$\mathcal{SCYON}$

The Star Clusters Young & Old Newsletter

edited by Holger Baumgardt, Ernst Paunzen and Pavel Kroupa

SCYON can be found at URL:
`http://astro.u-strasbg.fr/scyon`

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EDITORIAL

Here is the 35th issue of the SCYON newsletter. Todays edition contains 18 abstracts from refereed journals, conference announcements for conferences in Bonn and Heidelberg, and a job advertisement for a PhD position at ESO. It also contains an announcement for a new version of the Open Cluster Catalogue by Dias et al.

As usual, we would like to thank all who sent in their contributions.

Holger Baumgardt, Ernst Paunzen and Pavel Kroupa

CONTENTS

SCYON POLICY

The SCYON Newsletter publishes abstracts from any area in astronomy which are relevant to research on star clusters. We welcome all contributions. Topics to be covered include

1. Abstracts from refereed articles
2. Abstracts from conference proceedings
3. PhD summaries
4. General announcements : Conferences, new databases, and the likes.

Concerning possible infringements to copyright laws, we understand that the authors themselves are taking responsibility for the material they send us. We make no claim whatsoever to owning the material that is posted at our url or circulated by email. The newsletter SCYON is a free service. It does not substitute for our personal opinions, nor does it reflect in any way the views of our respective institutes of affiliations.

SCYON will be published initially once every two months. If the number of contributions justifies monthly installments, we will move toward more frequent issues in order to keep the newsletter relatively short, manageable for us, and up-to-date.

Conference and journal abstracts can be submitted at any time either by web download, or failing this, we also accept abstracts typeset using the latest latex abstract template (available from the SCYON webpage). We much prefer contributors to use the direct download form, since it is mostly automated. Abstracts will normally appear on the website as soon as they are submitted to us. Other contributions, such as PhD summaries, should be sent to us using the LaTeX template. *Please do not submit postscript files, nor encoded abstracts as e-mail attachments.*

All abstracts/contributions will be processed, but we reserve the right to not post abstracts submitted in the wrong format or which do not compile. If you experience any sort of problems accessing the web site, or with the LaTeX template, please write to us at scyon@astro.u-strasbg.fr.

A "Call for abstracts" is sent out approximately one week before the next issue of the newsletter is finalised. This call contains the deadline for abstract submissions for that coming issue and the LaTeX abstract template.

Depending on circumstances, the editors might actively solicit contributions, usually those spotted on a preprint server, but they do not publish abstracts without the author's consent.

We implicitly encourage further dissemination of the letter to institutes and astronomers who may benefit from it.

The editors

SCYON Mirrors

The official Scyon mirror site in Australia is hosted at the Centre for Astrophysics & Supercomputing of the University of Swinburne by Duncan Forbes and his team :

HTTP://ASTRONOMY.SWIN.EDU.AU/SCYON/)

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1. Star Forming Regions

Cluster Formation in Contracting Molecular Clouds

Eric Huff, Steven Stahler
UC, Berkeley

We explore, through a simplified, semi-analytic model, the formation of dense clusters containing massive stars. The parent cloud spawning the cluster is represented as an isothermal sphere. This sphere is in near force balance between self-gravity and turbulent pressure. Self-gravity, mediated by turbulent dissipation, drives slow contraction of the cloud, eventually leading to a sharp central spike in density and the onset of dynamical instability. We suggest that, in a real cloud, this transition marks the late and rapid production of massive stars.

We also offer an empirical prescription, akin to the Schmidt law, for low-mass star formation in our contracting cloud. Applying this prescription to the Orion Nebula Cluster, we are able to reproduce the accelerating star formation previously inferred from the distribution of member stars in the HR diagram. The cloud turns about 10 percent of its mass into low-mass stars before becoming dynamically unstable. Over a cloud free-fall time, this figure drops to 1 percent, consistent with the overall star formation efficiency of molecular clouds in the Galaxy.

