// COOLNEWS

A RESEARCH NEWSLETTER DEDICATED TO COOL STARS AND THE SUN

No. 116 — October 2005 Editor: Steve Skinner (coolnews@jila.colorado.edu)

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Stellar Abstracts

High-Resolution Spectroscopy of the Planetary Host HD 13189: Highly-Evolved and Metal-Poor

Simon C. Schuler[1], James H. Kim[1,2], Michael C. Tinker, Jr.[1], Jeremy R. King[1], Artie P. Hatzes[3], and Eike W. Guenther[3]

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We report on the abundances of 13 elements in the planetary host HD 13189, a massive K-type giant star. Abundances are found to be sub-solar, with [Fe/H] = -0.58 ± 0.04; HD 13189 is one of the most metal-poor planetary hosts yet discovered. Abundance ratios relative to Fe show no peculiarities with respect to random field stars. A census of metallicities of the seven currently known planet-harboring giants results in a distribution that is more metal-poor than the well-known metal-rich distribution of main sequence (MS) planetary hosts. This finding is discussed in terms of accretion of H-depleted material, one of the possible mechanisms responsible for the high-metallicity distribution of MS stars with planets. We estimate the mass of the HD 13189 progenitor to be 3.5 $M_\odot$ but cannot constrain this value to better than 2-6 $M_\odot$. A stellar mass of 3.5 $M_\odot$ implies a planetary mass of $m \sin i = 14.0 \pm 0.8\ M_J$, placing the companion at the planet/brown dwarf boundary. Given its physical characteristics, the HD 13189 system is potentially unique among planetary systems, and its continued investigation should provide invaluable data to extrasolar planetary research.

Accepted by ApJ Letters

For preprints contact: sschule@ces.clemson.edu

For preprints via ftp or WWW: http://www.ces.clemson.edu/ sschule/publications.htm

Sulphur Abundances in Metal-poor Stars

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We investigate the debated "sulphur discrepancy" found among metal-poor stars of the Galactic halo with [Fe/H] < -2. This discrepancy stems in part from the use of two different sets of sulphur lines, the very weak triplet at 8694 - 95 Å and the stronger triplet lines at 9212 - 9238 Å. For three representative cases of metal-poor dwarf, turnoff and subgiant stars, we argue that the abundances from the $\lambda\lambda$8694 - 95 lines have been overestimated which has led to a continually rising trend of [S/Fe] as metallicity decreases. Given that the near-IR region is subject to CCD fringing, these weak lines become excessively difficult to measure accurately in the metallicity regime of [Fe/H] < -2. Based on homogeneously determined spectroscopic stellar parameters, we also present updated [S/Fe] ratios from the $\lambda\lambda$9212 - 9238 lines which suggest a plateau-like behaviour similar to that seen for other alpha elements.

Accepted by A&A

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For preprints via ftp or WWW: http://arXiv.org/abs/astro-ph/0509161

XMM-Newton Observations of the σ Ori Cluster. II. Spatial and Spectral Analysis of the Full EPIC Field

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We present the results of an XMM-*Newton* observation of the young ($\sim 2-4$ Myr) cluster around the hot star σ Orionis. In a previous paper we presented the analysis of the RGS spectrum of the central hot star; here we discuss the results of the analysis of the full EPIC field. We have detected 175 X-ray sources, 88 of which have been identified with cluster members, including very low-mass stars down to the substellar limit. We detected also eleven new possible candidate members from the 2MASS catalogue. We find that late-type stars have a median $\log L_{\rm X}/L_{\rm bol} \sim -3.3$, i.e. very close to the saturation limit. We detected significant variability in $\sim 40\%$ of late-type members or candidates, including 10 flaring sources; rotational modulation is detected in one K-type star and possibly in other 3 or 4 stars. Spectral analysis of the brightest sources shows typical quiescent temperatures in the range $T_1 \sim 0.3-0.8$ keV and $T_2 \sim 1-3$ keV, with subsolar abundances $Z \sim 0.1-0.3\,Z_\odot$, similarly to what is found in other star-forming regions and associations. We find no significant difference in the spectral properties of classical and weak-lined T Tauri stars, although classical T Tauri stars tend to be less X-ray luminous than weak-lined T Tauri stars.

