CLASSIFICATION ERRORS IN LOW-DISPERSION SPECTROSCOPY

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With the two parts of the Bonn Spectral Atlas it was hoped to provide a tool for the improvement of accuracy in low-dispersion spectral classification. Earlier estimates from our spectra by different observers with classification experience indicated a rather small increase in classification errors with decreasing resolution. They amount to 0.17 spectral types per 1000 $Å$ mm^{-1} increase (larger numbers) in dispersion in the range 200 - 1300 $Å$ mm^{-1} dispersion added to the 0.1 spectral types which are typical errors at MK classification dispersion near 100 $Å$ mm^{-1} and 0.56 luminosity classes per 1000 $Å$ mm^{-1} increase (larger numbers) in dispersion in the range 200 - 1300 $Å$ mm^{-1} dispersion added to the 0.6 luminosity classes which are typical errors at MK classifications near 100 $Å$ mm^{-1}. In order to improve on the error determinations the three first-named authors, all graduate students with no previous experience in spectral classification, classified independently between 800 and 1300 spectra with each of the three Bonn Atlas dispersions of 240, 645 and 1280 $Å$ mm^{-1}. The classification errors of the three students differ by very small amounts and thus are averaged in the following discussion.

Of the various error determinations we present the following:

1. Average values of absolute differences between student classifi-
   cations and MK standards. These values may be influenced by an
   unknown recogniton factor because the plates used for classifi-
   cation were largely the same as those obtained for the atlas
   plates. Furthermore the number of known MK standards on the
   Schmidt-telescope plates was not much larger than the number of
   standards used in the atlas.

2. Average values of internal deviations from the mean between any
   two student classifications. This group contains between 15 and

37% MK standards for which the reservations concerning the recognition factor also apply. The errors are thus still some-what underestimated.

3. Average values of internal deviations from the mean between any two student classifications corrected for the recognition of standard stars. In this group all standard stars are con-sidered to be reclassified with zero error. The errors of the samples are then increased by the factor (total number of stars/ number of stars with classification errors). The errors thus determined do not contain systematic deviations from the stan-dard stars. Graphic presentations, however, show that these must be small.

4. The errors given are determined in the following way: the mean absolute difference Cannon-standards was determined and then used as a systematic correction factor applied to the mean ab-solute difference Cannon-students. The results are considered upper limits to the differences students-standards.

The same procedures (except, of course, 4) were applied to obtain the various errors in luminosity class. Instead of 4 a con-version factor obtained by comparing the entries of 1 and 4 in Table I were applied to the values of 1 in Table II in order to obtain 4.

Within the observed uncertainties the classification errors of the three different dispersions are sufficiently similar to permit the following general statements. At dispersions 200 - 1300 A mm^{-1} MK classification is possible with errors which are at best of the same order as those found at MK dispersions and at worst larger by factors 2 - 3. These accuracies can be obtained by inexperienced classifiers with no other tool than the Bonn Spectral Atlas. It is suggested that MK classification should be attempted at all disper-sions in place of the so-called natural groups which do not fully employ the information content of low-dispersion spectra.

TABLE I

ERRORS IN SPECTRAL CLASS

Dispersion, A mm^{-1}	240	645	1280
No			
1	0.15	0.19	0.19
2	0.08	0.10	0.09
3	0.10	0.13	0.12
4	0.21	0.22	0.25

TABLE II

ERRORS IN LUMINOSITY CLASS

Dispersion, A mm^{-1}	240	645	1280
No			
1	1.2	1.5	1.4
2	0.6	0.6	0.7
3	0.7	0.7	1.0
4	1.7	1.7	1.8