Accepted by : Astrophysical Journal
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2. Galactic Open Clusters

Old open clusters in the inner Galaxy: FSR1744, FSR89 and FSR31

Charles Bonatto, Eduardo Bica

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We examine the dynamical survival of intermediate-age/old open clusters in the inner Galaxy. We aim to establish the nature and derive fundamental and structural parameters of the recently catalogued objects FSR1744, FSR89 and FSR31 to constrain the Galactic tidal disruption efficiency, improve statistics of the open cluster parameter space, and better define their age-distribution function inside the Solar circle. The current status of the issue dealing with the small number of detected open clusters in the inner Galaxy is discussed. Properties of the objects are investigated with 2MASS colour-magnitude diagrams and stellar radial density profiles built with field star decontaminated photometry. Diagnostic diagrams of structural parameters are used to separate dynamical from high-background effects affecting such centrally projected open clusters. FSR1744, FSR89 and FSR31 are Gyr-class open clusters located at Galactocentric distances 4.0 - 5.6 kpc. Compared to nearby open clusters, they have small core and limiting radii. With respect to the small number of open clusters observed in the inner Galaxy, the emerging scenario in the near-infrared favours disruption driven by dynamical evolution rather than observational limitations associated with absorption and/or high background levels. Internally, the main processes associated with the dynamical evolution are mass loss by stellar evolution, mass segregation and evaporation. Externally they are tidal stress from the disk and bulge, and interactions with giant molecular clouds. FSR1744, FSR89 and FSR31 have structural parameters consistent with their Galactocentric distances, in the sense that tidally induced effects may have accelerated the dynamical evolution.

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A massive cluster of Red Supergiants at the base of the Scutum-Crux arm

Ben Davies ([1]), Don F. Figer ([1]), Rolf-Peter Kudritzki ([2]), John MacKenty ([3]), Francisco Najarro ([4]) and Artemio Herrero ([5])

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We report on the unprecedented Red Supergiant (RSG) population of a massive young cluster, located at the base of the Scutum-Crux Galactic arm. We identify candidate cluster RSGs based on it 2MASS photometry and medium resolution spectroscopy. With follow-up high-resolution spectroscopy, we use CO-bandhead equivalent width and high-precision radial velocity measurements to identify a core grouping of 26 physically-associated RSGs – the largest such cluster known to-date. Using the stars' velocity dispersion, and their inferred luminosities in conjuction with evolutionary models, we argue that the cluster has an initial mass of $\sim$40,000$M_{\odot}$, and is therefore among the most massive in the galaxy. Further, the cluster is only a few hundred parsecs away from the cluster of 14 RSGs recently reported by Figer et al (2006). These two RSG clusters represent 20% of all known RSGs in the Galaxy, and now offer the unique opportunity to study the pre-supernova evolution of massive stars, and the Blue- to Red-Supergiant ratio at uniform metallicity. We use GLIMPSE, MIPSGAL and MAGPIS survey data to identify several objects in the field of the larger cluster which seem to be indicative of recent region-wide starburst activity at the point where the Scutum-Crux arm intercepts the Galactic bulge. Future abundance studies of these clusters will therefore permit the study of the chemical evolution and metallicity gradient of the Galaxy in the region where the disk meets the bulge.

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η Cha: abnormal IMF or dynamical evolution ?

Moraux, E. ([1]), Lawson, W.A. ([2]), Clarke, C. ([3])

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η Chamaeleontis is a unique young ($\sim$ 9 Myr) association with 18 systems concentrated in a radius of $\approx$ 35 arcmin, i.e. 1pc at the cluster distance of 97pc. No other members have been found up to 1.5 degrees from the cluster centre. The cluster mass function is consistent with the IMF of other rich young open clusters in the higher mass range but shows a clear deficit of low mass stars and brown dwarfs with no objects below $0.1M_{\odot}$. The aim of this paper is to test whether this peculiar mass function could result from dynamical evolution despite the young age of the cluster. We performed N-body numerical calculations starting with a log-normal IMF and different initial conditions in terms of number of systems and cluster radius using the code NBODY3. We simulated the cluster dynamical evolution over 10 Myr and compared the results to the observations. We found that it is possible to reproduce η Cha when starting with a very compact configuration (with $N_{init} = 40$ and $R_0 = 0.005$pc) which suggests that the IMF of the association might not be abnormal. The high initial density might also explain the deficit of wide binaries that is observed in the cluster.

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Quasi-binarity of massive stars in young dense clusters - the case of the ONC

S. Pfalzner, C. Olczak

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Context. Observations indicate that in young stellar clusters the binary fraction for massive stars is higher than for solar mass stars. For the Orion Nebula Cluster (ONC) there is a binary frequency of $\sim 50\%$ for solar-mass stars compared to 70-100% for the massive O- and B-stars.

Aims. We explore the reasons for this discrepancy and come up with two possible answers: a) a primordially higher binarity of massive stars could be inherent to the star formation process or b) the primordial binary rate might be the same for solar-mass and massive stars, but the higher capture cross section of the massive stars possibly leads to the formation of additional massive binaries in the early cluster development. Here we investigate the likelihood of the latter scenario in detail using the ONC as an example.

