The University of Georgia
Department of Physics and Astronomy
Athens, Georgia 30602

The following report covers the Department activities from October 1995 through October 1996.

1. PERSONNEL

Department members participating in astrophysics or astronomy research or instruction were Professor J. Scott Shaw, Associate Professors Jean-Pierre Caillault and Loris Magnani, Assistant Professor Peter Hauschildt, graduate students Thomas Hearty, Sangeeta Mysore, Michael James, Inseok Song, Sharon Holcomb, Travis Barman, and J.D. Myers. Undergraduate student Jesse Chuhta (Colorado School of Mines) spent the summer as an NSF REU intern and Anna Varley (Cedar Shoals High School) was a summer intern.

2. FACILITIES

The Southeastern Association for Research in Astronomy (SARA), of which the University is a member, operates a 0.9-m telescope on Kitt Peak. This telescope is now completely functional with a CCD camera. The capability for robotic and remote operation is expected in the winter of 1996/97. The CCD camera was funded by a grant from the Research Corporation.

The astronomy group has five SUN Sparcstations, two HP workstations, and numerous smaller machines available for data processing and computation.

3. RESEARCH

Hauschildt, with E. Baron (U. Oklahoma) and F. Allard (Wichita St.) continue their work on numerical methods in stellar atmosphere computation with the parallel implementation of the generalized stellar atmosphere and NLTE radiative transfer computer program PHOENIX. Parallel algorithms have been developed for radiative transfer, spectral line opacity, and NLTE opacity and rate calculations. The implementation uses a MIMD design based on a relatively small number of MPI library calls. Calculations on a number of different parallel computers have been made along with scalability tests.

Hauschildt, with Baron and A. Mezzacappa (Oak Ridge) model the radiative transfer equation in a co-moving frame. The time-independent or quasi-static approximation is adequate for most astrophysical problems including supernovae. However, advection cannot be neglected in the co-moving solution of the radiation transport equation. Its main effect is on the temperature structure through the term it adds to the equation of radiative equilibrium. An approximate expression [good to $O(\beta)$] for the Rosseland mean opacity which can be used in radiation hydrodynamical calculations has been derived. The important effect of the Doppler shift is fully accounted for in this approximation.

Hauschildt, with A. Schweitzer (LSW-Heidelberg), F. Allard, and G. Basri (Berkeley) used a new version of the ‘‘NextGen’’ grid of cool star model atmospheres to compute synthetic line profiles which fit high resolution Keck spectra of the cool M dwarf VB10. The van der Waals broadening in cool, molecular (mostly H_2) stellar atmospheres is included in the model since line profiles are dominated by van der Waals pressure broadening and are a sensitive indicator for the gravity and metallicity. Therefore, the high resolution Keck spectra are useful for determining the parameters of M dwarfs. There is some ambiguity between the metallicity and gravity. For VB10, the high resolution spectra indicate that $5.0 < \log(g) < 5.5$ and $0 < [\mathrm{M/H}] < 0.5$ for an adopted fixed effective temperature of 2700 K, which is consistent with the calculations.

Allard, Hauschildt, I. Baraffe (CNRS-Lyon), and G. Chabrier (CNRS-Lyon) calculate preliminary non-grey model atmospheres and interiors for cool brown dwarfs. The resulting synthetic spectra are compared to available spectroscopic and photometric observations of the coolest brown dwarf yet discovered, Gl229B. Despite the grainless nature of the present models, the resulting synthetic spectra provide an excellent fit to most of the spectral features of the brown dwarf. The results confirm both the presence of methane absorption and the substellar nature of Gl229B. These preliminary models set an upper limit for the effective temperature of 1000 K.

Hauschildt, with Baraffe, Chabrier, and Allard have obtained new evolutionary models for metal-depleted ($[M/H] \leqslant -0.5$) low-mass stars ($m \leqslant 0.8\ M_\odot$), based on the most recent non-grey atmosphere models. They compare the results with the observed color-magnitude diagrams of five globular clusters, namely NGC6397, M4, M15, 47Tuc and ω Cen, for which HST observations are available. The observed characteristic changes in the slope of the main-sequence of the clusters are reproduced quantitatively, both in colors and in magnitude. Since these changes stem from the intrinsic physical properties of low-mass stars, this is a convincing demonstration of the accuracy of the physical inputs of the present models and of the reliability of these models to describe the mechanical and thermal properties of metal-depleted stars. This allows the derivation of reliable relations between the mass, the age and the observable properties of these objects over a metallicity range characteristic of the old disk, spheroid and halo population. As already pointed out by the authors in previous publications, non-grey atmosphere models and a consistent treatment of the atmosphere-interior boundary conditions are absolutely necessary conditions to derive accurate models for very-low-mass stars. They stress that the present models do not include *any* adjustable parameter, so that the agreement between theory and observation is the unbiased outcome from the very physics input into the models. Because the VLMS models do *not* require any free parameters, they represent a particularly severe challenge for theorists.

