

## Tube of the Month

### THE PHOTOMULTIPLIER

Years before the invention of the vacuum tube, scientists were experimenting with the effects of radiation on different compounds and surfaces. X-ray images and using cathode ray tubes (CRTs) are examples. Different types of minerals were discovered that would react to being hit by charged particles and produce visible photons. In later years, experiments with vacuum tubes showed the process of secondary emission where electrons hitting certain surfaces would excite additional electrons.

In 1941, the RCA Company produced the first photomultiplier tube that incorporated these principals. The RCA 5819, that was introduced in 1949, is the example shown. When an ion enters the chamber at the top, that is called a scintillator, it will strike an internal crystal that will produce photons. The photons are directed to a photocathode where they become electrons. The electrons are directed to a series of coated reflectors called dynodes. As the electrons bounce off the dynode they excite additional electrons due to the secondary emission effect. A second dynode charged at a higher potential, adds electrons to the stream until all ten dynodes have added to the output. The resulting signal at the anode can be measured or used to operate a circuit or relay. The multiplication process can result in a signal 1,000,000 times the input.

The original RCA photomultiplier, the 931, was used in a broadband jammer transmitter where the tube looked at a small lamp. The Manhattan Project stimulated the research on photomultiplier based radiation counters. A photomultiplier hooked to a telescope is a natural application. DX QSOs on a laser beam?

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