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Abstracts of recently accepted papers

Circumstellar disks around Herbig Be stars

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Aims. Our goal is to investigate the properties of the circumstellar disks around intermediate mass stars to determine their occurrence, lifetime and evolution.
Methods. We completed a search for circumstellar disks around Herbig Be stars using the NRAO Very Large Array (VLA) and the IRAM Plateau de Bure (PdB) interferometers. Thus far, we have observed 6 objects with 4 successful detections. The results towards 3 of these stars (R Mon, MWC 1080, MWC 137) were presented elsewhere. We present our new VLA and PdBI data for the three objects MWC 297, Z CMa, and LKHα 215. We constructed the SED from near-IR to centimeter wavelengths by adding our millimeter and centimeter data to the available data at other wavelengths, mainly Spitzer images. The entire SED was fitted using a disk+envelope model. In addition, we compiled all the disk millimeter observations in the literature and completed a statistical analysis of all the data.
Results. We show that the disk mass is usually only a small percentage (less than 10%) of the mass of the entire envelope in HBe stars. For the disks, there are large source-to-source variations. Two disks in our sample, R Mon and Z CMa, have similar sizes and masses to those found in T Tauri and Herbig Ae stars. The disks around MWC 1080 and MWC 297 are, however, smaller ($\tau_{\rm out} < 100$ AU). We did not detect the disks towards MWC 137 and LkHα 215 at millimeter wavelengths, which limits the mass and the size of the possible circumstellar disks.
Conclusions. A comparison between our data and previous results for T Tauri and Herbig Ae stars indicates that although massive disks ($\sim$0.1 $M_\odot$) are found in young objects ($\sim10^4$ yr), the masses of the disks around Herbig Be stars are usually 5-10 times lower than those around lower mass stars. We propose that disk photoevaporation is responsible for this behavior. In Herbig Be stars, the UV radiation disperses the gas in the outer disk on a timescale of a few 10^5 yr. Once the outer part of the disk has vanished, the entire gaseous disk is photoevaporated on a very short timescale ($\sim10^5$ yr) and only a small, dusty disk consisting of large grains remains.

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Probing the Age and Structure of the Nearby Very Young Open Clusters NGC 2244 and 2239

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The very young open cluster (OC) NGC 2244 in the Rosette Nebula was studied with field-star-decontaminated Two-Micron All-Sky Survey (2MASS) photometry, which shows the main-sequence (MS) stars and an abundant pre-MS (PMS) population. Fundamental and structural parameters were derived with colour-magnitude diagrams (CMDs), stellar radial density profiles (RDPs) and mass functions (MFs). Most previous studies centred NGC 2244 close to the bright K0V star 12 Monocerotis, which is not a cluster member. Instead, the near-infrared RDP indicates a pronounced core near the O5 star HD 46150. We derive an age within 1-6 Myr, an absorption $A_V = 1.7 \pm 0.2$, a distance from the Sun $d_\odot = 1.6 \pm 0.2$ kpc (≈1.5 kpc outside the solar circle), an MF slope $\chi = 0.91 \pm 0.13$ and a total (MS+PMS) stellar mass of ∼625 $M_\odot$. Its RDP is characterized by the core and cluster radii $R_c \approx 5.6$ arcmin (≈2.6 pc) and RRDP ≈ 10 arcmin (≈4.7 pc) , respectively. Departure from dynamical equilibrium is suggested by the abnormally large core radius and the marked central stellar excess. We also investigate the elusive neighbouring OC NGC 2239, which is low mass (mMS+PMS ≈ 301 $M_\odot$) , young (5 ± 4 Myr) rather absorbed ($A_V = 3.4 \pm 0.2$) , and located in the background of NGC 2244 at $d_{odot} = 3.9 \pm 0.4$ kpc . Its RDP follows a King-like function of $R_c \approx 0.5$ arcmin ≈ 0.5 pc and RRDP≈ 5.0 arcmin ≈ 5.6 pc . The MF slope, $\chi = 1.24 \pm 0.06$, is essentially Salpeter's initial mass function. NGC 2244 is probably doomed to dissolution in a few 107 yr. Wide-field extractions and field-star decontamination increase the stellar statistics and enhance both CMDs and RDPs, which is essential for faint and bright star clusters.

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Outflow-Driven Turbulence in Molecular Clouds

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In this paper, we explore the relationship between protostellar outflows and turbulence in molecular clouds. Using three-dimensional numerical simulations we focus on the hydrodynamics of multiple outflows interacting within a parsec scale volume. We explore the extent to which transient outflows injecting directed energy and momentum into a subvolume of a molecular cloud can be converted into random turbulent motions. We show that turbulence can readily be sustained by these interactions and it is possible to broadly characterize an effective driving scale of the outflows. We compare the velocity spectrum obtained in our studies with that of isotropically forced hydrodynamic turbulence finding that in outflow-driven turbulence a power law of the form $E(k) \propto k^{-\beta}$ is indeed achieved. However, we find that a steeper spectrum $\beta \sim 2.74$ is obtained in outflow-driven turbulence models than in isotropically forced simulations $\beta \sim 2.45$. We discuss possible physical mechanisms responsible for these results as well as their implications for turbulence in molecular clouds where outflows will act in concert with other processes such as gravitational collapse.

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The *Spitzer*/GLIMPSE Surveys: A New View of the Milky Way

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A brief description is given of the GLIMPSE surveys, including the areas surveyed, sensitivity limits, and products. The primary motivations for this review are to describe some of the main scientific results enabled by the GLIMPSE surveys and to note potential future applications of the GLIMPSE catalogs and images. In particular, we discuss contributions to our understanding of star formation and early evolution, the interstellar medium, galactic structure, and evolved

stars. Infrared dark clouds (IRDCs), young stellar objects (YSOs), and infrared bubbles/H II regions are discussed in some detail. A probable triggered star formation associated with expanding infrared bubbles is briefly mentioned. The distribution and morphologies of dust and polycyclic aromatic hydrocarbons (PAHs) in the interstellar medium are discussed. Examples are shown from GLIMPSE images of bow shocks, pillars (elephant trunks), and instabilities in massive star-formation regions. The infrared extinction law of diffuse interstellar dust is discussed. The large-scale structure of the Galaxy has been traced by red-clump giants using the GLIMPSE point-source catalog to reveal the radius and orientation of the central bar, the stellar radial scale length, an obvious increase in star counts toward the tangency to the Scutum-Centaurus spiral arm, the lack of an obvious tangency from star counts toward the Sagittarius spiral arm, and a sharp increase in star counts toward the nuclear bulge. Recent results on evolved stars and some serendipitous discoveries are mentioned. More than 70 refereed papers have been published based on GLIMPSE data as of 2008 November.

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Anachronistic Grain Growth and Global Structure of the Protoplanetary Disk Associated with the Mature Classical T Tauri Star, PDS 66

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We present ATCA interferometric observations of the old (13 Myr), nearby (86pc) classical T Tauri star, PDS 66. Unresolved 3 and 12 mm continuum emission is detected towards PDS 66, and upper limits are derived for the 3 and 6 cm flux densities. The mm-wave data show a spectral slope flatter than that expected for ISM-sized dust particles, which is evidence of grain growth. We also present HST/NICMOS 1.1 micron PSF-subtracted coronagraphic imaging observations of the circumstellar environment of PDS 66. The HST observations reveal a bilaterally symmetric circumstellar region of dust scattering $\sim$0.32% of the central starlight, declining in surface brightness as $r^{-4.53}$. The light-scattering disk of material is inclined 32$\pm$5° from a face-on viewing geometry, and extend to a radius of 170 AU. These data are combined with published optical and longer wavelength observations to make qualitative comparisons between the median Taurus and PDS 66 spectral energy distributions (SEDs). By comparing the near-infrared emission to a simple model, we determine that the location of the inner disk radius is consistent with the dust sublimation radius ($\sim$1400 K at 0.1 AU). We place constraints on the total disk mass using a flat-disk model and find that it is probably too low to form gas giant planets according to current models. Despite the fact that PDS 66 is much older than a typical classical T Tauri star ($\leq$5 Myr), its physical properties are not much different.

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The Last Gasp of Gas Giant Planet Formation: A Spitzer Study of the 5 Myr-old Cluster NGC 2362

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Expanding upon the IRAC survey from Dahm and Hillenbrand (2007), we describe Spitzer IRAC and MIPS observations of the populous, 5 Myr-old open cluster NGC 2362. We analyze the mid-IR colors of cluster members and

compared their spectral energy distributions to star+circumstellar disk models to constrain the disk morphologies and evolutionary states. Early/intermediate-type confirmed/candidate cluster members either have photospheric mid-IR emission or weak, optically-thin infrared excess emission at $\lambda \geq 24$ μm consistent with debris disks. Few late-type, solar/subsolar-mass stars have primordial disks. The disk population around late-type stars is dominated by disks with inner holes (canonical 'transition disks') and 'homologously depleted' disks. Both types of disks represent an intermediate stage between primordial disks and debris disks. Thus, in agreement with previous results, we find that multiple paths for the primordial-to-debris disk transition exist. Because these 'evolved primordial disks' greatly outnumber primordial disks, our results undermine standard arguments in favor of a $\lesssim 10^5$ year timescale for the transition based on data from Taurus-Auriga. Because the typical transition timescale is far longer than 10^5 yr, these data also appear to rule out standard UV photoevaporation scenarios as the primary mechanism to explain the transition. Combining our data with other Spitzer surveys, we investigate the evolution of debris disks around high/intermediate-mass stars and investigate timescales for giant planet formation. Consistent with Currie et al. (2008a), the luminosity of 24 μm emission in debris disks due to planet formation peaks at $\approx$ 10–20 Myr. If the gas and dust in disks evolve on similar timescales, the formation timescale for gas giant planets surrounding early-type, high/intermediate-mass ($\gtrsim 1.4$ $M_\odot$) stars is likely 1–5 Myr. Most solar/subsolar-mass stars detected by Spitzer have SEDs that indicate their disks may be actively leaving the primordial disk phase. Thus, gas giant planet formation may also occur by $\sim$ 5 Myr around solar/subsolar-mass stars as well.

