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This Week's Citation Classic

Rose A. An outline of some photoconductive processes. *RCA Rev.* **12**:362-414, 1951.
[Research Dept., RCA Lab. Division, Princeton, NJ]

A theoretical framework is outlined in terms of which a wide variety of photoconductive phenomena can be consistently interpreted. The role of traps and the distinction between response time and lifetime is emphasized. [The *SCI*® indicates that this paper has been cited over 190 times since 1961.]

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"In the interest of clarity, I should put this paper in context. For some 15 years at RCA Laboratories, beginning with 1935, I was charged with generating new and improved forms of television camera tubes. The first in this series was the Orthicon, introduced commercially in 1940. The second was the Image Orthicon, introduced about 1945. The Image Orthicon succeeded in reaching the limit of sensitivity as set by the quantum efficiency of the photocathode, namely about 10 percent. At that time, I set up a program with several of my colleagues to explore the feasibility of using photoconductors whose quantum efficiency could approach 100 percent.

"Historically, photoconductors date back to 1870 and preceded the discovery of photoemitters. Historically also, there was a long and unsuccessful record of trying to incorporate photoconductors in television camera tubes. I set the goals of our program to either achieve a successful tube or to uncover some fundamental reason why this could not be done. Accordingly, along with the efforts of Paul Weimer, Stan Forgue, Dan Cope, and Bob Goodrich on the camera tube, a parallel program was conducted by Roland Smith, Paul Weimer, and myself to get a more fundamental understanding of the photoconductive process.[1-6]

"Fortunately, the early efforts of Weimer et al., led to the first successful photoconductive television camera tubes, dubbed Vidicons. The photoconductor introduced by Weimer was amorphous selenium—a material ignored by the prior literature. In the light of the current widespread interest in amorphous materials it is worth noting that long before amorphous materials achieved status in the scientific literature, they helped to launch two highly profitable electronic industries, television and office copiers. By a quirk of history, the same amorphous selenium that Weimer uncovered for television camera tubes was independently shown by Schaffert and Oughton[7] to make a good office copier. In addition to the amorphous selenium, a second material, an amorphous form of antimony tri-sulphide, was demonstrated by Forgue in the Vidicon format and has enjoyed a widespread currency for the past 30 years.

"The prior literature on photoconductivity together with the work on Vidicons and the work by Smith on cadmium sulphide presented a rich array of data for which there was no consistent framework for interpretation. My paper on this subject tried to make a beginning on this framework and culminated some ten years later in Richard Bube's classic work on Photoconductivity of Solids[8] and in a small monograph[9] by myself on the same subject."

1. **Rose A.** Photoconductivity in insulators. *RCA Rev.* **12**:303-5, 1951.
2. **Weimer P K, Forgue S V & Goodrich R R.** The Vidicon—photoconductive camera tube. *RCA Rev.* **12**:306-13, 1951.
3. **Weimer P K & Cope A D.** Photoconductivity in amorphous selenium. *RCA Rev.* **12**:314-34, 1951.
4. **Forgue S V, Goodrich R R & Cope A D.** Properties of some photoconductors, principally antimony trisulfide. *RCA Rev.* **12**:335-49, 1951.
5. **Smith R W.** Some aspects of the photoconductivity of cadmium sulfide. *RCA Rev.* **12**:350-61, 1951.
6. **Rose A.** An outline of some photoconductive processes. *RCA Rev.* **12**:362-414, 1951.
7. **Schaffert R M & Oughton C D.** Xerography: a new principle of photography and graphic reproduction. *J. Opt. Soc. Amer.* **38**:991-8, 1948.
8. **Bube R H.** *Photoconductivity of solids.* New York: Wiley, 1960. 461 p.
9. **Rose A.** *Concepts in photoconductivity and allied problems*. New York: Wiley, 1963. 168 p.