Hauschildt, with H.R.A. Jones (U. Liverpool), A.J. Longmore (U. Edinburgh), and F. Allard compare 1.16–1.22μ

spectra of M dwarfs with synthetic spectra calculated with the stellar atmosphere code PHOENIX. The spectral region is rich in absorption features of which the strongest are K, Fe, Mg, and FeH. Each observed spectrum is compared against a grid of synthetic spectra extending well outside the expected parameter range for M dwarfs. The effective temperatures, metallicities and gravities are compared to expectations based on previous work. For the cooler objects the parameters show broad agreement; however for the hotter objects the ill-fitting Fe lines lead to models with low gravity and metallicity. Comparisons on a line-by-line basis yield consistent metallicities and gravities for the sample, although the complicated behavior of modeled equivalent widths with metallicity and gravity makes it awkward to separate effects due to a single model parameter. The comparison suggests a similar spread in metallicities than anticipated from the position of the stars on a Hertzsprung-Russell diagram (a more reliable indicator of metallicities than the space velocities of the objects). Comparison of the observed strong K lines in GD 165B with synthetic spectra indicate that it is relatively metal rich. This result together with an improved measurement of its distance means that it is likely to be a brown dwarf.

S. Legget, (U. Hawaii), Hauschildt, *et al.* present new low–resolution (R∼250) 1.0—2.4μm spectra for 13 red dwarf stars. The sample size is increased to 16 by including other published infrared spectra. New, as well as published, red spectra are presented for 10 of these 16 stars, and new and published VRIJHKLL′ photometry is also presented. Both halo and disk stars are included in the sample, which covers a range of spectral type from dM0 to dM6.5. Bolometric luminosities and bolometric corrections from the observational data are derived, finding good agreement with earlier results for the disk stars. Synthetic spectra generated by Allard & Hauschildt's model atmospheres are fit to the observed spectra. Although some discrepancies remain between the theoretical and observed spectra, we find that the molecular features give a consistent value for effective temperature across the entire observed wavelength range. The effective temperatures and radii derived are in good agreement with structural models of low–mass stars. This removes a long–standing discrepancy between the observed and calculated locations of such stars in the HR diagram, for stars more massive than 0.1 $M_{\odot}$.

Hauschildt, Allard, D.R. Alexander (Wichita St.), A. Schweitzer and Baron continue their study of M star model atmospheres. They present initial results of detailed NLTE model atmosphere calculations for M dwarfs and giants. Improvements compared to previous LTE model grids include (a) a replacement of straight mean TiO and water opacities with detailed line lists; (b) detailed, depth dependent Voigt profiles for the strongest 6-10 million atomic and molecular lines; (c) more complete line lists for important molecules; (d) an upgraded and enlarged EOS with 212 molecules; and (e) a detailed and self-consistent NLTE treatment for and Ti I (395 levels and 5279 primary b-b transitions). The calculations are performed with version 7.1 of their general NLTE model atmosphere computer code, PHOENIX, using a small subset of its available NLTE species. The results of detailed Ti I NLTE model calculations for a number of M dwarfs and giants indicate that, in the parameter range considered, LTE is a poor approximation to the Ti I line formation (due to the low collisional rates). However, the secondary effect of Ti I on the TiO opacity is small in the line forming region of TiO.

