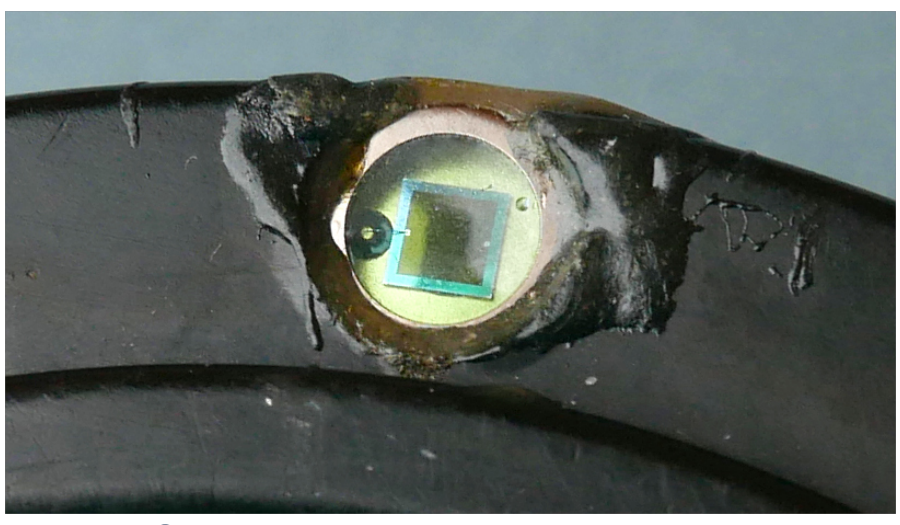
Weston Micro-Ammeter with modern Silicon Visible Light Photodiode

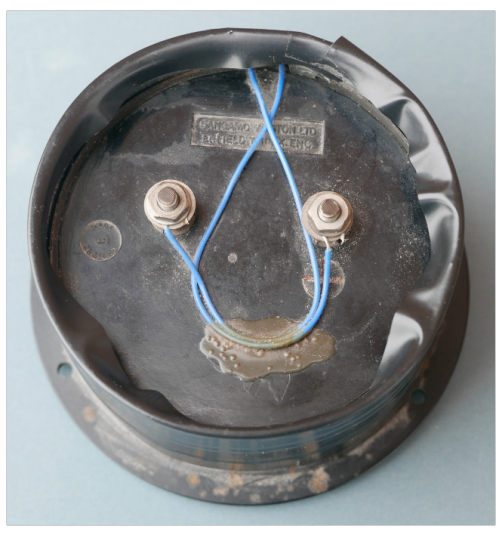
(BPW21R Visible Light Silicon Photodiode)

Sixty years old, or sixty years young! How do you make a light meter that's both? The meter here is a Weston micro-ammeter from the 1960s. The model number is not clear, but the range is marked at 0 to 50 micro-amps (μA). The meter is marked up from 0 to -1 in 50 individual steps. A large meter, the range is easy to read and has the potential to be very accurate.

In a solid metal panel mounting, the top flange has been drilled-out and a modern photodiode dropped in and set with epoxy resin. This diode, or a close equivalent, can be found in a current electronics catalogue. The nearest match is a BPW21R Visible Light Silicon Photodiode in a TO-5 casing, current cost about £10. The incident light capture angle for this device is 65 degrees.