Method. N-body simulations are performed to track the capture events in an ONC-like cluster.

Results. We find that whereas low-mass stars rarely form bound systems through capture, the dynamics of the massive stars - especially in the first 0.5 Myrs - is dominated by a rapid succession of "transient binary or multiple systems". In observations the transient nature of these systems would not be apparent, so that they would be rated as binaries. At 1-2 Myrs, the supposed age of the ONC, the "transient" massive systems become increasingly stable, lasting on average several 10^6 yrs. Despite the ONC being so young, the observed binary frequency for massive stars — unlike that of solar-mass stars — is not identical to the primordial binary frequency but is increased by at least 10-15% through dynamical interaction processes. This value might be increased to at least 20-25% by taking disc effects into account.

*Conclusions.*The primordial binary frequency could well be the same for massive and solar mass stars because the observed difference can be explained by capture processes alone.

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Lithium abundances in the old open cluster NGC 3960 from VLT/FLAMES observations

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Old open clusters are very useful targets to investigate mechanisms responsible for lithium (Li) depletion during the main sequence. Comparison of the Li abundances in clusters of different age allows us to understand the efficiency of the Li destruction process. Our goal is the determination of membership and Li abundance in a sample of candidate members of the open cluster NGC 3960 (age ∼1 Gyr), with the aim to fill the gap between 0.6 and 2 Gyr in the empirical description of the behavior of the average Li abundance as a function of the stellar age. We use VLT/FLAMES Giraffe spectra to determine the radial velocities and thus the membership of a sample of 113 photometrically selected candidate cluster members. From the analysis of the Li line we derive Li abundances for both cluster members and non-members. 39 stars have radial velocity consistent with membership, with an expected fraction of contaminating field stars of about 20%. Li is detected in 29 of the RV members; we consider these stars as cluster members, while we make the reasonable assumption that the remaining 10 RV members without Li, are among the contaminating stars. Li abundances of the stars hotter than about 6000 K are similar to those of stars in the Hyades, while they are slightly smaller for cooler stars. This confirms that NGC 3960 is older than the Hyades. The average Li abundance of stars cooler than about 6000 K indicates that the Li Pop. I plateau might start already at 1 Gyr rather than 2 Gyr that is the upper limit previously derived in the literature. We also find that the fraction of field stars with high Li abundance (> 1.5) is about one third of the whole sample, which is in agreement with previous estimates. The fraction of contaminating field stars is consistent with that previously derived by us from photometry.

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Red giants in open clusters. XIII Orbital elements of 156 spectroscopic binaries

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The identification and characterisation of spectroscopic binaries with red-giant primaries in open clusters is important for a proper understanding of the colour-magnitude diagrams of the clusters. Moreover, the orbital eccentricities and axial rotations of these binaries are valuable probes into the inner structure and tidal interaction of the stars.

We report on a comprehensive, long-term monitoring programme aiming to improve our knowledge of such binary systems.

The radial velocities of 1309 red giants in 187 open clusters in the whole sky have been monitored with the Coravel and CfA spectrometers for 20 years, with a typical accuracy of 0.4 km/s per observation.

In total, 289 spectroscopic binaries were detected in the sample. We present first orbits for 67 systems and improved elements for another 64 previously published orbits, based on additional observations. For completeness, 25 published orbits are listed as well. The orbits are based on a total of 4039 observations, an average of 26 per system. Orbital periods range from 41.5 to 14722 days (40 yrs), eccentricities from 0.00 to 0.81. The remaining 133 systems have too long periods, too few observations, and/or inadequate phase coverage for an orbit determination at this time.

This paper provides a dramatic increase in the body of homogeneous orbital data available for red-giant spectroscopic binaries in open clusters. It will form the basis for a comprehensive discussion of membership, kinematics, and stellar and tidal evolution in the parent clusters.

