arranging a background continuous radiator of variable effective brightness temperature, which can then be measured with an optical pyrometer at the precise point of line-reversal. This temperature is then that of the intervening gas containing the element whose line was reversed. The background radiation source must be hotter than the flame, and, since no feasible laboratory source higher than 3800°K was available, the sun introduced by a heliostat served this purpose for measuring the maximum flame temperature, which turned out to be $4300^{\circ} \pm 150^{\circ}\text{K}$ at atmospheric pressure.

This use of the sun in place of a laboratory continuous radiator implies many considerations of special interest to astronomers. Three such questions are discussed particularly.

First, the standard element sodium, introduced into the flame for its reversible lines, could not be freely used when the sun, with its D lines, was used as a background. Hence lithium was chosen for its conspicuous resonance line at 6708 Å which is, however, practically absent from the solar spectrum, as shown in spectrophotometric tracings by Greenstein and Richardson.¹ Another advantage of this line at 6708 Å is that the standard optical pyrometer filter band is centered at 6650 Å, so that, for such a short interval, the curve of intensity versus wave length can be assumed that of a black-body, a necessary condition for immediate application of calibration tables.

A second possible concern to astronomers in thus relying on the sun as a standard is the varying absorption by the earth's atmosphere. This effect is shown to be not harmful, provided it is sensibly constant for the minute or two between an observation of line-reversal and a pyrometer reading of the sun's brightness temperature. In fact, there was found advantage in combining the smog of Philadelphia with decreasing solar altitude to give a brightness temperature only slightly above 4300°K , so that little additional instrumental absorption was necessary for line-reversal.

Finally, there is the limb-darkening of the sun, which causes the sun's brightness temperatures, as viewed from outside the earth's atmosphere, to vary from about 6800°K to 5400°K , from center to limb, respectively. Hence for a flame temperature within the 1400° between these range points (reduced by absorption), and with a diametral slit setting, the reversed part of the line would appear broadest at the sun's center,

tapering to points at a limb-distance where flame and solar brightness temperatures were equal. Then the pyrometer could be set precisely at that same limb-distance to give the flame temperature. Photography and further investigation of this effect might prove useful also for purely astronomical purposes.

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Wood, Frank Bradshaw. Photometric observations of 31 Cygni.

Two-color photoelectric observations were taken on 16 nights from September 21 to November 30, 1951, because of letters from Dr. Andrew McKellar and Mr. Edwin Weston describing the spectral similarity to ζ Aurigae.

The observations were made with the pulse-counting photometer attached to the Cook Observatory 15-inch horizontal refractor. This photometer is essentially that described by W. Blitzstein at the 83rd meeting of this Society; the chief changes were the installation of filters outlining approximately the visual and photographic regions and the replacement of the counter by one of those built by N. L. Pierce and Blitzstein. Altogether, 46 observations during totality and 68 out-of-eclipse were taken under good photometric conditions. Eight observations were made by Blitzstein under less satisfactory conditions on October 13 when the eclipse was ending.

The observations were reduced to ρ Cygni, since the other comparison stars used, BD + $45^{\circ}3152$ and 30 Cygni, proved variable themselves. Confidence in the validity of the reduction is given by the constancy of the brightness of 31 Cygni during the total phases when derived by this method, and by the agreement between its out-of-eclipse brightness as so derived and as determined on the latter nights on which it could be reduced to ρ Cygni directly.

The depth of eclipse in the yellow was 0.15 and in the blue 0.36 mag. Because of the trouble with the comparison stars, I estimate these may be uncertain by about 0.02 mag. On JD 2433993.6 the system was nearly out of eclipse. The fraction of eclipse in the yellow was 0.11; in the blue, 0.18. If this difference between the two colors is real, it indicates that we are not dealing with an eclipse of the smaller star by the opaque limb of the larger, but with a phenomenon of gradual extinction by the atmosphere