The Star Clusters Young & Old Newsletter

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EDITORIAL

Dear subscribers,

SCYON issue 59 is going to be a special one. GAIA has been successfully launched last December 19, and we all know how much high quality data the satellite will provide for star cluster studies. In preparation for GAIA, a complementary spectroscopic survey already started beginning of 2012, the GAIA-ESO survey. We are extremely pleased to have in the current SCYON issue the first GAIA-ESO paper from this survey on star clusters, led by Paolo Donati, and focused on the Galactic star cluster Trumpler 20. Many other studies will follow this one in the coming months.

This new issue contains 20 refereed and proceedings abstracts, announcements of upcoming conferences, the announcement of a discussion forum, and Job opportunities. We look forward to have everybody's help to disseminate this Newsletter everywhere!

We kindly remind all SCYON contributors that submissions are possible all the time, and not only after the reminder! Please visit our webpage frequently for news and abstracts, which reach us between the SCYON issues!

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About the Newsletter

SCYON publishes abstracts from any area in astronomy, which are relevant to research on star clusters. We welcome all kinds of submitted contributions (abstracts of refereed papers or conference proceedings, PhD summaries, and general announcements of e.g. conferences, databases, tools, etc.)

The mission of this newsletter is to help all the researchers in the field with a quick and efficient link to the scientific activity in the field. We encourage everybody to contribute to the new releases! New abstracts can be submitted *at any time* using the **webform** on the SCYON homepage.

http://www.univie.ac.at/scyon

Galactic Open Clusters

Chemical Abundance analysis of the old, rich open cluster Tr 20

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Trumpler 20 is an open cluster located at low Galactic longitude, just beyond the great Carina spiral arm, and whose metallicity and fundamental parameters were very poorly known until now. As it is most likely a rare example of an old, rich open cluster – possibly a twin of NGC 7789 – it is useful to characterize it. To this end, we determine here the abundance of several elements and their ratios in a sample of stars in the clump of Trumpler 20. The primary goal is to measure Trumpler 20 metallicity, so far very poorly constrained, and revise the cluster's fundamental parameters. We present high-resolution spectroscopy of eight clump stars. Based on their radial velocities, we identify six bona fide cluster members, and for five of them (the sixth being a fast rotator) we perform a detailed abundance analysis. We find that Trumpler 20 is slightly more metal-rich than the Sun, having [Fe/H]=+0.09±0.10. The abundance ratios of alpha-elements are generally solar. In line with recent studies of clusters as old as Trumpler 20, Ba is overabundant compared to the Sun. Our analysis of the iron-peak elements (Cr and Ni) does not reveal anything anomalous. Based on these results, we re-estimate the cluster age to be $1.5^{+0.2}_{-0.1}$ Gyr. Its distance to the Galactic centre turns out to be 7.3 kpc. With this distance and metallicity, Trumpler 20 fits fairly well in the metallicity gradient for the galactic inner disc. With this new study, the characterization of Trumpler 20 is now on much more solid ground. Further studies should focus on the estimate of the binary fraction and on its main sequence membership.

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NGC 1817, NGC 2141 and Berkeley 81: three BOCCE clusters of intermediate age

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In this paper we analyse the evolutionary status of three open clusters: NGC 1817, NGC 2141 and Berkeley 81. They are all of intermediate age, two are located in the Galactic anticentre direction while the third one is located in the Galactic Centre direction. All of them were observed with Large Binocular Camera at Large Binocular Telescope using the Bessel B, V and I filters. The cluster parameters have been obtained using the synthetic colour-magnitude diagram (CMD) method, i.e. the direct comparison of the observational CMDs with a library of synthetic CMDs generated with different evolutionary sets (Padova, FRANEC and FST). This analysis shows that NGC 1817 has subsolar metallicity, age between 0.8 and 1.2 Gyr, reddening $E(B-V)$ in the range 0.21 and 0.34 and distance modulus $(m-M)_0$ of about 10.9; NGC 2141 is older, with age in the range 1.25 and 1.9 Gyr, $E(B-V)$ between 0.36 and 0.45, $(m-M)_0$ between 11.95 and 12.21 and subsolar metallicity; Berkeley 81 has metallicity about solar, with age between 0.75 and 1.0 Gyr, has reddening $E(B-V)\sim$0.90 and distance modulus $(m-M)_0\sim$12.4. Exploiting the large field of view of the instrument we derive the structure parameters for NGC 2141 and Berkeley 81 by fitting a King profile to the estimated density

profile. Combining this information with the synthetic CMD technique we estimate a lower limit for the cluster total mass for these two systems.