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3. Galactic Globular Clusters

Origin of the abundance patterns in Galactic globular clusters: constraints on dynamical and chemical properties of globular clusters

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Aims. We analyse the effects of a first generation of fast rotating massive stars on the dynamical and chemical properties of globular clusters. Methods. We use stellar models of fast rotating massive stars, losing mass through a slow mechanical equatorial winds to produce material rich in H-burning products. We propose that stars with high Na and low O abundances (hereafter anomalous stars) are formed from matter made of slow winds of individual massive stars and of interstellar matter. The proportion of slow wind and of interstellar material is fixed in order to reproduce the observed Li-Na anticorrelation in NGC 6752. Results. In the case that globular clusters, during their lifetime, did not lose any stars, we found that to reproduce the observed ratio of normal to anomalous stars, a flat initial mass function (IMF) is needed, with typically a slope x=0.55 (a Salpeter's IMF has x=1.35). In the case that globular clusters suffer from an evaporation of normal stars, the IMF slope can be steeper: to have x=1.35, about 96% of the normal stars would be lost. We make predictions for the distribution of stars as a function of their [O/Na] and obtain quite reasonable agreement with that one observed for NGC 6752. Predictions for the number fraction of stars with different values of helium, of the 12C/13C and 16O/17O ratios are discussed, as well as the expected relations between values of [O/Na] and those of helium, of [C/N], of 12C/13C and of 16O/17O. Future observations might test these predictions. We also provide predictions for the present day mass of the clusters expressed in units of mass of the gas used to form stars, and for the way the present day mass is distributed between the first and second generation of stars and the stellar remnants.

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Unveiling the core of the Globular Cluster M 15 in the Ultraviolet

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We have obtained deep far- (FUV) and near-ultraviolet (NUV) images of the inner region of the dense globular cluster M 15 with the Advanced Camera for Surveys on board the *Hubble Space Telescope*. The $FUV-NUV$ colour-magnitude diagram shows a well defined track of horizontal branch stars, as well as a trail of blue stragglers and white dwarfs. The main sequence turn-off is clearly visible at $FUV \simeq 23.5$ mag and $FUV - NUV \simeq 3$ mag, and the main sequence stars form a prominent track that extends at least two magnitudes below the main sequence turn-off. As such, this is the deepest $FUV - NUV$ colour-magnitude diagram of a globular cluster presented so far. Cataclysmic variable and blue straggler candidates are the most centrally concentrated stellar populations, which might either be an effect of mass segregation or reflect the preferred birthplace in the dense cluster core of such dynamically-formed objects. We find 41 FUV sources that exhibit significant variability. We classify the variables based on an analysis of their UV colours and variability properties. We find four previously known RR Lyrae and 13 further RR Lyrae candidates, one known Cepheid and six further candidates, six cataclysmic variable candidates, one known and one probable SX Phoenicis star, and the well known low-mass X-ray binary AC 211. Our analysis represents the first detection of SX Phoenicis pulsations in the FUV. We find that Cepheids, RR Lyraes and SX Phoenicis exhibit massive variability amplitudes in this waveband (several mags).

Accepted by: ApJ

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Constraining white-dwarf kicks in globular clusters : II. Observational Significance

Jeremy S. Heyl
UBC

If the winds of an asymptotic-giant-branch stars are sufficiently strong are slightly asymmetric, they can alter the star's trajectory through a globular cluster; therefore, if these winds are asymmetric, one would expect young white dwarfs to be less radially concentrated than either their progenitors or older white dwarfs in globular clusters. This latter effect has recently been observed. Additionally the young white dwarfs should have larger typical velocities than their progenitors. After phase mixing this latter effect is vastly diminished relative to the changes in the spatial distribution of young white dwarfs with kicks, so it is more difficult to detect than the change in the spatial distribution. The most powerful kinematic signature is the change in the eccentricity of the orbits that is revealed through the distribution of the position angles of proper motion.

To appear in : arXiv:0709.3118
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A spectral atlas of post-main-sequence stars in ω Centauri: kinematics, evolution, enrichment and interstellar medium

Jacco Th. van Loon[1], Floor van Leeuwen[2], Barry Smalley[1], Andrew W. Smith[1], Nicola A. Lyons[1], Iain McDonald[1] and Martha L. Boyer[3]