G.J. Schwarz (Arizona St.), Hauschildt, Starrfield (Arizona St.), Baron, Allard, S.N. Shore (U. Indiana, South Bend), and G. Sonneborn (GSFC) have analyzed the early optically thick ultraviolet spectra of Nova OS And 1986 using a grid of spherically symmetric, non-LTE, line-blanketed, expanding model atmospheres and synthetic spectra with the following set of parameters: 5,000$\leqslant T_{model} \leqslant$60,000K, solar abundances, $\rho \propto r^{-3}$, $v_{max}=$ 2000km s^{-1}, $L=6\times10^4$ $L_{\odot}$, and a statistical or microturbulent velocity of 50 km s^{-1}. Synthetic spectra are used to estimate the model parameters corresponding to the observed *IUE* spectra. The fits to the observations were then iteratively improved by changing the parameters of the model atmospheres, in particular T_{model}, and the abundances, to arrive at the best fits to the optically thick pseudo-continuum and the features found in the *IUE* spectra. Analysis of the *IUE* data indicates that OS And 86 had solar metallicities except for Mg which showed evidence of being underabundant by as much as a factor of 10. A distance of 5.1 kpc to OS And 86 has been derived with a peak bolometric luminosity of $\sim 5 \times 10^4$ $L_{\odot}$. The computed nova parameters provide insights into the physics of the early outburst and explain the spectra seen by *IUE*. Lastly, we find evidence in the later observations for large non-LTE effects of Fe II which, when included, lead to much better agreement with the observations.

Hauschildt, Baron, Starrfield, and Allard continue their study of the effects of Fe II NLTE on nova atmospheres and spectra. The atmospheres of novae at early times in their outbursts are very extended, expanding shells with low densities. Models of these atmospheres show that NLTE effects are very important and must be included in realistic calculations. Therefore, their atmospheric studies have been improved by increasing the number of ions treated in NLTE. One of the most important ions is Fe II which has a complex structure and numerous lines in the observable spectrum. NLTE effects for Fe II are investigated for a wide variety of parameters. A detailed Fe II model atom with 617 level and 13675 primary lines is used and treated using a rate-operator formalism. The radiative transfer equation in nova atmospheres *must* be treated with sophisticated numerical methods since simple approximations, such as the Sobolev method, *cannot* be used because of the large number of overlapping lines in the co-moving frame. Their results show that the formation of the Fe II lines is strongly affected by NLTE effects. For low effective temperatures, $T_{eff}<$ 20,000 K, the optical Fe II lines are most influenced by NLTE effects, while for higher T_{eff} the UV lines of Fe II are very strongly affected by NLTE. The departure coefficients are such that Fe II tends to be overionized in NLTE when compared to LTE. Therefore, Fe II-NLTE must be included with sophisticated radiative transfer in nova atmosphere models in order to reliably analyze observed nova spectra.

Hauschildt, Baron, P. Nugent (LBL), and D. Branch (U. Oklahoma) have examined the NLTE effects in modelling supernovae near maximum light. Supernovae, with their diversity of compositions, velocities, envelope masses, and interactions are good testing grounds for probing the importance of NLTE in expanding atmospheres. In addition to treating H, He, Li I, O I, Ne I, Na I, and Mg II in NLTE, a very large model atom of Fe II is used to test the importance of NLTE processes in both SNe Ia and II. Since the total number of potential line transitions that one has to include is enormous ($\approx$40 million), approximations and simplifications are required to treat the problem accurately and in finite computer time. With the large Fe II model atom described above, several assumptions for treating the background opacity that are needed to obtain correct UV line blanketing which determines the shape of near-maximum light supernova spectra can be tested. Due to interactions within the multiplets, treating the background lines as pure scattering (thermalization parameter $\epsilon=0$) is a poor approximation and an overall mean value of $\epsilon \sim 0.05-0.10$ is a far better approximation. This is true even in SNe Ia, where the continuum absorption optical depth at 5000 Å ($\equiv \tau_{std}$) is $\ll 1$.

Hauschildt, Baron, Nugent, and Branch have calculated NLTE synthetic spectra for the Type Ia supernovae SN 1992A SN 1981B, and SN 1991bg near maximum light. At this epoch both of the normal SNe Ia (SNe 1981b and 1992A) were observed from the UV through the optical. This wide spectral coverage is essential for determining the density structure of a SN Ia. The fits are in good agreement with observation and provide some insight as to the differences between these supernovae. SNe Ia form a spectral sequence which can be understood in terms of their luminosity. The application of the spectral fitting expanding atmosphere method (SEAM) is applied to SNe Ia which gives a distance that is independent of those based on the decay of ^{56}Ni and Cepheid variable stars.

Hauschildt, Baron, Branch, R.P. Kirshner (CfA), and A.V. Filippenko (Berkeley) present optical spectra of the Type Ic Supernova 1994I in M51 and preliminary non-LTE analysis of the spectra. The models are consistent with the explosions of C+O cores of massive stars. While no direct evidence for helium in the optical spectra has been found, the models cannot rule out small amounts of helium.