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http://cdsads.u-strasbg.fr/abs/2014MNRAS.437.1241D

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The Gaia-ESO Survey: Reevaluation of the parameters of the open cluster Trumpler 20 using photometry and spectroscopy

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Trumpler 20 is an old open cluster (OC) located toward the Galactic centre, at about 3 kpc from the Sun and ∼7 kpc from the Galactic centre. Its position makes this cluster particularly interesting in the framework of the chemical properties of the Galactic disc because very few old OCs reside in the inner part of the disc. For this reason it has been selected as a cluster target of the Gaia-ESO Survey, and spectra of many stars in the main-sequence and red-clump phases are now available. Moreover, although it has been studied by several authors in the past, no consensus on the evolutionary status of Tr 20 has been reached. The heavy contamination of field stars (the line of sight of Tr 20 crosses the Carina spiral arm) complicates a correct interpretation. Another interesting aspect of the cluster is that it shows a broadened main-sequence turn-off and a prominent and extended red-clump, characteristics that are not easily explained by classical evolutionary models. Exploiting both spectroscopic information from the Gaia-ESO Survey (and the ESO archive) and literature photometry, weobtain a detailed and accurate analysis of the properties of the cluster. We make use of the first accurate metallicity measurement ever obtained from several spectra of red clump stars, and of cluster membership determination using radial velocities. According to the evolutionary models adopted, we find that Tr 20 has an age in the range 1.35–1.66 Gyr, an average reddening $E(B-V)$ in the range 0.31–0.35 mag, and a distance modulus $(m-M)_0$ between 12.64 and 12.72 mag. The spectroscopic metallicity is [Fe/H] = +0.17 dex. We discuss the structural properties of the object and constrain possible hypotheses for its broadened upper main sequence by estimating the effect of differential reddening and its extended red clump.

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Two spotted and magnetic early B-type stars in the young open cluster NGC2264 discovered by MOST and ESPADONS

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Star clusters are known as superb tools for understanding stellar evolution. In a quest for understanding the physical origin of magnetism and chemical peculiarity in about 7% of the massive main-sequence stars, we analysed two of the ten brightest members of the ∼10 Myr old Galactic open cluster NGC2264, the early B-dwarfs HD47887 and HD47777. We find accurate rotation periods of 1.95 and 2.64 days, respectively, from MOST photometry. We obtained ESPADONS spectropolarimetric observations, through which we determined stellar parameters, detailed chemical surface

abundances, projected rotational velocities, and the inclination angles of the rotation axis. Because we found only small (<5 km/s) radial velocity variations, most likely caused by spots, we can rule out that HD47887 and HD47777 are close binaries. Finally, using the least-squares deconvolution technique, we found that both stars possess a large-scale magnetic field with an average longitudinal field strength of about 400 G. From a simultaneous fit of the stellar parameters we determine the evolutionary masses of HD47887 and HD47777 to be 9.4±0.7 $M_{\odot}$ and 7.6±0.5 $M_{\odot}$. Interestingly, HD47777 shows a remarkable helium underabundance, typical of helium-weak chemically peculiar stars, while the abundances of HD47887 are normal, which might imply that diffusion is operating in the lower mass star but not in the slightly more massive one. Furthermore, we argue that the rather slow rotation, as well as the lack of nitrogen enrichment in both stars, can be consistent with both the fossil and the binary hypothesis for the origin of the magnetic field. However, the presence of two magnetic and apparently single stars near the top of the cluster mass-function may speak in favour of the latter.