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We present a spectral atlas of the post-main-sequence population of the most massive Galactic globular cluster, ω Centauri. Spectra were obtained of more than 1500 stars selected as uniformly as possible from across the (B, B–V) colour-magnitude diagram of the proper motion cluster member candidates of van Leeuwen et al. (2000). The spectra were obtained with the 2dF multi-fibre spectrograph at the Anglo Australian Telescope, and cover the approximate range $\lambda \sim 3840$–4940 Å at a resolving power of $\lambda/\Delta\lambda \simeq 2000$. This constitutes the most comprehensible spectroscopic survey of a globular cluster. We measure the radial velocities, effective temperatures, metallicities and surface gravities by fitting ATLAS9 stellar atmosphere models. We analyse the cluster membership and stellar kinematics, interstellar absorption in the Ca II K line at 3933 Å, the RR Lyrae instability strip and the extreme horizontal branch, the metallicity spread and bimodal CN abundance distribution of red giants, nitrogen and s-process enrichment, carbon stars, pulsation-induced Balmer line emission on the asymptotic giant branch (AGB), and the nature of the post-AGB and UV-bright stars. Membership is confirmed for the vast majority of stars, and the radial velocities clearly show the rotation of the cluster core. We identify long-period RR Lyrae-type variables with low gravity, and low-amplitude variables coinciding with warm RR Lyrae stars. A barium enhancement in the coolest red giants indicates that 3$^{\rm rd}$ dredge-up operates in AGB stars in ω Cen. This is distinguished from the pre-enrichment by more massive AGB stars, which is also seen in our data. The properties of the AGB, post-AGB and UV-bright stars suggest that RGB mass loss may be less efficient at very low metallicity, [Fe/H]$\ll -1$, increasing the importance of mass loss on the AGB. The catalogue and spectra are made available via CDS.

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4. Extragalactic Clusters

Star cluster "infant mortality" in the Small Magellanic Cloud (Redivivus)

Richard de Grijs[1,2] **and Simon P. Goodwin**[1]
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The early evolution of star clusters in the Small Magellanic Cloud (SMC) has been the subject of significant recent controversy, particularly regarding the importance and length of the earliest, largely mass-independent disruption phase (referred to as "infant mortality"). Here, we take a fresh approach to the problem, using an independent, homogeneous data set of $UBVR$ imaging observations, from which we obtain the SMC's cluster age and mass distributions in a self-consistent manner. We conclude that the (optically selected) SMC star cluster population has undergone at most ~ 30 per cent (1σ) infant mortality between the age range from about $(3-10)$ Myr, to that of approximately $(40-160)$ Myr. We rule out a 90 per cent cluster mortality rate per decade of age (for the full age range up to 10^9 yr) at a $> 6\sigma$ level. We independently affirm this scenario based on the age distribution of the SMC cluster sample.

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On the interpretation of the age distribution of star clusters in the small magellanic cloud

M. Gieles ([1,2]), H.J.G.L.M. Lamers ([1]) & S.F. Portegies Zwart ([3])
([1]) Utrecht ([2]) ESO/Chile ([3]) Amsterdam

We re-analyze the age distribution (dN/dt) of star clusters in the Small Magellanic Cloud (SMC) using age determinations based on the Magellanic Cloud Photometric Survey. For ages younger than $3x10^9$ yr the dN/dt distribution can be approximated by a power-law distribution, dN/dt propto $t^{-\beta}$, with -β=-0.70+/-0.05 or -β=-0.84+/-0.04, depending on the model used to derive the ages. Predictions for a cluster population without dissolution limited by a V-band detection result in a power-law dN/dt distribution with an index of -0.7. This is because the limiting cluster mass increases with age, due to evolutionary fading of clusters, reducing the number of observed clusters at old ages. When a mass cut well above the limiting cluster mass is applied, the dN/dt distribution is flat up to 1 Gyr. We conclude that cluster dissolution is of small importance in shaping the dN/dt distribution and incompleteness causes dN/dt to decline. The reason that no (mass independent) infant mortality of star clusters in the first ∼10-20 Myr is found is explained by a detection bias towards clusters without nebular emission, i.e. cluster that have survived the infant mortality phase. The reason we find no evidence for tidal (mass dependent) cluster dissolution in the first Gyr is explained by the weak tidal field of the SMC. Our results are in sharp contrast to the interpretation of Chandar et al. (2006), who interpret the declining dN/dt distribution as rapid cluster dissolution. This is due to their erroneous assumption that the sample is limited by cluster mass, rather than luminosity.

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5. Dynamical evolution - Simulations

Evolution of Compact-Binary Populations in Globular Clusters: A Boltzmann Study. I. The Continuous Limit

Sambaran Banerjee and Pranab Ghosh
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We explore a Boltzmann scheme for studying the evolution of compact binary populations of globular clusters. We include processes of compact-binary formation by tidal capture and exchange encounters, binary destruction by dissociation and other mechanisms, and binary hardening by encounters, gravitational radiation and magnetic braking, as also the orbital evolution during mass transfer, following Roche lobe contact. For the encounter processes which are stochastic in nature, we study the probabilistic, continuous limit in this introductory work, deferring the specific handling of the stochastic terms to the next step. We focus on the evolution of (a) the number of X-ray sources N_{XB} in globular clusters, and (b) the orbital-period distribution of the X-ray binaries, as a result of the above processes. We investigate the dependence of N_{XB} on two essential cluster properties, namely, the star-star and star-binary encounter-rate parameters Γ and γ, which we call Verbunt parameters. We compare our model results with observation, showing that the model values of N_{XB} and their expected scaling with the Verbunt parameters are in good agreement with results from recent X-ray observations of Galactic globular clusters, encouraging us to build more detailed models.

