Euclid Consortium **Newsletter**

http://www.euclid-ec.org/

Issue 3, April 2013

News from the Bridge

Dear Friends of Euclid. "Welcome on board" could be a good summary of the Euclid activities over the past 6 months. After the integration of our 40 colleagues from NASA in the Euclid Consortium and 2 normal registration sessions for new full members in October and March, we are now 1150 EC full members. Worrisome indeed in terms of organisation and coordination, but also most satisfying to see how scientifically appealing this mission is for the physicists and astrophysicists. In parallel, the Payload Module was selected by ESA leading our colleagues of Astrium to also be on board since December. With the end of the on-going Service Module selection process in June, the full "Euclid Collaboration" that includes the Euclid Consortium (EC), ESA and Industry will be in place. Over the next decade, several thousands of people will then be involved in Euclid...

On the project side, ESA, the Payload, VIS and NISP instruments teams and detectors groups and the Science Ground Segment (SGS) and System teams, as well as the Calibration, Survey and all Science working groups have all been extremely busy since November as the schedules are very tight. Nevertheless, enormous progress has been done on all fronts. In particular, the collaboration between Astrium ESA and the EC instruments teams that started last December is indeed excellent. The Euclid Meeting in Leiden on May 13-16 will be an good opportunity for all of us to see during the plenary and splinter sessions where we are today and what are our next milestones and challenges. I would like to take this opportunity to warmly thank ESA and the VIS, NISP and SGS teams who kindly accepted to actively participate to this meeting despite the deadlines for delivery of the SGS Preliminary Requirements Reviews (PRR), and the VIS and NISP System Requirements Reviews data packs few days after.

The Euclid Consortium already welcomed Sabrina Pottinger (MSSL) , the new VIS Project Manager in its last Newsletter and thanked Richard Cole (MSSL) for his fantastic contribution to Euclid in that position. Since then, new key persons have been invited: Eugenie Girin at IAP, Stefanie Watcher at MPIA as new EC lead of the Calibration Working Group, Graham Willis (MSSL) as new PA/QA manager, Magda Szafraniec (MSSL) as new VIS detector scientist and Annette Ferguson as new lead of the "Milky Way and Resolved Stellar Population" SWG, in replacement of Mike Irwin. Welcome to all of them. On the other hand, Rory Holmes will leave the Consortium in June after years of excellent work and dedication to Euclid.

Finally, let me conclude by this great achievement: Euclid Consortium has now a logo! Congratulations to all of you who participated to the selection process at any stage. In particular the COMS groups and Malte Tewes, Stefano Camera, Eleonor Casetta and the artist Veronique Geubelle did have a major contribution to the design and finalisation of the logo. Be sure that we are all going to use it as the new flag of the Euclid Consortium.

Yannick Mellier

From the editors

Dear reader, welcome to the third issue of the Euclid consortium newsletter. This issue features the near-IR instrument and the near-IR imaging OU to complement last issue's coverage of the VIS instrument and OU. We also have an overview of the calibration working group - an essential group for the success of the mission of course but one which you might not know so much about. We continue our coverage of science with Euclid and get a glimpse into the workings at the ESA SOC in our tour of the ground segment.

The last months have also seen the influx of 40 NASA appointed scientists into Euclid and Jason Rhodes has written a piece to introduce this group and what they bring with them. Hopefully many of us will meet up in Leiden in a few week's time to get to know each other and look forwards to the decade of Euclid.

As always it is a pleasure to thank all our contributors, and to encourage you all to offer contributions and suggest topics for future newsletters.

Jarle Brinchmann, Richard Massey & Stefania Pandolfi

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News from the Project scientist

While writing this column I am still recovering from the 47th ESLAB Symposium held in ESTEC on the first Planck results. It was a joy to see the harvest of the Planck mission after years of hard work. All people involved in the Planck Mission should get the best credits for the job done so far. This includes the people in industry, the instrument teams, the operations teams, and the science teams who provided hardware and human power to enable a flawless sky survey. Even as a Planck insider, I was highly impressed by both the amount and depth of the scientific studies done by the Planck Consortia. I saw many exciting results, which were unknown to me to that level of detail. Like many of you, I am also eagerly waiting for the next round of data processing and analysis results, especially involving CMB polarisation.

Not only the scientific outcome, but many lessons learned from the Planck mission will be taken by Euclid. The Planck Consortia got about 3.5 years from the start of the nominal survey to arrive at this first major data release. For Euclid we have 26 months to prepare for the first big data release, which is substantially less time. This requires, already at the start of the survey, an extremely high level of readiness of the (science) ground segment, including the scientific pipelines. We are preparing ourselves for this scenario. In the coming months, the Euclid science ground segment (SGS) preliminary requirements review will be held to scrutinize the credibility of the requirements and development plans for the Euclid SGS. An important review item is the timely production of the envisaged data products which should be released to the public.

During the Planck Symposium, somewhere else in ESTEC the selection process for Euclid's Industrial Prime Contractor - the so called "Prime" - was in full swing. Review panel members were discussing until very late in the evenings the pro's and con's of the designs by the proposers. An important milestone happened on the last day of the Planck conference, which forced me to leave the conference one day earlier. At this point I can only say that the selection of the industrial prime is far from easy due to the excellent quality of the proposals and the intricate issues regarding the attitude and orbit control of the spacecraft. But we are on schedule and we hope to kick-off the contract at the beginning of June.

With the selection of the Prime we will obtain a more detailed view of the development schedule until launch and spacecraft in-orbit commissioning. The main industrial contractor for the payload module (PLM; Astrium Toulouse, selected in December 2012) will then fall under the responsibility of the Prime, replacing ESA. It should be mentioned that the present collaboration between the PLM contractor, EC instrument teams, and ESA is going very well with a good mutual understanding. I hope that this situation will continue among all major parties after the Prime selection.