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On the metallicity of open clusters II. Spectroscopy

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In a series of three papers, we investigate the current status of published metallicities for open clusters that were derived from a variety of photometric and spectroscopic methods. The current article focuses on spectroscopic methods. The aim is to compile a comprehensive set of clusters with the most reliable metallicities from high-resolution spectroscopic studies. This set of metallicities will be the basis for a calibration of metallicities from different methods. The literature was searched for [Fe/H] estimates of individual member stars of open clusters based on the analysis of high-resolution spectra. For comparison, we also compiled [Fe/H] estimates based on spectra with low and intermediate resolution. At medium and high resolution, we found that differences in the analysis methods have a stronger effect on metallicity than quality differences in the observations. We retained only highly probable cluster members and introduced a restriction on atmospheric parameters. We combined 641 individual metallicity values for 458 stars in 78 open clusters from 86 publications to form our final set of high-quality cluster metallicities. The photometric metallicities discussed in the first paper of this series are systematically lower than the spectroscopic ones by about 0.1 dex, and the differences show a scatter of about 0.2 dex. In a preliminary comparison of our spectroscopic sample with models of Galactic chemical evolution, none of the models predicts the observed radial metallicity gradient. Photometric metallicities show a large intrinsic dispersion, while the more accurate spectroscopic sample presented in this paper comprises fewer than half the number of clusters. Only a sophisticated combination of all available photometric and spectroscopic data will allow us to trace the metallicity distribution in the Galactic disk on a local and global scale.

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Anchors for the cosmic distance scale: the Cepheids U Sagittarii, CF Cassiopeiae, and CEab Cassiopeiae

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New and existing X-ray, UBVJHKsW(1–4), and spectroscopic observations were analyzed to constrain fundamental parameters for M 25, NGC 7790, and dust along their sight-lines. The star clusters are of particular importance because they host the classical Cepheids U Sgr, CF Cas, and the visual binary Cepheids CEa and CEb Cas. Precise results from the multiband analysis, in tandem with a comprehensive determination of the Cepheids period evolution (dP/dt) from ∼140 years of observations, helped to resolve concerns raised regarding the clusters and their key Cepheid constituents. Specifically, the distances derived for members of M 25 and NGC 7790 are 630±25 pc and 3.40±0.15 kpc, respectively.

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http://www.aanda.org/articles/aa/abs/2013/12/aa22670-13/aa22670-13.html

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X-ray emission from massive stars in Cyg OB2

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We report on the analysis of the Chandra-ACIS data of O, B and WR stars in the young association Cyg OB2. X-ray spectra of 49 O-stars, 54 B-stars and 3 WR-stars are analyzed and for the brighter sources, the epoch dependence of the X-ray fluxes is investigated. The O-stars in Cyg OB2 follow a well-defined scaling relation between their X-ray and bolometric luminosities: log(Lx/Lbol) = -7.2 ± 0.2. This relation is in excellent agreement with the one previously derived for the Carina OB1 association. Except for the brightest O-star binaries, there is no general X-ray overluminosity due to colliding winds in O-star binaries. Roughly half of the known B-stars in the surveyed field are detected, but they fail to display a clear relationship between Lx and Lbol. Out of the three WR stars in Cyg OB2, probably only WR144 is itself responsible for the observed level of X-ray emission, at a very low log(Lx/Lbol) = -8.8 ± 0.2. The X-ray emission of the other two WR-stars (WR145 and 146) is most probably due to their O-type companion along with a moderate contribution from a wind-wind interaction zone.

