

examples, it is currently not clear whether galaxy formation models can produce objects of comparable colours and sizes in sufficient numbers to be consistent with our observations.

Lastly, the substantial differences between HDF-N and HDF-S demonstrate that results based on such small fields can be seriously affected by cosmic variance. The results of the second field in the FIRES survey, the much larger MS1054-03 field, should decide which one of the fields is atypical. We are pursuing extended follow-up programmes to obtain more spectroscopic confirmation of the above results, allowing us to fully investigate the nature of these galaxies and the clues they provide for models of galaxy formation. Updates on the FIRES programme and access to the reduced images and catalogues can be found at our website <http://www.strw.leidenuniv.nl/~fires>.

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OTHER ASTRONOMICAL NEWS

Summary of the Workshop on

EXTRAGALACTIC GLOBULAR CLUSTER SYSTEMS

hosted by the European Southern Observatory in Garching on August 27–30, 2002

By M. KISSLER-PATIG

Extragalactic Globular Clusters, a Booming Field of Research

Globular cluster systems were established in the last decade as powerful

tools for the study of galaxy formation and evolution. For this purpose they are used in nearby galaxies with as much success as the diffuse stellar populations and complement the latter studies

by being superior in several practical aspects. For instance, globular clusters are better chronometers than the diffuse stellar population since each globular cluster can be identified as a single-age population. The age determination of the major globular cluster subpopulations allows one to precisely date the star formation events in the host galaxy.

Further, the study of globular cluster systems is the easiest way to detect multiple old or intermediate-age subpopulations within a galaxy. These in turn can trace multiple major star-formation episodes at early times, invisible in the studies of the diffuse galaxy light in which all populations are mixed.

Another advantage is that globular clusters can be traced far out in the halo, probing stellar populations and kinematics at several effective radii of the host galaxy – a range inaccessible to diffuse stellar light studies. The globular clusters can be used for dynamical studies at outer radii, shedding light on the assembly histories of the systems and the host galaxies.

Finally, globular clusters are very good calibrators at all wavelength for single stellar population models, an es-



Figure 1: NGC 6946 – a nearby spiral with a large number of very luminous young stellar clusters. Taken from Larsen's contribution. The observations were made with the ALFOSC instrument on the Nordic Optical Telescope on La Palma. ALFOSC is a twin instrument of DFOSC on the Danish 1.54-m and mounted on the NOT; it has a field size of about 6×6 arcmin. The colour image was generated from a mosaic of 3 pointings with red channel = $V + I + H\alpha$; green channel = V ; blue channel = B .

sential tool for all galaxy formation and evolution studies.

In summary, globular clusters are a very strong complement to diffuse galaxy-light studies. They are very good tracers of the major star-formation episodes of galaxies, including extreme conditions such as star-burst during violent merger events. The study of these systems allows us to learn not only about the formation of the globular clusters and their systems, but also about the formation and evolution of galaxies.

The ESO Workshop, a Follow-up on the Pucon IAU Symposium

Last year's IAU Symposium 207 on "Extragalactic Star Clusters" in Pucon (the first IAU symposium to be held in Chile) highlighted preliminary results from some of the currently ongoing, extensive programmes to study globular cluster systems. The size of the meeting did not lend itself to interactive discussions. However, the talks presented at this Symposium underlined the dramatic progress currently underway in this field.

This motivated us to follow it up a year and a half later with a workshop on a more focused aspect, namely "Extragalactic Globular Cluster Systems". The meeting was held at the headquarters of ESO in Garching, profiting from the freshly renovated Auditorium. About 60 participants enjoyed 4 days of lively discussion and excellent presentations. The low mean age of the researchers in this dynamic field spoke for the timeliness of the research. Participants who pioneered the research a couple of decades ago (such as W.E. Harris, and D. Hanes) expressed several times the joy of seeing the field blossom, even if it implied that they are now regarded as "dinosaurs" by the young graduates and post-graduates.