Hauschildt, Schmidtke (Arizona St.), A.P. Cowley (Arizona St.), A.L. Ponder (Arizona St.). T.K. McGrath (Arizona St.), L.M. Frattare (STScI), and B. Franklin (Arizona St.), describe IUE ultraviolet observations of three Be-star/X-ray binaries in the LMC: CAL 9, CAL E, and RX J0520.5–6932. Because the optical spectra show evidence of an overlying continuum source, ultraviolet spectra were obtained to further investigate its properties, but no UV emission lines are found. The UV spectra have been compared to models indicating that the stellar temperatures are near 30,000K (for $\log(g)=4.0$). This is in agreement with the temperatures suggested by the spectral type determined in the optical region. Thus, there is no clear evidence in either the optical or UV regions of the gas being accreted by the unseen compact companion which must give rise to the X-ray emission. Optical photometry shows these systems undergo irregular variations of up to a few tenths of a magnitude.

C. Briceno (CfA), L. Hartmann (CfA), J. Stauffer (CfA), M. Gagné (JILA), R. Stern (Lockheed) and Caillault have addressed the post-T Tauri problem in X-ray surveys. Recent studies using the *ROSAT* All-Sky Survey (RASS) towards nearby star-forming regions have identified a widely dispersed population of X-ray active stars, and have suggested that these objects are older pre-main sequence stars (post-T Tauri stars) located far from molecular clouds. They argue that the majority of these stars are not pre-main sequence stars, but young main sequence stars of ages up to $\sim 10^8$ yr. A simple model assuming continuing star formation over the past 10^8 yr quantitatively reproduces the number, surface density, X-ray emission, and optical properties of the RASS sources. Most of these stars are old enough to have dispersed far from their birth sites in molecular clouds, producing a relatively homogeneous spatial distribution of X-ray sources near the galactic plane. They conclude that the RASS results yield little evidence for a post-T Tauri population. They emphasize the importance of recognizing this wide-spread spatial distribution of 10^8 yr old stars in searches for possible older weak-emission T Tauri stars among X-ray selected samples in nearby star-forming regions.

Gagné, Caillault, Stauffer, and J. Linsky (JILA) have analyzed ten *ROSAT* HRI snapshots of the Trapezium cluster taken over the course of 21 days which show that the count rate of the O7 V star θ^1 Orionis C varies from 0.26 to 0.41 counts s^{-1} with a clear 15-day period. The soft X-ray variations have the same phase and period as Hα and He II λ4686 variations reported by Stahl *et al.*, and are in antiphase with the C IV and Si IV ultraviolet absorption features. They consider five mechanisms which might explain the amplitude, phase, and periodicity of the X-ray variations: (1) colliding-wind emission with the wind of an unseen binary companion, (2) coronal emission from an unseen late-type pre-main–sequence star, (3) periodic density variations, (4) absorption of magnetospheric X-rays in a corotating wind, and (5) magnetosphere eclipses. The *ROSAT* data rule out the first three scenarios, but cannot rule out either of the latter two which require the presence of an extended magnetosphere, consistent with the suggestion of Stahl *et al.* that θ^1 Ori C is an oblique magnetic rotator.

Caillault, Gagné, Stauffer, and Linsky have proposed for *ASCA* observations of θ^1 Ori C. The only existing *ASCA* X-ray spectrum of the Trapezium region shows a very strong component of high temperature plasma, with emission measure approximately five times larger than that of the cooler component. Although *ASCA* cannot spatially resolve θ^1 Ori C from the remainder of the Trapezium, they can use their *ROSAT* HRI data to limit the contribution of PMS stars to the overall flux. They propose to re-observe the Trapezium at θ^1 Ori C's rotational phases 0.0 and 0.5 in order to determine whether the spectrum changes as a function of rotational phase. This will allow them to distinguish between two scenarios for the X-ray emission of θ^1 Ori C.