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A large-scale CO survey of the Rosette Molecular Cloud: assessing the effects of O stars on surrounding molecular gas

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We present a new large-scale survey of J=3-2 ^{12}CO emission covering 4.8 square degrees around the Rosette Nebula, taken with a spatial resolution of 14 arcsec. Approximately 2000 compact gas clumps are identified in the region, having a constant power law mass distribution with index ?1.8. Most of the innermost clumps show velocity gradients of 1-3 km s^{-1}pc^{-1}, directed away from the exciting nebula. The gradients decrease with distance from the central O stars, and comparison of the results with a photoionised gas acceleration model implies clump lifetimes of a few 10^5 yrs. However, in the most spatially-extended clump, a constant velocity gradient is seen, which is difficult to explain with simple models.

Blue-shifted gas clumps are in all cases associated with dark absorbing optical globules. Few if any red-shifted clumps have associated dark clouds, which confirms that the dominant molecular gas motion throughout the region is expansion away from the O stars. Many clumps lie in a molecular ring, having an expansion velocity of 30 km s^{-1}, radius 11pc, and dynamical timescale of $\sim$1Myr.

The J=3-2/1-0 ^{12}CO line ratio in the clumps decreases with radial distance from the central O stars, implying a overall gradient in the clump surface temperatures. The results are compared with a simple model of clump surface heating through radiation from the central luminous stars.

Seven high-velocity molecular flows are found in the region, with a close correspondence between these flows and embedded young clusters. These flows are sufficiently energetic to drive local gas turbulence within each cluster.

We find 14 clear examples of an association between an embedded young star and a CO clump; these are thought to be photoevaporating circumstellar envelopes. CO clumps without evidence of embedded stars tend to have lower gas ve-

locity gradients, and it is suggested that the presence of the young star may extend the lifespan of the photoevaporating envelopes.

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http://www.alma.cl/∼wdent/rosette/mnras-paper.pdf

The extremely collimated bipolar H_2O jet from the NGC 1333-IRAS 4B protostar

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We have performed observations of water maser emission towards a sample of low-mass protostars, in order to investigate the properties of jets associated with the earliest stages of star formation and their interaction with the surrounding medium. The main aim is to measure the absolute positions and proper motions of the H_2O spots in order to investigate the kinematics of the region from where the jet is launched. We imaged the protostars in the nearby region NGC 1333-IRAS 4 in the water maser line at 22.2 GHz by using the VLBA in phase-reference mode at the milliarcsecond scale over four epochs, spaced by one month to measure proper motions. Two protostars (A2 and B) were detected in a highly variable H_2O maser emission, with an active phase shorter than four weeks. The H_2O maps allow us to trace the fast jet driven by the B protostar: we observed both the red- and blue-shifted lobes very close to the protostar, ≤ 35 AU, moving away with projected velocities of 10-50 km/s. The comparison with the molecular outflow observed at larger scale suggests a jet precession with a 18'/yr rate. By measuring the positional spread of the H_2O spots we estimate a jet width of 2 AU at a distance of 12 AU from the driving protostar.

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A Simple Model for the Relationship Between Star Formation and Surface Density

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We investigate the relationship between the star formation rate per unit area and the surface density of the ISM (the local Kennicutt-Schmitt law) using a simplified model of the ISM and a simple estimate of the star formation rate based on the mass of gas in bound clumps, the local dynamical timescales of the clumps, and an efficiency parameter of around $\epsilon \approx 5$ per cent. Despite the simplicity of the approach, we are able to reproduce the observed linear relation between star formation rate and surface density of dense (molecular) gas. We use a simple model for the dependence of H_2 fraction on total surface density to argue why neither total surface density nor the HI surface density are good local indicators of star formation rate. We also investigate the dependence of the star formation rate on the depth of the spiral potential. Our model indicates that the mean star formation rate does not depend significantly on the strength of the spiral potential, but that a stronger spiral potential, for a given mean surface density, does result in more of the star formation occurring close to the spiral arms. This agrees with the observation that grand design galaxies do not appear to show a larger degree of star formation compared to their flocculent counterparts.

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The Polarimetric and Photometric Variability of HH 30

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We have obtained ground-based photopolarimetry of the young stellar object HH 30 over the course of one year. Our observations reveal the presence of a dominant periodic modulation of the polarization with a period of 7.49 ± 0.04 days or one of the aliases of this period close to 1 day. There are also suggestions of a weak periodic modulation in the photometry with the same period but a phase displaced by one quarter of a period. These results are in agreement with the lighthouse model for HH 30, in which a beam or shadow from a central source sweeps across the disk. Our observations by themselves appear to be consistent with both of the mechanisms that have been proposed for the lighthouse — asymmetric accretion hot spots on the star or orbiting clumps or voids in the disk — and provide strong quantitative constraints for future models.

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The Molecular Environment of the Massive Star Forming Region NGC 2024: Multi CO Transition Analysis

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Context. Sites of massive star formation have complex internal structures. Local heating by young stars and kinematic processes, such as outflows and stellar winds, generate large temperature and velocity gradients. Complex cloud structures lead to intricate emission line shapes. CO lines from high mass star forming regions are rarely Gaussian and show often multiple peaks. Furthermore, the line shapes vary significantly with the quantum number $J_{\rm up}$, due to the different probed physical conditions and opacities.
Aims. The goal of this paper is to show that the complex line shapes of ^{12}CO and ^{13}CO in NGC 2024 showing multiple emission and absorption features, which vary with rotational quantum number J can be explained consistently with a model, whose temperature and velocity structure are based on the well-established scenario of a PDR and the "Blister model".
Methods. We present velocity-resolved spectra of seven ^{12}CO and ^{13}CO lines ranging from $J_{\rm up}$ to $J_{\rm up}$. We combined these data with ^{12}CO high-frequency data from the ISO satellite and analyzed the full set of CO lines using an escape probability code and a one-dimensional full radiative transfer code.
Results. We find that the bulk of the molecular cloud associated with NGC 2024 consists of warm (75 K) and dense (9×10^5 cm^{-3}) gas. An additional hot (∼300 K) component, located at the interface of the HII region and the molecular cloud, is needed to explain the emission of the high-J CO lines. Deep absorption notches indicate that very cold material (∼20 K) exists in front of the warm material, too.
Conclusions. A temperature and column density structure consistent with those predicted by PDR models, combined with the velocity structure of a "Blister model", appropriately describes the observed emission line profiles of this massive star forming region. This case study of NGC 2024 shows that, with physical insights into these complex regions and careful modeling, multi-line observations of ^{12}CO and ^{13}CO can be used to derive detailed physical conditions in massive star forming regions.

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Gas Phase Diagnostics of Protoplanetary Disc Extension

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Aims. We investigate the potential of using ratios of fine structure and near-infrared forbidden-line transitions of atomic carbon to diagnose protoplanetary disc extension.
Methods. Using results from 2D photoionisation and radiative transfer modelling of a realistic protoplanetary disc structure irradiated by X-rays from a T Tauri star, we obtain theoretical emission maps from which we construct radial distributions of the strongest emission lines produced in the disc.
Results. We show that ratios of fine structure to near-infrared forbidden-line emission of atomic carbon are especially promising for constraining the minimum size of gaseous protoplanetary discs. While theoretically viable, the method presents a number of observational difficulties that are also discussed here.

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The Transition Disc Frequency in M Stars

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We re-examine the recent suggestion of a high fraction of transition discs (i.e. those with a cleared inner hole) in M stars, motivated by the fact that we expect that, for M stars, even discs without inner holes should exhibit very weak excess shortwards of around 10 μm. Our analysis of spectral energy distribution models suggests that this indeed means that M stars where a detectable excess begins at around 6 μm may be misclassified as transition discs when in fact they have optically thick dust extending in to the dust sublimation radius. Consequently, we estimate that the transition disc fraction among M stars in the Coronet cluster is $\sim$15 $\pm$ 10 per cent (rather than the recently claimed value of 50 per cent). This revised figure would imply that the transition disc fraction is not after all markedly higher in later type stars. We suggest that, for M stars, transition discs can only be readily identified if they have emission that is close to photospheric out to >10 μm .

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Molecular hydrogen deficiency in HI-poor galaxies and its implications for star formation

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We use a sample of 47 homogeneous and high sensitivity CO images taken from the Nobeyama and BIMA surveys to demonstrate that, contrary to common belief, a significant number ($\sim$ 40%) of HI–deficient nearby spiral galaxies are also depleted in molecular hydrogen. While HI–deficiency by itself is not a sufficient condition for molecular gas depletion, we find that H_2 reduction is associated with the removal of HI inside the galaxy optical disk. Those HI–deficient galaxies with normal H_2 content have lost HI mainly from outside their optical disks, where the H_2 content is low in all galaxies. This finding is consistent with theoretical models in which the molecular fraction in a galaxy is determined primarily by its gas column density. Our result is supported by indirect evidence that molecular deficient galaxies form stars at a lower rate or have dimmer far infrared fluxes than gas rich galaxies, as expected if the star formation rate is determined by the molecular hydrogen content. Our result is consistent with a scenario in

which, when the atomic gas column density is lowered inside the optical disk below the critical value required to form molecular hydrogen and stars, spirals become quiescent and passive evolving systems. We speculate that this process would act on the time–scale set by the gas depletion rate and might be a first step for the transition between the blue and red sequence observed in the color–magnitude diagram.

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Maser emission from SiO isotopologues traces the innermost 100 AU around Radio Source I in Orion BN/KL

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We have used the Very Large Array (VLA) at 7 mm wavelength to image five rotational transitions ($J = 1 - 0$) from three SiO isotopologues towards Orion BN/KL: ^{28}SiO $v = 0, 1, 2$; and ^{29}SiO and ^{30}SiO $v = 0$. For the first time, we have mapped the ^{29}SiO and ^{30}SiO $J = 1 - 0$ emission, established the maser nature of the emission, and confirmed association with the deeply embedded high-mass young stellar object commonly denoted radio Source I. The ^{28}SiO $v = 0$ maser emission shows a bipolar structure that extends over ~ 700 AU along a northeast-southwest axis, and we propose that it traces a bipolar outflow driven by Source I. The high-brightness isotopic SiO maser emission imaged with a $\lesssim 0\farcs2$ resolution has a more compact distribution, generally similar to that of the ^{28}SiO $v = 1, 2$ emission, and it probably traces bulk gas flows in a region of diameter $\lesssim 100$ AU centered on Source I. On small scales of $\lesssim 10$ AU, however, compact ^{29}SiO/^{30}SiO $v = 0$ and ^{28}SiO $v = 1, 2$ emission features may be offset from one another in position and line-of-sight velocity.

