panding atmosphere of radius 10^{14} cm surrounding a 2000^{o} star of radius $3x10^{13}$ cm, with a mass loss rate of 10^{-5} $M_{\odot}$/yr and radial velocity 4 km/sec, gas temperature 1500^{o}, and $[SiO]/[H_2]=6x10^{-5}$. Collision cross sections for rotational excitation calculated by S. Green (1974, private comm.) for CO were extrapolated to SiO, and vibrational excitation rates were estimated from the formula of Millikan and White (1963, J. Chem. Phys. 39, 3209). This cloud has nearly saturated masers in the V=1, J=2-1 and 1-0 transitions, and sufficient available power to give the observed brightness of W Hya.

Higher temperatures and densities produce saturated masers in the V=2 level also, as recently observed by Buhl and Snyder.

No masers are predicted in the V=0 level, and searches have not found any.

J.M. is a NASA-NRC research associate.

26.06.04 Convection in Degenerate Dwarfs. G. FONTAINE, U. Montreal. - An improved thermodynamic description of the high density envelopes of degenerate dwarfs leads to the conclusion that convection plays a less important role in the cooling of these stars than previously suggested. The thermodynamically consistent theory of ionization equilibrium at high densities developed at Livermore by Graboske and his coworkers (1969 Phys. Rev. 186, 210) has been used in the construction of model envelopes. For the three chemical compositions considered ($X_H = 0.999$, $X_{He} = 0.999$, $X_C = 0.999$), it is found that convection lowers the core temperatures of degenerate dwarfs by at most 50% as compared to models in forced radiative equilibrium. The largest reductions occur for the lowest luminosity ($L = 10^{-4}L_{\odot}$) and smallest mass ($M = 0.22M_{\odot}$) considered.

26.07.09 Pulsar Magnetospheres. R.N. HENRIKSEN & J.A. NORTON, Queen's U. at Kingston. - We have made a study of the rotating pulsar magnetosphere problem. A significant extension has been made to the work of Michel (1974 Ap. J. 187, 585), Mestel (1973, Astr. and Sp. Sc. 24, 289), and Scharlemann and Wagoner (1973, AP. J. 182, 951). We have found an exact solution in the axisymmetric case with mass particles that has interesting properities, especially with respect to the recent work of Ruderman and Sutherland (preprint). In the massless charged particle approximation, we have developed a more general yet simplified set of equations for describing the field quantities. A non-trivial class of exact self consistent solutions for both the axisymmetric and oblique rotator have been discovered, valid for the entire region within the light cylinder. For the latter case we have found a subset of solutions that launch low frequency radiation. We can find quantities such as charge density, paricle velocities and fields all of which are physically reasonable. The oblique rotator solutions do not resemble the usually assumed dipole structure. Preliminary calculations indicate that an exact solution for mass particles near the light circle can be matched to the inner massless particle solution.

26.08.03 On Long-Period Hydromagnetic Oscillations of Self-Gravitating Compressible Masses, Y. SOBOUTI, Pahlavi University, Shiraz, Iran- A mass of a self-gravitating fluid on the verge of convective instability developes neutrally stable regions. If the fluid, is pervaded by a magnetic field, these neutral regions will be capable of maintaining pure hydromagnetic oscillations. The period associated with such modes of oscillation is of the order of time required by Alfven waves to cross the medium. For the Sun and for the magnetic fields of the order of few thousands of gauss the period can be as large as the period of solar magnetic cycle. A variational principle is employed to isolate pure hydromagnetic modes of oscillation of the fluid. For axisymmetric force-free fields and for an expansion of the perturbation field in spherical harmonics, an oscillation period is found for the harmonic $\ell = 1$. The stability of a magnetic configuration against convection is commonly sought by looking for a Schwarzschild - criterion modified to account for the magnetic field. The present analysis suggests the following alternative to this conventional approach. (a) A region of the fluid in which the temprature gradient is equal to the adiabatic gradient is considered. (b) The fluid is allowed to undergo a perturbation displacement and the oscillation frequencies of the ensuing hydromagnetic modes are found. If all the frequencies turn out to be real the fluid and the field will then be stable.

26.09.06 Binary Frequency of OB Stars with Anomalous Nitrogen and Carbon Absorption Line Strengths. G. ROGERS & C. T. BOLTON, David Dunlap Observatory, University of Toronto. - Results of a binary frequency study of eighteen OB stars with anomalous nitrogen and carbon absorption line strengths show that most, perhaps all, of the nitrogen enhanced (OBN) stars, and fewer than half, perhaps none, of the carbon enhanced (OBC) stars are spectroscopic binaries. Orbital elements are given for four of the OBN stars, and attention is drawn to the remarkably massive system HDE 235679. Evidence for mass loss is presented in support of the view that the spectroscopic peculiarities of the OBN stars are due to mass transfer in binary systems. All distance indicators give results consistent with the spectroscopic parallaxes for both the OBN and OBC stars. The OBN stars have a mean distance from the galactic plane five times greater than the OBC stars. All of the OBC stars have high luminosities (low surface gravities). This may be responsible for their spectral peculiarities.

26.10.06 Demise of a Binary System. W.Y. CHAU, R.N. HENRIKSEN & M.E. ALEXANDER, Queen's U., Kingston Ont. - The evolution of a binary system consisting of a red giant evolving off the main sequence and a white dwarf, has recently been followed to the point of 'contact' (Sparks & Stecher 1974, Astrophys. J. 188, 149) subsequent to the onset of instability due to tidal dissipation. We extend the model to later phases during which the white dwarf enters the (equilibrium) atmosphere of the giant companion, and discuss the evolution in terms of accretion onto the white dwarf and mass loss from the system. The white dwarf, instead of rapidly 'plunging' in to collide with the degenerate core as claimed, spends about 400 years (which is of the same order as that found by Sparks & Stecher) in 'cannibalizing' the giant as it spirals inwards. We expect several interesting observational features which may be related to such diverse objects as 'speeding up' X-ray binaries (HerX-1, CenX-3), symbiotic stars, and ultra-short period binaries consisting of a pair of white dwarfs (HZ 29). Alternatively, the rapid accretion onto the white dwarf may lead to a type of supernova on account of thermal runaway. This research is supported by a Canadian National Research Council operating grant.