THE STAR FORMATION NEWSLETTER

An electronic publication dedicated to early stellar evolution and molecular clouds

No. 2 — 1 Nov 1992 Editor: Bo Reipurth (reipurth@eso.org)

From the Editor

I am happy to report that the first issue of the Star Formation Newsletter was met with great enthusiasm. About 200 persons replied to the first mailing, so a large fraction of the community is now receiving the Newsletter, and the mailing list continues to grow every day. It thus appears that our principal goal, i.e. to provide the community with rapid dissemination of the latest research results in a comprehensive manner, can be met. If you have received this issue you are on the mailing list until you notify me to the contrary. Those who have not responded to the first mailing are no longer on the mailing list, as I do not want to fill peoples mailboxes with unsolicited mail.

I plan within a year from now to circulate a questionnaire with suggestions for improvements, but first the newsletter has to get into a more quiet phase, where it is more of a routine affair to produce than it is now. One activity that we are looking into is the possibility of creating a preprint data base, where people can pick up preprints, thus bypassing the cumbersome mailing of preprints upon every request. But this is not a trivial thing to develop, and it will take its time.

In this issue, we introduce a new section, Job Offers, in which jobs focused towards stellar and planetary formation, associated phenomena and molecular clouds are advertised. The two jobs listed this month come from the AAS Job Register, but institutes that are particularly looking for applicants, whether junior or senior, with interests in the above fields are invited to send their advertisements for inclusion in the Newsletter.

Abstracts of recently accepted papers

Bipolar structure of the Herbig-Haro object RNO40

J. Bohigas[1], P. Persi[2] and M. Tapia[1]

[1] Instituto de Astronomia, UNAM, Apdo. Postal 877, Ensenada, BC, Mexico
[2] Istituto Astrofisica Spaziale, CNR, c.p. 67, I-00044, Italy

Images of the Herbig–Haro object RNO 40 and its vicinity are presented covering the wavelength range $\lambda\lambda 600 - 2400$ nanometers. These include narrow band images in the lines Hα, [NII], [SII] and [OI]. A bipolar morphology centred in RNO 40 is found. Both lobes are defined by a series of fainter HH knots to the SE and NW of the brightest central peak. An elongated bar–like emission is seen on the SE lobe. The infrared images show the central nebular peak and a series of knots not always coincident with those found in the optical images. Although no star was detected in the nearby 23", the morphology of the complex argues in favour of the location of the exciting source close to the central emission peak and against the identification of the far infrared source IRAS05173–0555, located 2' away, as the source of excitation.

Accepted by Astron. Astrophys.

Protostellar Hydrodynamics: Constructing and Testing a Spatially and Temporally Second-Order Accurate Method. I. Spherical Coordinates

Alan P. Boss[1] **and Elizabeth A. Myhill**[1−2]

[1] DTM, Carnegie Institution of Washington, 5241 Broad Branch Road, NW, Washington, DC 20015, USA
[2] Department of Earth and Space Sciences, University of California, Los Angeles, CA 90024-1567, USA

An explicit, Eulerian numerical method for computing the collapse of protostellar clouds has been developed. The method has been applied to a family of codes of increasing dimensionality: spherically symmetric (1D), axisymmetric (2D), and fully three dimensional (3D). The method employs spatially second-order accurate advective fluxes based on van Leer monotonic interpolation and consistent advection, generalized to a spherical coordinate grid. Correction terms for the effects of spherical geometry on the advective terms are included in order to achieve a high degree of accuracy on the pressureless collapse test case. Self-gravity is handled by a spherical harmonic expansion of the Poisson equation, and radiative transfer through the solution of a mean intensity equation in the Eddington approximation. Correction terms necessary to make the code temporally second-order accurate have also been derived and implemented in the code, though for most test cases the temporal corrections have little or no discernible effect when compared to results obtained with the temporally first-order accurate version of the codes. The numerical methods have been shown to be second-order accurate through convergence testing. Global conservation of mass, angular momentum, and internal energy are assured by solving the hydrodynamical equations in conservation law form. The method for transport of angular momentum has been chosen to optimize local conservation of angular momentum, as monitored by the preservation of the specific angular momentum spectrum during axisymmetric collapse. The results of a number of other test cases are presented as well. The reduction of systematic errors in the new code should result in general in the prediction of an enhanced role for fragmentation during protostellar collapse.