From a radiative transfer analysis based on a large velocity gradient (LVG) pumping model, we derive similar temperatures and densities for the optimum excitation of both ^{29}SiO/^{30}SiO $v = 0$ and ^{28}SiO $v = 1, 2$ masers, significantly higher than required for ^{28}SiO $v = 0$ maser excitation. In order to account for the small-scale differences among the isotopologues ($v = 0$) and the main species ($v = 1, 2$), follow-up radiative transfer modeling that incorporates non-local line overlap among transitions of all SiO isotopic species may be required.

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The North American and Pelican Nebulae I. IRAC Observations

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We present a 9 deg^2 map of the North American and Pelican Nebulae regions obtained in all four IRAC channels with the Spitzer Space Telescope. The resulting photometry is merged with that at JHK_s from 2MASS and a more spatially limited BVI survey from previous ground-based work. We use a mixture of color- color diagrams to select a minimally contaminated set of more than 1600 objects that we claim are young stellar objects (YSOs) associated with the star forming region. Because our selection technique uses IR excess as a requirement, our sample is strongly biased against inclusion of Class III YSOs. The distribution of IRAC spectral slopes for our YSOs indicates that most of these objects are Class II, with a peak towards steeper spectral slopes but a substantial contribution from a tail of

flat spectrum and Class I type objects. By studying the small fraction of the sample that is optically visible, we infer a typical age of a few Myr for the low mass population. The young stars are clustered, with about a third of them located in eight clusters that are located within or near the LDN 935 dark cloud. Half of the YSOs are located in regions with surface densities higher than 1000 YSOs / deg^2. The Class I objects are more clustered than the Class II stars.

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Shocks in Dense Clouds II. Dust Destruction and SiO Formation in J Shocks

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Context. Observations of SiO line emission in shocks in star-forming regions indicate that silicate dust destruction must be occurring in these dense regions. Current models rely on predictions for dust destruction by sputtering in C-type shock waves. However, J-type shocks may also be relevant for interpreting the widely-observed optical line emission from species such as O I and Fe II.
Aims. In this work we explore, for the first time, dust destruction in J-type shocks slower than 50 km?s^{-1}.
Methods. We follow the dust trajectories throughout the shock using a model for the dust dynamics that allows us to solve the shock structure and at the same time calculate the degree of dust processing. We include the effects of sputtering in gas-grain collisions, and vaporisation and shattering in grain-grain collisions.
Results. We find that the amount of silicon released into the gas phase is a few percent. The dominant destructive process is vaporisation, not sputtering. The degree of dust destruction increases with the shock velocity but decreases as the preshock density increases.
Conclusions. Our results compare well with that of C-type shock models. J-type shocks are therefore reasonable candidates for an interpretation of SiO line emission in molecular outflows and jets.

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A Smoking Gun in the Carina Nebula

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The Carina Nebula is one of the youngest, most active sites of massive star formation in our Galaxy. In this nebula, we have discovered a bright X-ray source that has persisted for ∼30 years. The soft X-ray spectrum, consistent with kT ∼ 128 eV blackbody radiation with mild extinction, and no counterpart in the near- and mid-infrared wavelengths indicates that it is a $\sim 10^6$ year old neutron star housed in the Carina Nebula. Current star formation theory does not suggest that the progenitors of the neutron star and massive stars in the Carina Nebula, in particular η Car, are coeval. This result suggests that the Carina Nebula experienced at least two major episodes of massive star formation. The neutron star may be responsible for remnants of high-energy activity seen in multiple wavelengths.

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Serpens Cluster B and VV Ser Observed with High Spatial Resolution at 70, 160, and 350 μm

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We report on diffraction-limited observations in the far-infrared (FIR) and submillimeter of the Cluster B region of Serpens (G3-G6 Cluster) and of the Herbig Be star to the south, VV Ser. The observations were made with the *Spitzer*/MIPS instrument in fine-scale mode at 70 μm, in a normal mapping mode at 160 μm (VV Ser only), and the Caltech Submillimeter Observatory (CSO) Submillimeter High Angular Resolution Camera II (SHARC-II) camera at 350 μm (Cluster B only). We use these data to define the spectral energy distributions of the tightly grouped members of Cluster B, many of whose spectral energy distribution (SED)'s peak in the FIR. We compare our results to those of the *c2d* survey of Serpens and to published models for the FIR emission from VV Ser. We find that values of $L_{\rm bol}$ and $T_{\rm bol}$ calculated with our new photometry show only modest changes from previous values, and that most source SED classifications remain unchanged.

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A Spatially Resolved Inner Hole in the Disk around GM Aurigae

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We present 0.3" resolution observations of the disk around GM Aurigae with the Submillimeter Array (SMA) at a wavelength of 860 μm and with the Plateau de Bure Interferometer at a wavelength of 1.3 mm. These observations probe the distribution of disk material on spatial scales commensurate with the size of the inner hole predicted by models of the spectral energy distribution. The data clearly indicate a sharp decrease in millimeter optical depth at the disk center, consistent with a deficit of material at distances less than $\sim$20 AU from the star. We refine the accretion disk model of Calvet et al. (2005) based on the unresolved spectral energy distribution (SED) and demonstrate that it reproduces well the spatially resolved millimeter continuum data at both available wavelengths. We also present complementary SMA observations of CO J=3$-$2 and J=2$-$1 emission from the disk at 2" resolution. The observed CO morphology is consistent with the continuum model prediction, with two significant deviations: (1) the emission displays a larger CO J=3$-$2/J=2$-$1 line ratio than predicted, which may indicate additional heating of gas in the upper disk layers; and (2) the position angle of the kinematic rotation pattern differs by $11^\circ \pm 2^\circ$ from that measured at smaller scales from the dust continuum, which may indicate the presence of a warp. We note that photoevaporation, grain growth, and binarity are unlikely mechanisms for inducing the observed sharp decrease in opacity or surface density at the disk center. The inner hole plausibly results from the dynamical influence of a planet on the disk material. Warping induced by a planet could also potentially explain the difference in position angle between the continuum and CO data sets.

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http://www.cfa.harvard.edu/$\sim$mhughes/download/gmaur_ms.ps

The Fidelity of the Core Mass Functions Derived From Dust Column Density Data

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Aims. We examine the recoverability and completeness limits of the dense core mass functions (CMFs) derived for a molecular cloud using extinction data and a core identification scheme based on two-dimensional thresholding. We study how the selection of core extraction parameters affects the accuracy and completeness limit of the derived CMF and the core masses, and also how accurately the CMF can be derived in varying core crowding conditions.
Methods. We performed simulations where a population of artificial cores was embedded in the variable background extinction field of the Pipe nebula. We extracted the cores from the simulated extinction maps, constructed the CMFs, and compared them to the input CMFs. The simulations were repeated using a variety of extraction parameters and several core populations with differing input mass functions and differing degrees of crowding.
Results. The fidelity of the observed CMF depends on the parameters selected for the core extraction algorithm for our background. More importantly, it depends on how crowded the core population is. We find that the observed CMF recovers the true CMF reliably when the mean separation of cores is larger than the mean diameter of the cores (f>1). If this condition holds, the derived CMF for the Pipe nebula background is accurate and complete above $M > \sim 0.8...1.5\ M_{\odot}$, depending on the parameters used for the core extraction. In the simulations, the best fidelity was achieved with the detection threshold of 1 or 2 times the rms-noise of the extinction data, and with the contour level spacings of 3 times the rms-noise. Choosing a higher threshold and wider level spacings increases the limiting mass. The simulations also show that, when $f > \sim 1.5$, the masses of individual cores are recovered with a typical uncertainty of 25...30%. When $f \approx 1$, the uncertainty is ∼60%. In very crowded cases where $f < 1$ the core identification algorithm is unable to recover the masses of the cores adequately, and the derived CMF is unlikely to represent the underlying CMF. For the cores of the Pipe nebula $f \approx 2.0$ thereby justifying the use of the method in that region.

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DR21 Main: A Collapsing Cloud

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The molecular cloud, DR21 Main, is an example of a large-scale gravitational collapse about an axis near the plane of the sky where the collapse is free of major disturbances due to rotation or other effects. Using flux maps, polarimetric maps, and measurements of the field inclination by comparing the line widths of ion and neutral species, we estimate the temperature, mass, magnetic field, and the turbulent kinetic, mean magnetic, and gravitational potential energies, and present a three-dimensional model of the cloud and magnetic field.

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Chemical and dynamical evolution of gas in vicinity of an expanding HII region

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A self-consistent model of the chemical and dynamical evolution of an HII region around massive young star and surrounding gas is presented. Incorporated in the model are all primary chemical and physical processes, including photoionisation of atomic hydrogen and photodissociation of molecular hydrogen and other molecules as well as evaporation of dust grain mantles. To calculate temperature, heating and cooling processes are taken into account, including cooling in molecular and atomic lines. equations of hydrodynamics are solved using the Zeus2D code. This model is used to solve a problem of an expanding region of ionized hydrogen around massive star, having effective temperature 30000K and 40000K, in a medium with different initial density distributions. It is shown that competition

between mantle evaporation and molecule photodissociation leads to formation of a transition layer between hot Hii region and cold quiescent medium, which is characterized by high gas-phase abundances of various molecules. Breadth of the transition layer is different for different molecules. As there is a velocity gradient along the transition layers, and maxima in distributions of various molecules are located at different distances from the stars, observed emission lines of different molecules will be shifted relative to each other and to quiescent gas. A shift like this has been in fact detected during observations of HII region Sh2-235. At gas initial density of 10^3 cm$^{?3}$, abundances H_2O and H_2CO in the transition layer grow not sharply, but gradually after desorption from dust grains. Thus, the concept of ?evaporation front? is somewhat formal. Also, evaporation fronts for various molecules are located far away from each other. At higher initial gas density (10^4 cm$^{?3}$) distinct evaporation fronts form, which are located close to each other and to the shock front. This makes it possible to refer to a single evaporation front for CO, H_2O and H_2CO.