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Cluster membership probabilities from proper motions and multiwavelength photometric catalogues: I. Method and application to the Pleiades cluster

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We present a new technique designed to take full advantage of the high dimensionality (photometric, astrometric, temporal) of the DANCe survey to derive self-consistent and robust membership probabilities of the Pleiades cluster. We aim at developing a methodology to infer membership probabilities to the Pleiades cluster from the DANCe multidimensional astro-photometric data set in a consistent way throughout the entire derivation. The determination of the membership probabilities has to be applicable to censored data and must incorporate the measurement uncertainties into the inference procedure. We use Bayes' theorem and a curvilinear forward model for the likelihood of the measurements of cluster members in the colour-magnitude space, to infer posterior membership probabilities. The distribution of the cluster members proper motions and the distribution of contaminants in the full multidimensional astro-photometric space is modelled with a mixture-of-Gaussians likelihood. We analyse several representation spaces composed of the proper motions plus a subset of the available magnitudes and colour indices. We select two prominent representation spaces composed of variables selected using feature relevance determination techniques based in Random Forests, and analyse the resulting samples of high probability candidates. We consistently find lists of high probability ($p > 0.9975$) candidates with ≈ 1000 sources, 4 to 5 times more than obtained in the most recent astro-photometric studies of the cluster. The methodology presented here is ready for application in data sets that include more dimensions, such as radial and/or rotational velocities, spectral indices and variability.

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Galactic Globular Clusters

Terzan 8: a Sagittarius-flavoured globular cluster

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Massive globular clusters (GCs) contain at least two generations of stars with slightly different ages and clearly distinct light element abundances. The Na-O anticorrelation is the best studied chemical signature of multiple stellar generations. Instead, low-mass clusters usually appear to be chemically homogeneous. We are investigating low-mass GCs to understand what the lower mass limit is where multiple populations can form, mainly using the Na and O abundance distribution. We used VLT/FLAMES spectra of giants in the low-mass, metal-poor GC Terzan 8 that belongs to the Sagittarius dwarf galaxy to determine abundances of Fe, O, Na, α-, Fe-peak, and neutron-capture elements in six stars observed with UVES and 14 observed with GIRAFFE. The average metallicity is [Fe/H] $= -2.27 \pm 0.03$ (rms $= 0.08$), based on the six high-resolution UVES spectra. Only one star, observed with GIRAFFE, shows an enhanced abundance of Na and we tentatively assign it to the second generation. In this cluster, unlike what happens in more massive GCs, the second generation seems to represent at most a minority fraction. We discuss the implications of our findings, comparing Terzan 8 with the other Sgr dSph GCs, and to GCs and field stars in the Large Magellanic Cloud, Fornax, and in other dwarfs galaxies.

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A sequence of nitrogen-rich very red giants in the globular cluster NGC 1851

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We present the abundances of N in a sample of 62 stars on the red giant branch (RGB) in the peculiar globular cluster NGC 1851. The values of [N/Fe] ratio were obtained by comparing the flux measured in the observed spectra with that from synthetic spectra for up to about 15 features of CN. This is the first time that N abundances are obtained for such a large sample of RGB stars from medium-resolution spectroscopy in this cluster. With these abundances we provide a chemical tagging of the split red giant branch found from several studies in NGC 1851. The secondary, reddest sequence on the RGB is populated almost exclusively by N-rich stars, confirming our previous suggestion based on Stromgren magnitudes and colours. These giants are also, on average, enriched in s-process elements such as Ba, and are likely the results of pollution from low mass stars that experienced episodes of third dredge-up in the asymptotic giant branch phase.

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The extreme chemistry of multiple stellar populations in the metal-poor globular cluster NGC 4833

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Our FLAMES survey of Na-O anticorrelation in globular clusters (GCs) is extended to NGC 4833, a metal-poor GC with a long blue tail on the horizontal branch (HB). We present the abundance analysis for a large sample of 78 red giants based on UVES and GIRAFFE spectra acquired at the ESO-VLT. We derived abundances of Na, O, Mg, Al, Si, Ca, Sc, Ti, V, Cr, Mn, Fe, Co, Ni, Cu, Zn, Y, Ba, La, Nd. This is the first extensive study of this cluster from high resolution spectroscopy. On the scale of our survey, the metallicity of NGC 4833 is [Fe/H]=−2.015±0.004±0.084 dex (rms=0.014 dex) from 12 stars observed with UVES, where the first error is from statistics and the second one refers to the systematic effects. The iron abundance in NGC 4833 is homogeneous at better than 6%. On the other hand, the light elements involved in proton-capture reactions at high temperature show the large star-to-star variations observed in almost all GCs studied so far. The Na-O anticorrelation in NGC 4833 is quite extended, as expected from the high temperatures reached by stars on the HB, and NGC 4833 contains a conspicuous fraction of stars with extreme [O/Na] ratios. More striking is the finding that large star-to-star variations are seen also for Mg, which spans a range of more than 0.5 dex in this GC. Depletions in Mg are correlated to the abundances of O and anti-correlated with Na, Al, and Si abundances. This pattern suggests the action of nuclear processing at unusually high temperatures, producing the extreme chemistry observed in the stellar generations of NGC 4833. This extreme changes are also seen in giants of the much more massive GCs M 54 and omega Cen, and our conclusion is that NGC 4833 has probably lost a conpicuous fraction of its original mass due to bulge shocking, as also indicated by its orbit.

