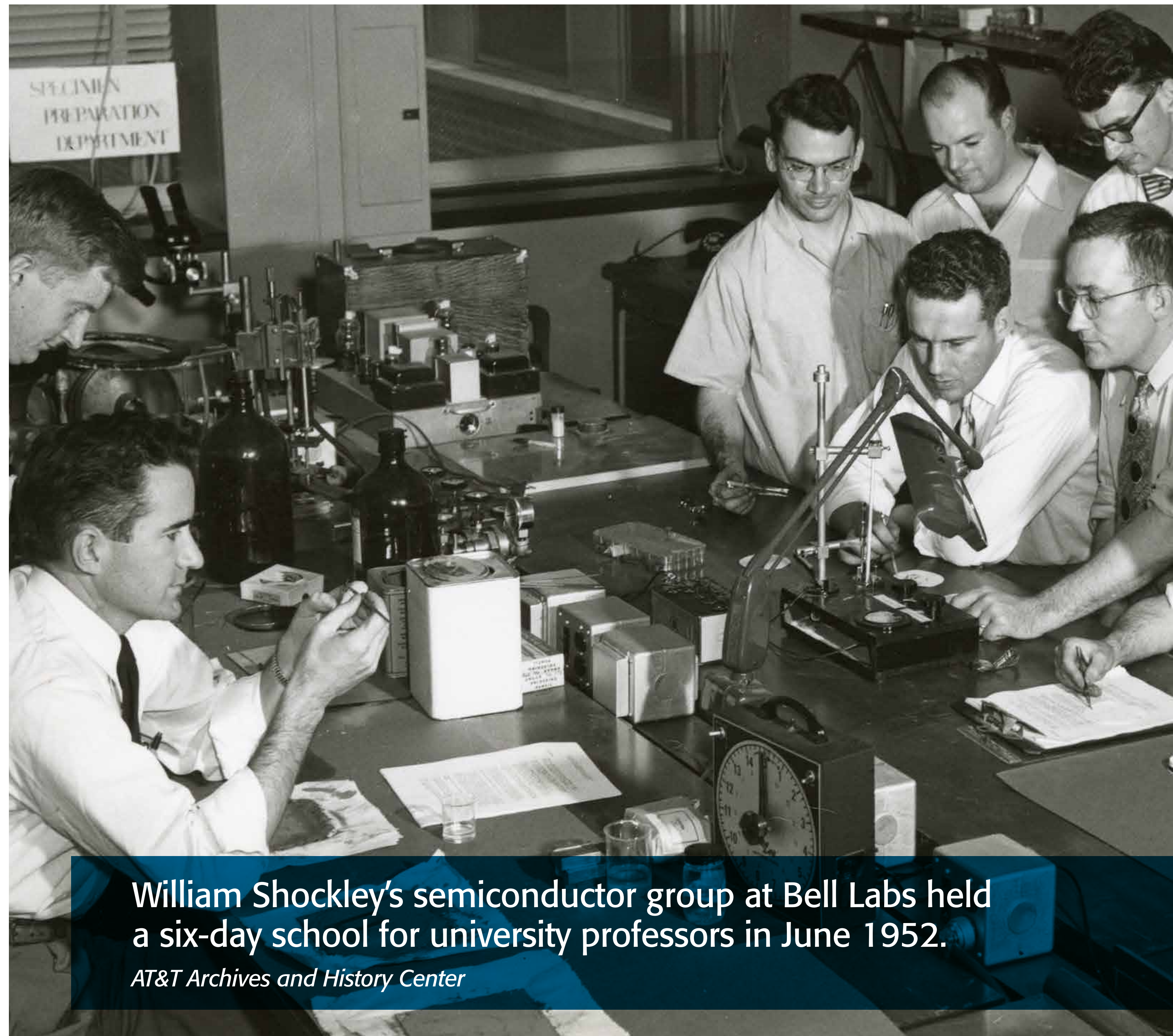
# SOLID STATE DEVICES

## Early R&D Climate

Unique conditions fostered the rapid commercialization of solid state devices during the 1950s and 1960s.

### Knowledge Sharing

Regulation of its telephone monopoly led AT&T to pursue an open-information policy for junction transistor technology invented at Bell Labs. Bell Labs hosted symposia and training in the early 1950s to share crystal-growing and transistor-fabrication techniques. License agreements enabled the global expansion of transistor production and shaped the business direction of innovative companies like Texas Instruments. A further Bell symposium in 1956, on diffusion and oxide-masking processes, set Fairchild on a path towards the planar process.