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Oxygen in dense interstellar gas: the oxygen abundance of the star forming core ρ Oph A

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Context: Oxygen is the third most abundant element in the universe, but its chemistry in the interstellar medium is still not well understood.

Aims: To critically examine the entire oxygen budget, we initially attempt to estimate the abundance of atomic oxygen, O, in the only region where molecular oxygen, O_2, has been detected to date.

Methods: We analysed ISOCAM-CVF spectral image data toward ρ Oph A to derive the temperatures and column densities of H_2 at the locations of ISO-LWS observations of two [O I] ^3P_J lines. The intensity ratios of the (J=1-2) 63 μm to (J=0-1) 145 μm lines largely exceed ten, attesting to these lines being optically thin. This is confirmed by radiative transfer calculations, making these lines suitable for abundance determinations. For that purpose, we calculated line strengths and compared them to the LWS observations.

Results: Excess [O I] emission is observed to be associated with the molecular outflow from VLA 1623. For this region, we determine the physical parameters, T and $N(H_2)$, from the CAM observations, and the gas density, $n(H_2)$, is determined from the flux ratio of the 63 μm and 145 μm lines. For the oxygen abundance, our analysis essentially leads to three possibilities: (1) extended low-density gas with standard ISM O-abundance, (2) compact high-density gas with standard ISM O-abundance, and (3) extended high-density gas with reduced oxygen abundance, [O/H] $\sim 2\times10^{-5}$.

Conclusions: As option (1) disregards valid 145 μm data, we do not find it very compelling; instead, we favour option (3), as lower abundances are expected as a result of chemical cloud evolution, but we are not able to dismiss option (2) entirely. Observations at higher angular resolution than offered by the LWS are required to decide between these possibilities.

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Quantifying the contamination by old main-sequence stars in young moving groups: the case of the Local Association

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The associations and moving groups of young stars are excellent laboratories for investigating stellar formation in

the solar neighborhood. Previous results have confirmed that a non-negligible fraction of old main-sequence stars is present in the lists of possible members of young stellar kinematic groups. A detailed study of the properties of these samples is needed to separate the young stars from old main-sequence stars with similar space motion, and identify the origin of these structures. We used stars possible members of the young ($\sim 10-650$ Myr) moving groups from the literature. To determine the age of the stars, we used several suitable age indicators for young main sequence stars, i.e., X-ray fluxes and other photometric data. We also used spectroscopic data, in particular the equivalent width of the lithium line Li I λ6707.8 Å and H_α, to constrain the range of ages of the stars. By combining photometric and spectroscopic data, we were able to separate the young stars ($10-650$ Myr) from the old ($> 1Gyr$) field ones. We found, in particular, that the Local Association is contaminated by old field stars at the level of $\sim 30\%$. This value must be considered as the contamination for our particular sample, and not of the entire Local Association. For other young moving groups, it is more difficult to estimate the fraction of old stars among possible members. However, the level of X-ray emission can, at least, help to separate two age populations: stars with < 200 Myr and stars older than this. Our results are consistent with a scenario in which the moving groups contain both groups of young stars formed in a recent star-formation episode and old field stars with similar space motion. Only by combining X-ray and optical spectroscopic data is it possible to distinguish between these two age populations.

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The Legacy of SCUPOL: 850 micron Imaging Polarimetry from 1997 to 2005

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SCUPOL, the polarimeter for SCUBA on the James Clerk Maxwell Telescope, was the most prolific thermal imaging polarimeter built to date. Between 1997 and 2005, observations of 104 regions were made at 850 μm in the mapping mode. The instrument has produced ~ 50 refereed journal publications, and that number is still growing. We have systematically re-reduced all imaging polarimetry made in the standard "jiggle-map" mode from the SCUBA archive (2800+ individual observations) to produce a catalog of SCUPOL images and tables. We present the results of our analysis with figures and data tables produced for all 83 regions where significant polarization was detected. In addition, the reduced data cubes and data tables can be accessed online. In many cases, the data included in this paper have been previously published elsewhere. However, this publication includes unpublished datasets, in whole or in part, toward 39 regions, including cores in ρ Ophiuchus, Orion's OMC-2 region, several young stellar objects and the galaxy M87.

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http://astrowww.phys.uvic.ca/~ brenda/preprints.html

Observational $5-20\mu$m Interstellar Extinction Curves Toward Star-Forming Regions Derived From Spitzer IRS Spectra

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Using *Spitzer* Infrared Spectrograph observations of G0–M4 III stars behind dark clouds, I construct $5-20\mu$m empirical extinction curves for $0.3 \leq A_K < 7$, which is equivalent to A_V between ≈ 3 and 50. For $A_K < 1$ the curve appears similar to the Mathis diffuse interstellar medium extinction curve, but with a greater degree of extinction. For $A_K > 1$, the curve exhibits lower contrast between the silicate and absorption continuum, developes ice absorption, and lies closer to the Weingartner and Draine $R_V = 5.5$ case B curve, a result which is consistent with that of Flaherty et al. and Chiar et al. Recently work using *Spitzer* Infrared Array Camera data by Chapman et al. independently reaches a

similar conclusion, that the shape of the extinction curve changes as a function of increasing A_K. By calculating the optical depths of the 9.7μm silicate and 6.0, 6.8, and 15.2 μm ice features, I determine that a process involving ice is responsible for the changing shape of the extinction curve and speculate that this process is coagulation of ice-mantled grains rather than ice-mantled grains alone.

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Model Infrared Spectra of Passively Heated Proto-Planetary Disks Surrounding Intermediate-Mass Pre-Main-Sequence Stars

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Aims. We study theoretical spectra at mid-infrared (5-40 μm) wavelengths of proto-planetary disks surrounding intermediate-mass pre-main-sequence stars. Observations show a wide range of spectral shapes and a rich variety in strength and shape of dust resonances. These strong variations in spectral shape reflect differences in the nature and spatial distribution of dust particles in the disk. The aim of this study is to establish what model parameters influence the mid-IR spectra of planet-forming disks.
Methods. A grid of models of passively heated proto-planetary disks is used to calculate the infrared spectrum. We use hydrostatic equilibrium disk models and radiative transfer to calculate the emerging spectrum. We focus on the effects that different disk geometries (flaring, self-shadowed) and dust mineralogy have on the emerging 5-40 μm spectrum. We adopt four scenarios for the radial and vertical distribution of crystalline silicate dust.
Results. In our model, the 23.5 μm forsterite band is more sensitive to emission from regions <30 AU, while the 33.5 μm forsterite band probes regions up to 50 AU. The 23.5 μm band strength does not depend on the degree of flaring of the disk, while the 33.5 μm band does. Only models with a substantial abundance (>5 percent) of crystalline silicates at a long distance from the star (>20-50 AU) show detectable emission in the 33.5 μm forsterite band. The carbon-dust abundance affects the strength of the dust resonances in the 10 μm spectral region, but not in the 30 μm region.

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Magnetic Braking and Protostellar Disk Formation: Ambipolar Diffusion

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It is established that the formation of rotationally supported disks during the main accretion phase of star formation is suppressed by a moderately strong magnetic field in the ideal MHD limit. Non-ideal MHD effects are expected to weaken the magnetic braking, perhaps allowing the disk to reappear. We concentrate on one such effect, ambipolar diffusion, which enables the field lines to slip relative to the bulk neutral matter. We find that the slippage does not sufficiently weaken the braking to allow rotationally supported disks to form for realistic levels of cloud magnetization and cosmic ray ionization rate; in some cases, the magnetic braking is even enhanced. Only in dense cores with both exceptionally weak fields and unreasonably low ionization rate do such disks start to form in our simulations. We conclude that additional processes, such as Ohmic dissipation or Hall effect, are needed to enable disk formation. Alternatively, the disk may form at late times when the massive envelope that anchors the magnetic brake is dissipated, perhaps by a protostellar wind.

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Properties of the Ionized Gas in HH 202 - I. Results From Integral Field Spectroscopy with PMAS

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We present results from integral field spectroscopy with the Potsdam Multi-Aperture Spectrograph of the head of the HerbigHaro (HH) object HH 202 with a spatial sampling of 1×1 arcsec^2 . We have obtained maps of different emission lines, physical conditions — such as electron temperature and density — and ionic abundances from recombination and collisionally excited lines. We present the first map of the Balmer temperature and of the temperature fluctuation parameter, t^2. We have calculated the t^2 in the plane of the sky, which is substantially smaller than that determined along the line of sight. We have mapped the abundance discrepancy factor (ADF) of O^{2+}, ADF(O^{2+}) , finding its maximum value at the HH 202-S position. We have explored the relations between the ADF(O^{2+}) and the electron density, the Balmer and [O III] temperatures, the ionization degree as well as the t^2 parameter. We do not find clear correlations between these properties and the results seem to support that the ADF and t^2 are independent phenomena. We have found a weak negative correlation between the O^{2+} abundance determined from recombination lines and the temperature, which is the expected behaviour in an ionized nebula, hence it seems that there is no evidence for the presence of supermetal-rich droplets in H II regions.

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Prestellar and protostellar cores in Ori B9

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Context. Dense molecular cores are studied in order to gain insight into the processes causing clouds to fragment and form stars. In this study we concentrate on a region which is assumed to represent an early stage of clustered star formation in a giant molecular cloud.

Aims. The aims of this study are to determine the properties and spatial distribution of dense cores in the relatively quiescent Ori B9 cloud, and to estimate their ages and dynamical timescales.

Methods. The cloud was mapped in the 870 μm continuum with APEX/LABOCA, and selected positions were observed in the lines of N_2H^+ and N_2D^+ using IRAM-30m. These were used together with our previous H_2D^+ observations to derive the degree of deuteration and some other chemical characteristics. Moreover, archival far-infrared Spitzer/MIPS maps were combined with the LABOCA map to distinguish between prestellar and protostellar cores, and to estimate the evolutionary stages of protostars.