Mysore, Caillault, and Stauffer are continuing their program of using SARA to observe low-mass Hyades dwarfs. Spectroscopy has provided an understanding of the general properties of how the rotational velocities of solar- and lower-mass stars evolve with time, which has, in turn, prompted a lot of useful theoretical modeling. However, in order to discriminate between the theoretical models at this point (and thus determine the importance of PMS disks, whether cores and envelopes decouple rotationally, etc.), one needs to determine rotation periods for a population of slower rotating low-mass stars in Alpha Per, the Pleiades, and the Hyades, since spectroscopy only allows one to obtain data for the most rapid rotators. This aspect of the observing program focusses on the Hyades M-dwarfs. Long monitoring programs such as this one will allow for rotation periods (free of inclination effects) for the more slowly rotating stars to be obtained. Another problem which can be addressed by monitoring the Hyades concerns the dK stars which have been detected as X-ray sources. The dK binaries are more X-ray luminous than the single dK stars, but the binaries are long-period ($>$ 1 yr) and thus are not tidally locked and spun up. However, their rotation periods could still be fast enough to account for the difference in X-ray luminosity functions of the single and binary dK stars. A reasonable explanation for this might be that the binaries disrupted disks early in the binaries' histories, thus removing a source of rotational braking.

Song, Caillault & Stauffer have proposed to use the HST WFPC-2 to search for the companion to the highly-reddened WN8 Wolf-Rayet star AS431 which is both a hard, strong X-ray source and also a double radio source (separation $=0''.58$). Although the X-ray emission is currently best explained by capture of the WR-star's dense, equatorial wind by a neutron star companion, the true nature of the companion to AS431 is not known. High-spatial resolution *B*-, *V*- and *I*-band WFPC2 Planetary Camera observations of AS431 will allow for a high S/N search for the companion down to $V \sim 25$, enabling them to determine from its magnitude and *B-V* and *V-I* colors whether the companion is a faint pre-MS star, an early-type MS star, or a neutron star. If it is indeed a NS, then this would be only the third known NS with an (approximate) MS companion. In addition, this would be the first resolved NS in a binary with a MS companion and thus one which could be studied optically if detected with the PC.

Magnani, Caillault, Hearty, Stauffer, R. Neuhäuser (MPE-Garching), J.H.M.M. Schmitt (MPE-Garching), F. Verter (NASA/GSFC), and E. Dwek (NASA/GSFC) have explored the star formation status of the translucent high-latitude molecular cloud, MBM 40, through analysis of radio, infrared, optical, and X-ray data. With a peak visual extinction of 1 to 2 mag, MBM 40 is an example of a high-latitude cloud near the diffuse/translucent demarcation. However, unlike most translucent clouds, MBM 40 exhibits a compact morphology and a kinetic energy-to-gravitational potential energy ratio near unity. Their radio data, encompassing the CO (1-0), CS (2-1), and H_2CO 1_{11}-1_{10} spectral line transitions, reveal that the cloud contains a ridge of molecular gas with $n \geqslant 10^3$ cm^{-3}. In addition, the molecular data, together with *IRAS* data, indicate that the mass of MBM 40 is $\sim 40\ M_\odot$. In light of the ever-increasing number of recently formed stars far from any dense molecular clouds or cores, they searched the environs of MBM 40 for any trace of recent star formation. They used the RASS X-ray data and a *ROSAT* PSPC pointed observation toward MBM 40 to identify 33 stellar candidates with properties consistent with PMS stars. Follow-up optical spectroscopy of the candidates with V $<$ 15.5 was conducted with the 1.5-m Fred Lawrence Whipple Observatory telescope in order to identify signatures of T Tauri or PMS stars (such as the Li 6708 Å resonance line). Since none of their optically observed candidates display standard PMS signatures, MBM 40 displays no evidence of recent or ongoing star formation. The absence of high-density molecular cores in the cloud and the relatively low column density compared to star-forming interstellar clouds may be the principal reasons that MBM 40 is devoid of star formation. More detailed comparison bewteen this cloud and other, high-extinction translucent and dark clouds may elucidate the necessary initial conditions for the onset of low-mass star formation.

Shaw, Caillault, and Schmitt have conducted a survey of near-contact binary systems observed during the RASS. The near-contact binaries (NCBs) have an A- or F-type primary, with a companion which is one to two spectral types cooler. The systems have periods less than 1 day and display strong tidal interaction, but they are not in contact like the W UMa systems. There are more than 150 such systems known to exist. They have analyzed the RASS data for all (58) of those known to lie within 400 pc. They report the detection of 14 systems with X-ray count rates >0.01 counts s^{-1}. The X-ray luminosity function for the NCBs derived from this sample is very similar to that for A-type W UMa systems (derived, admittedly, from only a handful of *Einstein* observations) but appears to be significantly different from those of W-type W UMa systems and RS CVn binaries. This is consistent with the proposed scenario that the NCBs are evolutionary precursors to the A-type W UMa binaries. The mean X-ray luminosity of the NCBs is log $L_x = 29.3 \pm 0.1$ ergs s^{-1}, less than that of the RS CVns, but greater than that of normal late-type main sequence stars. The L_x/L_{bol} values for the handful of stars for which bolometric luminosities could be determined are consistent with their being near saturation. The detection of these systems may help to explain why many presumably single A-type stars were detected in the RASS; i.e., the ''single'' A stars may, in fact, be binaries, like the NCBs, with late-type companions.

