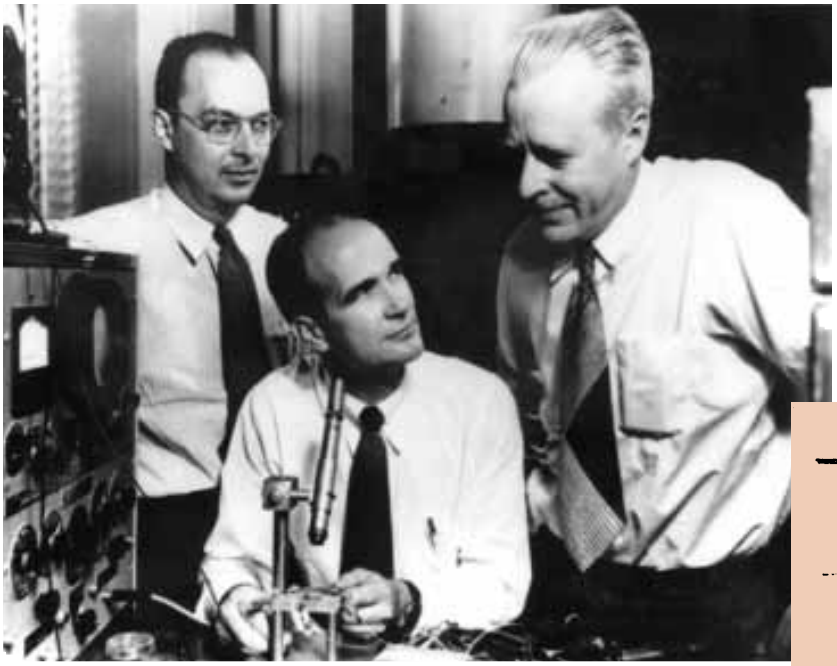
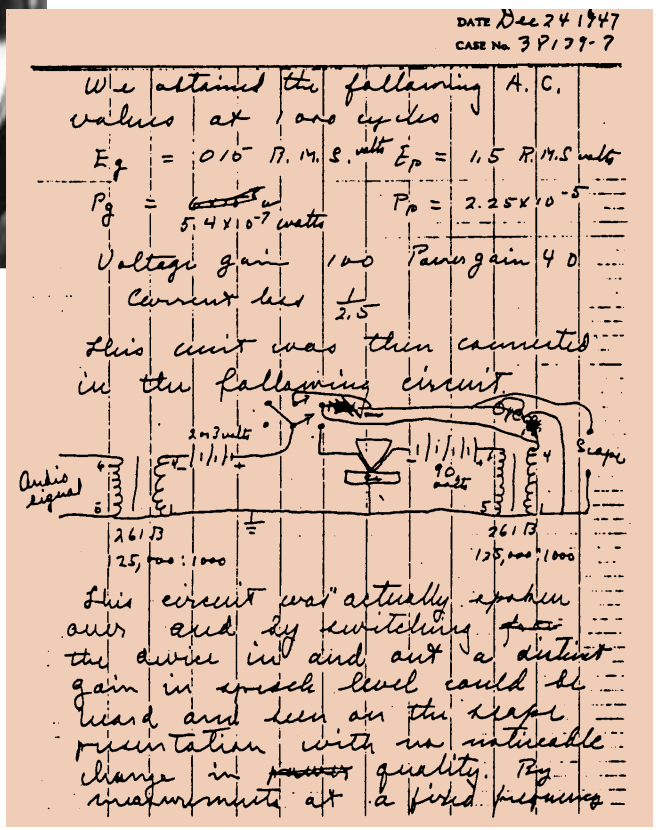


Left: John Bardeen, William Shockley, and Walter Brattain, who shared the 1956 Nobel Prize in physics for the invention of the transistor. (Courtesy AT&T Archives)

Bottom: Page from Brattain's lab notebook that records the 23 December 1947 demonstration of the first transistor. (Courtesy AT&T Archives)



DATE Dec 24 1947
CASE No. 39179-7

We obtained the following A. C. values at 1000 cycles

E_g = .010 R.M.S. volts E_p = 1.5 R.M.S. volts

P_g = 5.4×10^{-7} watts P_p = 2.25×10^{-5}

Voltage gain 100 Power gain 40

Current loss $\frac{1}{2.5}$

This unit was then connected in the following circuit.

This circuit was actually spoken over and by switching the device in and out a distinct gain in speech level could be heard and seen on the scope presentation with no noticeable change in quality. By measurements at a fixed frequency

advanced technology. Perhaps this complementary relationship is one reason why, during the past decade or so, we have witnessed the emergence of a "photonics" industry that threatens to supplant electronics in some commercial sectors.

No comparable partnership exists, for example, between quarks and gluons. Quarks are *not* detachable, at least not yet, and gluon fields do not extend to infinity like the electromagnetic. It makes all the difference in the world. We still have only rough values for the quark masses, especially the up and down quarks that make up the bulk of ordinary matter. Only a few wild-eyed speculators dare to mention the possibility of "quarkonics" or "gluonics" industries. Maybe one day soon we will manipulate quarks for practical benefit, say by using high-energy electron beams. Perhaps, but I seriously doubt it will ever amount to much of an industry. For now, quarks and gluons remain the playthings of pure physics.

Just a hundred years after its discovery, the electron sits at the core of modern life. Where previous generations of writers, for example, used chemical inks and mechanical devices to cast their ideas onto paper (and deliver them to readers), I have composed this article while staring at a luminous screen—behind which a blazing stream of electrons traces out my fumbling thoughts as my fingertips tap keys that activate transistor-laden microprocessors deep within my computer. And some of you now read my words on luminous screens of your own, conveyed to your desks by surging rivers of electrons and photons pulsating as ones and zeroes through an intricate network that stretches into almost every corner of the globe. The only paper involved in the exchange is the pages marked with red ink that now lie crumpled in my wastebasket.

We all owe a debt to J. J. Thomson—and the scientists and engineers who followed the path that he pioneered—for taming the first subatomic particle and adapting its unique properties for the practical applications that are relentlessly redefining what it means to be human.