Until the Preliminary Design Review (PDR), the main contractors will form industrial consortia with subcontractors from all ESA member states, obeying the ESA geographic return rules. Before the composition of the industrial consortia are finalised, we will hold system requirements reviews. We expect to obtain the full understanding of the designs of the telescope, instruments, and the spacecraft to carry out detailed scientific performance predictions for the mission. The most important and last system requirements review will deal with the mission as a whole and will be held at the beginning of 2014.

I am looking forward to attend the May 2013 Consortium meeting in Leiden, because I can come by my own bicycle (and get wet), and more importantly to hear about the promise of Euclid after the first Planck results.

René Laureijs

Update from the COMS group

It is now a year since the creation of the Communications (COMS) team, responsible for improving internal communications (iCOMS) and coordinating our Educational and Public Outreach (EPO) strategy. In the last year, our small team - made up of scientists who have volunteered their time - has had weekly telecons to discuss a variety of issues including EC websites and wiki-pages, coordination with ESA communications and promoting public outreach activities. For more details on the COMS remit, please see the latest EC Management Plan which was updated in April.

One of our most visible products is the new EC logo. Thanks again to everyone for your design effort, assistance and votes; 43 consortium members submitted 88 initial suggestions, which were further developed by professional graphic designers. You then voted on their shortlist (57% turnout of exactly 1000 members at the time). The favourite logo was inspired by submissions from Malte Tewes, Stefano Camera & Eleonor Casetta, and has now been finalised by professional artist Veronique Geubelle. Special thanks to all of you.

High resolution images are available from `http://euclid.roe.ac.uk/projects/referencet/wiki/Logo` where we also supply some templates for Powerpoint. Please start using the new logo on consortium documents, and if you create templates that will be useful for others, please upload those to the redmine pages in turn.

Other COMS tools include the creation of a consortium-wide calendar (Valeria Pettorino) and newsletter (Jarle Brinchmann, Stefania Pandolfi and Richard Massey), as well as helping with redmine wiki administration and providing easy access to information on EC management, acronyms and science. Please visit the COMS redmine wiki-page to learn more, especially our recent "starters guide" `http://tinyurl.com/c798xo3` which was designed by Valeria Pettorino to help new EC members integrate into the collaboration while also being a great reminder for existing EC members. On the EPO side, the COMS team have also established a Euclid YouTube channel with video interviews of EC members taken during the EC Copenhagen meeting. You can subscribe to our Youtube channel at `http://www.youtube.com/user/euclidmission` to receive automatic updates on new videos. We have also set up a @euclidmission twitter account and encourage EC members to follow it and use the `#euclidmission` hashtag where appropriate. The twitter feed is also available on the Euclid Consortium website.

Looking forward, the COMS team has several new projects on the horizon, including an updated main web page with science blog page and an EPO activity tracker to promote the coordination and advertising of EPO activities across the consortium. We hope these new tools, in combination with existing ones, will help to promote communications and outreach activities across the collaboration.

We encourage everyone to engage with the COMS team. If you would like to join and contribute, please contact us via email or join us in Leiden where we have several COMS events.

Richard Massey, Bob Nichol, Valeria Pettorino, Anais Rassat

The Euclid Consortium Meeting

The Euclid Consortium Meeting takes place in Leiden, Netherlands, 13-15 May 2013. The meeting is organized by Leiden Observatory with support from Astrium, ESA, Dutch Space, Leiden University, SRON, and TNO.

The aim is to bring together many of the more than 1000 members contributing to the Euclid mission. The consortium currently comprises more than 100 laboratories from 13 European countries: Austria, Denmark, France, Finland, Germany, Italy, Netherlands, Norway, Spain, Switzerland, Portugal, Romania and the UK. In addition, it includes several US NASA and Berkeley laboratories.

The meeting comes at an important juncture in the Euclid mission. Euclid is in full construction phase and important advances are made in all areas related to the mission, including payload and satellite description, science requirements, survey definition, reduction pipelines, catalogues, and simulations.

The meeting consists of plenary sessions with invited talks that cover this range of topics and splinter sessions co-organised by the Science Working Groups (SWGs), Organisational Units (OUs) and other groups. Finally, a joint SWG/Science Ground Segment "garage day" is organized to consolidate links and iron out any issues (see program overview for details).

Leiden is a charming historic university town with a population of 120,000. The meeting is held in the civic auditorium right in the historic city centre, surrounded by canals, windmills, 17th century buildings, and cafes and restaurants hidden away in narrow alley ways. Leiden University (founded in 1575) is the oldest university in the Netherlands and the historic university buildings are spread throughout the city.

The civic auditorium in Leiden lies in the Breestraat - one of the oldest streets in the city, on the site of a former poor people's home cum hospital, the Sint-Catharina-gasthuis. Today it is the main concert hall in Leiden.

We are looking forward to seeing you in Leiden!