Shaw and Chuhta searched for eclipsing binaries in open clusters using the SARA telescope. CCD images of NGC7092 have revealed short period, low amplitude variability for 2 cluster members, but no evidence of binarity. During the study, over 50 field stars in the region of NGC 7092 evidenced variability. Observations of NGC 6811 were begun in the summer with completion planned for 1997.

Shaw and Dittmann (DeKalb) have begun investigation of NGC 1342 during October and November of 1996. Any cluster members showing light variation which indicates the system is a close binary star will be re-observed in three colors to obtain a light curve which can be solved for the physical parameters of the system. The intent is to elucidate the evolutionary status of close binaries (primarily W Ursae Majoris systems) and to investigate the relationship between binary frequency and the dynamics of star clusters.

Magnani, J. Onello (SUNY-Cortland), N.G. Adams (U. Georgia), D. Hartmann (CfA), and P. Thaddeus (CfA) continue their study of the ''X-factor,'' the ratio of the molecular hydrogen column density to the velocity-integrated CO(J=1-0) antenna-temperature, in translucent molecular clouds. Their current effort focusses on the variation of the X-factor from position to position in particular translucent clouds. The two clouds which have been studied thus far, MBM40 and MBM16, show markedly different behavior: The X-factor tends to vary significantly from position to position in MBM16 but not in MBM40. This variation may be due to the CO(1-0) integrated antenna temperature being a poor tracer of H_2 in low-column density regions.

Magnani, Hartmann, and Thaddeus continue their survey for high-latitude molecular gas. The entire northern Galactic hemisphere has been sampled in a locally-cartesian 1 deg $\times$ 1 deg grid. A total of 23 detections have been made in the North, underscoring the paucity of molecular gas at $b \geqslant 30°$. A similar survey of the Southern Galactic hemisphere is underway and has already resulted in many more detections.

PUBLICATIONS

The publication list includes all papers published or submitted between October 1995 and October 1996 by the staff.

Allard, F., **Hauschildt, P.H.**, Baraffe, I., & Chabrier, G. 1996, ''Synthetic Spectra and Mass Determination of the Brown Dwarf Gl229B,'' ApJ, 465, L123.

Baraffe, I., Chabrier, G., Allard, F., **Hauschildt, P.H.** 1996, ''Evolutionary Models for Metal-poor Low-mass Stars. Lower Main Sequence of Globular Clusters and Halo Field Stars,'' ApJ, submitted.

Baron, E., **Hauschildt, P.H.**, & Mezzacappa, A. 1996, ''Radiative Transfer in the Co-moving Frame,'' MNRAS, 278, 763.

Baron, E., **Hauschildt, P.H.**, Branch, D., Kirshner, R.P., & Filippenko, A.V. 1996, ''Preliminary Spectral Analysis of SN1994I,'' MNRAS, 279, 170.

Baron, E. **Hauschildt, P.H.**, Nugent, P., & Branch, D. 1996, ''NLTE Effects in Modelling Supernovae near Maximum Light,'' MNRAS, in press.

Briceno, C., Hartmann, L.W., Stauffer, J., Gagné, M., Stern, R.A., & **Caillault, J.-P.** 1996, ''X-Ray Surveys and the Post-T Tauri Problem,'' AJ, submitted.

Caillault, J.-P. 1995, ''*ROSAT* Observations of Open Clusters,'' in *Röntgenstrahlung From the Universe*, eds. H. Zimmermann, J. Trümper, & H. Yorke, 1.

Caillault, J.-P., **Magnani, L.**, & Fryer, C. 1995, ''A Search for Pre-Main Sequence Stars in High-Latitude Molecular Clouds. III. A Survey of the *Einstein* Database,'' ApJ, 441, 261.

