DISCUSSION (Abt and Morrell; Hunger)

LECKRONE: (To Abt) Wolff and Preston, who studied the rotational velocities of HgMn and related normal late B- and early A-type stars, drew the very important conclusion that slow rotation is a necessary but not a sufficient condition to produce the HgMn anomalies. That is, in their sample there appeared to be a statistically significant number of intrinsically slowly rotating normal (non-HgMn) stars. Your distribution curves seem to contradict this conclusion except possibly for the stars you include as SB2's.

ABT: We have difficulty in recognizing Ap(Hg) stars, which is why Wolff and Preston used coudé dispersions. But for the remaining Ap and Am stars, there are statistically no normal stars at $v_e \lesssim 100$ km s^{-1}.

LECKRONE: Did the SB2's included in your distribution have normal MK classifications? Why should a star that had achieved very slow intrinsic rotation in a close binary retain its normal character; i.e., with rotationally-induced circulation or other perturbations suppressed, why has not diffusion taken over in these particular SB2's?

ABT: Most or all of the SB2's are, as I recall, Am or abnormal stars, but your point is well taken and we will check the remainder.

GRAY: I was interested to note that you find that 18% of field A-type stars are λ Boo stars. In my classification work, I found that λ Boo stars make up only about 1% of the field population. We know there is a continuum between the field stars and the λ Boo stars, and so this may simply be a matter of where to draw the line. But I generally do not label a star λ Boo unless it also shows a significant overall metal weakness. Do your λ Boo stars also appear significantly metal weak? If most of your λ Boo stars do not show a significant overall metal weakness, would it not be better, from the standpoint of terminology, to label these stars as "Mg II 4481-weak" and leave the appellation "λ Boo" for stars that also show a significant overall metal-weakness?

ABT: On the one hand, we are still not agreed upon a definition of λ Boo stars. On the other hand, you are right that we should label only what we see: "4481-weak" is an observation, while "λ Boo" is an interpretation. We probably agree that maybe 1% of the early A stars are grossly metal weak, while about 18% are 4481-weak.

LODÉN: There is a selection effect due to the fact that the difficulty to detect peculiarities increases with increasing $v \sin i$. Have you tried to correct for this circumstance in your statistics?

ABT: There would be no difficulty in recognizing Ap and Am stars in broad-lined spectra if they existed, just as we recognize λ Boo spectra in the broadest-lined stars.

LODÉN: The parameter $v \sin i$ is malicious. Do you think that we now have the possibility to perform adequate photometric and spectrophotometric measurements of rotation periods, so that, in a few years, you can repeat your investigation with $v \sin i$ replaced by revolutions per day?

ABT: That would be interesting to do. It has already been done in the Ap (spectrum variables) where we have independent knowledge of the rotational periods.

DWORETSKY: Have you tried confronting your results on, for example, the A2 IV - A2 V classification anomaly with other data, such as $uvby\beta$ or Geneva photometry calibrations, to check the evolutionary state of the stars?

ABT: Not yet.
DWORETSKY: *A propos* the discussion of Mg II 4481 Å, I can recall, very long ago, discussing with Ann Cowley the problem of a star classed by her as very 4481-weak, which looked normal on my higher dispersion spectrograms. She commented that she didn't rely so much on 4481 "because it varied so much from star to star".
ABT: Charles Cowley informs me that at the time they did their study, the definition of λ Boo stars was sufficiently unclear that they were not looking for them.
SREEDHAR RAO: Did you find the K line of calcium also weak in A2 IV stars?
ABT: In some of them, yes.
SHORE: There may be a test for what $v \sin i$ actually means in your data. Have you compared the line profiles for the SB2 systems to those of non-binaries at the same $v \sin i$ to see if they really are the same?
ABT: No, but that might require a higher resolution than 0.2 Å or greater S/N than our 100.
LINSKY: (To Hunger) In your model for σ Ori B, what happens to the wind material that is trapped in the closed-field region? Does the trapped gas pile up forever, does it suppress the wind, does the neutral component diffuse out of the cloud field region, or is there another explanation?
HUNGER: At a rate of 10^{-9} $M_\odot$ yr^{-1}, mass is transferred to the clouds. In a steady state, the same amount is passed on to space. Whenever the Alfvénic density limit is reached, field lines reconnect, ms is expelled, and a substantial amount of energy is released by Havnes-Goertz mechanism. As a consequence, the outer magnetosphere is heated to 10^6 - 10^7 K. This is confirmed by the observation of gyrosynchrotron radiation and by x-rays.
MICHAUD: In He-rich stars, are there regions where there are underabundances or overabundances of C, N or O? Also, are there regions where there is mass loss larger than 10^{-13} $M_\odot$ yr^{-1}?
HUNGER: HD 37479 has a mass loss of 10^{-9} $M_\odot$yr^{-1}. C is depleted in the polar caps as shown in my paper, while it is "solar" in between the caps. However, the wind is confined to the He-patches, which could mean that in these patches, metals are "solar".