Accepted by A&A

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Editor's Note: The above abstract is being cross-listed with the Star Formation Newsletter.

A Model to Simulate Synthetic Light Curves of Solar-like Stars

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A model to synthetize stellar variability induced by solar-like magnetic activity is presented. It is based on the model introduced by Lanza et al. (2003) and Lanza, Rodonò & Pagano (2004) to fit the time variations of the solar bolometric and spectral irradiances. The model parameters are scaled in the case of solar-like stars in order to provide light curve amplitudes comparable with those observed for active stars with rotation periods ≤ 10 days. Simultaneous light curves in different optical passbands can be synthetized with the model in order to test, e.g., the methods that were recently proposed to detect planetary transit signatures in multiband photometric observations by space-borne telescopes.

Accepted by AN (*continued* →)

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A Compact Flare Eclipsed in the Corona of SV Cam

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The eclipsing active binary SV Cam (G0V/K6V, $P_{\rm orb}$=0.593071 d) was observed with XMM-*Newton* during two campaigns in 2001 and 2003. No eclipses in the quiescent emission are clearly identified, but a flare was eclipsed during the 2001 campaign, allowing us to strongly constrain, from purely geometrical considerations, the position and size of the event: the flare is compact and it is formed at a latitude below 65°. The size, temperature and Emission Measure of the flare imply an electron density of $\log n_{\rm e}$ (cm^{-3})$\sim$10.6–13.3 and a magnetic field of $\sim$65–1400 G in order to confine the plasma, consistent with the measurements that are obtained from density-sensitive line ratios in other similar active stars. Average emission seems to come from either extended or polar regions because of lack of eclipses. The Emission Measure Distribution, coronal abundances and characteristics of variability are very similar to other active stars such as AB Dor (K1V).

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^{6}Li in the Atmosphere of GJ 117

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We present high resolution VLT UVES observations of the active K dwarf GJ 117. ^{6}Li enhancement has been shown for energetic solar events, one chromospherically active binary, and several dwarf halo stars. Our analysis reveals the detection of ^{6}Li on this source with $\frac{^{6}Li}{^{7}Li}$ = 0.030$\pm$0.010. We found no significant contribution from other lines, including Ti I, in the Li profile of GJ 117 and a template star of similar spectral type and metallicity. We discuss the possibility for ^{6}Li production by spallation and find it to be consistent with the activity levels of the object.

Accepted by ApJ Letters

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For preprints via ftp or WWW: http://arxiv.org/abs/astro-ph/0509247

Rotation- and Temperature-dependence of Stellar Latitudinal Differential Rotation

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More than 600 high resolution spectra of stars with spectral type F and later were obtained in order to search for signatures of differential rotation in line profiles. In 147 stars the rotation law could be measured, with 28 of them found to be differentially rotating. Comparison to rotation laws in stars of spectral type A reveals that differential rotation sets in at the convection boundary in the HR-diagram; no star that is significantly hotter than the convection boundary exhibits the signatures of differential rotation. Four late A-/early F-type stars close to the convection boundary and at $v\,\sin i \approx 100\,{\rm km\,s^{-1}}$ show extraordinarily strong absolute shear at short rotation periods around one day. It is suggested that this is due to their small convection zone depth and that it is connected to a narrow range in surface velocity; the four stars are very similar in $T_{\rm eff}$ and $v\,\sin i$. Detection frequencies of differential rotation $\alpha = \Delta\Omega/\Omega > 0$ were analyzed in stars with varying temperature and rotation velocity. Measurable differential rotation

