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Robinson L B & Wampler E J. The Lick Observatory image-dissector scanner. *Publ. Astron. Soc. Pac.* 84:161-6, 1972.
[Lick Observatory, Board of Studies in Astronomy and Astrophysics, University of California, Santa Cruz, CA]

The image-dissector spectrum scanner greatly increased the efficiency of optical spectrographs used on astronomical telescopes. While previous electronic spectrum scanners[1] had looked at single-wavelength regions sequentially, this computer-controlled device examined several hundred wavelength intervals simultaneously, by rapidly scanning short-lived images of the spectrum stored on the phosphor of an image-intensifier tube. [The *SCI*® indicates that this paper has been cited in over 345 publications, making it the most-cited paper from this journal.]

An Electronic Detector for Astronomy

L.B. Robinson
Lick Observatory
University of California
Santa Cruz, CA 95064
and
E.J. Wampler
European Southern Observatory
8046 Garching/Munich
Federal Republic of Germany

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One way to increase the effectiveness of an astronomical telescope is to increase the size of the telescope or to improve the optics associated with it. Another less expensive way is to improve the performance of the detector that ultimately records the photons that have been collected by the telescope. Our paper described the image-dissector scanner (IDS), which is an example of the second approach.

In 1969 E.J. Wampler was developing the Cassegrain focus for the Lick Observatory three-meter telescope (then the second largest in the world), and L.B. Robinson was developing a "real-time, online" minicomputer-based data taking and analysis system. The late John McNall joined us during a sabbatical leave to evaluate the options for an efficient optical spectrum recorder that could be used at the telescope.

We chose to experiment with image-intensifier tubes in spite of their well-known faults, such as nonlinear phosphors, sensitivity to magnetic fields, nonuniform response, and pincushion distortion. We had all the necessary parts on hand, with no review committee to dampen our enthusiasm, and were attracted by the commercial availability, inherent simplicity, and reliability of the devices. Thus, by early 1970, after testing the response of a tube-chain to single photons,[2] we were testing a breadboard scanner attached to a borrowed spectrograph in a university parking lot, observing the spectrum of the night-sky. (In turn we were observed by the university police, who called the observatory director to question this nocturnal activity.) The instrument's sensitivity to the well-known faint night-sky spectrum was proof enough that the device could work also for stellar spectra, and within a few months, a preliminary version of the scanner was under test at the telescope.

Although the tests were successful, our first paper was initially rejected by the reviewer, who felt that image tubes could not provide quantitative data. Also about this time, one distinguished colleague suggested that we should "stop developing new gadgets and do some real astronomy." Another agreed that the scanner was an interesting device, but argued that having a computer near the telescope would distract the astronomer from his or her work. However, we were strongly supported by others who recognized the value of this new approach.

The IDS became the most-used instrument at the Lick Observatory from about 1972 until around 1980, when the new charge-coupled-device (CCD) sensors became competitive. An exact copy was built and taken to Australia where it was used for several years at the Anglo-Australian Observatory. Several observatories built slightly modified versions. The record for detecting the most distant astronomical object[3] was held by the scanner at the Lick Observatory for several years. The number of citations is closely related to the large number of astronomers who have used these scanners at various observatories.

A review of this fairly mature technology by P.B. Boyce was published in 1977,[4] while a review of the CCDs that have largely replaced the image-tube instruments was published by C.D. Mackay in 1986.[5]

1. **Wampler E J.** Scanner observations of 4430A. *Astrophysical J.* 144:921-36, 1966. (Cited 125 times.)
2. **McNall J, Robinson L & Wampler E J.** The response of phosphor-output image intensifiers to single-photon inputs. *Publ. Astron. Soc. Pac.* 82:837-46, 1970. (Cited 20 times.)
3. **Wampler E J, Robinson L B, Baldwin J A & Burbidge E M.** Redshift of OQ172. *Nature* 243:336-7, 1973. (Cited 75 times.)
4. **Boyce P B.** Low light level detectors for astronomy. *Science* 198:145-8, 1977. (Cited 10 times.)
5. **Mackay C D.** Charge coupled devices in astronomy. *Annu. Rev. Astron. Astrophys.* 24:255-83, 1986. (Cited 10 times.)

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