post main sequence evolution stage. The Z value needed is 0.01 for the longer periods and 0.001 for the shortest period, which is close to that of the variable SX Phe. For SX Phe but not for longer periods it appears that helium has gravitationally settled downward to deplete the surface layers to the depth where \( T = 300,000 \) K. The periods for these stars have been used to determine the pulsation constant as a function of \( N, R, L, \) and \( T_0 \). With the observed periods and approximate surface effective temperatures, the period-mean density and mass-luminosity relations based on the evolution tracks of MENGEL and SWIGERT (1979) give theoretical masses for 9 individual variables also between 1.1 and 2.2 M\(_\odot\). The dwarf Cepheids are apparently only large amplitude \( \delta \) Scuti variables with more helium and lower Z in their surface ionization zones which gives then their larger amplitude light variation.

09.09.04 Metallicism and Pulsation-Theoretical Results. COX, A. N., Los Alamos Scientific Laboratory, KING, D. G., The Univ. of New Mexico, and HUDSON, S. W., Los Alamos Scientific Laboratory. - The linear theory radial pulsation stability of low helium \( \delta \) Scuti variable models \((1.0 - 1.5 \) M\(_\odot\)) has been investigated to see if metallicism and pulsation can occur simultaneously. Metallicism, which occurs after the gravitational settling of the He II convection zone and its deep mixing for \( Y < 0.1 \), can then establish itself rapidly compared to the evolution timescale. Pulsation can still occur with driving due to the residual helium and the enhanced hydrogen. The radial pulsation instability strip is about half as wide as for normal helium abundance. Zero helium in the surface driving regions produce blue edges so red that probably no instability strip exists at all. The red edge, predicted theoretically on the basis of the importance of convection in the outer zone, agrees well with the observational one. Cool, low helium and metallic line stars are then predicted to pulsate in a 200 to 500 K wide strip that is widest between the main sequence luminosity of 5 L\(_\odot\) and 15 L\(_\odot\). This strip reasonably includes the observed pulsating \( \delta \) Del and mild \( \alpha \) Scuti stars, but there may be conflicts. Since blue edges for varying ionisation zone helium content occur across the entire instability strip, bluer first and higher overtone pulsators are also predicted everywhere from less than 700 K to over 8000 K, the redder ones probably showing metallicism.

10.09.09 The 78 Day Period in Cygnus XR-1. DOLAN, J. P., CAVENE, P., CRANHEAL, C. J., DENNIS, B. E., FROST, K. J., O'MIG, L. E., and ODE, M. M., Laboratory for Astronomy and Solar Physics, NASA GSFC. The modulation with 78 day period reported in the optical photometry and polarimetry in the low energy x-ray observations of Cygnus XR-1/ HDE 226868 by Kemp et al. (AJ, 83, 962, 1978) has been sought in GSO-8 high energy x-ray observations and independent optical polarimetry of the source. Using the phase and period given by Kemp et al., no modulation of the shape they observed was detected in either the 23 to 153 keV x-ray count rate or the U band polarimetry. Because of the irregular variability of the source in these observed quantities, the upper limits we are able to place on the amplitude of the 78 day modulation fall at approximately the level of variability detected by Kemp et al. If such a 78 day modulation exists, it is less likely to be related to the existence of a third body in the system than to the fundamental rotation properties of the free modes of oscillation of the primary, thought to be the ultimate cause of the intensity transitions in the state of the x-ray source (Dolan et al., Ap. J., in press).

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11.09.09 Gamma-Ray Observations of XP 0532. G. FRYE, P. ALBATS, T. JENKINS, R. KOGA, S. SCHINDLER, Case West. Res. U.- The Crab pulsar has been observed on two high altitude balloon flights with a one sq. m. MWPC \( \gamma \)-ray telescope with a maximum sensitivity in the 10 to 30 MeV region. The main pulse is observed on the first flight with a 1.5 ms width. The interpulse intensity is, at most, one-half the main pulse intensity as has been observed previously for this energy interval, in contrast to both higher and lower energies where the main pulse and interpulse intensities are approximately equal.

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12.09.09 Do Pulsar Magnetospheres Really Corotate? W. L. ROBERTS, Planetary Science Institute. The closed portion of oblique magnetospheres in which the gyrotral motion of the charged particles is classical are known to corotate through the agency of magnetic mirroirings. The \( F \times B \) drift is not corotational. In the magnetosphere of a neutron star, gyrotral motion is essentially quantal. Electrons near a neutron star will lie almost entirely in the lowest Landau level because of (1) the difficulty of exciting their gyrotral motion and (2) their very short cyclotron lifetimes. We show that, in the magnetosphere of a radio pulsar, nuclei can mirror only weakly and electrons not at all. To zeroth order in the coupling