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On the efficiency of field star capture by star clusters

Steffen Mieske[1], Holger Baumgardt[2]
([1]) ESO, ([2]) University of Bonn

An exciting recent finding regarding scaling relations among globular clusters is the so-called 'blue tilt': clusters of the blue sub-population follow a trend of redder colour with increasing luminosity. In this paper we evaluate to which extent field star capture over a Hubble time may explain the 'blue tilt'. We perform collisional N-body simulations to quantify the amount of field star capture occuring over a Hubble time to star clusters with 10^3 to 10^6 stars. In the simulations we follow the orbits of field stars passing through a star cluster and calculate the energy change that the field stars experience due to gravitational interaction with cluster stars during one passage through the cluster. The capture condition is that their total energy after the passage is smaller than the gravitational potential at the cluster's tidal radius. By folding this with the fly-by rates of field stars with an assumed space density as in the solar neighbourhood and a range of velocity dispersions, we derive estimates on the mass fraction of captured field stars as a function of environment. We find that integrated over a Hubble time, the ratio between captured field stars and total number of clusters stars is very low ($< 10^{-4}$), even for the smallest considered field star velocity dispersion $\sigma = 15$ km/s. This holds for star clusters in the mass range of both open clusters and globular clusters. We furthermore show that tidal friction has a negligible effect on the energy distribution of field stars after interaction with the cluster. We conclude that field star capture is not a probable mechanism for creating the colour-magnitude trend of metal-poor globular clusters.

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Implementing Few-Body Algorithmic Regularization with Post-Newtonian Terms

Seppo Mikkola, David Merritt
University of Turku, Rochester Institute of Technology

We discuss the implementation of a new regular algorithm for simulation of the gravitational few-body problem. The algorithm uses components from earlier methods, including the chain structure, the logarithmic Hamiltonian, and the time-transformed leapfrog. The code can be used for the normal N-body problem, as well as for problems with softened potentials and/or with velocity-dependent external perturbations, including post-Newtonian terms, which we include up to order PN2.5. Arbitarily extreme mass ratios are allowed. Coordinate transformations are not used and thus the algorithm is somewhat simpler than many earlier regularized schemes. We present the results of performance tests, then use our algorithm to integrate the orbits of the S stars around the Milky Way supermassive black hole for one million years, including PN2.5 terms and an intermediate-mass black hole. The three S stars with shortest periods are observed to escape from the system after a few hundred thousand years.

Submitted to : Astronomical Journal
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6. Miscellaneous

The primordial binary population II: Recovering the binary population for intermediate mass stars in Sco OB2

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We characterize the binary population in the young and nearby OB association Scorpius OB2 (Sco OB2) using available observations of visual, spectroscopic, and astrometric binaries with intermediate-mass primaries. We take into account observational biases by comparing the observations with simulated observations of model associations. The available data indicate a large binary fraction ($> 70\%$ with 3σ confidence), with a large probability that all intermediate mass stars in Sco OB2 are part of a binary system. The binary systems have a mass ratio distribution of the form $f_q(q) \propto q^{\gamma_q}$, with $\gamma_q \approx -0.4$. Sco OB2 has a semi-major axis distribution of the form $f_a(a) \propto a^{\gamma_a}$ with $\gamma_a \approx -1.0$ (Öpik's law), in the range $5\,\mathrm{R}_\odot < a < 5 \times 10^6\,\mathrm{R}_\odot$. The log-normal period distribution of Duquennoy & Mayor results in too few spectroscopic binaries, even if the model binary fraction is 100%. Sco OB2 is a young association with a low stellar density; its current population is expected to be very similar to the primordial population. The fact that practically all stars in Sco OB2 are part of a binary (or multiple) system demonstrates that multiplicity is a fundamental factor in the star formation process, at least for intermediate mass stars.