The workshop programme was planned such that no less than 2 hours for lunch break and another one hour

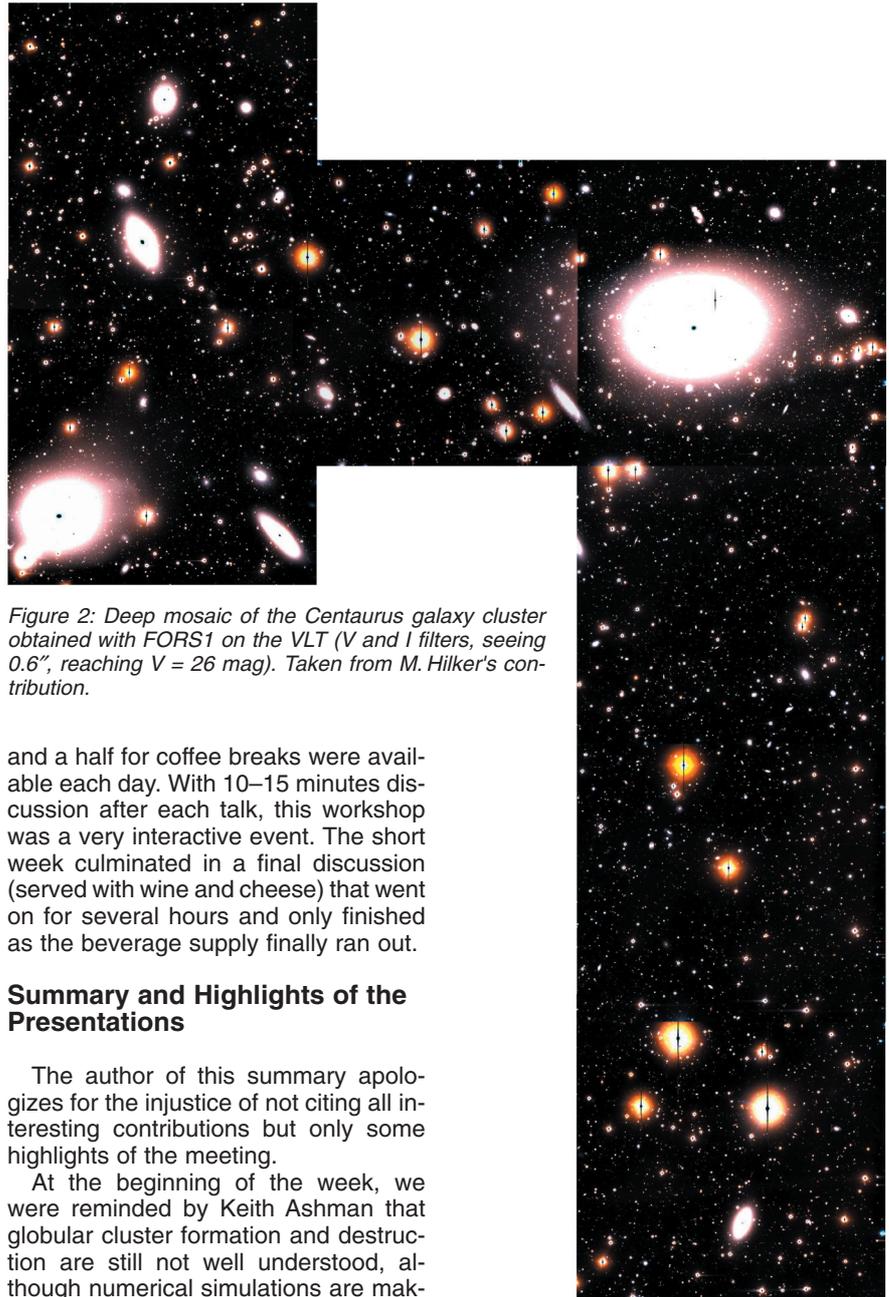


Figure 2: Deep mosaic of the Centaurus galaxy cluster obtained with FORS1 on the VLT (V and I filters, seeing 0.6", reaching $V = 26$ mag). Taken from M. Hilker's contribution.

and a half for coffee breaks were available each day. With 10–15 minutes discussion after each talk, this workshop was a very interactive event. The short week culminated in a final discussion (served with wine and cheese) that went on for several hours and only finished as the beverage supply finally ran out.

