The above picture suggests that, in addition to the theoretical studies of outbursts of white dwarfs that are being carried out at several institutions, a stability analysis of the process may be profitable. Theoretical demonstration of an equilibrium situation may lead to improved estimates of masses or luminosities of Z Cam stars.

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VARIATIONS IN THE SPECTRA OF A-TYPE SUPERGIANTS

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It has been known[1] for many years that absorption lines for several supergiants of type A show changes of *radial velocity* with time. However, it is only in the past few years that spectrophotometry has been carried out in sufficient detail to manifest definite variations in *intensity* of the lines as well. In this paper the evidence will be reviewed that the duration of a cycle of semi-regular variation in line strengths for several A supergiants is correlated with their absolute magnitudes, as first proposed by Abt[2]. Several investigators have published new quantitative data recently. It must be emphasized that spectrograms of dispersion 60 microns per Ångstrom or greater, from which the weaker lines of the metallic ions can be utilized, are needed for this study. The stronger lines are not very sensitive, because they fall on the transitional part of the curve of growth.

Three stars—6 Cas, 9 Per and ν Cep—exhibit[3] coupling of microturbulence with radial velocity (see Table 1 for details). More recently Rosendhal[4] found changes in $H\alpha$ emission profiles, presumably caused by radial mass motions in the chromospheres of luminous B and A stars having $M_v < -6{\cdot}4$. Some of the rising columns of gas exceed the velocity needed to escape gravity. The estimated[5] mass loss for stars of luminosity class Ia exceeds 10^{-6} solar mass per year.

TABLE I

Supergiants With Spectral Variations

HD	*Name*	*MK Class*	M_v	*Microturbulence Fe* II	*R.V. range km* s^{-1}	*Cycle days*
207260	ν Cep	A2 Ia	−6·4	9 to 12	4	7·6
14489	9 Per	A2 Ia	−7·4	9 to 18	6	10 :
197345	α Cyg	A2 Ia	−7·8	12±	10	11·7
223385	6 Cas	A3 Ia	−8·5	8 to 19	19	30
92207	211 Car	A0 Ia	−8 :	6 to 25	50	30 :

If one further subdivides the absorption lines by ion and between ultimate and subordinate transitions, one finds a difference of amplitude and phase, as in the chromospheres of Cepheids. The gradient of radial velocity as a function of excitation potential reveals the stratification in these extended atmospheres. Groth[6] has constructed a model to represent this behaviour for α Cyg. Even though this closest of A supergiants is one of the brightest stars in the sky, it still requires further observation in many respects.

Aydin[7] has very thoroughly documented the dependence of both microturbulence and radial velocity on excitation potential. He found that, in addition to the stars already mentioned, HD 39866 and HD 210221 also show time-dependent variations due to expanding atmospheres. The largest range of variation in the parameters yet observed in any A-type supergiant has been found[8] for HD 92207. In each of these cases, curve-of-growth studies yield values for microturbulent velocity which are largest for *Fe* II and progressively smaller for the ions *Cr* II, *Ti* II and *Fe* I. If line-splitting occurs, the very high resolution of a Fabry-Perot interferometer will be required to detect it.

Wolf[9], with a model atmosphere computed to interpret coudé spectrograms for the brightest star (HD 33579) in the Large Magellanic Cloud, shows that the microturbulence increases from 2 to 26 km/sec as a function of height, and that the upper chromosphere is expanding at 170 km/sec.

On the H–R diagram these stars lie above and to the left of the cepheid instability strip. Maeder and Rufener[10] detected variations in brightness with ranges frequently less than 0·05 magnitude, which are probably synchronous with the changes in the spectrum. It will be of interest to watch for effects in the farther ultraviolet, where the problems of blended lines may be more troublesome than in the visible spectrum, not to mention the weakness of the continuum due to attenuation of flux by the interstellar dust in the line of sight. Data from continuum scans, which might be useful in matching the temperature parameters used in computations of model atmospheres, are as yet sparse.

At the I.A.U. Symposium No. 59 on Stellar Instability and Evolution, it was suggested that the cycle of variation observed in the A-type supergiant atmospheres may be a fluctuation like the solar 5-minute cycle, but scaled up in accordance with the mass and radius. Calculations of the energy generated in the stellar interior indicate that instability in many modes is on the point of developing, but that most of the possible frequencies are usually damped out. Other oscillations interfere destructively, so that the amplitudes differ from one cycle to the next. In contrast to the situation in a Cepheid, a regular shock wave fails to develop because energy from the second ionization of helium is not transferred by convection to the star's upper atmosphere.

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OBSERVATIONAL SELECTION IN THE IDENTIFICATION OF QUASARS AND CLAIMS FOR ANISOTROPY

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It has been claimed that quasars are distributed anisotropically with position over the sky. Although the effects of observational selection in these deductions are important, they are often either ignored or dealt with inadequately. By discussing several claims of anisotropy, it is shown that two such selection effects are largely responsible.

Introduction. Several claims that quasars are distributed anisotropically with position over the sky have been made since their discovery. Following Schmidt's[1] usage, one will use "quasar" to denote quasi-stellar objects with abnormally large redshifts selected according to either purely optical criteria or according to both optical and radio criteria. Although the research generated by the first major claim of an anisotropy (see below) led many workers to believe that the finding was due to effects of observational selection, other claims of anisotropies have been made subsequently.

In this paper, several such claims will be examined in the light of two simple selection effects. It will be argued that they are largely responsible for the appearance of the anisotropies.

Claim of anisotropic distribution of quasars. The first major claim that quasars are distributed anisotropically with position over the sky was made by Strittmatter, Faulkner, and Walmsley[2]. They suggested that quasars with redshifts greater than 1·5 are distributed preferentially in two regions of the sky, one near the North Galactic Pole with an especially high concentra-