is more frequent in late-type stars and slow rotators. The strength of absolute shear, $\Delta\Omega$, and differential rotation α are examined as functions of the stellar effective temperature and rotation period. The highest values of $\Delta\Omega$ are found at rotation periods between two and three days. In slower rotators, the strongest absolute shear at a given rotation rate $\Delta\Omega_{\mathrm{max}}$ is given approximately by $\Delta\Omega_{\mathrm{max}} \propto P^{-1}$, i.e., $\alpha_{\mathrm{max}} \approx$const. In faster rotators, both α_{max} and $\Delta\Omega_{\mathrm{max}}$ diminish less rapidly. A comparison with differential rotation measurements in stars of later spectral type shows that F-stars exhibit stronger shear than cooler stars do and the upper boundary in absolute shear $\Delta\Omega$ with temperature is consistent with the temperature-scaling law found in Doppler Imaging measurements.

Accepted by A&A

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Solar Abstracts

The Extent of 3-min Oscillations in Regions Other than Sunspot Plumes

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The active region, AR0554, was observed with NIS/CDS on board SoHO to examine the extent and range of oscillations from a range of features. Among all the NIS spectral lines analysed, significant oscillations were found in Si XII 520 Å, Mg X 625 Å, O V 629 Å and He I 522 Å. The periods of the strongest oscillations in these lines were ≈ 10–20 min. After the dominant 10–20 min oscillations were filtered out from these lines, only O V 629 Å showed significant (i.e. above the 95% significance level) shorter-period oscillations. Specifically, we found that weak but significant 3-min oscillations are *not* confined to the umbra/plume but can be seen in many bright locations. The duration of these non-umbral 3-min oscillations is mostly ≈ 20 min. In contrast, the 3-min oscillations within the umbra are strong and stable for longer than 50 min. The duration could be related to the size of the oscillating source region, rather than the lifetime of the oscillation. To find the possible sources of these 3-min oscillations outside of the umbra, we compared the oscillations of single pixels in different regions. The results of our comparison indicate a possible connection between the magnetic fields and the oscillations. Therefore, we suggest that 3-min oscillations may exist in many magnetic structures, but are often too weak to be seen in an unfiltered signal.

Accepted by A&A

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Very Long Period Activity at the Base of Solar Wind Streams

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Using time series data of spectral lines originating from a wide range of temperatures in the solar transition region, above a polar coronal hole, from SUMER (Solar Ultraviolet Measurements of Emitted Radiation) on SoHO (Solar and Heliospheric Observatory), we report on the detection of very long (≈170 min) periodic intensity fluctuations, above the limb. Our data also reveal long periodicities (10-90 min), previously observed with other SoHO instruments. With the acoustic cut-off frequency implying a maximum allowable period of ≈ 90 min, it is unclear whether these intensity fluctuations are due to waves or are the result of a recurrent magnetic reconnection process.

Accepted by A&A

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Footpoint Excitation of Standing Acoustic Waves in Coronal Loops

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A new theoretical model for the study of slow standing sausage mode oscillations in hot ($T > 6$ MK) active region coronal loops is presented. These oscillations are observed by the SUMER spectrometer on board the SoHO satellite. The model contains the transition region and the upper chromosphere which enables us to study the entire process of hot loop oscillations - from the impulsive footpoint excitation phase to the rapid damping phase. It is shown that standing acoustic waves can be excited by an impulsive heat deposition at the chromospheric footpoint of a loop if the duration of the pulse matches the fundamental mode period. The pulse is immediately followed by a standing wave consistent with the SUMER observations in hot loops. The amount of released energy determines the oscillation amplitude. The combined effects of thermal conduction and radiation on the behaviour of the standing acoustic waves in hot gravitationally stratified loops are investigated. In addition to damping, these effects lead to downflows which are superimposed on the oscillations. The implications of the results in coronal seismology are discussed.

