

The Birthplace of Silicon Valley

The Legacy of Shockley Labs

Invention of the Transistor

The discovery of the transistor at Bell Telephone Labs in 1947 was one of the greatest inventions of the 20th century. The transistor replaced bulky vacuum tubes and formed the basis of today's high-tech society. Credit for the invention is shared by the team of William Shockley, Walter Brattain and John Bardeen. The point contact transistor was discovered serendipitously by Brattain and Bardeen in December of that year. While this device proved the principle of a transistor, it was not something that could be produced in volume. In January 1948, Shockley devised an improved version called the junction transistor, which could be manufactured uniformly and reliably. This device eventually became the basis for all future transistors.

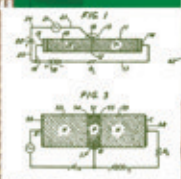
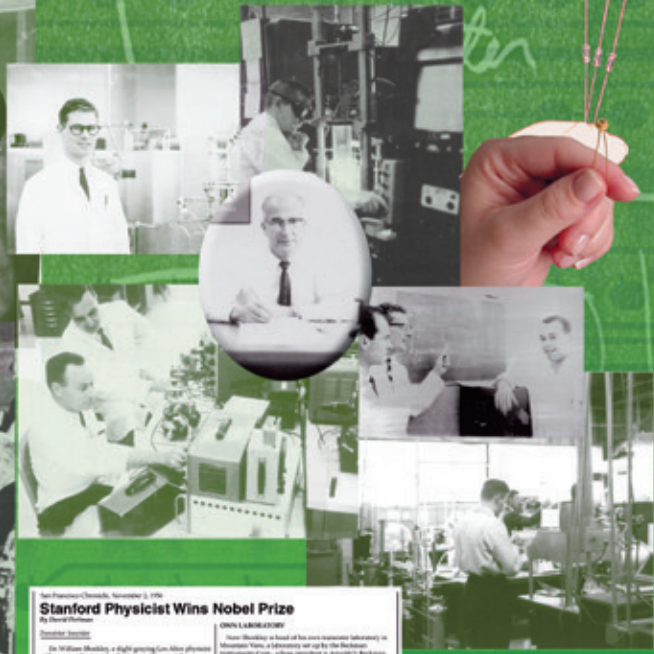


Fig. 1-2. Diagrams from the junction transistor (see page 21) by William Shockley. Figures are discussed in detail in the text.



William Shockley (left), co-inventor of the transistor, with Lee de Forest, inventor of the vacuum tube.



The 4-Layer Diode

On September 18, 1957, a group of eight employees, led by Robert Noyce, resigned from Shockley Labs to establish Fairchild Semiconductor. Shockley hired new recruits, mostly from Europe, and pushed ahead with the 4-layer diode. In 1958 the company was renamed Shockley Transistor Corporation. Soon after, commercial production of 4-layer diodes began. However, the market Shockley envisioned for the new device did not materialize. In April 1960, Beckman sold the operation to Cleve Corporation. Shockley continued as a consultant until the business was sold to ITT in 1965. Although Shockley Labs was never a commercial success, it was the genesis for future semiconductor start-ups in Silicon Valley.

SITE OF FIRST SILICON DEVICE AND RESEARCH MANUFACTURING COMPANY IN SILICON VALLEY. THE RESEARCH CONDUCTED HERE LED TO THE DEVELOPMENT OF THE SILICON VALLEY, 1956

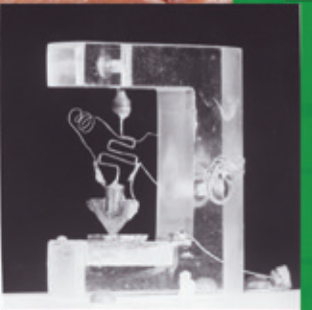


Mrs. Emory Shockley (standing) attends the ceremony to unveil the commemorative plaque in front of 391 San Antonio Road.

SHOCKLEY SEMICONDUCTOR LABORATORY
This site, 391 South San Antonio Road, is the former location of the Shockley Semiconductor Laboratory. At this location in 1956, Dr. William Shockley started the first silicon device research and manufacturing company in the valley. The individuals that gathered to work at this site went on to form the pioneering Silicon Valley startup companies, Fairchild Semiconductor Corporation, and invent the first practical integrated circuit. The advanced research and ideas developed here led to the development of Silicon Valley and were breakthroughs in the computer industry.



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The Quantum Theory of Solids, II
The Quantum Theory of Solids, III
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Handwritten notes and diagrams, including a circuit diagram and a list of names: Shockley, Brattain, Bardeen, Noyce, Moore, Hoerni, Last.

Electronics Lab Planned By Beckman
The Shockley Transistor Laboratory, which will be the first of its kind in the world, is being planned by Arnold Beckman, founder of Beckman Instruments, Inc. The laboratory will be located at 391 San Antonio Road, San Jose, California. It will be a major center for the development of silicon transistors and other semiconductor devices. The laboratory will be equipped with the latest scientific instruments and will employ a staff of about 100 people. The laboratory is expected to be completed by the end of 1956.

Splitter Plans Shockley Transistor Laboratory
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Stanford Physicist Wins Nobel Prize
Dr. William Shockley, a distinguished physicist and a member of the National Academy of Sciences, has been awarded the Nobel Prize in Physics for his discovery of the transistor effect. The award was presented to him at the Stockholm Concert Hall on December 10, 1956. Shockley's discovery of the transistor effect was a major breakthrough in the field of solid-state physics and led to the development of the transistor, which has revolutionized the electronics industry.