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Constraints on Helium Enhancement in the Globular Cluster M4 (NGC 6121): The Horizontal Branch Test

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Recent pieces of evidence have revealed that most, and possibly all, globular star clusters are composed of groups of stars that formed in multiple episodes with different chemical compositions. In this sense, it has also been argued that variations in the initial helium abundance (Y) from one population to the next are also the rule, rather than the exception. In the case of the metal-intermediate globular cluster M4 (NGC 6121), recent high-resolution spectroscopic observations of blue horizontal branch (HB) stars (i.e., HB stars hotter than the RR Lyrae instability strip) suggest that a large fraction of blue HB stars are second-generation stars formed with high helium abundances.

In this paper, we test this scenario by using recent photometric and spectroscopic data together with theoretical evolutionary computations for different Y values. Comparing the photometric data with the theoretically-derived color-magnitude diagrams, we find that the bulk of the blue HB stars in M4 have $\Delta Y \lesssim 0.01$ with respect to the clusters red HB stars (i.e., HB stars cooler than the RR Lyrae strip) a result which is corroborated by comparison with spectroscopically derived gravities and

temperatures, which also favor little He enhancement. However, the possible existence of a minority population on the blue HB of the cluster with a significant He enhancement level is also discussed.

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Clusters in the Magellanic clouds

Binary-corrected velocity dispersions from single- and multi-epoch radial velocities: massive stars in R136 as a test case

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Orbital motions from binary stars can broaden the observed line-of-sight velocity distribution of a stellar system, artificially inflating the measured line-of-sight velocity dispersion, which can in turn lead to erroneous conclusions about the dynamical state of the system. Cottaar et al. (2012b) proposed a maximum likelihood procedure to recover the intrinsic velocity dispersion of a resolved star cluster from a single epoch of radial velocity data of individual stars, which they achieved by simultaneously fitting the intrinsic velocity distribution of the single stars and the centres of mass of the binaries along with the velocity shifts caused by binary orbital motions. Assuming well-characterized binary properties, they showed that this procedure can accurately reproduce intrinsic velocity dispersions below 1 km s^{-1} for solar-type stars. Here we investigate the systematic offsets induced in cases where the binary properties are uncertain, and we show how two epochs of radial velocity data with an appropriate baseline can help to mitigate these systematic effects. We first test the method above using Monte Carlo simulations, taking into account the large uncertainties in the binary properties of OB stars. We then apply it to radial velocity data in the young massive cluster R136, an example for which the intrinsic velocity dispersion of O-type stars is known from an intensive multi-epoch approach. For typical velocity dispersions of young massive clusters ($\gtrsim$ 4 km s^{-1}) and with a single epoch of data, we demonstrate that the method can just about distinguish between a cluster in virial equilibrium and an unbound cluster. This is due to the higher spectroscopic binary fraction and more loosely constrained distributions of orbital parameters of OB stars compared to solar-type stars. By extending the maximum likelihood method to multi-epoch data, we show that the accuracy on the fitted velocity dispersion can be improved to a few percent by using only two epochs of radial velocities. This procedure offers a promising method of accurately measuring the intrinsic stellar velocity dispersion in other systems for which the binary properties are not well constrained, for example young clusters and associations whose luminosity is dominated by OB stars.