Caillault, J.-P. 1996, ''*ROSAT* Observations of Open Clusters,'' in *Cool Stars, Stellar Systems, and the Sun*, eds. A. Dupree & R. Pallavicini, ASP Conference Series, in press.

Gagné, M., **Caillault, J.-P.**, & Stauffer, J.R. 1995, ''Deep *ROSAT* HRI Observations of the Orion Nebula Region,'' ApJ, 445, 280

Gagné, M., **Caillault, J.-P.**, & Stauffer, J.R. 1995, ''Spectral and Temporal Characteristics of X-Ray Bright Stars in the Pleiades,'' ApJ, 450, 217.

Gagné, M., **Caillault, J.-P.**, Stauffer, J.R., & Linsky, J.L. 1996, ''Periodic X-Ray Emission from the O7 V Star θ^1 Orionis C,'' ApJL, submitted.

Hauschildt, P.H., Starrfield, S., Baron, E., & Allard, F. 1996, ''The Hot Winds of Novae,'' in *Astrophysics in the Extreme Ultraviolet*, eds. S. Bowyer & R.F. Malina, 413.

Hauschildt, P.H., Allard, F., Alexander, D.R., Schweizer, A., & Baron, E. 1966, ''NLTE Model Atmospheres for M Dwarfs and Giants,'' in *Stellar Surface Structure*, eds. K. Strassmeier and J.L. Linsky, 539.

Hauschildt, P.H., Baron, E., Starrfield, S., & Allard, F. 1996, ''The Effects of FeII NLTE on Nova Atmospheres and Spectra,'' ApJ, 462, 386.

Hauschildt, P.H., Baron, E., & Allard, 1996, ''Parallel Implementation of the PHOENIX Generalized Stellar Atmosphere Program,'' ApJ, submitted.

Jones, H.R.A., Longmore, A.J., Allard, F., & **Hauschildt, P.H.** 1996, ''Spectral Analysis of M dwarfs,'' MNRAS, 280, 77.

Leggett, S.K., Allard, F., Berriman, G., Dahn, C.C., & **Hauschildt, P.H.** 1996, ''Infrared Spectra of Low-mass Stars: Towards a Temperature Scale for Red Dwarfs,'' ApJS, 104, 117.

Magnani, L., **Caillault, J.-P.**, Buchalter, A., & Beichman, C.A. 1995, ''A Search for T Tauri Stars in High-Latitude Molecular Clouds. II. The IRAS Faint Source Survey Catalog,'' ApJS, 96, 159.

Magnani, L., **Caillault, J.-P.**, **Hearty, T.**, Stauffer, J., Schmitt, J.H.M.M., Neuhäuser, R., Verter, F., & Dwek, E. 1996, ''A Search for Star Formation in the Translucent Cloud MBM40,'' ApJ, 465, 825.

Magnani, L. & J.S. Onello 1996, ''A New Method for Determining the CO to H_2 Conversion Factor for Translucent Clouds,'' ApJ, 443, 169.

Magnani, L., Hartmann, D., & Speck, B.G. 1996, ''A Catalog of Molecular Gas at High Galactic Latitudes,'' ApJS, 106, 447

Schmidtke, P.C., Cowley, A.P., **Hauschildt, P.H.**, Ponder, A.L., McGrath, T.K., Frattere, L.M, & Franklin, B.E. 1996, ''UV Observations of Three LMC Be-Star/X-ray Binaries, PASP, 108, 668.

Prosser, C.F., Stauffer, J.R., **Caillault, J.-P.**, Balachandran, S., Stern, R.A., & Randich, S. 1995, ''An X-Ray Survey of the Open Cluster NGC 6475 (M7)with *ROSAT*,'' AJ, 110, 1229.

Schweitzer, A. **Hauschildt, P.H.**, Allard, F., & Basri, G. 1996, ''Analysis of Keck High Resolution Spectra of VB10,'' MNRAS, in press.

Schwarz, G.J., **Hauschildt, P.H.**, Starrfield, S., Baron, E., Allard, F., Shore, S.N., & Sonneborn, G. 1996, ''Non-LTe model atmosphere analysis of the early ultraviolet spectra of nova Andromedae 1986,'' MNRAS, in press.

Shaw, J.S., **Caillault, J.-P.**, & Schmitt, J.H.M.M. 1996, ''Near-Contact Binary Systems in the *ROSAT* All-Sky Survey,'' AJ, 461, 951.

L. Magnani