Accepted by A&A

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Low-Mass and Substellar Abstracts

Discovery of a Magnetic White Dwarf/Probable Brown Dwarf Short-Period Binary

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The spectrum of the magnetic white dwarf SDSS J121209.31+013627.7 exhibits a weak, narrow Hα emission line whose radial velocity and strength are modulated on a period of $\sim$90 minutes. Though indicative of irradiation on a nearby companion, no cool continuum component is evident in the optical spectrum, and IR photometry limits the absolute magnitude of the companion to $M_J > 13.37$. This is equivalent to an isolated L5 dwarf, with $T_{\rm eff} < 1700$ K. Consideration of possible evolutionary histories suggests that, until $\sim$0.6 Gyr ago, the brown dwarf orbited a $\sim$1.5 $M_\odot$ main seqeunce star with $P \sim 1$ yr, $a \sim 1$ AU, thus resembling many of the gaseous superplanets being found in extrasolar planet searches. Common envelope evolution when the massive star left the main sequence reduced the period to only a few hours, and ensuing angular momentum loss has further degraded the orbit. The binary is ripe for additional observations aimed at better studying brown dwarfs and the effects of irradiation on their structure.

Accepted by ApJL (to appear Sept. 10, 2005)

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Upcoming Meeting

Eclipse 2006:
Solar and Stellar Physics Through Eclipses
27 - 29 March 2006
Side-Antalya, Turkey

Dear Colleagues & Friends

An international meeting **Solar and Stellar Physics Through Eclipses** will take place from 27 – 29 March 2006 in Side-Antalya, Turkey.

The meeting is being jointly organized by:

- Ankara University Observatory (AUO)
- Canakkale Onsekiz Mart University Observatory (CAAM)
- TUBITAK - Turkish National Observatory (TUG).

Information on meeting topics, registration, accommodation and other details are available via the WEB page given below.

Hope to see you all in the meeting, With best wishes.

http://eclipse2006-conf.ankara.edu.tr

email: eclipse2006-conf@ankara.edu.tr

fax: +90 312 223 23 95

Upcoming Meeting

The Nature of V838 Mon and Its Light Echo

16 - 19 May 2006

La Palma, Canary Islands

Web page: http://www.ing.iac.es/conferences/v838mon

– BACKGROUND –

The 2002 outburst of V838 Monocerotis has been one of the major hits in stellar astrophysics in recent years. The object is the most studied member of an exciting class of rare objects undergoing tremendous stellar explosions, so powerful as to make V838 Mon at peak brightness one of the most luminous stars in the whole Local Group (at $M_V = -10$ mag). Other objects similar to V838 Mon are M31-RV, which exploded in 1988 in the Andromeda galaxy, and V4332 Sgr which erupted in 1994 in our Galaxy. V838 Mon progenitor must have been massive and young, given the presence of a normal B3V companion.

The eruption of V838 Mon was discovered on January 2002 (cf. IAUC 7785). V838 Mon has displayed a complex light curve characterized by multiple maxima of very different colors, a very red spectral energy distribution, a long phase during which the optical brightness was below the quiescence value while the star remained very bright in the near-IR, and a recent re-warming accompanied by a recovery of the optical luminosity.

The spectral evolution of V838 Mon was as peculiar as its light curve. In spite of large ejection velocities at the outburst onset (500 km/sec), the expanding ejecta never reached optically thin conditions. It remained optically thick and got cooler and cooler with time, initially mimicking a K giant, then making a complete excursion along the whole sequence of M giant spectra down to M10, and finally entering the new realm of L-type supergiants, a spectral type never seen before anywhere in the Universe and characterized by temperatures so low that were previously measured only in brown dwarfs.

Besides this, V838 Mon became one of the major attractions in stellar astrophysics over the last few years by displaying a 2 arcmin wide bright circumstellar light-echo, the first one seen in our Galaxy in the last 70 years. At the peak of its development around 2003, it was so bright that it became a favourite object even for amateur-sized telescopes. HST soon started monitoring the light-echo evolution (with eye-catching images appearing even on the front cover of Nature 422, 405 - 2003). These are set to continue during the next observing season, starting in October 2005, when V838 Mon will emerge from its seasonal conjunction with the Sun.

Little consensus has been reached so far on the nature and causes of the outburst of V838 Mon. The interpretations published in the literature cover a wide range of possibilities such as the swallowing of giant planets, merging of the components of a binary star, surface helium flash in a highly evolved and very massive star and a highly degenerate hydrogen flash in a low mass, cool and very slowly accreting white dwarf.