Accepted by Astrophys. J. Suppl.

The H_2 Velocity Field in Herbig-Haro 7 to 11

John S. Carr[1]

[1] Department of Astronomy, The Ohio State University, 174 W. 18th Ave., Columbus, OH 43210

Fabry-Perot images of the H_2 1-0 S(1) emission line in Herbig-Haro 7 to 11 have been obtained with a velocity resolution of 25 km s^{-1} and a spatial resolution of 1.2 arcsec. The H_2 line profiles peak at lower (absolute) radial velocity than the atomic lines and have smaller line widths (FWHM). However, the H_2 profiles have weak high-velocity wings, and the full width at zero intensity velocities are similar to those of the atomic lines. In the vicinity of HH 11, the velocity extent of the H_2 emission is greater than 200 km s^{-1}. It is suggested that the weak emission near HH 11 may be produced by H_2 reformation pumping in fast shocks and that the extremely high-velocity CO observed in the same region could have a similar origin. The H_2 emission in HH 7 has the velocity field expected for a radiating bow- shock, with strong H_2 emission at the apex of the bow-shock. It is suggested that the H_2 emission from HH 7 consists of two components: (1) a magnetic precursor in a high-velocity (100 km s^{-1}) J-shock which produces most of the H_2 emission, and (2) a post- shock component that is responsible for the weak high-velocity emission. The post-shock component could be reformation pumping or emission from H_2 that has survived dissociation in the shock front. A theoretical bow-shock with a simple parameterized model for the magnetic precursor is presented to explain the observed velocity field in HH 7. J-shocks with magnetic precursors are the most attractive explanation for the combined optical and infrared data, although detailed theoretical calculations of such shocks are required.

Accepted by Astrophys. J.

IR and Optical Imaging of IRAS Sources with CO Outflow: A Snapshot of Early Star Formation

H. Chen[1], **A.T. Tokunaga**[1], **K.M. Strom**[2] **and K.-W. Hodapp**[1]

[1] Inst. for Astronomy, U. of Hawaii, 2680 Woodlawn Dr. Honolulu, HI 96822
[2] Five College Astronomy Department, U. of Mass., Amherst, MA 01003

We present multiband imaging (BVRI and HK'nbLM) of three IRAS sources (05338-0624, 05339-0626, and 05363-0702) associated with CO molecular outflows. We find stellar density enhancements around all three IRAS sources.

Optical and near-IR photometry indicates that at least 60% of the near-IR sources in the vicinity of the IRAS sources are pre-main- sequence stars. Using the photometric data at nbL and M, we are able to identify candidates for the near-IR counterparts of the IRAS sources. We also find that (1) the spectral energy distribution of the deeply embedded sources could be complicated by source confusion and scattered light from the young stellar objects; (2) star formation in the vicinity of the IRAS sources is a continuous process with an age span of 0.5-3 Myr; and (3) stellar density enhancement is probably a phenomenon found at the earliest stage of star formation.

Accepted by Astrophys. J.

The Radio Continuum Morphology of the Orion Nebula: from 10′ to 0.1″ Resolution

Marcello Felli[1], Ed Churchwell[2], Tom L. Wilson[3] and Gregory B. Taylor[4]

[1] Osservatorio Astrofisico di Arcetri, Largo E. Fermi 5, I-50125 Firenze, Italy
[2] University of Wisconsin, 475 N. Charter St., Madison, WI 53706, U.S.A.
[3] Max-Planck-Institut für Radioastronomie, Auf dem Hugel 69, D-5300 Bonn 1, Germany
[4] Osservatorio Astrofisico di Arcetri, Largo E. Fermi 5, I-50125 Firenze Italy, now at California Institute of Technology, Radio Astronomy, 105-24, Pasadena, CA 91125, U.S.A.

A complete set of newly measured radio continuum maps of the Orion Nebula at 20 and 2 cm is presented. The largest field covers a region of $2^\circ \times 2^\circ$ with a resolution of $10'$, the smallest covers a $3' \times 3'$ field, centered on the peak, with a resolution of $0.1''$.