Results. Twelve dense cores were detected at 870 μm continuum in the Ori B9 cloud. The submm cores constitute $\sim 4\%$ of the total mass of the Ori B9 region. There is an equal number of prestellar and protostellar cores. Two of the submm sources, which we call SMM 3 and SMM 4, are previously unknown Class 0 candidates. There is a high likelyhood that the core masses and mutual separations represent the same distributions as observed in other parts of Orion. We found a moderate degree of deuteration in N_2H^+ $(0.03 - 0.04)$. There is, furthermore, evidence for N_2H^+ depletion in the core SMM 4. These features suggest the cores have reached chemical maturity. We derive a relatively high degree of ionization ($\sim 10^{-7}$) in the clump associated with IRAS 05405-0117. The ambipolar diffusion timescales for two of the cores are $\sim 70 - 100$ times longer than the free-fall time.

Conclusions. The distribution and masses of dense cores in Ori B9 are similar to those observed in more active regions in Orion, where the statistical core properties have been explained by turbulent fragmentation. The 50/50 proportions of prestellar and protostellar cores suggest that duration of the prestellar phase is comparable to the free-fall time. This timescale can be questioned, however, on the basis of chemical data on the IRAS 05405-0117 region. A possible

explanation is that this survey samples only the densest, i.e., dynamically most advanced cores.

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Limits on initial mass segregation in young clusters

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Mass segregation is observed in many star clusters, including several that are less than a few Myr old. Timescale arguments are frequently used to argue that these clusters must be displaying primordial segregation, because they are too young to be dynamically relaxed. Looking at this argument from the other side, the youth of these clusters and the limited time available to mix spatially distinct populations of stars can provide constraints on the amount of initial segregation that is consistent with current observations. We present n-body experiments testing this idea, and discuss the implications of our results for theories of star formation. For system ages less than a few crossing times, we show that star formation scenarios predicting general primordial mass segregation are inconsistent with observed segregation levels.

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High Resolution Spectroscopy of [NeII] Emission from AA Tau and GM Aur

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We present high resolution (R=80,000) spectroscopy of [NeII] emission from two young stars, GM Aur and AA Tau, which have moderate to high inclinations. The emission from both sources appears centered near the stellar velocity and is broader than the [NeII] emission measured previously for the face-on disk system TW Hya. These properties are consistent with a disk origin for the [NeII] emission we detect, with disk rotation (rather than photoevaporation or turbulence in a hot disk atmosphere) playing the dominant role in the origin of the line width. In the non-face-on systems, the [NeII] emission is narrower than the CO fundamental emission from the same sources. If the widths of both diagnostics are dominated by Keplerian rotation, this suggests that the [NeII] emission arises from larger disk radii on average than does the CO emission. The equivalent width of the [NeII] emission we detect is less than that of the spectrally unresolved [NeII] feature in the *Spitzer* spectra of the same sources. Variability in the [NeII] emission or the mid-infrared continuum, a spatially extended [NeII] component, or a very (spectrally) broad [NeII] component might account for the difference in the equivalent widths.

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Edge-on Disk Around the T Tauri Star [MR81] Hα 17 NE in Corona Australis

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Aims. Using the speckle camera SHARP at the 3.5?m ESO NTT, Köhler and collaborators found an object ∼3.5 mag fainter in K only 1.3″ north-east of the T Tauri star [MR81] Hα17 in the Corona Australis (CrA) star-forming region, which could be either a brown dwarf or a T Tauri star with an edge-on disk. We attempt to study this faint object in detail.
Methods. We acquired deep VLT NACO near-infrared images at three epochs to determine, whether [MR81] Hα17 and the nearby faint object are comoving and to measure the infrared colors of both objects. We obtained optical and infrared spectra of both objects with the VLT using FORS and ISAAC, respectively, to determine spectral types and temperatures as well as ages and masses.
Results. The T Tauri star [MR81] Hα17 and the faint nearby object have a projected separation of 1369.58 mas, i.e. 178 AU at 130 pc. They share the same proper motion ($\sim 5\sigma$), so that they most certainly form a bound binary pair. The apparently fainter component [MR81] Hα17 NE has a spectral type of M2e, while the apparently brighter component [MR81] Hα17 SW, the previously known T Tauri star, has a spectral type of M4-5e. We can identify a nearly edge-on disk around [MR81] Hα17 NE by visual inspection, which has a diameter of at least 30 to 50 AU. We are able to detect strong emission lines in [MR81] Hα17 NE, which are almost certainly due to ongoing accretion. The NE object is detectable only by means of its scattered light.
Conclusions. If both objects are co-eval (23 Myr) and located at the same distance (∼130 pc as CrA), then the apparently fainter [MR81] Hα17 NE is more massive (primary) component with a nearly edge-on disk and the apparently brigther component [MR81] Hα17 SW is less massive (companion). Both are low-mass T Tauri stars with masses of ∼0.5 and 0.23 ± 0.05 $M_{\odot}$, respectively.

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Near Infrared polarimetry of a sample of YSOs

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Our goal is to study the physical properties of the circumstellar environment of young stellar objects (YSOs). In particular, the determination of the scattering mechanism can help to constrain the optical depth of the disk and/or envelope in the near infrared. We used the IAGPOL imaging polarimeter along with the CamIV infrared camera at the LNA observatory to obtain near infrared polarimetry measurements at the H band of a sample of optically visible YSOs, namely, eleven T Tauri stars and eight Herbig Ae/Be stars. An independent determination of the disk (or jet) orientation was obtained for twelve objects from the literature. The circumstellar optical depth could be then estimated comparing the integrated polarization position angle (PA) with the direction of the major axis of the disk

projected in the plane of the sky. In general, optically thin disks have polarization PA perpendicular to the disk plane. In contrast, optically thick disks produce polarization PA parallel to the disks. Among the T Tauri stars, three are consistent with optically thin disks (AS 353A, RY Tau and UY Aur) and five with optically thick disks (V536 Aql, DG Tau, DO Tau, HL Tau and LkHalpha 358). Among the Herbig Ae/Be stars, two stars show evidence of optically thin disk (Hen 3-1191 and VV Ser) and two of optically thick disks (PDS 453 and MWC 297). Our results seem consistent with the fact that optically thick disks at near infrared bands are associated more likely with younger YSOs. Marginal evidence of polarization reversal is found in RY Tau, RY Ori, WW Vul, and UY Aur. On the first three cases this feature can be associated to the UXOR phenomenon. Correlations with the IRAS colours and the spectral index yielded evidence of an evolutionary segregation with the disks tend to be optically thin when they are older.

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Evidence for an Edge-on Disk Around the Young Star MWC 778 from Infrared Imaging and Polarimetry

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MWC 778 is an unusual and little-studied young stellar object located in the IC 2144 nebula. Recent spectroscopy by Herbig & Vacca suggested the presence of an edge-on circumstellar disk around it. We present near-infrared adaptive optics imaging polarimetry and mid-infrared imaging which directly confirm the suspected nearly edge-on disk around MWC 778 ($i \sim 70°$-$80°$) plus reveal a more extensive envelope pierced by bipolar outflow cavities. In addition, our mid-infrared images and near-infrared polarization maps detect a spiral-shaped structure surrounding MWC 778, with arms that extend beyond $6''$ on either side of the star. Although MWC 778 has previously been classified as a Herbig Ae/Be star, the properties of its central source (including its spectral type) remain fairly uncertain. Herbig & Vacca suggested an F or G spectral type based on the presence of metallic absorption lines in the optical spectrum, which implies that MWC 778 may belong to the fairly rare class of intermediate-mass T Tauri Stars (IMTTSs) which are the evolutionary precursors to Herbig Ae/Be objects. Yet its integrated bolometric luminosity, $> \sim 750\ L_\odot$ (for an assumed distance of 1 kpc) is surprisingly high for an F or G spectral type, even for an IMTTS. We speculate on several possible explanations for this discrepancy, including its true distance being much closer than 1 kpc, the presence of a binary companion, and/or a nonstellar origin for the observed absorption lines.

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Universality of young cluster sequences

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Most stars do not form in isolation but as part of a cluster comprising anywhere between a few dozen to several million stars with stellar densities ranging from 0.01 to several 10^5 $M_\odot pc^{-3}$. The majority of these clusters dissolve within 20 Myr. The general assumption is that clusters are born more or less over this entire density range. A new analysis of cluster observations is presented. It demonstrates that, in fact, clustered star formation works under surprisingly tight constraints with respect to cluster size and density. The observed multitude of cluster densities simply results from snapshots of two sequences evolving in time along pre-defined tracks in the density-radius plane. This implies that the cluster size can actually be used to determine its age.

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Kinematic Signatures of Subvirial Initial Conditions in Young Clusters

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Motivated by kinematic observations of young embedded clusters, this paper explores possible kinematic signatures produced by asphericity and departures from initial virial equilibrium in these systems. Specifically, the kinematic quantity that is measured and calculated in this study is the distribution of the line-of-sight velocities as a function of position along the cluster. Although clusters are found within a wide range of sizes, we focus on the regime with stellar membership $N \sim 10^3$. The gravitational potential of these young clusters is dominated by the gas, and the geometry of the gas distribution is generalized to include axisymmetric (and triaxial) forms. With this loss of symmetry, the kinematic results thus depend on viewing angle. This work also considers the stars to begin their trajectories with subvirial speeds, as indicated by observations of core motions in such clusters. Our results determine the conditions necessary for the kinematic signature to display interesting structure, i.e., a non-spherical potential, a viewing angle that is not along one of the principal axes, and subvirial starting conditions. We characterize the effects on this signature due to projection angle, initial stellar velocities, cluster elongation, and star formation efficiency. Finally, we compare our theoretical results to recent kinematic observations of the Orion Nebula Cluster; we find that the observations can be explained provided that the cluster is non-spherical, starts with subvirial initial velocities, and is not viewed along a principal axis.