Accepted by Astronomy & Astrophysics
For preprints, contact `t.kouwenhoven@sheffield.ac.uk`
Also available from the URL `http://xxx.lanl.gov/abs/0707.2746`

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A Discontinuity in the Low-Mass Initial Mass Function

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The origin of brown dwarfs (BDs) is still an unsolved mystery. While the standard model describes the formation of BDs and stars in a similar way recent data on the multiplicity properties of stars and BDs show them to have different binary distribution functions. Here we show that proper treatment of these uncovers a discontinuity of the multiplicity-corrected mass distribution in the very-low-mass star (VLMS) and BD mass regime. A continuous IMF can be discarded with extremely high confidence. This suggests that VLMSs and BDs on the one hand, and stars on the other, are two correlated but disjoint populations with different dynamical histories. The analysis presented here suggests that about one BD forms per five stars and that the BD-star binary fraction is about 2%–3% among stellar systems.

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Also available from the URL `http://arxiv.org/abs/0708.1764`
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New catalogue of optically visible open clusters and candidates - version 2.8 (2007)

W. S. Dias[1], B. S. Alessi, A. Moitinho[2] and J. R. D. Lépine[3]

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We have compiled a new edition of the catalogue of open clusters and candidates which updates the previous edition published in 2002 (Dias et al. 2002). The number of clusters (1766) presently known represents an important increment of objects relative to the 1987 edition of the Lynga catalogue.

In this new edition (version 2.8), we included 6 new open cluster or candidate in the database. Virtually all papers published after the version 2.7 of the catalogue were investigated resulting in the inclusion of new fundamental parameters, mean radial velocities and metallicities for various clusters. Corrections of coordinates and apparent diameters for the open clusters were performed, specially for the Dolidze objects. The new informations are given in the link whatsnew and the references of the investigated papers are given in the file references.

This catalogue is being constantly updated and maintained in electronic form for the widest possible accessibility. The latest version (2.8) can be accessed on line at http://www.astro.iag.usp.br/~wilton

For preprints, contact `wilton@unifei.edu.br6`
Also available from the URL `http://www.astro.iag.usp.br/~wilton`

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Second Announcement

MODEST-8

5-8, December, 2007
Bonn/Bad Honnef, Germany

The stellar-dynamics group at the Argelander Institute for Astronomy (AIfA) wishes to invite the dense-stellar-systems community to the 8th annual meeting of the MODEST consortium, MODEST-8, and the fourth annual meeting of the Rhine Stellar dynamics Network, RSDN.

Scientific Rationale:

The fundamental building blocks of galaxies are dense stellar systems: star clusters. These range from open clusters at the low-mass end to massive star-burst systems containing millions of stars, some of which may evolve to globular clusters. The fraction of massive star-burst clusters that do so remains unknown and heavily debated. The physics of star-cluster formation has many unknowns, but it is becoming increasingly clear that the processes driving cluster assembly also have a significant impact on the morphology and kinematical properties of whole galaxies. Clusters re-shape their stellar population through dynamical encounters that dissociate multiple stars but which can also merge stars. Star clusters are environments in which gravitational dynamics meets stellar physics such that the evolution towards energy equipartition is significantly affected by stellar evolution since both time-scales are comparable. Dealing with these processes therefore poses extreme computational challenges, leading to the development of innovative software and hardware super-computer solutions. Because stars are of the same age and metal composition in most star clusters, these systems also offer excellent environments for testing stellar evolution theory. Observations of such systems stand therefore at the fore-front of observational astrophysics, ranging from star-by-star scrutiny to observations of extra-galactic star-cluster systems in old but also in massively interacting galaxies.

Venue:

The MODEST-8 meeting will be taking place in the Physics Centre of Bad Honnef nearby to Bonn, see http://www.astro.uni-bonn.de/~modest8/ . This is a beautiful ambiente on the River Rhine. Conference participants stay in the Physics Centre which also has its own beer cellar. The nearby Christmas market in Bonn will provide some additional relaxation with one or more Gluehweins and other seasonal specialities.

Programme:

The programme for MODEST-8 has not been finalised yet, but the idea is to have an exchange between observers and theoreticians working on globular clusters and other dense stellar systems, and their distributions. We plan to incorporate plenty of time for discussions, including beer, also in small sub-groups.

Register:

Please register at the following URL: http://www.astro.uni-bonn.de/~modest8/ **until November 1st**. There will be no conference fee. It is planned that all participants stay at the Physics Centre

in Bad Honnef, although hotels are also available in Bad Honnef. See the above link for more details about the accomodation. Further details will be send out to registered participants in November.

Pavel Kroupa and Holger Baumgardt on behalf of the SOC (Michael Hilker, Piet Hut, Pavel Kroupa, Rainer Spurzem, Steve McMillan) and the LOC (Holger Baumgardt, Claudia Bruens, Pavel Kroupa, Joerg Dabringhausen, Thomas Maschberger, Manuel Metz).