Given the many important questions opened by the intensive study of V838 Mon in the last three years, a conference dedicated to the subject is planned for May 16-19, 2006, on the island of La Palma (Canary Islands, Spain). The Conference aims to bring together researchers interested in V838 Mon and related stars, in light-echos, in the atmospheres and chemistry of very cool giant stars, in circumstellar cocoons, in the latest evolutionary stages of very massive stars and in the various alternative scenarios proposed to account for the unique properties of V838 Mon and its associates. One main goal of the conference is to compare observational evidence and theoretical interpretations, so as to gain a better understanding of the V838 Mon phenomenon. Another objective is to foster cooperation and coordination of future observational and modelling efforts, both concerning its still active outburst phase and in view of the return to quiescence conditions in the years to come.

—- TOPICS, SOC, LOC —-

The conference topics include: (*continued* →)

* Photometric evolution, optical and IR * Spectroscopic evolution, optical and IR * L-supergiant spectra, interpretation, molecular chemistry * Structure and evolution of mass loss in early phases * Polarimetry and spectropolarimetry * Pre-Outburst properties and progenitor * The B3V companion * Young stars in the outskirts of the Galaxy * The circumstellar cocoon * The interstellar medium toward and around * The light echo structure and evolution * Distance from light-echo evolution * Evolutionary status of the outbursting component * Models of the outburst * Similar or related objects (e.g. M31-RV, V4332 Sgr)

The SOC of the Conference is composed of

Nagarhalli Ashok India Howard Bond USA Romano Corradi (co-chair) Spain Silvano Desidera Italy Aneurin Evans UK Arne Henden USA Tonu Kipper Estonia Ulisse Munari (co-chair) Italy Noam Soker Israel Sumner Starrfield USA Oscar Straniero Italy Jacco van Loon UK Patricia Whitelock South Africa

and the Conference LOC is composed of

Romano Corradi Javier Mendez Ulisse Munari Pierre Leisy Margaret Lennon Miguel Santander Alessandro Siviero

—- PROCEEDINGS, VENUE, REGISTRATION —-

The Conference' Proceedings will be edited by R.L.M.Corradi and U.Munari. Negotiations are in progress for publication on the ASP (Astronomical Society of the Pacific).

The conference, organized by the Isaac Newton Group of Telescopes, will be held in the Hotel H10 Taburiente Playa in Los Cancajos, a quiet beach resort located between the airport and the capital Santa Cruz de La Palma. We expect most participants to be based in the hotel, which offers very attractive prices for participants (even cheaper accommodation is available in the attached H10 Costa Salinas Apartments that belong to the same hotel chain).

The registration fee has been fixed at 200 Euros for registration earlier than Nov 15, 2005, and is payable upon arrival at the conference. It is expected to cover the Proceedings book, coffee breaks, and all social events (social dinner, excursions). A late registration will be possible until 15 Feb 2006, with the registration fee increased to 250 Euros.

We are applying to various funding agencies. If these applications are successful, limited financial help might be available for applicants who are short of funding.

The scientific program will be finalized by SOC after the registration by the participants has been completed. Plenty of time for discussion will be allocated during the conference.

To register as a participant go to the Conference web-page

http://www.ing.iac.es/conferences/v838mon

and fill in the registration form.

—- DEADLINES —-

The most important dates and deadlines are:

* Nov 15 2005 for early registration * Feb 15 2006 for late registration * Mar 15 2006 closing of abstract book * Apr 15 2006 block booking of hotel rooms expires * Jun 20 2006 for submitting the contributions to the Proceedings

Contact: Romano Corradi & Ulisse Munari (Co-chairs, SOC & LOC) v838mon@ing.iac.es

Job Openings

Marie Curie Fellowships
INAF - Osservatorio Astronomico di Palermo Giuseppe S. Vaiana
Palermo, Italy

large Closing Date: 30 November 2005

INAF - Osservatorio Astronomico di Palermo (OAPA) Giuseppe S. Vaiana will appoint one fellow in the area of Astrophysics under the European Commission's Marie Curie Actions Host Fellowship - Transfer of Knowledge programme "The Influence of Stellar High Energy Radiation on Planetary Atmospheres". The selected fellow will work on the interaction of stellar X-ray emission with circumstellar disks and/or planetary atmospheres.