On behalf of the Euclid LOC,
Ivo Labbé

Agenda

http://euclid.strw.leidenuniv.nl/home.html

Monday 13/5

09:00 - 10:00	Registration
10:00 - 10:15	Welcome
	Coffee
10:30 - 12:30	Splinter 1
	Lunch
13:30 - 14:00	EC update (Mellier)
14:00 - 14:30	ESA PO update (Racca)
14:30 - 15:00	ESA PS update (Laureijs)
15:00 - 15:30	Mission - System (Amiaux)
	Coffee
16:00 - 18:00	Splinter 2
18:00 - 19:00	Reception

Tuesday 14/5

09:00 - 09:30	Galaxy clustering (Percival/Guzzo)
09:30 - 10:00	Weak lensing (Kitching)
10:00 - 10:30	Legacy science (Brinchmann)
	Coffee
11:00 - 11:30	Additional cosmology (Bartlett)
11:30 - 12:00	Cosmological simulations (Fosalba)
12:00 - 12:30	Mission - Survey (Scaramella)
	Lunch
13:30 - 15:30	Splinter 3
	Coffee
16:00 - 18:00	Splinter 4
19:00 - 23:00	Dinner at Scheltema

Wednesday 15/5

09:00 - 09:45	NIR instrument (Maciaszek)
09:45 - 10:30	Visible instrument (Cropper)
	Coffee
10:50 - 11:35	Payload module (Cazaubiel)
11:35 - 12:20	Science Ground Segment (Pasian)
12:20 - 12:50	COMS group (Rassat)
	Lunch
13:30 - 15:30	Splinter 5
	Coffee
16:00 - 18:00	Splinter 6

Thursday 16/5

For ECB and OU/SWG leads

09:00 - 12:30 - ECB meeting

09:00 - 18:00 - Science Ground Segment and Science Working Group garage day

NASA Joins the EC

With the signing of an official Memorandum of Understanding (MoU) on January 10, NASA and ESA officially agreed to partner on the Euclid mission. NASA will provide the Sensor Chip Systems (SCS) for the NISP by procuring, characterizing, and delivering to ESA 20 ‘triplets’, each consisting of a Teledyne H2RG (2k by 2k) near infrared detector, a flexible cryogenic cable, and associated readout electronics (SIDECAR ASIC). This will include 16 flight triplets to be integrated into the NISP by the EC and 4 spares. The process will be managed by NASA’s Jet Propulsion Laboratory, under the guidance of NASA Euclid Project Manager Ulf Israelsson, while the bulk of the detector validation will be done at Goddard Space Flight Center’s Detector Characterization Laboratory (DCL), which has significant experience with this family of detector via the HST and JWST projects.

NASA, in exchange, was given the opportunity to nominate 40 people to the EC, one person to be a full member of the Euclid Consortium Board, and one person to be a permanent member of the ESA Euclid Science Team. Last summer, NASA solicited proposals for these slots and conducted a peer review of the submitted proposals. NASA ultimately selected 3 proposals for funding and nominated the team members on the 3 proposals for EC membership. These nominations were endorsed by ESA, the ECB, and the ECMC, and 40 new US scientists joined the EC in February.

The three NASA-nominated teams will fully integrate into the EC SWGs and OUs span a wide range of science interests. The largest team, led by Jason Rhodes (JPL) consists of 43 people. This includes 29 new members of the EC (nominated via the NASA call) and 14 existing EC members. The 14 existing EC members include some of the early architects of the Euclid mission, dating back to the days of DUNE and SPACE, as well as 7 Department of Energy funded scientists at Lawrence Berkeley Laboratory (LBL). The LBL scientists became EC members in exchange for assistance in planning the NISP during the Euclid selection phase. This large team will engage in a wide range of Euclid science, including the primary weak lensing and galaxy clustering dark energy science as well as legacy science related to galaxy evolution. A second team, led by Alexander Kashlinsky (GSFC), has joined the Primeval Universe SWG to participate in measurements of the cosmic infrared background using Euclid and ancillary data sets. This team consists of 7 people, including a postdoc to be named later. A third team, consisting of 3 people including a postdoc to be named later, is led by Ranga-Ram Chary (Caltech/IPAC) and plans to study nebular emission from galaxies with an eye toward better photo-zs and a better understanding of galaxy evolution. Rounding out the NASA-nominated scientists is NASA Euclid Project Scientist Michael Seiffert, who was given the 40th NASA slot. In addition to his duties as Project Scientist, he will participate in the GC SWG. All of the NASA-nominated teams interacted with the appropriate SWG leads in developing their proposals and look forward to productive collaboration with their European colleagues. NASA nominated Jason Rhodes for membership on the Euclid Consortium Board and the ESA Euclid Science team. The nominations were endorsed by ESA and the ECB and he began participating in those groups in February.

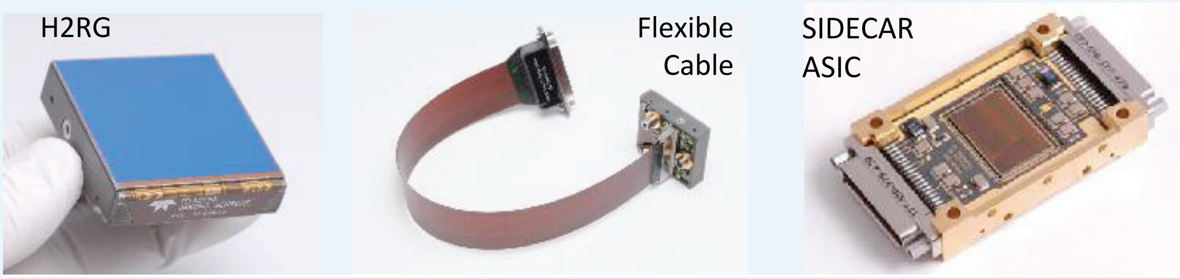


Figure 1: SIDECAR™ (system image, digitizing, enhancing, controlling, and retrieving) ASIC (Application Specific Integrated Circuit)

NASA is currently exploring options for possible participation in the Euclid SGS. The Infrared Processing and Analysis Center (IPAC) at Caltech has entered into discussions with the ECL and the SGS leads to identify areas where US SGS participation would enhance Euclid’s science return.