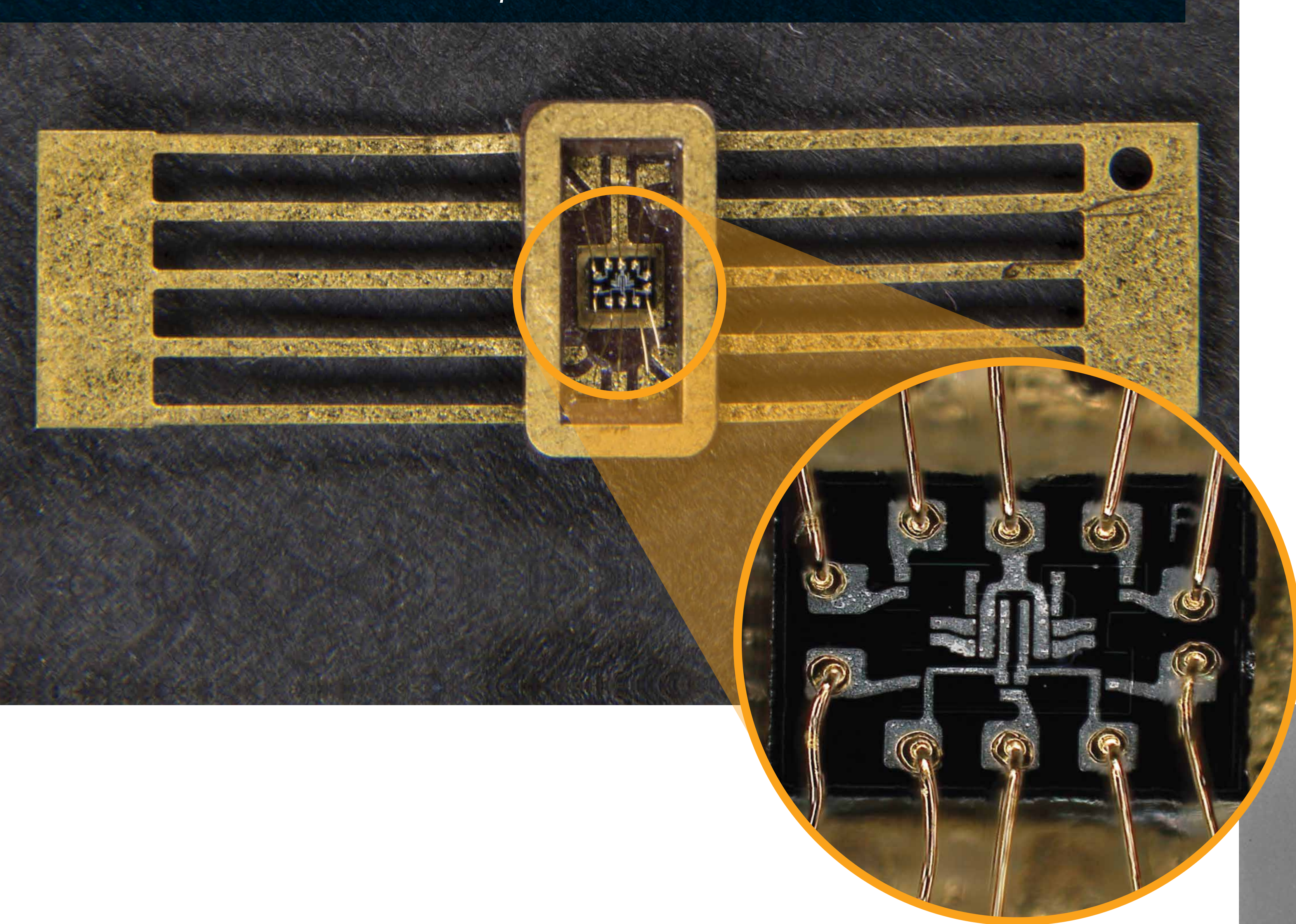


William Shockley's semiconductor group at Bell Labs held a six-day school for university professors in June 1952.

AT&T Archives and History Center

Designed in 1962, NASA's Apollo Guidance Computer was built from around 4,000 of these silicon logic chips.