The lower resolution maps emphasize the extended emission of the diffuse ionized gas. As the resolution increases, the maps sample regions of higher emission measure. A detailed comparison with Hα images shows a very good match on all scale sizes. As the resolution becomes finer than $1''$ a completely new aspect of the radio emission appears: a new class of weak, small diameter sources of high surface brightness are found. Many of these features are associated with stars.

Finally, a morphological comparison of the radio continuum emission with similar-scale maps of molecular and atomic emission is presented.

Accepted by Astron. and Astrophys. Suppl.

The molecular outflow very near L1551 IRS5

C.V.M. Fridlund[1], L.B.G. Knee[2]

[1] Astrophysics Division, Space Science Department, ESTEC, Postbox 299, NL-2200AG, Noordwijk, The Netherlands
[2] Onsala Space Observatory, S-439 00 Onsala, Sweden

Observations of the molecular transitions CO (J=1-0), ^{13}CO (J=1-0) and HCO$^+$(J=1-0) towards the driving source of the bipolar molecular outflow in L1551, are presented. They show that outflowing gas is present within 2500 AU of the driving source, L1551 IRS5, and that molecular gas dense enough to excite HCO$^+$ is present. The mass loss rate close to IRS5 is found to be within an order of magnitude of the value determined earlier from global properties of the outflow. This implies that the average mass loss rate has not changed significantly during the dynamical life time of the outflow.

Accepted by Astron. Astrophys.

Ammonia Clumps in the Orion and Cepheus Clouds

J.Harju[1], C.M.Walmsley[2] and J.G.A.Wouterloot[3]

[1] Observatory and Astrophysics Laboratory, University of Helsinki, Tähtitorninmäki, SF-00130 Helsinki, Finland
[2] Max Planck Institut für Radioastronomie, Auf dem Hügel 69, D-5300 Bonn 1, Germany
[3] I Physikalisches Institut, University of Cologne, Zülpicherstrasse 77, D-5000 Köln 41, Germany

We present integrated intensity maps made with the Effelsberg 100-m telescope of the (1,1) and (2,2) transitions of ammonia towards 43 star formation regions in nearby molecular clouds. Of these regions, 16 are associated with the Orion L1630 and L1641 clouds and 21 with the molecular complexes in Cepheus. As well as the ammonia cores apparently associated with embedded IRAS sources, we have found and mapped 12 nearby clumps which have no known

associated infrared objects. For these cores, we derive sizes, masses, mean temperatures, and velocity dispersions. We compare the characteristics of the cores in our samples with earlier studies of clumps in Taurus by Benson and Myers (1983,1989). The clumps in Orion and Cepheus are found to be larger, warmer, more massive, and to have greater velocity dispersions than the Taurus cores. If one uses the linear separation between IRAS sources and their associated ammonia cores as a measure of age, one finds that the infrared sources in Orion are young relative to those found in the other complexes.

Accepted by Astron.Astrophys. Supplements

A Flattened Cloud Core in NGC 2024

Paul T. P. Ho[1], Yun-Lou Peng[2], José M. Torrelles[3,1], José F. Gómez[1,3], Luis F. Rodríguez[4], and Jorge Cantó[4]

[1] Harvard-Smithsonian Center for Astrophysics, 60 Garden Street, Cambridge, MA 02138.
[2] Nanjing University, Nanjing, PRC.
[3] Instituto de Astrofísica de Andalucía, CSIC, Ap. Correos 3004, C/ Sancho Panza S/N, E-18080 Granada, Spain.
[4] Instituto de Astronomía, UNAM, Ap. Postal 70-264, 04510 México, D.F., México.

