Walker, Merle F. A study of extremely young clusters of stars.

In order to extend our knowledge of the color-magnitude diagrams of extremely young clusters and to attempt to confirm the above interpretation of the diagram of NGC 2264, at the Mount Wilson Observatory during the summer and fall of 1955 three-color photometric observations were obtained for the clusters h Per, IC 1805, NGC 2244, NGC 6530, NGC 6611, NGC 6823, NGC 6910, IC 4996, and IC 5146. For NGC 6530 and IC 5146, the measurements were primarily photoelectric. For the other clusters a photoelectric sequence was set up in the cluster and photometric plates were obtained for the measurement of the other stars in the cluster. The observations extend to $V = 16$ or 17 for most of the clusters.

So far, the following partial results have been obtained:

1. NGC 6530. The color-magnitude diagram resembles that obtained earlier for NGC 2264 (Walker 1954). The cluster possesses a normal main sequence for the brightest stars, but below about A0 the cluster sequence departs from the main sequence, the fainter stars lying above the main sequence. Thus, the unusual nature of the color-magnitude diagram of NGC 2264 is repeated in this second cluster and lends support to the interpretation that in both clusters the fainter stars are still in the gravitational contraction stage. A total of 70 faint variable stars have also been found in the cluster from plates available at the Lowell and Mount Wilson Observatories. These are presumably the same type of variables, T Tauri stars, which are encountered in NGC 2264 and the Orion nebula.

2. NGC 6611. The cluster is heavily reddened, and the reddening varies from 1 to 4 mag. across the cluster. As a result, even though the observations were extended to $V = 17$, the color-magnitude diagram does not reach sufficiently faint absolute magnitudes to enable us to determine whether stars fainter than about A0 fall above the main sequence as they do in NGC 2264 and NGC 6530. That the cluster is probably similar to NGC 2264 and NGC 6530 is suggested by the fact that using plates available at the Mount Wilson Observatory taken with the 60, 100, and 200-inch reflectors, 13 extremely faint variable stars have been found in the densest part of the cluster.

3. IC 5146. This object is probably similar to the clusters already discussed, since from plates

taken with the 100-inch reflector a total of 19 faint variables have been found concentrated toward the center of the object.

From the location of the T Tauri variables in the color-magnitude diagrams of NGC 2264 and NGC 6530 and their occurrence in the other extremely young clusters discussed here, it would appear that these stars are extremely young and are still in the gravitational contraction stage. It is not yet clear whether all stars must go through this stage before reaching the main sequence. However, the observations to date indicate that any extremely young cluster which contains intrinsically faint stars and which is situated in nebulosity will contain these variables.

In addition to the photometric observations discussed above, spectra were obtained of faint stars in NGC 2264 which fall above the main sequence. The luminosity classifications of most of these stars indicated that they were members of the cluster and not foreground dwarf stars. In addition, a good many of the stars show peculiarities such as weak hydrogen lines and anomalous intensities of certain other lines. However, the most striking fact brought out by these spectra is that with the exception of the yellow giants found in the cluster, the stars of spectral type later than about F8 show rotational broadening of the lines which increases with advancing spectral type. It would appear that these stars may be ones in which the initial angular momentum of the cloud from which they were formed has not yet been dissipated.

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Whipple, Fred L. and Jacchia, Luigi G. The orbits of 308 meteors photographed with super-Schmidt cameras.

Orbits have been determined from 308 meteor trails of the highest quality photographed with the Baker super-Schmidt meteor cameras. Precision reduction techniques have been applied. Velocities within the atmosphere are generally precise in the range from 0.1 to 0.3 per cent. Corrections for atmospheric resistance are based upon the measured decelerations, making the corrected velocities nearly as accurate. Errors arising from uncertainty in the instants of the meteors are very few in number while adverse geometrical circumstances have reduced precision in only a few other cases. These uncertain cases are about 21 in all.