atomic hydrogen and possible decomposition of the hydrogen peroxide already formed this is a minimum value.

The work is being continued.

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Summary.—The parallelism between the intensity of hydroxyl bands and the formation of hydrogen peroxide has been pointed out.

[1] Watson, *Astrophys. J.*, **60**, 145 (1924).

[2] Mecke, *Z. Physik*, **28**, 274 (1924).

[3] Bonhoeffer, *Z. Phys. Chem.*, **116**, 391 (1925).

[4] Bonhoeffer and Reichardt, *Z. Phys. Chem.*, **139A**, 75 (1928).

[5] Lavin and Stewart, *Nature*, **123**, 607 (1929).

[6] Urey and Lavin, soon to be published.

A SPECTROPHOTOMETRIC STUDY OF CLASS A STARS

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During the past two years a study has been in progress at Harvard of the absorption line contours and color temperatures of 119 stars of Class A. The results are published in detail in Harvard Circular 348, and a synopsis of the conclusions is given in the present note.

1. The total energy absorption of the K line of Ca^+ is found to be a good index of stellar temperature from Class $B8$ to $F0$. Considering the wide range of absolute magnitudes among A stars, and hence the probable wide range in pressure in the reversing layer from star to star, this seems at first glance to be almost too simple a finding, but the observational evidence points to it quite clearly, although perhaps a few exceptional cases exist.

A key to the explanation of this simple relation is contained in a recent note by Milne.[1] Considering stars of any given temperature higher than 8000° arranged in a sequence according to absolute luminosity, it is found from his theory that in the more luminous stars the decrease in the intensity of the K line which is to be expected on account of the decreasing pressure is almost precisely balanced by an increase in intensity on account of the greater depth of the reversing layer.

2. It is found that the Henry Draper classification is a surprisingly accurate index of temperature from $A0$ to $F0$. This is, of course, due to the fact that the criterion for these Henry Draper classes is largely the strength of the K line, which has been found to be a good temperature

index. The Mount Wilson classification,[2] on the other hand, is not primarily a temperature classification, the "*n*" classes being systematically cooler than the "*s*" classes, and the temperature range within any one class considerably greater than for the Henry Draper classes.

3. Among stars of any given temperature in the range from *B*8 to *A*2 it is found that the contour of the hydrogen lines depends on the luminosity of the star, the lines growing progressively wider for their depth as we pass toward the less luminous stars. This gives a fairly reliable criterion for absolute magnitude in stars from *B*8 to *A*2.

The widening is interpreted as a manifestation of the Stark effect, the less luminous stars having the higher pressures and hence larger values of q (the number of charged particles per unit volume). Milne has found, according to his theory, which neglects the effects of radiation pressure and of q, that at any given low temperature an increase in absolute luminosity is accompanied by an increase in the intensity of the hydrogen lines but that at temperatures around 10,000° and higher temperatures the increase should theoretically become negligible.

It seems improbable that q is negligible in the case of hydrogen line contours in *A* stars, in view of the evidence of Struve[4,5] and Elvey[6] that the Stark effect is detectable in the helium lines in *B* stars, and also in view of Unsöld's evidence[7] that the Stark effect accounts satisfactorily for the broad shallow character of the later members of the Balmer series in the solar spectrum. Hence, since the hydrogen lines become wider in the less luminous *A* stars, instead of remaining unchanged, as they would according to Milne's theory if q were negligible, it is inferred that the Stark effect is responsible for the widening of the Balmer lines in *A* stars.

4. The "peculiar" *A* stars in which the helium lines are prominent and the *K* line is as strong as in *A*0 stars are satisfactorily explained according to Milne's theory. For according to the contours of the hydrogen lines these are stars of relatively low atmospheric pressure, in whose spectra the helium lines should theoretically be strengthened and the intensity of the *K* line remain unchanged. The predicted effects are exactly as observed.

5. In the study of color temperature two unexpected phenomena were uncovered. There is a considerable apparent variation in color index with season, under Cambridge climatic conditions, stars appearing redder in the summer months; thus the color of an *A*0 star in summer is the same as the color of an *A*2 star in winter.

The *cA* stars that are abnormally red for their spectral class have a peculiar spectral energy distribution such that the "temperature" of a given star depends on the region of the spectrum investigated. For example, the "temperature" of μ Cephei, a *cA*2 star, as determined from certain spectral regions to the red of 4000*A*, is 1500° less than the "temperature" as determined from spectral regions to the violet of 4000*A*. A similar phenomenon in *B* stars has already been referred to by Gerasimovič,[8] who speaks of the stars in question as being cool stars with an "ultra-violet appendage."

[1] Milne, *H. B.* 870, 1929.

[2] Adams and Joy, *Ap. J.*, **56**, 242, 1922.

[3] Milne, *Proc. Roy. Soc.*, (in press), Bakerian Lecture, 1929.

[4] Struve, *Ap. J.*, **62**, 198, 1925.

[5] Struve, *Ibid.*, **69**, 173, 1929.

[6] Elvey, *Ibid.*, **69**, 237, 1929.

[7] Unsöld, *Ann. d. Physik* (a paper on the pressure effect on the hydrogen lines in the sun, to appear shortly).

[8] Gerasimovič, *H. C.* 339, 1929.

GENETIC FACTORS STIMULATING MUTABILITY OF THE MINIATURE-GAMMA WING CHARACTER OF DROSOPHILA VIRILIS

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The mutable miniature gene of *Drosophila virilis* is in a labile condition reverting frequently to its wild type allelomorph.[1] These reversions occur at any stage in the development of the fly, in the germ cells as well as in the somatic cells. Recently several lines of mutable miniature were isolated, in each one of which the mutability of the miniature gene manifests itself at certain particular stages in the development of the organism. In the alpha line, the miniature gene is mutable both in the germ cells and in the somatic cells; in the gamma line, the mutability is limited to the somatic cells only; and in the beta line, the gene remains almost constant.

The experiments to be described in this paper involve only the miniature-gamma line. The somatic reversions occurring in the cells of the wings of the flies of this line produce wings which are mosaics of miniature and wild type tissues.

In an earlier paper[2] evidence was presented on the inheritance of two dominant genes which stimulate the mutability of mutable miniature. One of these genes, known as *M*, stimulates the mutability in the miniature-alpha line; that gene, however, does not influence the mutability of the miniature-gamma gene. The other gene, originally named *S*, but now known as *S*-1, stimulates the mutability of the miniature-gamma gene.