The (J,K) = (1,1) and (2,2) NH_3 lines were mapped toward a molecular cloud core in NGC 2024 using the VLA in its C/D configuration. This region is associated with one of the most highly collimated molecular outflows. We find that the molecular condensations associated with FIR 5, 6, and 7 have kinetic temperatures $T_K \simeq 40$ K. We also find line broadening toward FIR 6 and FIR 7. This suggests that these condensations may not be protostars heated by gravitational energy released during collapse, but that they have an internal heating source. A flattened structure of ammonia emission is found extending parallel to the unipolar CO outflow structure, but displaced systematically to the east. If the NH_3 emission traces the denser gas environment, there is no evidence that a dense gas structure is confining the molecular outflow. Instead, the location of the high velocity outflow along the surface of the NH_3 structure suggests that a wind is sweeping material from the surface of this elongated cloud core.

Accepted by Astrophys.J

The Distance to the Lupus Star Formation Region

Joanne Hughes[1], Patrick Hartigan[1] and Lori Clampitt[2]

[1] Five College Astronomy Department, University of Massachusetts, Amherst MA 01003
[2] Five College Astronomy Department, Smith College, Northampton MA 01063

We use photometric and spectroscopic observations of 31 field stars in Lupus to determine the distance to the dark clouds. A plot of extinction vs. distance for the field stars indicates a distance of 140 ± 20 pc to the Lupus clouds, which is at the lower end of the range defined by previous estimates. One of the "field" stars has weak Hα emission and a far-infrared excess, indicating that it is a previously uncatalogued pre-main sequence star.

Accepted by Astron. J.

Interacting H_2O Masers in Star-forming Regions

Nikolaos D. Kylafis and Konstantinos G. Pavlakis

Univ. of Crete, Physics Dept., 714 09 Heraklion, Crete, Greece

We have studied the interaction of H_2O masers in star forming regions (and through it the enhancement of the observed luminosity) as a physical mechanism for the explanation of the very strong H_2O maser sourses. For each individual maser we have taken a collisional pump model. Such a model can explain the low and medium luminosity masers but not the very powerful ones. We have carried out detailed numerical calculations for both saturated and unsaturated masers and have derived approximate analytic expressions for the expected brightness temperature from interacting masers. We have found that the interaction of two low or medium power H_2O masers can in principle lead to the appearance of a very strong one. Extremely strong OH masers have not been observed yet, but this could be a result of interstellar scattering.

Accepted by Astrophys. J.

New Herbig-Haro objects and pre-main sequence stars in the star formation region NGC 7129

L. F. Miranda[1], C. Eiroa[2] and A. I. Gomez de Castro[3]

[1] Dpto. de Astrofisica, Facultad de Ciencias Fisicas, Universidad Complutense de Madrid, 28040 Madrid, Spain
[2] Dpto. Fisica Teorica C-XI, Facultad de Ciencias, Universidad Autonoma de Madrid, Cantoblanco, 28049 Madrid, Spain
[3] ESA-IUE Observatory, Villafranca Satellite Tracking Station, P.O. Box 50727, 28080 Madrid, Spain

We present CCD images of the central part of the star forming region NGC 7129 as well as spectra of moderate spectral and high spatial resolution of some nebular objects and stars. The images show many reflection filaments which seem to trace the edges of the molecular cavity associated with the pre-main- sequence star LkHα 234. Three new T Tauri-like stars and five new Herbig-Haro (HH) objects have been identified in the region. One of the new young stars probably illuminates an elongated reflection filament. One of the new HH objects presents a highly collimated structure and an abrupt and unusually large bending of $\approx 90^\circ$. The object emanates from the Hα -emission line star HL 14. Our spectra indicate that this star is likely to be a T Tauri- like star. Large and systematic variations of the radial velocity, electron density, excitation degree and velocity dispersion exist in the object. The data favor the idea that the object is a jet-like outflow which encounters an obstacle -density enhancement or pressure gradient- in the cloud and deflects. The obstacle could be related to the walls of the molecular cavity associated with LkHα 234 or to the energetic wind from this star

Accepted by Astronomy and Astrophysics

Formation of Double-peaked Lines in Stochastic Winds of T Tauri Stars

A.S.Mitskevich[1], A.Natta[1] and V.P.Grinin[2]

[1] Osservatorio di Arcetri, Largo Fermi 5, 50125 Firenze, Italy
[2] Crimean Astrophysical Observatory, p/o Nauchny, 334413, Ukraina