Jason Rhodes (JPL/Caltech)

What does the acronym stand for? WIMP

Weakly Interacting Massive Particles, or WIMPs are hypothetical particles proposed to make up dark matter. They are assumed to interact only through gravity and possibly also the weak nuclear force. This makes them challenging to detect but a number of claimed detections have been made although none have yet been generally accepted.

The Science Ground Segment and Instruments

The Science Ground Segment

The main activity of the staff working on the Science Ground Segment (SGS) for the Euclid mission is to carry on the organisational work needed to undergo successfully the SGS Preliminary Requirements Review (PRR). Nineteen documents need to be ready by mid-May (immediately after the Leiden meeting) which is the deadline to deliver the documentation package to the reviewers. Beforehand, the documents will be reviewed internally, by a group of interested people, to whom the SGS Team is very grateful. The kick-off meeting for the internal review is scheduled on April 24th in Garching.

The teams of the EC SGS and the ESA Science Operations Centre (SOC) are working in tight cooperation to prepare a complete and convincing implementation plan for the SGS, which needs to be compliant with the scientific, data processing and organisational requirements set by ESA. Such requirements are flowed down into a set of more detailed SGS Requirements. The Data Processing Flow is a "big picture" document demonstrating that data processing can be built appropriately so as to reach the scientific goals of the mission; the Architecture Dossier allows to understand which are the technical means that guarantee the Data Processing to be feasible.

There is furthermore a whole set of formal documents which deal with management (both common and specific to EC and SOC), product assurance, validation & verification, configuration management, risk management, documentation, schedules, and a work breakdown structure with the detailed description of each work-package. All of these formal documents are compliant with a simplified version of the standards from the European Cooperation for Space Standardization (ECSS), "tailored" to the Euclid SGS. The selected management techniques should therefore be appropriate to control a system having the worrisome complexity of the Euclid ground segment.

Needless to say, carrying on the activity aimed at the SGS PRR implies the organisation of a whole set of meetings, teleconferences, debates, e-mail discussions which involve scientific, technical, operational and managerial aspects. Although sometimes heated, these discussions are a fundamental step to organise a robust project and, especially, to build a solid team spirit.

To be noted, two data centres (IPAC in Pasadena and ASDC in Frascati) expressed their interest in participating in the development of the SGS by contributing to some of the OU work-packages. Discussions and negotiations are under way.

Fabio Pasian

The Calibration Working Group

Calibration is typically viewed as science's ugly cousin, a tedious yet necessary chore with all the appeal of preparing one's tax return. After all, we scientists are in the business of observing the wonders of the universe, not longingly waiting for that next set of flat fields. Nevertheless, for a mission such as Euclid---where systematic effects must be understood and controlled to a very high level---obtaining a good calibration is critical. The Euclid science goals dictate the need for cutting-edge calibration performances. For example, the point-spread function (PSF) in the visible images needs to be precisely determined for the weak lensing analysis to succeed, the requested photometric redshift accuracies put tight constraints on the relative photometric error in the near-infrared images, and the galaxy clustering science probe requires exquisitely calibrated spectra. In the end, a thorough and careful calibration of the data is at the core of achieving the scientific potential of the Euclid mission.

Euclid is a complex and complicated system and as such, the calibration of its two instruments cannot be viewed in isolation. With Euclid, even seemingly trivial calibration requests, such as slewing to an absolute standard for the near-infrared instrument, can be complex in practice: when will the target be visible to Euclid with its strict sun-angle constraints, will such a movement perturb the telescope and destroy the visible PSF calibration, can we afford the fuel? In fact, when we get down into the details, we find that almost all calibration activities must be considered in a global context: the visible flat-field calibration unit might leak light into the near-infrared instrument, rotating the near-infrared filter wheel to the shutter position shifts the pointing of the satellite and thus prevents simultaneous visible observations and so-on. It was based on this realization that the Euclid Calibration Working Group (CalWG) was born roughly a year ago, with a remit to bring all of the different aspects of the mission into one forum, so that calibration activities can be coordinated across the entire system. This twenty-person group includes key members from the science teams, the instrument teams, the ground segment, the survey planners, and individuals concerned with the interfaces to the telescope and the satellite. It is also supplemented with experts of important sub-systems, such as detector scientists, as well as legacy science team members.

The group's task is not solely focused on instrument calibration. In fact, the Calibration Working group is responsible for the calibration of the mission as a whole. This, of course, involves the details of instrument calibration: how can we correct the non-uniformities in the visible imager's pixel-to-pixel sensitivity variation, how can we build a model for the near-infrared slitless spectrometer's dispersion solution, how can we compensate for intra-pixel sensitivity variations in the undersampled near-infrared images? However, a large part of this group's activities pertain to the "scientific calibration" of the mission, for example, which calibration fields should be observed to determine the galaxy colour gradients in the weak lensing analysis, to train the photometric redshift codes, and to help disentangle the slitless spectroscopy images?

During the last year, the CalWG's efforts have focused heavily on the calibration requirements, in particular on flowing down the top-level science calibration requirements into instrument, survey and ground data processing requirements. To capture this effort, two additional documents have been added to the Euclid Requirement Structure: the Calibration Concept Document Part A and Part B. The size of these documents adequately represents the tremendous amount of work completed over the last twelve months: combined, these documents cover over 130 pages and contain over 450 requirements! In the last year, we have only laid the groundwork. The calibration strategies will evolve as we continue to better understand the instruments and the various mission constraints. In fact, the Calibration Working Group will stay active through the instrument development, the launch, the performance verification phase, the scientific operation and beyond.