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The Complex Distribution of Recently Formed Stars. Bimodal Stellar Clustering in the Star-Forming Region NGC 346

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We present a detailed stellar clustering analysis with the application of the two-point correlation function on distinct young stellar ensembles. Our aim is to understand how stellar systems are assembled at the earliest stages of their formation. Our object of interest is the star-forming region NGC 346 in the Small Magellanic Cloud. It is a young stellar system well-revealed from its natal environment, comprising complete samples of pre–main-sequence and upper main-sequence stars, very close to their formation. We apply a comprehensive characterization of the autocorrelation function

for both centrally condensed stellar clusters and self-similar stellar distributions through numerical simulations of stellar ensembles. We interpret the observed autocorrelation function of NGC 346 on the basis of these simulations. We find that it can be best explained as the combination of two distinct stellar clustering designs, a centrally concentrated, dominant at the central part of the star-forming region, and an extended self-similar distribution of stars across the complete observed field. The cluster component, similar to non-truncated young star clusters, is determined to have a core radius of ∼2.5 pc and a density profile index of ∼2.3. The extended fractal component is found with our simulations to have a fractal dimension of ∼2.3, identical to that found for the interstellar medium, in agreement to hierarchy induced by turbulence. This suggests that the stellar clustering at a time very near to birth behaves in a complex manner. It is the combined result of the star formation process regulated by turbulence and the early dynamical evolution induced by the gravitational potential of condensed stellar clusters.

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Not-So-Simple Stellar Populations in the Intermediate-age Large Magellanic Cloud Star Clusters NGC 1831 and NGC 1868

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Using a combination of high-resolution Hubble Space Telescope/WFPC2 observations, we explore the physical properties of the stellar populations in two intermediate-age star clusters in the Large Magellanic Cloud, NGC 1831 and NGC 1868, based on their color-magnitude diagrams. We show that both clusters exhibit extended main-sequence turn-offs. To explain the observations, we consider variations in helium abundance, binarity, age dispersions, and fast rotation of the clusters' member stars. The observed narrow main sequence excludes significant variations in helium abundance in both clusters. We first establish the clusters' main-sequence binary fractions using the bulk of the clusters' main-sequence stellar populations >1 mag below their turn-offs. The extent of the turn-off regions in color–magnitude space, corrected for the effects of binarity, implies that age spreads of order 300 Myr may be inferred for both clusters if the stellar distributions in color–magnitude space were entirely due to the presence of multiple populations characterized by an age range. Invoking rapid rotation of the population of cluster members characterized by a single age also allows us to match the observed data in detail. However, when taking into account the extent of the red clump in color–magnitude space, we encounter an apparent conflict for NGC 1831 between the age dispersion derived from that based on the extent of the main-sequence turn-off and that implied by the compact red clump. We therefore conclude that, for this cluster, variations in stellar rotation rate are preferred over an age dispersion. For NGC 1868, both models perform equally well.

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The most distant clusters

Shocks and Star Formation in Stephan's Quintet. I. Gemini Spectroscopy of Hα-bright knots

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We present a Gemini-GMOS spectroscopic study of HST-selected Hα-emitting regions in Stephan's Quintet (HCG 92), a nearby compact galaxy group, with the aim of disentangling the processes of shock-induced heating and star formation in its intra-group medium. The $\sim$40 sources are distributed across the system, but most densely concentrated in the $\sim$kpc-long shock region. Their spectra neatly divide them into narrow- and and broad-line emitters, and we decompose the latter into three or more emission peaks corresponding to spatial elements discernible in HST imaging. The emission line ratios of the two populations of Hα-emitters confirm their nature as H II regions (90% of the sample) or molecular gas heated by a shock-front propagating at $\leq$300 km/s. Their redshift distribution reveals interesting three-dimensional structure with respect to gas-phase baryons, with no H II regions associated with shocked gas, no shocked regions in the intruder galaxy NGC 7318B, and a sharp boundary between shocks and star formation. We conclude that star formation is inhibited substantially, if not entirely, in the shock region. Attributing those H II regions projected against the shock to the intruder, we find a lopsided distribution of star formation in this galaxy, reminiscent of pile-up regions in models of interacting galaxies. The Hα luminosities imply mass outputs, star formation rates, and efficiencies similar to nearby star-forming regions. Two large knots are an exception to this, being comparable in stellar output to the prolific 30 Doradus region. We also examine Stephan's Quintet in the context of compact galaxy group evolution, as a paradigm for intermittent star formation histories in the presence of a rich, X-ray emitting intra-group medium.

