**1947****Invention of the point-contact transistor****(Bell Telephone Laboratories)****~ Discrete Semiconductor/Others ~**

In December 1947, John Bardeen (1908-1991) and Walter Houser Brattain (1902-1987) of BTL (Bell Telephone Laboratories) found a phenomenon of current amplification in a pure Ge(germanium) single crystal, with a configuration of two gold needles placed in point contacts to the surface, closely with each other. When an electric current was passed in one needle, then an amplified current flow in the other needle was observed with the amplification of 100 times. This device was named "Transistor" by J.R. Pierce.

This transistor invented at the beginning was called a point-contact transistor (Fig. 1). William Shockley (1910-1989) also at BTL found that the operation of this transistor was due to minority carrier injection and diffusion, and he developed this to the invention of the junction transistor (Fig. 2). It was in January 1948, five weeks after the invention of the point-contact transistor. Compared with the point-contact type, the junction transistor was capable of stable operation and was easy to mass-produce. After that, in April 1949 he further invented a transistor with a sandwich structure. It was a bipolar transistor (publicized in July 1951). Shockley, Bardeen, Brattain received the Nobel Prize in Physics in 1956.

The group of Shockley, Bardeen, Brattain and others confirmed the operation of the point contact transistor using a Ge single crystal in December 1947. BTL published this invention in June 1948, and at the same time Western Electric, the manufacturing department of BTL, announced the plan to mass-produce transistors. The New York Times reported its contents on July 1, one day after the BTL announcement, [see Mr. Shimura's Essays with Historic Photos, ([http://www.shmj.or.jp/shimura/ssis\\_shimura1\\_04.htm](http://www.shmj.or.jp/shimura/ssis_shimura1_04.htm)).]

It is said that it was reported to the concerned parties in Japan in the middle of July from F. Polkinghorn, General Manager of the CCS (Civil Communication Section) of GHQ (General Headquarters, the Supreme Commander for the Allied Powers). By the way, CCS also taught about "quality control" etc. to Japan.

In Japan, the transistor became widely known in the industry by an article on the November 1, 1953 issue of "Nippon Telegraph and Telecommunications Industry Association Newsletter", which introduced the transistor as "a big revolution replacing a vacuum tube" (Fig. 3).

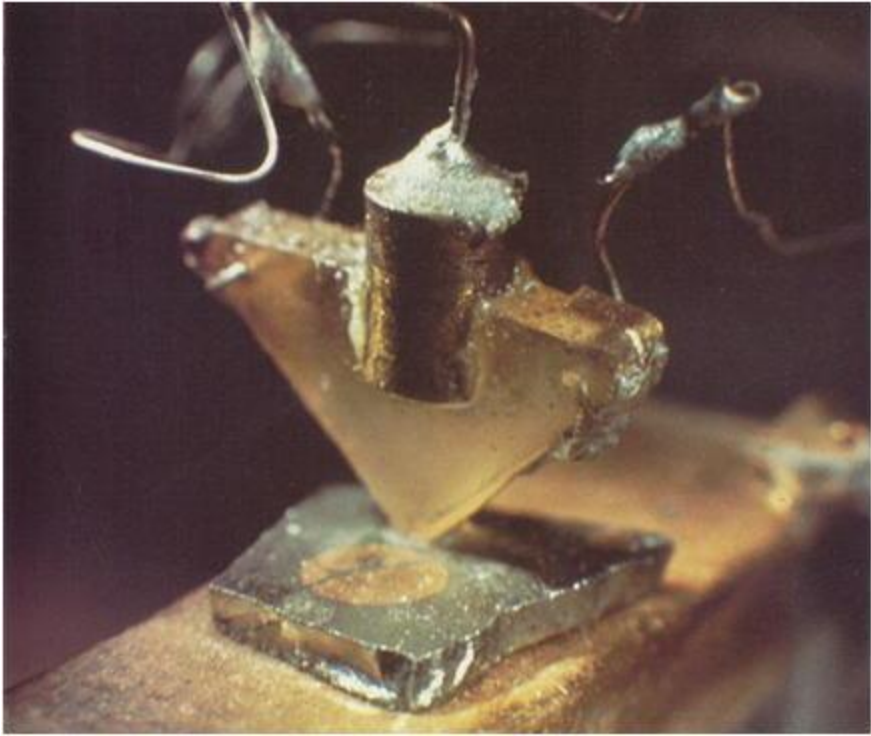


Fig. 1: Point-Contact Transistor (4)