The fellowship is expected to start before the end of May 2006 and to last 24 months.

Candidates should have a PhD or at least four years of full-time research experience at postgraduate level in a relevant field. In either case the candidate cannot have more than ten years of research experience.

The applicant must be national of a Member State of the European Community (other than Italy) or an Associated State, or otherwise residing in the Community or in an Associated State for at least four years out of the last five (except Italy). Candidates should not have been resident in Italy for more than 12 months in the three years prior to selection. Candidates from third countries could be considered, subject to formal approval by the European Commission. In the case of a researcher holding more than one nationality including the Italian one, (s)he could apply if (s)he has not resided in Italy during the previous 5 years. As an exception to the general rule, an Italian citizen can apply if (s)he can provide evidence testifying that (s)he has legally resided and had his/her main activity in a third country for at least four out of the last five years immediately prior to his/her appointment.

Gross salary is fixed at 3889.25 Euro per month, for the duration of the contraxt, plus a mobility allowance according to the family situation.

Female candidates are explicitly encouraged to apply.

Applications should include

1. Documents certifying the doctoral degree or four years of full time research experience.
2. Statement of compliance with the eligibility requirements relative to the citizenship or residence.
3. Curriculum Vitae.
4. Publication list.
5. Description of applicant's research interests/program.
6. Copy of a valid picture identification (passport or national id card)
7. Two letters of recommendation.

Documents 1,2,3,4,5 and 6 should be signed by the candidate.

All documents should arrive by 30 November 2005 at:

INAF - Osservatorio Astronomico di Palermo
Marie Curie Fellowship Selection
Piazza del Parlamento 1
I-90134 Palermo, Italy (*continued* →)

For further information contact:
Giusi Micela - giusi@astropa.unipa.it or
http://www.astropa.unipa.it/ISHERPA

Abstract Guidelines

Abstracts for *COOLNEWS* are solicited for papers that have been recently accepted by or submitted to refereed journals, and for recent Ph.D. theses. Abstracts for conference proceedings articles are *not* posted in *COOLNEWS*. The subject matter should pertain directly to cool stars (spectral types F,G,K,M or L), substellar objects, or the sun. Both theoretical and observational abstracts are appropriate.

Abstracts dealing with cool pre-main-sequence (PMS) stars will generally not be included in *COOLNEWS*, since they are already covered by the *Star Formation Newsletter*. Exceptions to this rule will be considered if the subject matter is truly cross-disciplinary. If you wish to submit a cross-disciplinary abstract on PMS stars, then first submit it to the *Star Formation Newsletter*. After doing so, submit the abstract to *COOLNEWS* accompanied by a short e-mail stating that it has already been submitted to the *Star Formation Newsletter*, and summarizing why it will be of interest to the cool star/solar community at large.

A monthly call for abstracts will be issued and abstracts received by the last day of the month will usually appear in the following month's newsletter. Announcements of general interest to the cool star and solar communities may also be submitted for posting in the newsletter. These might include (but are not restricted to) the following: (i) *Job Openings* directed toward cool star or solar researchers, (ii) announcements of *Upcoming Meetings*, (iii) announcements of *Upcoming Observing Campaigns* for which participation is solicited from the community at large, (iv) reviews of *New Books*, and (v) *General Announcements* that provide or request research-related information. Please send all correspondence to the editor at coolnews@jila.colorado.edu. Abstract templates and back issues can be obtained from the COOLNEWS Web-page at

`http://casa.colorado.edu/~skinners/coolnews.html .`

*** Please send abstracts in the body of the message and *not* as attachments.***