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http://arxiv.org/abs/1312.0706

Dynamical evolution - Simulations

R144: a very massive binary likely ejected from R136 through a binary-binary encounter

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R144 is a recently confirmed very massive, spectroscopic binary which appears isolated from the core of the massive young star cluster R136. The dynamical ejection hypothesis as an origin for its location is claimed improbable by Sana et al. due to its binary nature and high mass. We demonstrate here by means of direct N-body calculations that a very massive binary system can be readily dynamically ejected from an R136-like cluster, through a close encounter with a very massive system. One out of four N-body cluster models produces a dynamically ejected very massive binary system with a mass comparable to R144. The system has a system mass of $\sim$355 $M_{\odot}$ and is located at 36.8 pc from the centre of its parent cluster, moving away from the cluster with a velocity of 57 km/s at 2 Myr as a result of a binary-binary interaction. This implies that R144 could have been ejected from R136 through a strong encounter with another massive binary or single star. In addition, we discuss all massive binaries and single stars which are ejected dynamically from their parent cluster in the N-body models.

Accepted by : Monthly Notices of the Royal Astronomical Society
`http://adsabs.harvard.edu/abs/2014MNRAS.437.4000O`

Miscellaneous

Stochastic Stellar Cluster Initial Mass Functions: Models and Impact on Integrated Cluster Parameter Determination

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Stellar clusters are regularly used to study the evolution of their host galaxy. Except for a few nearby galaxies, these studies rely on the interpretation of integrated cluster properties, especially integrated photometry observed using multiple filters (i.e., the spectral energy distribution, SED). To allow interpretation of such observations, we present a large set of GALEV cluster models using the realistic approach of adopting stochastically sampled stellar initial mass functions. We provide models for a wide range of cluster masses (10^3 – 2×10^5 $M_\odot$), metallicities ($-2.3 \leq$ [Fe/H] $\leq +0.18$ dex), foreground extinction, and 184 regularly used filters. We analyze various sets of stochastic cluster SEDs by fitting them with non-stochastic models, which is the procedure commonly used in this field. We identify caveats and quantify the fitting uncertainties associated with this standard procedure. We show that this can yield highly unreliable fitting results, especially for low-mass clusters.

Accepted by : Astrophysical Journal
http://iopscience.iop.org/0004-637X/778/2/138/; http://arxiv.org/abs/1310.4936

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On the origin of the B-stars in the Galactic center

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We present a new directly-observable statistic which uses sky position and proper motion of stars near the Galactic center massive black hole to identify populations with high orbital eccentricities. It is most useful for stars with large orbital periods for which dynamical accelerations are difficult to determine. We apply this statistic to a data set of B-stars with projected radii $0.1'' < p < 25''$ (0.004 − 1 pc) from the massive black hole in the Galactic center. We compare the results with those from N-body simulations to distinguish between scenarios for their formation. We find that the scenarios favored by the data correlate strongly with particular K-magnitude intervals, corresponding to different zero-age main-sequence (MS) masses and lifetimes. Stars with $14 < m_K < 15$ (15 − 20 solar masses, $t_{MS} = 8-13$ Myr) match well to a disk formation origin, while those with $m_K > 15$ (<15 solar masses, $t_{MS} > 13$ Myr), if isotropically distributed, form a population that is more eccentric than thermal, which suggests a Hills binary-disruption origin.