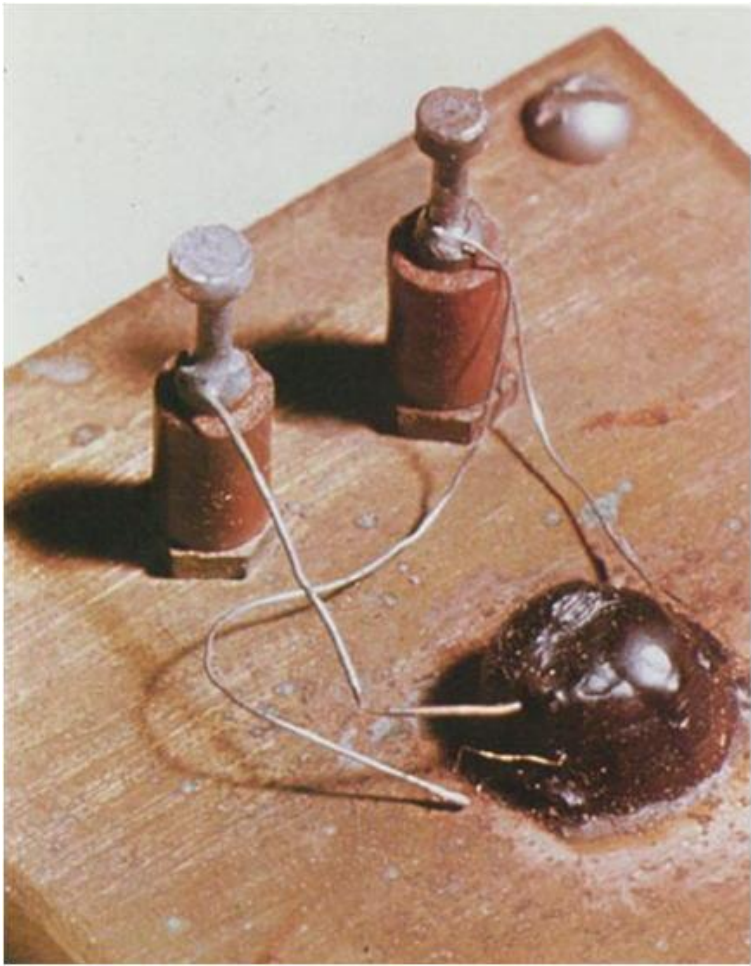


Fig. 2: Junction Transistor (5)

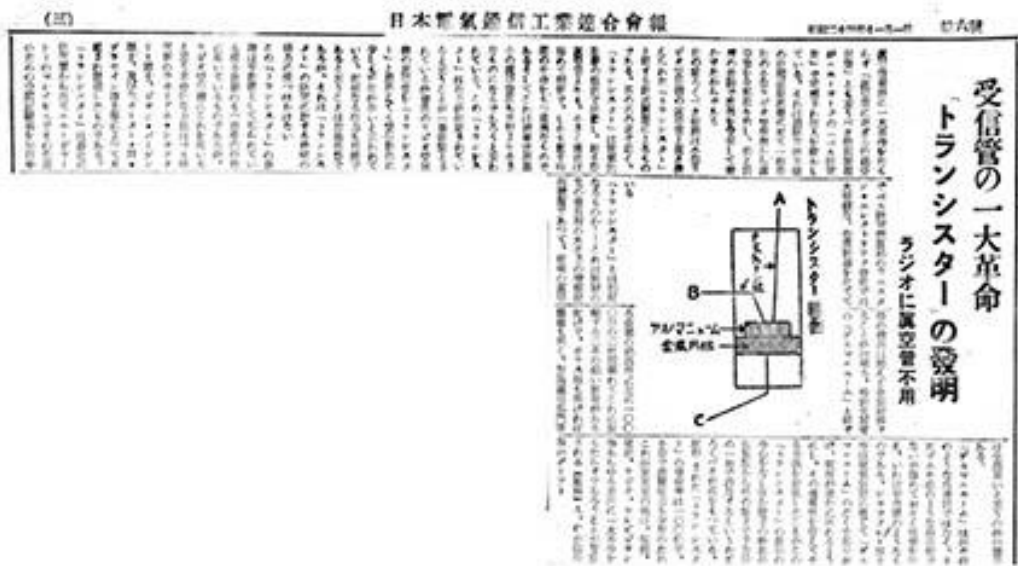


Figure 3 The first article introducing the transistor

References:

- (1) 1947 Invention of the point-contact transistor  
<http://www.computerhistory.org/semiconductor/timeline/1947-invention.html>
- (2) 1948 Conception of the junction transistor  
<http://www.computerhistory.org/semiconductor/timeline/1948-conception.html>
- (3) The Nobel Prize in Physics 1956, William B. Shockley, John Bardeen, Walter H. Brattain  
[http://nobelprize.org/nobel\\_prizes/physics/laureates/1956/](http://nobelprize.org/nobel_prizes/physics/laureates/1956/)
- (4) The birth of modern electronics, The Point-Contact Transistor  
<http://smithsonianchips.si.edu/augarten/p2.htm>
- (5) Solid-state electronics goes commercial, Junction Transistor  
<http://smithsonianchips.si.edu/augarten/i4.htm>