Summary and Highlights of the Presentations

The author of this summary apologizes for the injustice of not citing all interesting contributions but only some highlights of the meeting.

At the beginning of the week, we were reminded by Keith Ashman that globular cluster formation and destruction are still not well understood, although numerical simulations are making steady progress in explaining the evolution of globular cluster systems

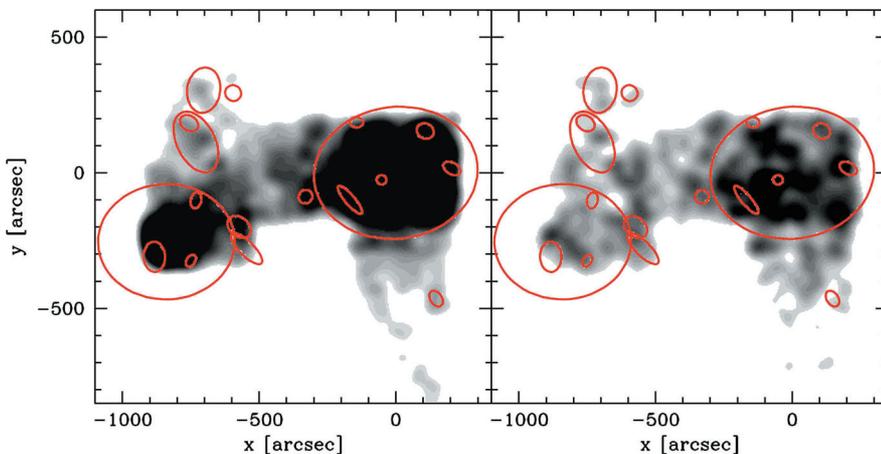


Figure 3: The smoothed density map of globular cluster candidates shows clear over-densities outside the isophotes of the major galaxies. Centaurus must host a significant population of free floating, intra-galaxy globular clusters.

(e.g. the presentation of Enrico Vesperini).

Young star clusters are, however, extensively observed and studied as a whole session demonstrated. The main current result is that these young clusters get better and better connected with their old counter-parts and that little doubt remains that a vast number of the observed massive young clusters will evolve into objects similar to the old globular clusters observed today, although their initial properties might contain surprises (e.g. S. Mengel's review).

Early- and late-type giant galaxies remain the favourites for studying cluster systems as a whole. Spectroscopic studies with 8- to 10-m telescopes produce impressive results both on the kinematics of the outer regions of galaxies (e.g. the many hundred velocities collected in the outskirts of NGC

1399 by Tom Richtler and his group), as well as on the chemistry of the old clusters (e.g. Puzia et al.). A number of studies also reported on large intermediate age populations of globular clusters in early-type galaxies, detected both by a combination of optical and near-infrared photometry as well as by spectroscopy (e.g. Hempel et al., Goudfrooij et al.). Interestingly, the globular clusters in dwarf galaxies look “almost but not quite unlike” their counterparts in giant galaxies as Jennifer Lotz showed us. Despite the similarity, populations in dwarfs can extend to very low metallicity.

Interestingly (even if not unexpectedly), globular clusters are found in large numbers in the intergalactic medium of galaxy clusters. Michael Hilker and collaborators show clear evidence for globular clusters floating through the Hydra I and Centaurus galaxy clusters.