Smithsonian National Air and Space Museum

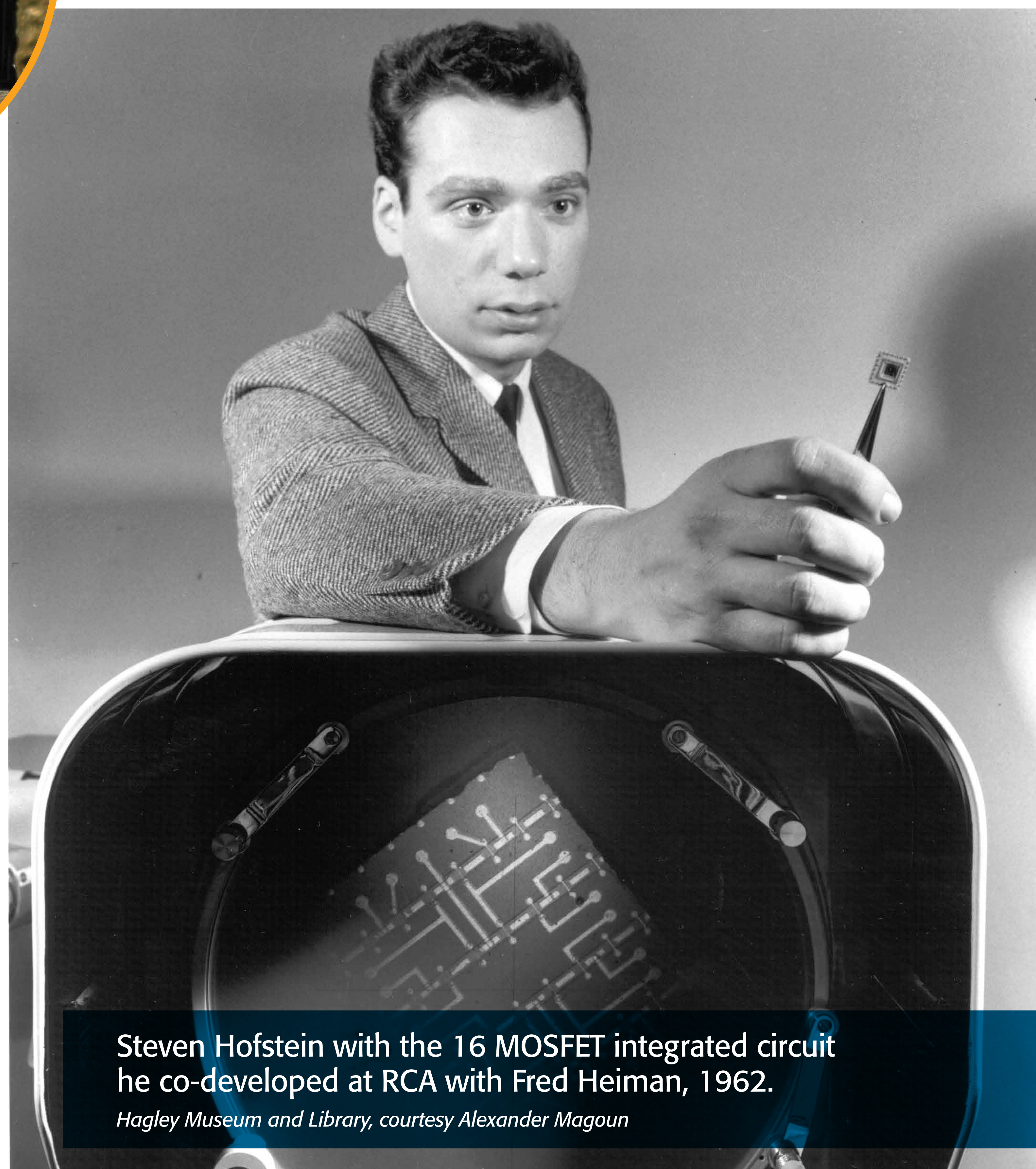


### Military Investment

U.S. military investment sustained transistor and early integrated circuit development during the 1950s and 1960s as the Cold War heated up. For rockets and satellites, the reduction in size and weight afforded by low-power, solid-state electronics outweighed the high costs. RCA, Texas Instruments, and AT&T's manufacturing company, Western Electric, all received funding in return for guaranteed production runs. Competition and improved production methods opened up industrial and commercial markets.

### Long-term Research Horizons

Commercial FETs emerged from long-term corporate visions of miniaturized electronics though integrated circuits. RCA worked out that—unlike the junction transistor—the performance of FETs would improve as they shrank. Making a big push to build computers, the company committed early to developing MOS (Metal-Oxide-Semiconductor) technology. Fairchild gave the individualistic inventor Frank Wanlass room to create a stable silicon MOS transistor based on the company's planar process. He foresaw how it would simplify the production and improve the reliability of integrated circuits.



Steven Hofstein with the 16 MOSFET integrated circuit he co-developed at RCA with Fred Heiman, 1962.

Hagley Museum and Library, courtesy Alexander Magoun

A new device  
MOSFET structure conceived by RCA engineer  
Steven Hofstein, 22 June 1962.

Hagley Museum and Library, courtesy Alexander Magoun

Consider the following structure (cross-section)