The CalWG has met officially three times during the last year, with many more telecons and targeted discussions---not only within the EC, but also with ESA---to follow up on specific issues raised during these meetings. In the future, the CalWG aims to maintain roughly quarterly meetings. The CalWG would also like to draw on the vast calibration experience derived from past missions that is doubtlessly present within the Euclid Consortium. We welcome input from the Euclid community at large, please share your ideas and thoughts on best practices to ensure the success of the Euclid mission.

Rory Holmes (outgoing CalWG Lead),
Stefanie Wachter (incoming CalWG Lead)

ESA SOC

The Euclid Science Operations Centre (SOC) is the ESA contribution to the Euclid Science Ground Segment. It is located at the European Space Astronomy Centre (ESAC) in Villafranca del Castillo near Madrid, Spain. ESAC hosts the Science Operations Centres for ESA's astrophysics, planetary exploration and heliospheric physics missions.

Views (above and below) of ESAC in Villafranca del Castillo, Spain.

The SOC contributes to many aspects of the Science Ground Segment (SGS); one of the key roles that it plays is as the interface between the Euclid Mission Operations Centre (MOC) located in ESOC in Germany and the rest of the Science Ground Segment. This interface focuses on routine operational activities with the spacecraft. The life cycle of these activities begins with survey planning. The Euclid Consortium (EC) will produce an integrated sky survey incorporating the different survey elements (e.g., the Wide and Deep surveys) and the routine calibration observations. The SOC assists the generation of this sky survey providing tool to verify that it is compatible with the mission constraints. Once agreed, the SOC executes the survey, periodically sending to the MOC the upcoming set of pointing requests corresponding to the survey fields and calibrations.

Once these pointing requests have been executed on-board, the science data from the spacecraft will be collected by the MOC and sent to the SOC for Level 1 processing along with the necessary auxiliary data required for generation of the Euclid data products. A routine daily quality assessment of the data will be performed at the SOC using the Level 1 data, complemented by a deeper analysis by the EC SGS Instrument Operations Teams over a longer timescales using the Level 2 data. With this quality information in hand, the progress of the survey and the scientific health of the instruments can be monitored and the SGS can implement any corrective actions needed to achieve the sky coverage and high data quality required for Euclid science.

A core system within the SGS is the Euclid Archive which manages the large volume of data produced by the Euclid mission within the SGS. The SOC collaborates with the EC in the development of the Euclid Archive providing the core element; the Euclid Archive Core Services (EACS). This service provides the central repository of product meta-data. Recalling that products such as images and spectra generated during the data processing will be distributed across the SDCs rather than stored in a central system, this meta-data includes the physical location of those products enabling users of the Euclid data to retrieve it in a seamless manner. In the long term, all data made public will be served from ESAC, forming a new element in its portfolio of science archives for ESA science missions.

These activities require a close collaboration with the EC; our closest partners are the EC SGS. The SOC management team works with the EC SGS Project Office to guide the development and operations of the SGS, while at a technical level the EC System Team and Instrument Operations Teams are essential partners. The development of systems by the EC SGS for operation at the SOC is coordinated through these groups. Beyond the Science Ground Segment, the SOC participates in mission-level activities such those coordinated by the Calibration Working Group and Sky Survey Working Group.

John Hoar

OU-NIR

Like OU-VIS and OU-SIR, OU-NIR is one of three operational units within the Euclid Ground Segment that is "very close to the metal" and whose operations will be tightly coupled with the hardware and constant inflow of observations soon to be available with Euclid.

As members of the OU-NIR operation unit, we have the grand task of proto-typing a pipeline that is capable of taking the considerable amount of near-IR imaging observations to be acquired with Euclid and producing high-fidelity near-infrared images over a sizeable fraction of the sky. The scale of this task with Euclid, in terms of the depth and areal coverage, is completely unprecedented, being several magnitudes deeper or factors of 10 wider than any wide-area survey from the ground or space.

Similar to the optical imaging observations Euclid will obtain with the VIS instrument, the deep near-IR imaging observations from the NISP instrument serve an essential role in the entire Euclid mission despite their somewhat shallower depth and coarser spatial resolution. The task for the near-IR observations is to provide extremely accurate information on the redshifts of all the sources covered by the survey. Accurate redshifts are required for the precise tomography of the universe Euclid will obtain with weak lensing, the cosmological constraints Euclid will achieve from baryon acoustic oscillations, and a wide variety of other legacy and cosmological science. While the uncertainties on the redshift of individual sources allowed by the surveys is modest, $\sigma(z)/(1+z) < 0.05$, the accuracy on the mean of the redshift distribution must be extraordinarily high, i.e., $\sigma(z)/(1+z) < 0.002$, to accomplish the core science goals of the Euclid mission.

One of the primary challenges for the NIR operational unit is therefore ensuring that our near-IR reductions are of such a quality that we can attain this level of redshift accuracy over a huge fraction of sky. To accomplish this, we need to prototype a pipeline that is capable of achieving a very high relative (1.5%) and absolute (3%) photometric precision throughout the mission. These stringent photometric requirements demand that we anticipate and correct for most of the significant artifacts or other issues that may affect these goals, like persistence-type effects or position-dependent backgrounds that may result from the scattered light from bright stars. Even issues like cosmic-ray rejection or artifact removal will be a challenge since a sizeable fraction of the area in our shallow survey will only be covered by two or three distinct exposures.

Work within the OU-NIR operation unit is now well on track. The kick-off meeting for OU-NIR took place at the Observatory in Rome in late June with great weather. We had two lively days of intense brainstorming, with ~15 scientists in attendance. This past March, we hired one talented software engineer to work full time on OU-NIR activities in Rome, and we expect to hire another talented scientist to begin work this fall in Leiden. Discussions have also been ongoing to involve our American partners, and in particular the Infrared Processing and Analysis Center, in prototyping key pipeline steps for which their significant past experience with WISE or the Spitzer Space Telescope is especially useful.