This paper discusses the formation of spectral lines in stochastic moving media. The method used to solve the radiation transfer is based on that developed by Lindsey & Jefferies 1990 for static, inhomogeneous media. Both the wind structure (i.e., the velocity, size and filling factor of the clumps which form the wind) and the gas radiative properties (i.e., optical depth and source function at each distance from the star) are considered as free parameters. Most of the calculations are intended to investigate the formation of of double-peaked line profiles, as those often seen in Hα in T Tauri stars, and their dependence on the wind parameters. Within the limits set by the adopted parametric description of the wind properties, we find that the observed features can be understood if the winds are clumpy and decelerate at large distance from the star. By comparing the model calculations to several observed Hα spectra, we assign a typical clump size near the stellar surface of $\leq$0.1 stellar radii, and a volume filling factor of about 0.1. ¿From the depth of the absorption dip, there is an indication that the wind remains clumpy also at large distances from the star.

Some results for lines of intermediate optical depth are also discussed. We find that in this case the profiles are similar to those obtained in continuous winds of much lower optical depth. In stochastic winds, it is therefore possible to have lines, which, while forming in an optically thick gas, have profiles typical of optically thin conditions. This fact can explain the properties of the Ca II infrared triplet lines in many T Tauri stars.

Accepted by Astrophys. J.

Sensitive imaging polarimetry of the faint IR reflection nebula in B5 IRS1

T.J.T. Moore[1] & J.P. Emerson[2]

[1] Herzberg Institute for Astrophysics, National Research Council, Ottawa, Ontario K1A 0R6, Canada
[2] Physics Department, Queen Mary & Westfield College, Mile End Road, London E1 4NS, UK

Sensitive J, H, K imaging polarimetry of the low-mass young stellar object B5 IRS1 reveals a very faint reflection

nebula (mean K surface brightness $\simeq 7\mu$Jy arcsec^{-2}), composed of light scattered in a thin, limb-brightened dust shell associated with the blue-shifted lobe of the weak molecular outflow from IRS1 itself. It appears that the flow is collimated on scales of $\sim$20 arcseconds by partial pressure confinement within the shell and that the shell density is maintained by residual lateral expansion of the flow. The polarization pattern close to the source suggests a disk around IRS1 and anomalous polarization patterns in the nebula are found to be qualitatively consistent with scattering from a population of grains deficient in sizes smaller than $\sim$0.5 μm.

As in other reflection nebulae, the surface brightness gradient in the scattered light is much shallower than θ^{-2}. An explanation for this is sought by postulating gradients in extinction, scattering optical depth or grain albedo across the nebula. Forward-biased scattering alone can produce a shallow brightness distribution but, if isotropic scattering is assumed, an extinction gradient similar to that predicted for a collapsing protostellar core provides the best model of the current data.

Multi-epoch photometry at J, H and K, compared with existing data, shows that the near-infrared luminosity of the source has declined significantly between 1983 and 1990 without significant change in colour. We suggest that this may indicate the growth of large grains (with colour-neutral extinction) in the disk around IRS1 and speculate that this process may lead to the formation of planetesimals.

Accepted by M.N.R.A.S.

Imaging polarimetry of the bipolar nebula Parsamyan 22

S.M. Scarrott[1], P.W.Draper[1] and C.N.Tadhunter[2]

[1] Physics Department, University of Durham, South Road, Durham, DH1 3LE
[2] Physics Department, University of Sheffield, Sheffield S37RH.

Par 22 shows high levels of polarization which confirm that it is a bipolar reflection nebula. We suggest that circumstellar material which is very patchy and forms fingers which penetrate the central regions of the nebula is the remnant of the circumstellar disc which is in the process of disintegration. We take this as an indication that the system is in the later stages of pre-main-sequence evolution. We discuss the origin of the sharp rim/diffuse boundary of each of the nebular lobes.

