The meetings were concluded Friday by a trip to Palomar Mountain, where the members were taken on a complete tour of the 200-inch dome and the two Schmidt telescopes, a privilege not ordinarily accorded visitors.

Abstracts of the papers presented which are available at this time, and which have not already been printed in the June number of the *Publications,* follow, their order being dictated simply by convenience.

SPECTRA OF SUPERNOVAE

By R. Minkowski

(*Abstract*)

Spectroscopic observations indicate at least two types of supernovae. Nine objects (represented by the supernovae in IC 4182 and in NGC 4636) form an extremely homogeneous group provisionally called "type I." The remaining five objects (represented by the supernova in NGC 4725) are distinctly different; they are provisionally designated as "type II." The individual differences in this group are large; at least one object, the supernova in NGC 4559, may represent a third type or, possibly, an unusually bright ordinary nova.

Spectra of supernovae of type I have been observed from 7 days before maximum until 339 days after. Except for minor differences, the spectrograms of all objects of type I are closely comparable at corresponding times after maxima. Even at the earliest premaximum stage hitherto observed, the spectrum consists of very wide emission bands. No significant transformation of the spectrum occurs near maximum. Spectra of type II have been observed from maximum until 115 days after. Up to about a week after maximum, the spectrum is continuous and extends far into the ultraviolet, indicating a very high color temperature. Faint emission is suspected near $H\alpha$. Thereafter, the continuous spectrum fades and becomes redder. Simultaneously, absorptions and broad emission bands are developed. The spectrum as a whole resembles that of normal novae in the transition stage, although the hydrogen bands are relatively faint and forbidden

lines are either extremely faint or missing. The supernova in NGC 4559, while generally similar to the other objects in this group, shows multiple absorptions of *H* and *Ca* II; the emission bands are fainter than in the other objects.

No satisfactory explanation for the spectra of type I has been proposed. Two [*O* I] bands of moderate width in the later spectra of the supernova in IC 4182 are the only features satisfactorily identified in any spectrum of type I. They are, at the same time, the only indication of the development of a nebular spectrum for any supernova. The synthetic spectra by Gaposchkin and Whipple disagree in many details with the observed spectra of type I. However, these synthetic spectra agree better with spectra of type II and provide a very satisfactory confirmation of the identifications which, in this case, are already suggested by the pronounced similarity to the spectra of ordinary novae. As compared with normal novae, supernovae of type II show a considerably earlier type of spectrum at maximum, hence a higher surface temperature (order of 40,000°), and the later spectrum indicates greater velocities of expansion (5000 km/sec or more) and higher levels of excitation. Supernovae of type II differ from those of type I in the presence of a continuous spectrum at maximum and in the subsequent transformation to an emission spectrum whose main constituents can be readily identified. This suggests that the supernovae of type I have still higher surface temperature and higher level of excitation than either ordinary novae or supernovae of type II.

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THE ABSOLUTE MAGNITUDES OF THE GIANT K-TYPE STARS

BY GUSTAF STRÖMBERG

(*Abstract*)

The bright star Arcturus is representative of a class of fairly numerous stars, known as K-type giants, which differ in many