Finally, globular clusters, as the oldest objects known in the sky, are now being put in a cosmological context. Mike Beasley investigated the constraints that they put on semi-analytic models in the hierarchical clustering scenario of galaxy formation. Michael Santos presented a model in which the

old metal-poor globular clusters formed prior to re-ionization.

Clearly, extragalactic globular clusters currently dominate the study of stellar populations in nearby galaxies. Their properties set hard constraints on galaxy formation and evolution models, but also shed new light on the star formation history of the universe. This research area will clearly produce a number of astonishing results in the next 5 years.

The organizers would like to warmly thank Christina Stoffer who perfectly controlled the logistics of the conference, as well as Pam Bristow for helping in the proceedings editing.

The VLTI: Challenges for the Future

WORKSHOP AT JENAM 2002 IN PORTO

A. GLINDEMANN, ESO

On the verge of becoming a major science facility, the VLTI was the subject of one of the workshops at this year's Joint European and National Astronomical Meeting in Porto (Portugal) in September. The two and a half day workshop had the aim of introducing interferometry and the VLTI to the non-expert. About 65 participants, many of them young and from outside the interferometric community (the two essentials for success) showed the large interest in interferometry.

After an introduction to interferometry, to the VLTI and its instruments, and to the two other large interferometers –

the Keck Interferometer and the Large Binocular Telescope – on the first day, the second day was devoted to science. In 16 presentations, stellar astrophysics was addressed including accretion disks and outflows of young stellar objects, surface structure and circumstellar envelopes of Mira stars, diameter of Cepheids, and mass loss of Wolf-Rayet stars. The possibilities of observing nuclear regions of AGNs with the VLTI were also explored. The emphasis of the presentations was on the possibilities with the VLTI. Some of the presentations contained results of interferometric observations with smaller interferometers. The report on

Mira was based on new observations done with the VLTI and made public through the regular VLTI releases.

On the last day, the discussion on the future of the VLTI and on projects for second-generation instrumentation concluded the workshop.

This workshop was a success in attracting the non-interferometrists in the astronomical community and in summing up the scientific topics to be tackled in the near future. It became evident that it is now important to finally make the observations and produce the results that have been discussed over the last years.

Summary of a Meeting on Science Operations with ALMA, held on Friday, 8 November 2002

P. SHAVER (ESO) and E. VAN DISHOECK (Leiden)

With the recent approvals by the ESO Council and the US National Science Board for the construction of the Atacama Large Millimeter Array (ALMA), it was thought timely to update the European astronomical community on the project and to solicit input on the plans for science operations and user support. To this end, a one-day meeting was held at ESO Headquarters in Garching on Friday, 8 November. It was very well attended; the auditorium was filled to capacity with some 100 participants from all over Europe.

The meeting began with an overview of the project and its current status by S. Guilloteau. Three very stimulating talks reviewed some of the major science drivers for ALMA: the high-redshift

Universe (S. Lilly), star and planet formation (A. Natta), and late-type stars (H. Olofsson).

The meeting then moved on to consider operations: concepts and plans for the operations phase were outlined by E. van Dishoeck, D. Silva talked about the relevant operational lessons from the VLT, and R. Lucas discussed the ALMA data reduction software and observing tools. After lunch P. Cox discussed the coordination of the European astronomical community and preparation for ALMA, including the opportunities within the EU Framework 6 programme. The discussion session then started with seven short contributions on a variety of topics, which led on to a very stimulating and useful open dis-

ussion chaired by J. Richer and E. van Dishoeck. Topics of discussion included the role and nature of a possible European Regional Support Centre (RSC) which could assist users in the observation preparation and data analysis processes, and ideas and priorities concerning software, receiver bands, surveys, future enhancements, and preparation for ALMA science. In view of the success of this meeting, there will probably be more such meetings for the community as the project evolves.

The viewgraphs from the invited talks given at the meeting are posted on the ALMA website, <http://www.eso.org/projects/alma/doclib/talks/>, where more details on the ALMA project can also be found.