As with VIS operational unit, the near-infrared pipeline represent the initial stages of a very extensive set of processing to be executed within the Euclid Science Ground Segment. Data from our pipeline will be immediately fed to OU-SIR for wavelength calibrating the Euclid near-infrared spectra, to OU-MER and OU-PHZ for producing high-fidelity photometric and redshift catalogues, and finally to the other OUs for higher-level scientific analyses. In the end, our near-infrared pipeline will be responsible for producing a mosaic of some 15,000 square degrees on the sky to a depth of 24 magnitude and some 40 square degrees 2 magnitudes deeper. This extraordinarily deep panoramic image of our corner of the universe will represent a significant treasure trove for exploration, allowing for the discovery of some 30-55 z~8 quasars, some ~100 bright z~9 galaxies, as well as thousands of z~1 SNe. As never before, the diversity and richness of the distant universe come alive with this deep skyscape from Euclid, providing a significant legacy for many years into the future.

Rychard Bouwens & Andrea Grazian for OU-NIR

Figure: Simulated image showing the appearance and depth of a typical 9.5' x 3.5' section of the Euclid Deep survey. This image represents but a small fraction of the total field of view of the NISP instrument (0.76 times 0.72 sq. deg.). For comparison, the Euclid Deep Survey will be 4300 times larger than this image, covering 40 square degrees. The Euclid Wide Survey (2 magnitudes shallower) will cover an area (15000 sq. degrees) that is 1.6 million times larger than this image. This simulated image was produced using tools developed by OU-NIR and OU-MER staff at INAF-OAR.

The NISP Instrument

The instrument development

NISP, the Near Infrared Spectro- and Photometer is designed to produce direct and dispersed images in the near infrared range. The current design is represented in Figure 1 and is built by the NISP team, a large group with contributors from France, Italy, Germany, Spain, Norway and Denmark.

The instrument is both simple and complex. It is simple because it basically operates like every ground-based NIR photometer, a lens assembly and two wheels with several slots for optical elements, only with the added feature that four of these slots provide slitless spectra. However, it is complex due to the strict scientific requirements for performance on throughput and low backgrounds, which needs a narrow point-spread function (PSF) and high transmission of all optical elements.

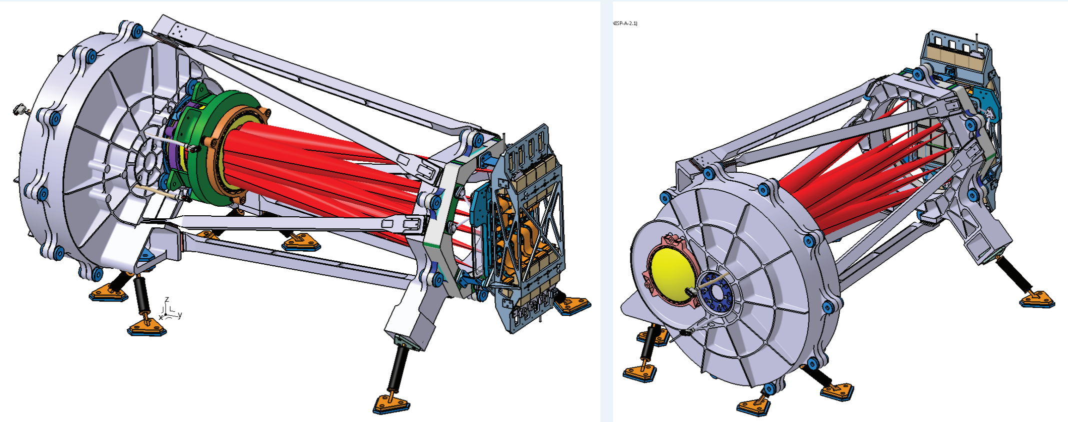


Figure 1: An illustration of the current design for the NISP instrument.

This drove the design to currently four different materials for the four lenses, with correspondingly four materials for the lens holders matching in thermal expansion coefficient. This challenging design feature is partly also due to the large field of view of ≈0.5x 0.5 degrees, requiring very large optical elements. The photometry filter and spectroscopic grisms used in NISP are also large. The former will by far be the largest ever flown in the NIR — at least publicly known — with 140mm diameter and 400g a piece at nearly twice the diameter of those in JWST's NIRCam.

The NI-DS concept: a large focal plane of 16 H2Rg detectors

The current NISP Detector System (NI-DS) concept seen in the Figure 2 on the right, is built of a plate of Molybdenum on which 16 detectors are integrated with their readout electronic SIDECAR. The detector and is electronic is called a SCS (Sensor Chip System) and will be provided by Teledyne, and selected by NASA within Euclid specifications. The 16 SCS will be then integrated, tested and calibrated by a detector characterization team in Marseille.

An important other element of the detection chain is called the Warm Electronics, developed by the Italian team, and is an electronic chain that allows on-board control and preprocessing of these detectors.

The success of this detector chain processing is a very important part of the NISP instrument activities as all detectors should be processed in a very 'similar' way with some challenging issues on performances as ensuring different readout mode for photometry and spectroscopy on board with a low noise and an accurate pixel response. This is needed to achieve a final calibration at the % level.

The NISP team is currently working closely with ESA and NASA to provide and ensure the control of such an detection chain and the delivery of the best SCS for Euclid.