Accepted by : Astrophysical Journal
http://arxiv.org/abs/1305.1625

Proceedings abstracts

On the Origin of Young Stars at the Galactic Center

A.-M. Madigan [1,2], O. Pfuhl [3], Y. Levin [2,4], plus 3 co-authors

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The center of our galaxy is home to a massive black hole, SgrA*, and a nuclear star cluster containing stellar populations of various ages. While the late type stars may be too old to have retained memory of their initial orbital configuration, and hence formation mechanism, the kinematics of the early type stars should reflect their original distribution. In this contribution we present a new statistic which uses directly-observable kinematical stellar data to infer orbital parameters for stellar populations, and is capable of distinguishing between different origin scenarios. We use it on a population of B-stars in the Galactic center that extends out to large radii (0.5 pc) from the massive black hole. We find that the high K-magnitude population form an eccentric distribution, suggestive of a Hills binary-disruption origin.

To appear in : IAU Symposium No. 303: The Galactic Center: Feeding and Feedback in a Normal Galactic Nucleus

http://arxiv.org/abs/1401.7932

Conferences

The Formation of the Solar System

13-15 May, 2014
Bonn (Germany)
https://indico.mpifr-bonn.mpg.de/indico/conferenceDisplay.py?confId=71

Registration deadline: February 28, 2014 / Abstract submission deadline: February 15, 2014

Stellar N-body Dynamics

8-12 September, 2014
Sexten (Italy)
http://www.sexten-cfa.eu/en/conferences/2014/details/42-stellar-n-body-dynamics

pre-registration deadline: March 15, 2014 / SOC will issue invitations by 15 April, 2014

Formation and Evolution of Star Clusters in Chile

14-16 May, 2014
Santiago (Chile)
http://www.eso.org/sci/activities/santiago/projects/ClusterGroup/2014workshop.html

Registration deadline: March 28, 2014

The dance of stars: dense stellar systems from infant to old

2-6 June, 2014
Bad Honnef (Germany)
http://www.astro.uni-bonn.de/~sambaran/DS2014/

Registration / Abstract submission deadline: March 31, 2014

Binary systems, their evolution and environments

1-5 September, 2014
Ulaan Baatar (Mongolia)
http://mongolia.csp.escience.cn

Abstract submission deadline: April 1st, 2014

IAU Symposium 307: New windows on massive stars

23-27 June, 2014
Geneva (Switzerland)
http://obswww.unige.ch/Conferences/IAU307/index.html

end of late registration: June 15, 2014 / Abstract submission deadline: April 30, 2014

Mass assembly from clouds to clusters

7-11 July, 2014
Sexten (Italy)
http://www.sexten-cfa.eu/en/conferences/2014/details/44-mass-assembly-from-clouds-to-clusters

A Critical Look at Globular Cluster Formation Theories: Constraints from Young Massive Clusters

14-18 July, 2014
Sexten (Italy)
http://www.sexten-cfa.eu/en/conferences/2014/details/41-a-critical-look-at-globular-cluster-formation-theories-testing-p

Announcements

Michael Marks (Argelander-Institut für Astronomie, Bonn, Germany) has set up a Facebook group for professional astronomers with the research topic "star clusters". The idea is to share *recent* papers appearing on arXiv which are, in the widest sense, related to star clusters. It thus allows short discussions soon after their appearance. The larger the group the more will (hopefully) actively contribute and the better this group will work.

The editors consider this as a valuable extension to a 'classical' Newsletter like SCYON.

"Star Clusters on arXiv" - https://www.facebook.com/groups/1396194597298607/

Jobs

PhD positions
at the Department of Physics, University of Surrey, Guildford UK.

The newly formed astrophysics research group of the University of Surrey has various PhD positions available as part of the departmental startup package and a Starting Grant of the European Research Council (ERC, PI: Prof. Mark Gieles).

Details on the positions, the application procedure, and general information can be found here:

http://www.surrey.ac.uk/physics/astrophysics/opportunities/phd_projects
http://www.surrey.ac.uk/physics/astrophysics
http://www.surrey.ac.uk

Informal inquiries about the positions can be addressed to Prof. Mark Gieles (m.gieles@surrey.ac.uk) and/or Dr. Alessia Gualandris (a.gualandris@surrey.ac.uk)