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Molecular clouds and clumps in the Boston University–Five College Radio Astronomy Observatory Galactic Ring Survey

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The Boston University–Five College Radio Astronomy Observatory (BU-FCRAO) Galactic Ring Survey (GRS) of ^{13}CO $J = 1 \rightarrow 0$ emission covers Galactic longitudes $18 < \ell < 55.7$ deg and Galactic latitudes $|b| \leq 1$ deg. Using the SEQUOIA array on the FCRAO 14m telescope, the GRS fully sampled the ^{13}CO Galactic emission (46 arcsec angular resolution on a 22 arcsec grid) and achieved a spectral resolution of 0.21 km s^{-1} . Because the GRS uses ^{13}CO, an optically thin tracer, rather than ^{12}CO, an optically thick tracer, the GRS allows a much better determination of column density and also a cleaner separation of velocity components along a line of sight. With this homogeneous, fully-sampled survey of ^{13}CO emission, we have identified 829 molecular clouds and 6124 clumps throughout the inner Galaxy using the CLUMPFIND algorithm. Here we present details of the catalog and a preliminary analysis of the properties of the molecular clouds and their clumps. Moreover, we compare clouds inside and outside of the 5 kpc ring and find that clouds within the ring typically have warmer temperatures, higher column densities, larger areas, and more clumps compared to clouds located outside the ring. This is expected if these clouds are actively forming stars. This catalog provides a useful tool for the study of molecular clouds and their embedded young stellar objects.

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Variability of the transitional T Tauri star T Chamaeleontis

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Context: It is renown that for solar mass stars planet formation begins in a circumstellar disc. The study of transitional objects presenting clear signs of evolution in their discs, like growth of dust particles and beginning of disc dispersal, is fundamental for understanding the processes governing dust grains coagulation and the onset of planet formation.
Aims: Our intent is to characterize the physical properties of T Chamaeleontis, a transitional T Tauri star showing UX Ori-type variability, and of its associated disc, and probe possible effects of disc clearing processes.
Methods: Different spectral diagnostics were examined, based on a rich collection of optical high- and low-resolution spectra. The cross-correlation technique was used to determine radial and projected rotational velocities; shape changes of photospheric lines were analysed via bisector-method applied to the cross-correlation profile; equivalent widths of the Li I λ6708 Å photospheric absorption and of the most prominent emission lines (e.g. Hα, Hβ and [OI] 6300 Å) were measured. Variability of the main emission features was inspected through line-profile correlation matrices. Available optical and near-infrared photometry combined with infrared data from public catalogues was used to construct the spectral energy distribution (SED) and infer basic stellar and disc properties.
Results: Remarkable variability on time-scale of days in the main emission lines, with Hα changing from pure emission to nearly photospheric absorption, is correlated with variations in visual extinction of over three magnitudes, while the photospheric absorption spectrum shows no major changes. The strength of emission in Hα and Hβ is highly variable and well correlated with that of the [OI] lines. The structure of the Hα line-profile also varies on daily time-span, while the absence of continuum veiling suggests very low or no mass accretion. Variations up to nearly 10 km s^{-1} in the radial velocity of the star are measured on analogous time-scale, but with no apparent periodicity. SED modelling confirms the existence of a gap in the disc.
Conclusions: Variable circumstellar extinction is pointed out as responsible for the conspicuous variations observed in the stellar continuum flux and for concomitant changes in the emission features by contrast effect. Clumpy structures, incorporating large dust grains and orbiting the star within a few tenths of AU, obscure episodically the star and, eventually, part of the inner circumstellar zone, while the bulk of the hydrogen lines emitting zone and outer low-density wind region traced by the [OI] remain unaffected. Coherently with this scenario, the detected radial velocity changes are also explainable in terms of clumpy materials transiting and partially obscuring the star.

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Fragmentation in Molecular Clouds and its connection to the IMF

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We present an analysis of star-forming gas cores in an SPH simulation of a Giant Molecular Cloud. We identify cores using their deep potential wells. This yields a smoother distribution with clearer boundaries than density. Additionally, this gives an indication of future collapse, as bound potential cores (p-cores) represent the earliest stages of fragmentation in molecular clouds. We find that the mass function of the p-cores resembles the stellar IMF and the observed clump mass function, although p-core masses (~ 0.7 M$_\odot$) are smaller than typical density clumps. The bound p-cores are generally subsonic, have internal substructure, and are only quasi-spherical. We see no evidence of massive bound cores supported by turbulence. We trace the evolution of the p-cores forward in time, and investigate the connection between the original p-core mass and the stellar mass that formed from it. We find that there is a poor correlation, with considerable scatter suggesting accretion onto the core is dependent on more factors than just the initial core mass. During the accretion process the p-cores accrete from beyond the region first bound, highlighting the importance of the core environment to its subsequent evolution.

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The X-ray emission from Z CMa during an FUor-like outburst and the detection of its X-ray jet

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Accretion shocks have been recognized as important X-ray emission mechanism for pre-main sequence stars. Yet the X-ray properties of FUor outbursts, events that are caused by violent accretion, have been given little attention. We have observed the FUor object Z CMa during optical outburst and quiescence with *Chandra*. No significant changes in X-ray brightness and spectral shape are found, suggesting that the X-ray emission is of coronal nature. Due to the binary nature of Z CMa the origin of the X-ray source is ambiguous. However, the moderate hydrogen column density derived from our data makes it unlikely that the embedded primary star is the X-ray source. The secondary star, which is the FUor object, is thus responsible for both the X-ray emission and the presently ongoing accretion outburst, which seem however to be unrelated phenomena. The secondary is also known to drive a large outflow and jet, that we detect here for the first time in X-rays. The distance of the X-ray emitting outflow source to the central star is higher than in jets of low-mass stars.

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VLBA determination of the distance to nearby star-forming regions III. HP Tau/G2 and the three-dimensional structure of Taurus

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Using multi-epoch Very Long Baseline Array observations, we have measured the trigonometric parallax of the weak-line T Tauri star HP Tau/G2 in Taurus. The best fit yields a distance of 161.2 ± 0.9 pc, suggesting that the eastern portion of Taurus (where HP Tau/G2 is located) corresponds to the far side of the complex. Previous VLBA observations have shown that T Tau, to the South of the complex, is at an intermediate distance of about 147 pc, whereas the region around L1495 corresponds to the near side at roughly 130 pc. Our observations of only four sources are still too coarse to enable a reliable determination of the three-dimensional structure of the entire Taurus star-forming complex. They do demonstrate, however, that VLBA observations of multiple sources in a given star-forming region have the potential not only to provide a very accurate estimate of its mean distance, but also to reveal its internal structure. The proper motion measurements obtained simultaneously with the parallax allowed us to study the kinematics of the young stars in Taurus. Combining the four observations available so far, we estimate the peculiar velocity of Taurus to be about 10.6 km s^{-1} almost completely in a direction parallel to the Galactic plane. Using our improved distance measurement, we have refined the determination of the position on the HR diagram of HP Tau/G2, and of two other members of the HP Tau group (HP Tau itself and HP Tau/G3). Most pre-main sequence evolutionary models predict significantly discrepant ages (by 5 Myr) for those three stars –expected to be coeval. Only in the models of Palla & Stahler (1999) do they fall on a single isochrone (at 3 Myr).

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An Outflow Origin of the [Ne II] Emission in the T Tauri Triplet

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Context. The 12.81μm [Ne II] line has recently gained interest as a potential tracer of gas in the tenuous surface layers of circumstellar disks and in outflow-related shocks. Evidence has been found for a proportionality between [Ne II] emission and X-ray luminosity, supporting the hypothesis that X-rays are responsible for the required ionization and heating of the gas. Alternatively, ionization and heating by EUV photons and in J-type (dissociative) shocks has been proposed.
Aims. The T Tau multiple system harbors three stars with circumstellar disks, at least one strong X-ray source (T Tau N), and regions of shocked gas in the immediate vicinity. ISO and Spitzer spectra revealed remarkably strong [Ne II] emission, but because of insufficient spatial and spectral resolution those observations could neither pinpoint *where* in the system the [Ne II] emission arises, nor identify the emission mechanism. We aim to clarify this by observing the system with enough resolution to spatially separate the various components and spectrally resolve the line emission.
Methods. We performed high-resolution (R = 30 000) spectroscopy of the T Tau triplet at $\sim$0.4$''$ spatial resolution with VISIR at the VLT early February 2008. We spatially separated T Tau N from the southern close binary T Tau S, as well as the structures of shocked gas surrounding the stars. The individual southern components Sa and Sb remained spatially unresolved in our observations.
Results. The dominant component of [Ne II] emission is centered on T Tau S and has a spatial extent of $FWHM \sim 1.1''$ in a Gaussian fit. We detect spatially extended red-shifted emission NW of the system and fainter blue-shifted emission to the SE, which we associate with the N-S outflow from T Tau S. Only a small fraction of the [Ne II] emission appears directly related to the X-ray bright northern component. Shocks may account for a substantial and possibly dominant fraction of the observed [Ne II] emission. We estimate the total [Ne II] flux to be 23 $\pm$ 6 $\times 10^{-16}$ Wm^{-2}, in good agreement with the values measured by ISO in late 1997 and Spitzer in early 2004.
Conclusions. Our observations show that outflows rather than the disk surface may dominate the observed [Ne II] emission in stars with strong outflow activity. We propose [Ne II] emission in jets as a major factor causing the observed large scatter in the L_X vs. $L_{[\mathrm{NeII}]}$ relation. We argue that T Tau S is the driving source of the T Tau "NW-blob".

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A Chandra Study of the Rosette Star-Forming Complex. II. Clusters in the Rosette Molecular Cloud

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We explore here the young stellar populations in the Rosette Molecular Cloud (RMC) region with high spatial resolution X-ray images from the *Chandra X-ray Observatory*, which are effective in locating weak-lined T Tauri stars as well as disk-bearing young stars. A total of 395 X-ray point sources are detected, 299 of which (76%) have an optical or near-infrared (NIR) counterpart identified from deep FLAMINGOS images. From X-ray and mass sensitivity limits, we infer a total population of $\sim$ 1700 young stars in the survey region. Based on smoothed stellar surface density maps, we investigate the spatial distribution of the X-ray sources and define three distinctive structures and substructures

within them. Structures B and C are associated with previously known embedded IR clusters, while structure A is a new X-ray-identified unobscured cluster. A high mass protostar RMCX #89 = IRAS 06306+0437 and its associated sparse cluster is studied. The different subregions are not coeval but do not show a simple spatial-age pattern. Disk fractions vary between subregions and are generally $\lesssim$20% of the total stellar population inferred from the X-ray survey. The data are consistent with speculations that triggered star formation around the HII region is present in the RMC, but do not support a simple sequential triggering process through the cloud interior. While a significant fraction of young stars are located in a distributed population throughout the RMC region, it is not clear they originated in clustered environments.