NISP Photometry: New bandpasses and calibration work

On the photometry side the main activities in the past months centred on one side around a re-definition of the filter bandpasses. Together with Gregor Seidel at MPIA, Frank Grupp at MPE and several members of OU-PHZ we carried out simulations to determine the performance and its dependencies of alternative band-pass designs. It turned out that for the bulk of objects residing at the faint end of the Euclid survey, the main driver for the performance of photometric redshifts is the limiting sensitivity reached. The exact slopes of the filter edges and out-of-band-blocking levels are rather secondary. The only feature really needed was that the three filters did not show gaps. To reach these conclusions nearly 50 alternative designs were assessed, in the end also with feedback from the optical design, which provided updated PSF widths, directly impacting limiting sensitivities, for a few designs.

Several substantially different designs were seriously considered. Upon request by OU-PHZ an extension of the H-band to 2300nm was studied by the overall NISP team and it turned out that this would have too much of a substantial impact even on the telescope design and hence would incur severe costs and delays to the overall mission. Hence this was ruled out in the end. We settled on the most useful alternative to the previous, "historically grown" design -- two narrower Y and J bands juxtaposed to a

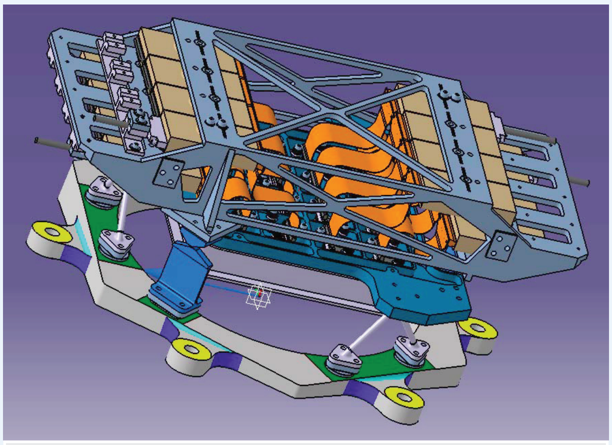


Figure 2: The current NISP Detector System concept.

very wide H band -- which are logarithmically spaced bandpasses: Y=920–1192nm, J=1192–1544nm and H=1544–2000nm. The performance of this distribution should be very good and make sense also for all legacy aspects.

The other main activity was the creation of a substantially finer and stringent concept for calibrating the NISP photometry channel (also done for spectroscopy and VIS). Resulting in the so called Calibration Concept Document (CalCD) which contained a reference breakdown as well as budgets for the main calibration requirements, with flow-downs of resulting requirements to the survey planning and hardware needs. The CalCD now contains a reference calibration approach which should permit to actually reach e.g. the required precision in relative photometric accuracy of 1.5%, which allows to size the calibration needs on the survey side. At the same time it shows which parameters inside the instrument can be traded off with respect to each other, e.g. the direct dependency of number of needed dark frames as function of actually reached detector noise or impact of functional form of the detector non-linearity on number of linearity ramps to be taken at faint fluxes. In the this self-consistent framework of requirements can be implemented on the survey, instrument and ground segment side, after which they can be verified — one by one.

NISP Spectroscopy status

The spectroscopy mode of the NISP instrument will provide dispersed images that should allow the detection of emission lines of galaxies, mainly the Hα line in the near infrared range. The slitless technology, and performance in space, is well known thanks to HST expertise but Euclid has to face new challenging issues because of the size of the field and of the survey. The images will be very crowded, and thousand of objects are mixed and can contaminate each other's. For a given Hα line flux, the precision and accuracy of the measurements depend on the intrinsic NISP instrumental parameters (PSF size, resolution, and instrumental background) and on the observing strategy adopted to mitigate the specific limitations of the slitless technique, namely confusion and a higher astrophysical background. Also, for clustering measurement, no selection is applied *a priori* on the objects then the control of the purity and completeness of the science sample, ensuring enough galaxy density, will be a critical issue and will be a trade off between the instrument performance and the data reduction performance..

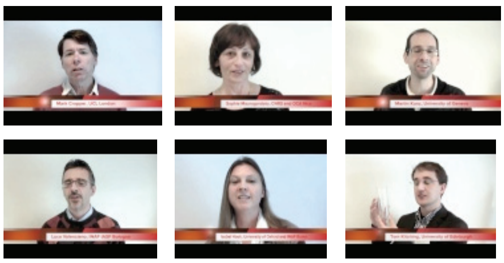
Current work includes the evaluation of performance on realistic images as studying impact of cosmic rays or impact of the on board processing on final performance.

One other important work is also to validate the wavelength calibration concept at a sub pixel level, which is needed to recover accurately the positions of all objects in the field and to associate for each of them a wavelength solution to a line position. The exact procedure using the imaging information is under investigation with a spectroscopic team including people from France, Italy and Germany. This team ensures a full simulation chain with an accurate instrument simulator, and a 'prototype' of the redshift extraction and can trade off between instrument, calibration and reduction to demonstrate we can achieve the needed accuracy on clustering science needed for Euclid.

Knud Jahnke & Anne Ealet

What does the acronym stand for? SEP

The South Ecliptic Pole (SEP) is located in the constellation Dorado, the dolphinfish, at a right ascension of 6^h and declination of -66° 33' 38.55". By definition it is located along a line perpendicular to the ecliptic plane, the plane of the orbit of the Earth. For this reason it is a particularly favourable location, together with its northern cousin the North Ecliptic Pole, for long exposures from space missions and for that reason parts of the Euclid deep fields are likely to lie on or near the Ecliptic Poles.