Accepted by MNRAS

Circularly Polarized Radio Emission from the T Tauri Star Hubble 4

Stephen L. Skinner[1]

[1] JILA, Campus Box 440, Univ. of Colorado, Boulder, CO 80309-0440 USA

I discuss multiwavelength VLA observations of the weak-lined T Tauri star (WTTS) Hubble 4 (Herbig & Bell no. 374), located in Taurus-Auriga. A near-simultaneous detection at 3.6, 6, and 20 cm yielded a flat spectral energy distribution with a spectral index $\alpha \approx 0$. The star was in a state of low radio activity ("quiescence") with flux densities in the range 1.3 - 1.7 mJy. The emission at *both* 3.6 and 6 cm is right circularly polarized at levels of 19 ($\pm$5)% and 18 ($\pm$3)% respectively, with an upper limit of $\leq$15% (3σ) at 20 cm. This provides direct evidence for the existence of ordered magnetic fields in Hubble 4. An interpretation of the emission in terms of optically thin gyrosynchrotron radiation implies magnetic field strengths of a few tens of Gauss in the radio-emitting region. The field strength at the stellar surface is not known, but values as large as a few kilo-Gauss are not ruled out. Observations taken $\approx$ 7 months apart showed no change in the helicity or degree of polarization, and suggest that the magnetic field structure may remain stable for relatively long periods. These new data sharpen the radio analogy between WTTS and RS CVn binaries, and provide further encouragement that the magnetosphere models now under development for RS CVns may also apply qualitatively to WTTS.

Accepted by Astrophys. J.

High resolution CO observations of S88-B

G.J. White[1], C.V.M. Fridlund[2]

[1] Department of Physics, Queen Mary and Westfield College, University of London, Mile End Road, London E1 4NS,

England
[2] Astrophysics Division, Space Science Department, ESTEC, Postbox 299, NL-2200AG, Noordwijk, The Netherlands

CO J=2-1 and ^{13}CO J = 2-1 and 1-0 observations have been made of the HII region S88-B using the 15m James Clerk Maxwell telescope in Hawaii, and the 20m telescope at Onsala. The core of the cloud is resolved into a horseshoe-like structure which surrounds a diffuse reflection nebula. The central core has a mass of $\geq$ 1000 solar masses, with 400 solar masses in the horseshoe structure. The gas in the horseshoe appears highly fragmented, and has a kinetic temperature of $\approx$ 60 K, suggesting it is closely coupled to the dust temperature. A recently formed high mass star appears to be in the process of evacuating a cavity, possibly through a large molecular outflow that is found to show an accelerated component in its blue-shifted lobe. A velocity gradient across the horseshoe structure suggest ordered motion, and could represent rotation in the parental cloud.

Accepted by Astron. Astrophys.

Emission-line stars in L1641

J.G.A. Wouterloot[1] and J. Brand[2,*]

[1] I. Physikalisches Institut, Zülpicher Straße 77, D-W-5000 Köln 41, FRG
[2] Osservatorio Astrofisico di Arcetri, Largo Enrico Fermi 5, 50125 Firenze, Italy
[*] Present address: Istituto di Radioastronomia, CNR, Via Irnerio 46, 40126 Bologna, Italy

We have searched for Hα emission-line stars in a one square degree area in the molecular cloud L1641 located in the Orion-South complex, and detected 112 stars with Hα strength between 1 (weak) and 4 (strong). In 87 of these stars, Hα emission has been detected for the first time. In L1647 we found three candidate emission-line stars. Subsequently, we obtained spectra of 27 of the stars in L1641 in the wavelength interval 5000-6700 Å and derived spectral types and emission-line strengths. We compare the distribution and properties of emission-line stars in Orion with those in the Taurus dark clouds. Although a definite comparison is still hampered by selection effects, it seems clear that Orion is more efficient in low-mass star formation as well as massive star formation.

Accepted by Astronomy & Astrophysics

IRAS sources beyond the solar circle. III. Observations of H_2O, OH, CH_3OH and CO.