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A Spectroscopic Study of Young Stellar Objects in the Serpens Cloud Core and NGC 1333

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We present spectral observations of 130 young stellar objects (YSOs) in the Serpens Cloud Core and NGC 1333 embedded clusters. The observations consist of near-IR spectra in the H and K-bands, from SpeX on the IRTF and far-red spectra (6000 - 9000 Å) from Hectospec on the MMT. These YSOs were identified in previous *Spitzer* and *Chandra* observations, and the evolutionary classes of the YSOs were determined from the *Spitzer* mid-IR photometry. With these spectra, we search for corroborating evidence for the pre-main sequence nature of the objects, study the properties of the detected emission lines as a function of evolutionary class, and obtain spectral types for the observed YSOs. The temperature implied by the spectral types are combined with luminosities determined from the near-IR photometry to construct HR diagrams for the clusters. By comparing the positions of the YSOs in the HR diagrams with the pre-main sequence tracks of Baraffe (1998), we determine ages of the embedded sources and study the relative ages of the YSOs with and without optically thick circumstellar disks. The apparent isochronal ages of the YSOs in both clusters range from less than 1 Myr to 10 Myr, with most objects below 3 Myr. The observed distribution of ages for the Class II and Class III objects are statistically indistinguishable. We examine the spatial distribution and extinction of the YSOs as a function of their isochronal ages. We find the sources < 3 Myr to be concentrated in the molecular cloud gas while the older sources are spatially dispersed and are not deeply embedded. Nonetheless, the sources with isochronal ages > 3 Myr show all the characteristics of young stellar objects in their spectra, their IR spectral energy distributions, and their X-ray emission; we find no evidence that they are contaminating background giants or foreground dwarfs. However, we find no corresponding decrease in the fraction of sources with infrared excess with isochronal age; this suggests that the older isochronal ages may not measure the true age of the > 3 Myr YSOs. Thus, the nature of the apparently older sources and their implications for cluster formation remain unresolved.

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A rotating molecular jet in Orion

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We present CO(2-1), ^{13}CO(2-1), CO(6-5), CO(7-6), and SO(6_5-5_4) line observations made with the *IRAM 30 m* and Atacama Pathfinder Experiment (*APEX*) radiotelescopes and the *Submillimeter Array (SMA)* toward the highly collimated (11°) and extended ($\sim 2'$) southwest lobe of the bipolar outflow *Ori-S6* located in the Orion South region.

We report, for all these lines, the detection of velocity asymmetries about the flow axis, with velocity differences roughly on the order of 1 km s^{-1} over distances of about 5000 AU, 4 km s^{-1} over distances of about 2000 AU, and close to the source of between 7 and 11 km s^{-1} over smaller scales of about 1000 AU. The redshifted gas velocities are located to the southeast of the outflow's axis, the blueshifted ones to the northwest. We interpret these velocity differences as a signature of rotation but also discuss some alternatives which we recognize as unlikely in view of the asymmetries' large downstream continuation. In particular, any straightforward interpretation by an ambient velocity gradient does not seem viable. This rotation across the *Ori-S6* outflow is observed out to (projected) distances beyond 2.5×10^4 AU from the flow's presumed origin. Comparison of our large-scale (single dish) and small-scale (SMA) observations suggests the rotational velocity to decline not faster than 1/R with distance R from the axis; in the innermost few arcsecs an increase of rotational velocity with R is even indicated. The magnetic field lines threading the inner rotating CO shell may well be anchored in a disk of radius ~ 50 AU; the field lines further out need a more extended rotating base. Our high angular resolution SMA observations also suggest this outflow to be energized by the compact millimeter radio source 139-409, a circumbinary flattened ring that is located in a small cluster of very young stars associated with the extended and bright source FIR4.

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A ring/disk/outflow system associated with W51 North: a very massive star in the making

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Sensitive and high angular resolution ($\sim 0.4''$) $SO_2[22_{2,20} \rightarrow 22_{1,21}]$ and SiO[5→4] line and 1.3 and 7 mm continuum observations made with the Submillimeter Array (SMA) and the Very Large Array (VLA) towards the young massive cluster W51 IRS2 are presented. We report the presence of a large (of about 3000 AU) and massive (40 $M_\odot$) dusty circumstellar disk and a hot gas molecular ring around a high-mass protostar or a compact small stellar system associated with W51 North. The simultaneous observations of the silicon monoxide molecule, an outflow gas tracer, further revealed a massive (200 $M_\odot$) and collimated ($\sim 14^\circ$) outflow nearly perpendicular to the dusty and molecular structures suggesting thus the presence of a single very massive protostar with a bolometric luminosity of more than 10^5 $L_\odot$. A molecular hybrid LTE model of a Keplerian and infalling ring with an inner cavity and a central stellar mass of more than 60 $M_\odot$ agrees well with the $SO_2[22_{2,20} \rightarrow 22_{1,21}]$ line observations. Finally, these results suggest that mechanisms, such as mergers of low- and intermediate- mass stars, might be not necessary for forming very massive stars.

Accepted by Astrophysical Journal

http://arXiv.org/abs/0904.0325

Lectureships/Senior Lectureships/Associate Professorships in Star Formation or Extra-solar Planets

Applications are invited for up to two lectureships/associate professorships in a further expansion of the Astrophysics Group in the School of Physics. This Group currently comprises 8 permanent academic staff, with more than 20 post-doctoral researchers and PhD students. 95% of research from the School of Physics has been classified as being of international quality in the Research Assessment Exercise (RAE).

Our current research programme consists of both observational and theoretical studies of galactic star formation and extra-solar planets, and thus we seek applicants directly in these areas, or in a related field. We particularly encourage applications from candidates with ongoing active observational programmes at optical/ infrared and/or (sub-) millimetre wavelengths, with the goal of exploiting major future facilities including ALMA, JWST, and E-ELT.

The successful applicants will have full competitive access to facilities available to UK astronomers, including the VLT and Gemini, as well as high-performance computing resources at Exeter. The Group leads CONSTELLATION, the EC-funded Research Training Network of 12 European teams working on the origin of stellar masses, and is also involved in CoRoT and eSTAR.

Applicants will have a proven world-class research track record, an appropriate first degree and a PhD. They will be able to demonstrate an independent research programme, which will strengthen and complement the existing team at the University. Applicants will have a strong record in attracting research funding, or demonstrable potential to attract such funding as well as enthusiasm for delivering undergraduate programmes.

Appointments at a more senior level will be considered for applicants of appropriate experience, details of which are contained within our application pack.

Appointments will be made within the following salary range: Associate Professor £50,816 – £53,650 pa with access to further contribution points rising to £64,060; Senior Lecturer £38,757 – £44,930 pa with access to further contribution points rising to £52,086; Lecturer £31,513 – £35,469 pa with access to further contribution points rising to £38,757.

Informal enquiries may be made to Professor Matthew Bate (telephone: +44 (0)1392 725 513; email: mbate@astro.ex.ac.uk).

Application packs are available from http://www.exeter.ac.uk/working/prospective/vacancies/ or by contacting hradmin@exeter.ac.uk

Applications should quote reference E06. The closing date for completed applications is 12 noon on 1 June 2009.

The University of Exeter is an equal opportunity employer and promotes diversity in its workforce and, whilst all applicants will be judged on merit alone, is particularly keen to consider applications from groups currently underrepresented in the workforce.

Post-doctoral Position on Star and Planet Formation at ETH Zurich

A post doctoral position is available in the growing group on star and planet formation at the Institute of Astronomy at ETH Zurich. Work on star formation has started at ETH Zurich in the frame of hardware and software development for HIFI on Herschel, as well as chemical modeling of molecular gas irradiated by protostellar FUV and X-rays (Arnold Benz, Pascal Staeuber et al.). On a different path, Hansmartin Schmid is developing hardware and expertise to measure exoplanetary polarization at the VLT. Recently, Michael Meyer has arrived and started to expand the activities with a focus on planet formation. In the coming years, these developments are expected to grow towards a sizeable center on star and planet formation.

Following the Herschel developments, the group participates in several guaranteed time and open time key programs on the Herschel Space Observatory. In the WISH OT Key Program (Water In Star forming regions with Herschel, http://www.strw.leidenuniv.nl/WISH/) the group is leading the sub-program on Radiation Diagnostics (FUV and

X-ray irradiation by protostars). The group also participates in WADI (warm and dense ISM, http://www.ph1.uni-koeln.de/hifiwiki/index.php/) and HOP (Herschel Oxygen Project, http://adsabs.harvard.edu/abs/2009AAS...21336005G) and plans several other projects.

The applicant is expected to participate in the exploitation of these programs. Some preparatory works toward the targeted sources (JCMT, IRAM 30m and SMA observations, and modeling) which are in progress will also be part of the proposed work. In addition, the candidate will develop analytic and theoretical skills toward the interpretation of the data.

Candidates must obtain a Ph.D. degree prior to the starting date and have a strong background in star formation and interstellar medium science. The appointment is for two years (until mid 2011) and may be extended to a third year. Experience in submillimeter observations and radiative transfer codes applied to molecular lines will be an asset. Salaries (total) will be approximately CHF 80,000 - 90,000 (about Euro 54,000 - 61,000), depending on experience.

Applicants should send a CV, a list of publications, a brief description of past and proposed research (maximum 3 pages each), and should arrange for two letters of recommendation to be sent to Prof. Dr. Arnold Benz, Institute of Astronomy, ETH, CH-8092 Zurich, Switzerland. Applications may be submitted electronically to benz@astro.phys.ethz.ch. Consideration of completed applications will begin immediately and will continue until a suitable candidate is identified.

Post-doctoral position in the study of Star Formation with Herschel (Laboratoire d'Astrophysique de Bordeaux)

A post-doctoral position is available in the Star Formation group at the Laboratoire d'Astrophysique de Bordeaux (LAB, OASU, Bordeaux), in the framework of the group activities for the Herschel mission. This fellowship is funded by the Université Bordeaux 1.