Putting the Silicon in Silicon Valley
In 1955 William Shockley formed a new company dedicated to silicon transistor development and manufacturing. He secured financing from Arnold Beckman, the founder of Beckman Instruments. The Shockley Semiconductor Laboratory, at 391 San Antonio Road, Mountain View, was officially launched in February 1956. Shockley recruited what he called "hot" minds in science and technology to work for him. They included Robert Noyce, Gordon Moore, Jean Hoerni and Jay Last. In November 1956 Shockley, Brattain and Bardeen were named co-recipients of the Nobel Prize in Physics, recognizing their work on the transistor 10 years earlier. Meanwhile, Shockley's management style did not sit well with many of his lab staff. Discontent grew among the ranks, and they openly disagreed with his decision to switch the focus of R&D to a device called the 4-layer diode.

BELL LABORATORIES SERIES

ELECTRONS AND HOLES IN SEMICONDUCTORS

WITH APPLICATIONS TO TRANSISTOR ELECTRONICS

WILLIAM SHOCKLEY, Ph. D.

A comprehensive introduction to the important new field of transistor electronics—these books provide the theoretical background, the physical principles, and the practical applications of the transistor. The first book in the series is "Electrons and Holes in Semiconductors" by William Shockley, Ph.D. The second book is "The Theory of P-N Junctions" by William Shockley, Ph.D. The third book is "The Theory of the Transistor" by William Shockley, Ph.D. The fourth book is "The Theory of the Diode" by William Shockley, Ph.D. The fifth book is "The Theory of the Triode" by William Shockley, Ph.D. The sixth book is "The Theory of the Pentode" by William Shockley, Ph.D. The seventh book is "The Theory of the Hexode" by William Shockley, Ph.D. The eighth book is "The Theory of the Heptode" by William Shockley, Ph.D. The ninth book is "The Theory of the Octode" by William Shockley, Ph.D. The tenth book is "The Theory of the Nonode" by William Shockley, Ph.D. The eleventh book is "The Theory of the Decade" by William Shockley, Ph.D. The twelfth book is "The Theory of the Undecade" by William Shockley, Ph.D. The thirteenth book is "The Theory of the Duodecade" by William Shockley, Ph.D. The fourteenth book is "The Theory of the Tridecade" by William Shockley, Ph.D. The fifteenth book is "The Theory of the Quadecade" by William Shockley, Ph.D. The sixteenth book is "The Theory of the Quindecade" by William Shockley, Ph.D. The seventeenth book is "The Theory of the Sexdecade" by William Shockley, Ph.D. The eighteenth book is "The Theory of the Septecade" by William Shockley, Ph.D. The nineteenth book is "The Theory of the Octecade" by William Shockley, Ph.D. The twentieth book is "The Theory of the Nondecade" by William Shockley, Ph.D. The twenty-first book is "The Theory of the Decadecade" by William Shockley, Ph.D. The twenty-second book is "The Theory of the Undecadecade" by William Shockley, Ph.D. The twenty-third book is "The Theory of the Duodecadecade" by William Shockley, Ph.D. The twenty-fourth book is "The Theory of the Tridecadecade" by William Shockley, Ph.D. The twenty-fifth book is "The Theory of the Quadecadecade" by William Shockley, Ph.D. The twenty-sixth book is "The Theory of the Quindecadecade" by William Shockley, Ph.D. The twenty-seventh book is "The Theory of the Sexdecadecade" by William Shockley, Ph.D. The twenty-eighth book is "The Theory of the Septecadecade" by William Shockley, Ph.D. The twenty-ninth book is "The Theory of the Octecadecade" by William Shockley, Ph.D. The thirtieth book is "The Theory of the Nondecadecade" by William Shockley, Ph.D. The thirty-first book is "The Theory of the Decadecade" by William Shockley, Ph.D. The thirty-second book is "The Theory of the Undecadecade" by William Shockley, Ph.D. The thirty-third book is "The Theory of the Duodecadecade" by William Shockley, Ph.D. The thirty-fourth book is "The Theory of the Tridecadecade" by William Shockley, Ph.D. The thirty-fifth book is "The Theory of the Quadecadecade" by William Shockley, Ph.D. The thirty-sixth book is "The Theory of the Quindecadecade" by William Shockley, Ph.D. The thirty-seventh book is "The Theory of the Sexdecadecade" by William Shockley, Ph.D. The thirty-eighth book is "The Theory of the Septecadecade" by William Shockley, Ph.D. The thirty-ninth book is "The Theory of the Octecadecade" by William Shockley, Ph.D. The fortieth book is "The Theory of the Nondecadecade" by William Shockley, Ph.D. The forty-first book is "The Theory of the Decadecade" by William Shockley, Ph.D. The forty-second book is "The Theory of the Undecadecade" by William Shockley, Ph.D. The forty-third book is "The Theory of the Duodecadecade" by William Shockley, Ph.D. The forty-fourth book is "The Theory of the Tridecadecade" by William Shockley, Ph.D. The forty-fifth book is "The Theory of the Quadecadecade" by William Shockley, Ph.D. The forty-sixth book is "The Theory of the Quindecadecade" by William Shockley, Ph.D. The forty-seventh book is "The Theory of the Sexdecadecade" by William Shockley, Ph.D. The forty-eighth book is "The Theory of the Septecadecade" by William Shockley, Ph.D. The forty-ninth book is "The Theory of the Octecadecade" by William Shockley, Ph.D. The fiftieth book is "The Theory of the Nondecadecade" by William Shockley, Ph.D.

BELL TELEPHONE SYSTEM

Some contributions to transistor electronics



Handwritten notes and diagrams, including a circuit diagram and a list of names: Shockley, Brattain, Bardeen, Noyce, Moore, Hoerni, Last.



William R. Shockley, Ph.D., Creator of Transistor and Theory of P-N Junction

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