First Announcement

NUCLEAR STAR CLUSTERS ACROSS THE HUBBLE SEQUENCE

February 25-27, 2008

MPI for Astronomy, Heidelberg, Germany

Rationale:

The nuclei of galaxies are bound to be "special" locations in the universe because they are located in a unique environment at the bottom of the galaxy potential. The evolution of the nuclei is closely linked to the evolution of the entire galaxy, as evidenced by a number of global-to-nucleus scaling relations discovered in the last decade.
Recently, a number of studies have refocused observational interest onto the relatively new field of compact, massive, nuclear star clusters, whose presence in galaxies of all Hubble types has now been firmly established by recent HST studies. Historically, the nuclei of dE,N galaxies have been best studied, but it has become clear that similar objects exist also in normal spirals and ellipticals. At face value, these nuclear clusters are an intriguing environment for the formation of intermediate mass black hole formation because of their extreme stellar density. They may also constitute the progenitors of other massive clusters in galaxy halos. Finally, their formation process is influenced by (and important for) the central potential of their host galaxies, which is another area of ongoing debate.
The aim of this workshop is to bring together scientists working in fields relevant for the understanding of these nuclei. The program is designed to review the observational and theoretical progress made in the last years, identify connections between hitherto unconnected research lines, and provide a fertile environment to develop ideas for future studies of galaxy nuclei. The workshop will cover the following topics:

- detection of NCs along the Hubble sequences: general observational aspects
- NC structure, mass, and population properties
- relation to UCDs, Globular Clusters, and other stellar systems
- connection (or disjunction) between BHs/AGN and NCs
- Dynamics of the nuclear environment - gas & stars, observations & theory
- formation scenarios from z$\sim$10

The workshop lasts for 3 full days and the program will give ample time for lively discussions of new results. The venue at the Max Planck Institute for Astronomy, Heidelberg, Germany, provides space for about 60 participants.

Workshop Web-site:

http://www.mpia.de/NC08/

Important Dates:

Nov. 01, 2007:	Abstract deadline
Dec. 01, 2007:	Preliminary program announced
Jan. 15, 2008:	Final registration and hotel reservation deadline
Feb. 25-27, 2008:	Workshop at MPIA

Scientific Organizing Committee:

Torsten Böker (Chair, ESTEC), Julianne Dalcanton (University of Washington), William Harris (McMaster University), Luis Ho (Carnegie Observatories), David Merritt (Rochester Institute of Technology), Roeland van der Marel (Space Telescope Science Institute)

PhD Position on observational research in the area of intermediate-mass black holes and their roles as seeds for supermassive black holes

In the framework of the cluster of excellence "Origin and Structure of the Universe", ESO Garching is looking for a PhD student to work with Dr. Markus Kissler-Patig on Intermediate Mass Black Holes.

The presence of intermediate-mass black holes (few 1000 solar masses) in the center of globular clusters is hotly debated. Their existence would have significant consequences on understanding the seeds for super-massive black holes and they would also be an important source for gravitational wave detectors.

The proposed research aims at identifying (or excluding!) intermediate-mass black holes in the center of globular clusters and to expand on the consequences.

The project is based on data obtain in March and November 2006 with the world-wide unique facility of NACO (a Fabry-Perot behind an adaptive optics system) that was used to measure the radial velocities of stars in the center of several Galactic globular clusters. These results provide accurate estimates of the central kinematics which will be used to measure the central mass profile and to determine whether the selected clusters contain black holes or not.

For this project we are looking for a PhD student who will be embedded into the cluster and participate in the structured graduate program of the Cluster. The candidate will be selected by a PhD committee which will evaluate the application and invite short listed candidates for an interview. The successful applicant would be interested in (and ideally have knowledge/experience) in one or more of the following topics: observational astronomy, numerical N-body simulations, kinematics of hot stellar systems and the physics of black holes.

Besides these research actvities the candidate is expected to actively participate in the cluster's academic life (lectures, seminars, workshops, discussions with invited guests). Upon successful completion the candidate will be awarded the doctoral degree in physics of the Universität München (TUM or LMU).

The contract (ESO studentship) will be for 3 years. We will offer support for installation and child care. As the cluster actively supports female scientists, such applications are strongly encouraged. Please apply electronically only. Don't forget to add your CV, a short summary of previous research actvities and the names of 2 scientists willing to write a letter of recommendation.

For more information see http://www.universe-cluster.de/ or contact:

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