J.G.A. Wouterloot[1], J. Brand[2,*] and K. Fiegle[1]

[1] I. Physikalisches Institut der Universität zu Köln, Zülpicher Straße 77, D-W-5000 Köln 41, Germany
[2] Osservatorio Astrofisico di Arcetri, Largo Enrico Fermi 5, I-50125 Firenze, Italy
[*] Present address: Istituto di Radioastronomia, CNR, Via Irnerio 46, I-40126 Bologna, Italy

We have used the 100-m Effelsberg and 32-m Medicina radiotelescopes to search for H_2O maser emission (22.235 GHz) towards 1143 IRAS sources, for OH (1665/67 MHz) towards 303 IRAS sources, and for CH_3OH (12.179 GHz) towards 19 IRAS sources. The IRAS sources have been selected to have colours of pre-main sequence objects. To obtain an estimate of the (kinematic) distance we observed ^{12}CO(J=2$\rightarrow$1) and ^{12}CO(J=3$\rightarrow$2) with the KOSMA 3-m telescope towards 25 sources showing H_2O emission and not yet observed in CO. This paper presents the observational results in form of tables with line parameters or upper limits and spectra of detected sources. The analysis of these data will be published separately.

Accepted by Astronomy & Astrophysics Supplements

New Jobs

Research Associate (Stellar and Planetary System Formation)

Carnegie Institution of Washington
Department of Terrestrial Magnetism
5241 Broad Branch Road, NW
Washington, DC 20015–1305, USA

Attention: Origins Associateship

Applications are invited for a NASA-supported postdoctoral research associateship in the general area of stellar and planetary system formation. The associate will work with Alan Boss on theoretical models of the interactions of interstellar shock waves with dense cloud cores and on cosmochemical implications (e.g., for meteorites) of the transport and mixing processes occurring during protostellar collapse and disk evolution. The cosmogony group at DTM includes Alan Boss, John Graham, and George Wetherill. DTM has a network of Sun SPARC stations, an HP/Apollo 10040 workstation, a video production facility, and network access to the national supercomputer centers.

The position requires a Ph.D. in a relevant field, experience with numerical hydrodynamics codes, and excellent computer skills. The position will become available July 1, 1993, and is available for one year, with the expectation of a second year. The salary is $32,000 per year, plus applicable benefits and travel funds.

Applications should include a curriculum vita, a publication list, and three letters of recommendation to be sent directly to us by those familiar with your work. Completed applications are due by January 31, 1993.

Women and minority candidates are encouraged to apply.

Staff Scientist Position (Planet Formation, Origins of Planetary Systems, ...)

Lunar and Planetary Institute
3600 Bay Area Boulevard
Houston, TX 77058, USA

Attention: Renu Malhotra
Chair, Search Committee

The Lunar and Planetary Institute is a center for research in planetary science located in Houston, Texas, in close proximity to the Johnson Space Center. Areas of current research at the Institute are diverse and include the study of lunar and meteoritic materials, geophysical analysis of global datasets, and planetary geology, including analysis of Voyager and other spacecraft data. Theoretical studies include the origin of the solar system and other planetary systems and solar system dynamics.

The Institute has two scientific staff positions available, starting in the Fall of 1993, for a duration of two years with possibility of renewal. Scientists are expected to carry out original research in general areas of planetary science. At the present time, we are particularly interested in candidates conducting research in the areas of planet formation and origins of planetary systems, planetary atmospheres, and science related to the planet Mars. Applicants should send a curriculum vitae and a statement of research interests and should arrange to have three letters of recommendation sent to the above address.

Meetings

Circumstellar Matter 1994

Dates: 29 August – 2 September 1994

Venue: Heriot-Watt University Conference Centre, Edinburgh, Scotland

Intended Topics Include:

- star formation processes in molecular clouds
- formation and evolution of protostars
- circumstellar disk formation and subsequent evolution
- comparisons between low and high mass young stellar objects
- structure, dynamics and chemistry of Herbig-Haro objects and T Tauri stars
- dynamics, chemistry and evolution of outflows, winds and jets
- dynamics of evolved and post main sequence stars
- circumstellar dust, shell and envelope structure and chemistry
- mass loss from hot stars: Wolf-Rayet stars, OB and Ae/Be stars, FU Orionis types, etc.
- instabilities and accelerations in flows and winds (ie: shocks, blobs, winds, jets)
- features of Luminous Blue Variables
- role of magnetic field in star formation and early stellar evolution

Scientific Organizing Committee: J.E.Dyson, I.D.Howarth, H.Olofsson, G.Sandell, L.B.Waters

For further details contact: Graeme Watt (ROE) Internet: gdw@starlink.roe.ac.uk