The LAB is an astronomy institute located in the suburbs of Bordeaux, in the south-west of France (3 hrs from Paris by fast train). In addition to research activities in star formation, interstellar medium, proto-planetary disk, astrometry and planetology (including exoplanets and exobiology), the Institute participates in the technical development and commissioning of major systems in space projects (Herschel) and in the large ground-based project ALMA. Recently, together with the CESR/Toulouse, the LAB has developed and produced the high resolution spectrometer (HRS) of HIFI aboard Herschel. The "star formation" group has a long experience in the interstellar medium studies both in our Galaxy and in nearby galaxies, with a strong experience in radio/mm techniques and observations mostly of spectral lines. Following the Herschel developments, the group participates in several key programs on Herschel, and is leading the sub-program WISH (Water In Star forming regions with Herschel, http://www.strw.leidenuniv.nl/WISH/) on IR-quiet massive protostars (Herpin et al.).

The applicant is expected to participate in the exploitation of this sub-program on massive protostars. Some preparatory works toward the targeted sources (IRAM 30m telescope observations, and modeling) which are in progress will also be part of the proposed work. In addition the candidate will develop analytic and theoretical skills toward the interpretation of the data. The project is also supported by the ANR (Agence Nationale de la Recherche) research program PROBeS (http://www.obs.u-bordeaux1.fr/radio/SBontemps/probes/).

The position is available for an initial period of one year (to begin before end of 2009), and will most certainly be extended to a second year starting before the end of 2009. The gross (net) yearly salary will be 30200 (24700) euros. Applicants should have a PhD degree and a strong background in star formation and interstellar medium science. Experience in spatial missions, submillimeter observations, and radiative transfert codes applied to molecular lines will be an asset.

The applicants should send (by mail) a Curriculum Vitae, a statement of research interests and a list of publications. They should also arrange for three letters of references to be sent independently at the address below:

Mr Fabrice Herpin, LAB-OASU, B.P.89, 33271 Floirac, France

phone: +33 (0)5 57 77 61 57; fax: +33 (0)5 57 77 61 55
E-mail: herpin@obs.u-bordeaux1.fr (other contact: Sylvain Bontemps bontemps@obs.u-bordeaux1.fr)

The deadline for submission of applications is May 1st 2009. Candidates may be invited for an interview.

Postdoctoral Research Scientist with Herschel/PACS (GASPS)

The Kapteyn Astronomical Institute in Groningen, The Netherlands, invites applications for a postdoctoral research scientist.

The successful candidate will mainly work with Dr. Inga Kamp on Herschel/PACS data obtained from the Open Time Key Program GASPS ("Gas Evolution in Protoplanetary Systems", PI: Dent). He or she is expected to actively participate in the PACS data analysis and to carry out research on protoplanetary disks. The candidate will be given the opportunity to pursue independent astrophysical research and to collaborate with other Herschel Key Programs.

The postdoctoral research scientist will encounter a stimulating scientific environment being in the same building as SRON, the PI institute and Instrument Control Center for the HIFI instrument. Staff from the Kapteyn Astronomical Institute and SRON are involved in many galactic and extragalactic Herschel Key Programs such as WISH ("Water In Star-forming regions with Herschel", PI: van Dishoeck), HS3F ("HIFI Spectral Surveys of Star Forming Regions", PI: Ceccarelli), WADI ("The warm and dense ISM", PI: Ossenkopf), HEXOS ("Herschel/HIFI Observations of EXtraOrdinary Sources: The Orion and Sagittarius B2 Starforming Regions", PI: Bergin), HERCULES ("A Herschel survey of molecular lines in (U)LIRGs: physical conditions, the nature of the power source, and a benchmark for high-z observations", PI: van der Werf). Thus, there is an exciting range of opportunities to establish new collaborations.

Interested applicants should have a PhD in astrophysics or physics and proven experience in far-infrared observations, including analysis of line data and good knowledge of (molecular) spectroscopy. The ability to work in an international team and a good command of the English language are essential. Experience with the Herschel/PACS instrument and knowledge of the Python/Jython scripting language are considered an asset.

The University of Groningen offers a salary dependent on qualifications and work experience up to a maximum of EUR 4374 (scale 11) gross per month for a full-time position. The duration of the contract is 2 years with a possible extension to a third year.

Interested candidates should send application material, including a curriculum vitae, a brief statement of past research and future plans, and arrange for three letters of reference to be sent to Dr. Inga Kamp, Kapteyn Astronomical Institute, P.O. Box 800, 9700 AV Groningen, The Netherlands (E-mail address: kamp@astro.rug.nl). Selection of candidates will start June 2, 2009, and will continue until the position is filled.

Moving ... ??

If you move or your e-mail address changes, please send the editor your new address. If the Newsletter bounces back from an address for three consecutive months, the address is deleted from the mailing list.

ASTROCAM School: "Young Stellar Objects: from cool stars to exoplanets"

ASTROCAM, the Astrophysical Network of the Comunidad de Madrid (http://www.astrocam.es) formed by researchers from CSIC, UCM, UAM, ESAC, UPM and UEM, with the participation of the local companies DEIMOS, GMV, SERCO, VEGA and INSA, is pleased to announce the organisation of an international School on "Young Stellar Objects: from cool stars to exoplanets" to be held at the Real Centro Universitario Escorial-Maria Cristina, sited at San Lorenzo de El Escorial, Madrid, Spain, on 29 June - 3 July 2009.

The school intends to offer an introduction to the theme of young stellar and substellar objects and will include lectures on young stars and angular momentum evolution, young stars in associations and moving groups, brown dwarfs and isolated planetary mass objects, and exoplanets of young stars. The lectures will cover theoretical and observational topics including practical exercises on real data.

Pre-registration: The number of attendants will be limited to 30 Master and PhD students and recent post-docs. All the interested students should fill the pre-registration form (deadline 30 April 2009). Positions will be filled priorizing Master and PhD students and on the basis of "first arrived first served" approach. The final list of accepted students will be published at the beginning of May.

Financial support: There is no registration-fee. The accommodation expenses for all the students at the Real Centro Universitario Escorial-Maria Cristina will be covered by the organization of the school. No financial support is available for the travel expenses.

Scientific Organising Committee: D. Montes (chair), J.A. Caballero, E. de Castro, M. Cornide, M.J. Fernández-Figueroa, J. López Santiago (UCM, Fis.), A.I. Gómez de Castro (UCM, Mat.), E.L. Martín (IAC), B. Montesinos (LAEX-CAB). Local Organising Committee: J.A. Caballero (chair), J. López Santiago, R.M. Martínez Arnáiz, D. Montes (UCM, Fis.), M. Castellanos (ASTROCAM Manager).

Detailed information of the School including preliminary program and pre-registration instructions can be found in this web page: **http://www.astrocam.es/school09/**

From Stars to Galaxies: Connecting our understanding of star and galaxy formation

1st Announcement University of Florida, Gainesville Wed. 7th - Sat. 10th April 2010

Gas and star formation are being resolved in large samples of nearby galaxies, and this trend will accelerate with the advent of the next generation of telescopes. Many large surveys of the Galactic interstellar medium and young stellar population are complete, in progress orbeing planned. At the same time, many open questions remain: What are the physical drivers of star formation, including what sets its rate and efficiency? What sets the initial mass function of stars and clusters? What are the timescales for giant molecular cloud (GMC) formation and evolution? How does the star formation process depend on environment? How do massive stars form and how do they influence their natal protocluster, GMC and galaxy?

This conference aims to bring together researchers studying star formation on local and extragalactic scales to help them better understand the recent observational advances in each of these fields and make connections between the physical mechanisms responsible for star formation and galaxy formation and evolution. We expect the discussions to help motivate future observational tests of theoretical ideas.

The conference will be held at the University of Florida in Gainesville, located within 2 hours drive from Orlando, Tampa, Jacksonville, St. Augustine, and the Atlantic and Gulf Coasts. The weather in April is generally dry, sunny and warm. For more information and to show your interest in attending by pre-registration please visit

http://conference.astro.ufl.edu/STARSTOGALAXIES/

Jonathan Tan
on behalf of the LOC and SOC

From Circumstellar Disks to Planetary Systems

November 3-6 2009, Garching

An ESO-MPE-MPA-USM workshop

The study of circumstellar disks and the formation of planetary systems is experiencing enormous progress in recent years. Thanks to wide-field imaging surveys with the Spitzer Space Telescope and ground-based near-infrared and submillimeter telescopes, unbiased samples of thousands of young stellar objects with disks down to 0.01 LSun (brown dwarf regime) have been identified in the nearest molecular clouds. High angular resolution observations provide key insight into disk structure and evolution. New and exciting developments range from the characterization of disks in the embedded phase to the development of gaps and holes in a new set of transitional disks, and the direct detection of (proto)planets around pre-main sequence stars.

The goals of the workshop will be to review the status of the field and to discuss transformational programs that will be made possible with upcoming facilities. We propose to bring together the communities working with ground based infrared large telescopes and interferometers, with space observatories and millimeter interferometers as well as theorists.

Main science topics include

* Properties of circumstellar disks across the stellar mass spectrum

* Evolution of protoplanetary disks

* Chemistry in disks (gas phase and solids)

* Initial phases of planet formation

* Young (proto)planets

* Planet-disk interactions

* Debris disks

For more information and scientific rationale, see **http://www.eso.org/sci/meetings/disks2009/index.html**

Important dates:

- Closing dates for abstracts: July 1 2009

- Closing date for registration: September 10 2009

The Star Formation Newsletter is a vehicle for fast distribution of information of interest for astronomers working on star formation and molecular clouds. You can submit material for the following sections: *Abstracts of recently accepted papers* (only for papers sent to refereed journals), *Abstracts of recently accepted major reviews* (not standard conference contributions), *Dissertation Abstracts* (presenting abstracts of new Ph.D dissertations), *Meetings* (announcing meetings broadly of interest to the star and planet formation and early solar system community), *New Jobs* (advertising jobs specifically aimed towards persons within the areas of the Newsletter), and *Short Announcements* (where you can inform or request information from the community).

Latex macros for submitting abstracts and dissertation abstracts (by e-mail to reipurth@ifa.hawaii.edu) are appended to each issue of the newsletter. You can also submit via the Newsletter web interface at http://www2.ifa.hawaii.edu/star-formation/index.cfm .

The Star Formation Newsletter is available on the World Wide Web at http://www.ifa.hawaii.edu/users/reipurth/newsletter.htm.