Stars of sequence B are further divided into B I and B II types. In B I stars silicon is very *strong,* and in B II stars it is *weak.*

Cepheid Instability Strip. R. F. CHRISTY, *California Institute of Technology.*—Nonlinear pulsation calculations, similar to those used for RR Lyrae models, are under way to explore the nature of the Cepheid instability strip, and in particular the high-temperature boundary, for model stars of luminosity ranging from $M_b=+3.0$ to $M_b=-7.0$. The calculated location of the high T_e boundary of instability can be approximated by the relation

$$\theta_e=1.09-0.11 \log g-0.20\, Y,$$

where Y is the mass fraction of helium and g is the surface gravity. This relation agrees satisfactorily with observation and, in addition, can serve to determine the helium abundance of Cepheid variable groups in different star groupings. The general behavior of the models is very similar over this wide range in luminosity although there is a change in the relative importance, to the excitation of pulsation, of the hydrogen ionization zone and the helium+ionization zone. For short-period models of relatively large g, the helium+zone dominates the excitation of pulsation; whereas for the longest-period models of very low surface gravity, the hydrogen ionization zone is most important. First overtone instability is found for Cepheid models just as for RR Lyrae models. For a fixed luminosity, models for different assumed mass show fundamental instability only for periods greater than some shortest period, the larger masses are unstable only in the first overtone, if at all. This shortest period of fundamental instability follows approximately the law found for RR Lyrae models

$$P_{\mathrm{tr}}=0.057\ (L/L_\odot)^{0.6}\ \text{days}$$

An examination of evolutionary calculations relating luminosity and mass in the Cepheid region, together with the calculated shift to the overtone mode, suggests that Cepheid variables of mass less than 10 $M_\odot$ should show first overtone pulsation as well as fundamental pulsation.

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Martian Canal System. ALVIN J. COHEN, *University of Pittsburgh.*—The Martian canal system is an illusion probably caused by observation of combinations of arcuate and elliptical rays from numerous impact craters on the surface. Presence of arcuate and elliptical rays completely covering areas seen in several Mariner IV photographs confirms this possibility as well as the impact nature of the craters. The presence of large numbers of rays compared to the lunar surface may indicate almost total lack of outgassing on the Martian surface. Presence of complex overlapping ray systems on Mars indicates the seasonal colors are due to changes in superficial coatings of inorganic complexes and frozen gases.

The relatively small number of impact craters observed on Mariner IV pictures and therefore the possible young age ($\sim 8\times 10^8$ yr) of the observed craters could indicate a rather recent ice cover of molecules of low atomic number atoms on the Martian surface. Earlier impacts in the ice would by now have been largely obscured due to the large diameter: depth ratio of impact structures. A primordial ice cover would help account for the lack of surface relief on Mars.

Detailed observation of arcuate and elliptical ray structures on the Martian surface was facilitated by use of optically filtered Mariner IV glossy press release photographs. These were produced for the author by means of laser-beam filtering techniques by Dr. Morris Taylor and his associates at the Gulf Research and Development Company, Harmerville, Pennsylvania.

Seasonal Color Changes on Mars. ALVIN J. COHEN, *University of Pittsburgh.*—The atmosphere, seasonal color changes, polar ice caps, and "dust storms" on the Martian surface may be all explained by various molecules, compounds and complexes of permutations among iron, carbon, and oxygen. The atmosphere is almost certainly made of carbon dioxide along with dissociation products, CO_2^+, CO, O_2, O, and O^+. Enough carbon monoxide probably has been present at the surface to react with the free iron as follows:

$$Fe+5CO \rightleftarrows Fe(CO)_5.$$

At temperatures of >200°C the pentacarbonyl will dissociate to give finely divided iron and carbon monoxide along with traces of carbon and iron oxides. $Fe(CO)_5$ is yellow in color, melts at −20°C and boils at 103°C (atmospheric pressure). It probably accounts for the so-called "yellow dust clouds" on Mars. Under action of ultraviolet light two molecules of the pentacarbonyl associate to form yellow triclinic crystals of $Fe_2(CO)_9$ which decomposes above 100°C to form green monoclinic crystals of $Fe_3(CO)_{12}$ and $Fe(CO)_5$ again. $Fe_3(CO)_{12}$ is stable to 140°C, thus in the warmer period on Mars it will be the predominant stable specie. Above 140°C it will decompose again to $Fe(CO)_5$ gas. As the temperature cools, $Fe(CO)_5$ under action of long-wave-