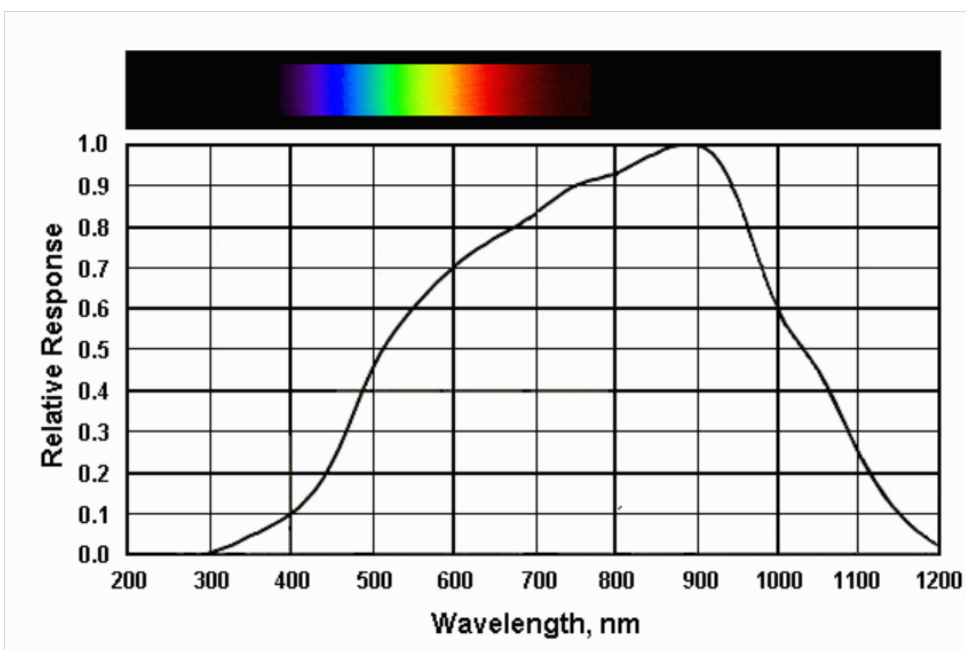


The TO-5 cased Photodiode mounted at the top of the micro-ammeter

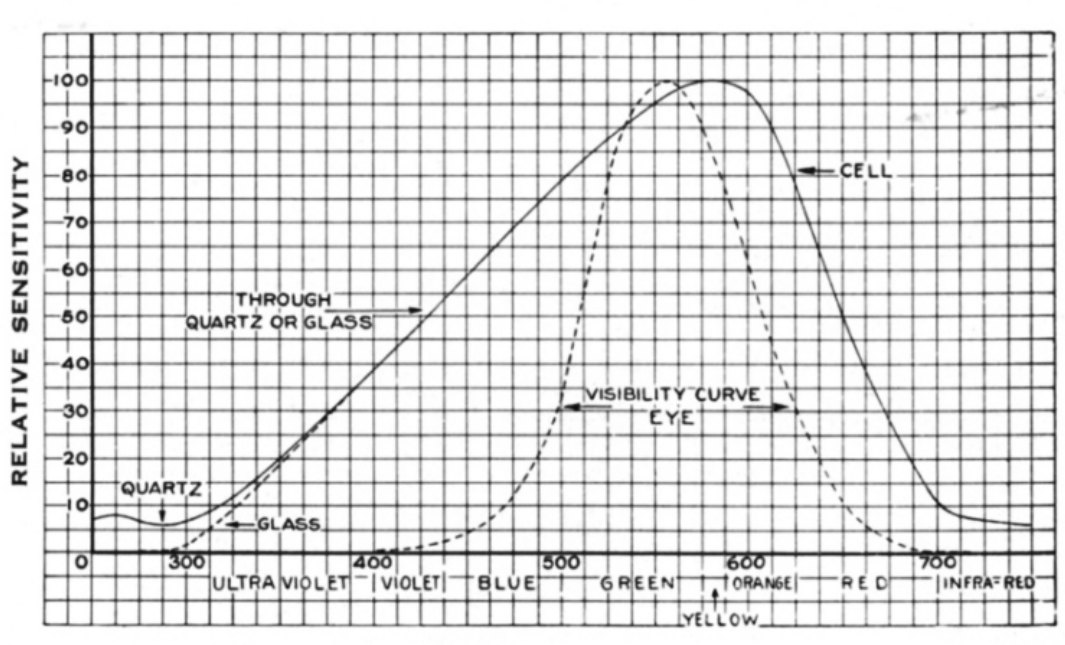


The rear of the meter shows the components wired directly and the leads fixed in position.

With around sixty years spanning these two components, a miss-match in impedance would be expected. Yet an inspection of the rear shows that the photodiode is wired-in directly. Because the photodiode is an active component, delivering an output current directly as a result of the light falling on it, there is no issue to be dealt with here. Ballast resistance could be introduced to scale the meter's response but without that, this meter is still perfectly operational, though it quickly peaks out as the incident light falling on the diode increases.



Typical Silicon Photodiode Spectral Response



Spectral Sensitivity of the PHOTRONIC Cell

It's worth comparing the spectral response of the modern Silicon Photodiode (above left graph) with the older Selenium cell that was the basis of the Weston Photronic cell (above right graph). What is immediately apparent is that the photodiode has a much stronger response to the infra-red part of the electro-magnetic spectrum compared to the visible spectrum lying between 400 to 700nm wavelengths. The older Selenium cell (right graph) has a response that more closely mirrors the visible spectrum.

That being said, the photodiode most likely used for this assembly is designed for use in the visible spectrum. A green filter over the diode face has probably been introduced to knock out the diode's response in the IR band beyond 700nm. Because of its spectral response, the Silicon photodiode is eminently suitable for infra-red detection and specialist components for this purpose are also readily available.

Further work is planned to establish an incident light response curve for this unit by calibrating it against a Weston exposure meter to be determined. (JB 04/2026)