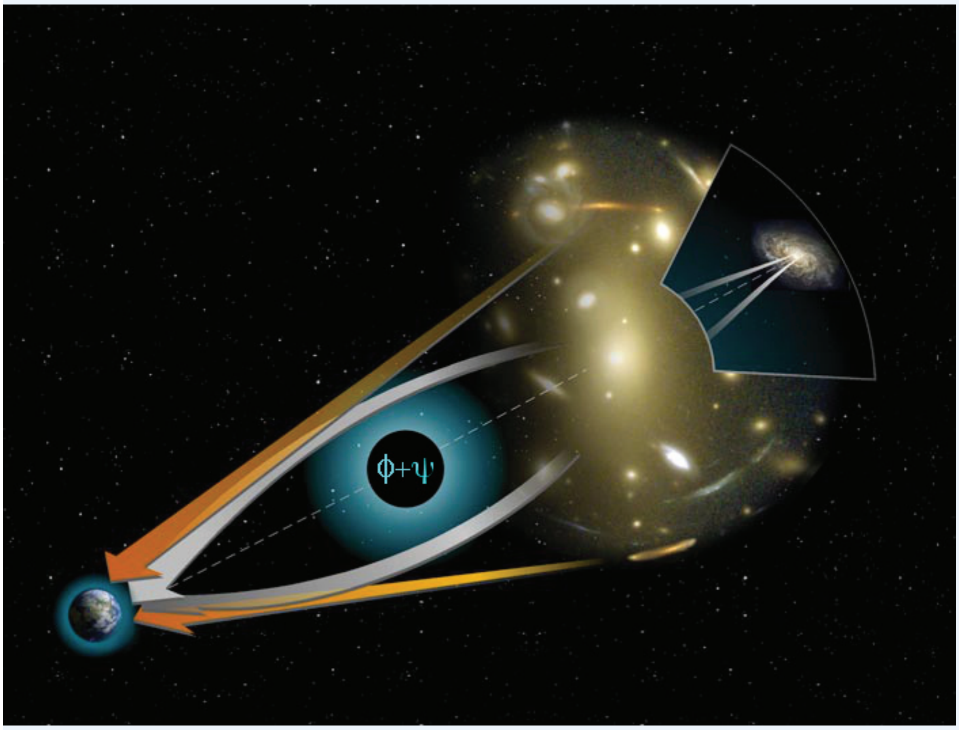
Several video interviews with EC members made in Copenhagen by Valeria Pettorino from the COMS group are available through YouTube, see the EC web site for further links.

Science with Euclid

The Road to Reality: Enlightening the Dark Universe

Euclid will perform an amazing array of surveys and measure a wide range of cosmological quantities to unprecedented precision. In the last two newsletters we have already encountered the two primary probes, weak lensing and the large-scale structure of the Universe. These measurements will allow for important new insights into the history and evolution of the cosmos -- but we need a framework within which we can interpret them.

Keeping up to date with new theories, in particular theories of the elusive "dark energy" that accelerates the cosmic expansion, is part of the "daily work" of the theory group. But there are so many theories (probably more than theorists...) that testing them all appears quite impossible, and even if we did it, we still wouldn't know if we had not overlooked some possibilities. We need a unifying principle that allows us to classify the different possible explanations in order to chart a course for Euclid through the space of possible theories. One possibility is to search for the most general theory, based on very general properties like mathematical consistency and stability. This approach allows now to characterize essentially all acceptable models of dark energy, and is an active area of research within the theory group. In the context of the actual observations it still appears not optimal, though, as the connection between the data and the theories remains rather indirect. For example, it is difficult to identify which theories can be distinguished by Euclid, and what quantities are really determined by the observations.



Since Euclid's cosmological measurements all involve gravity, it appears necessary to turn to the theory of gravity, General Relativity (GR), for guidance to improve the situation. At the most basic level Einstein's equations link the geometry of space time with the matter content. As physicist J. A. Wheeler once put it, matter tells the space-time how to curve, and space-time tells matter how to move. The curvature of space-time then leads to gravitational lensing while the motion of matter creates the large-scale structure and the so-called redshift space distortions. But how many different quantities would we need to determine the space-time geometry? It turns out that there are surprisingly few.

If the universe were perfectly homogeneous and isotropic, then its geometry would be completely described by a single function of time, the so-called scale factor $a(t)$, a bit like the geometry of a sphere is completely described by its radius. But since fortunately our universe is clearly not completely homogeneous (otherwise no galaxy or star could form!), its geometry depends also on other quantities, analogous to the familiar Newtonian potential that governs the falling of apples and the orbits of planets. It turns out that we need to introduce two potentials, not just one, often denoted $\Phi(x,t)$ and $\Psi(x,t)$. As far as cosmology goes, we can summarize the grand task of Euclid as the one of determining the expansion rate and the two potentials Φ and Ψ!

The Einstein equations connect this set of functions, $\{a(t), \Phi(x,t), \Psi(x,t)\}$, to the so-called energy momentum tensor, the quantity that describes the ``stuff" that is present in the Universe. Returning to the special case of a completely homogeneous and isotropic universe, the Einstein equations simply connect the scale factor $a(t)$ to the energy density $\rho(t)$ and the pressure $p(t)$ of the various matter components (ordinary matter, radiation, dark matter, dark energy). If we can measure $a(t)$, e.g. with the baryon acoustic oscillations (cf the science item in the second Euclid newsletter), then we can infer the evolution of $\rho(t)$ and thus of the pressure $p(t)$. The pressure then provides information about the physical nature of the dark sector. For example, cold dark matter has a negligible pressure, radiation is characterized by $p = \rho/3$ and the cosmological constant by $p = -\rho$. In this way we can disentangle quite precisely, at least within the current standard model, the composition of the Universe. The currently best constraints come from the Planck data release of March 2013, and point to a universe that is composed of 5%

'normal' baryonic matter, 27% cold dark matter and 68% dark energy in the form of a cosmological constant.

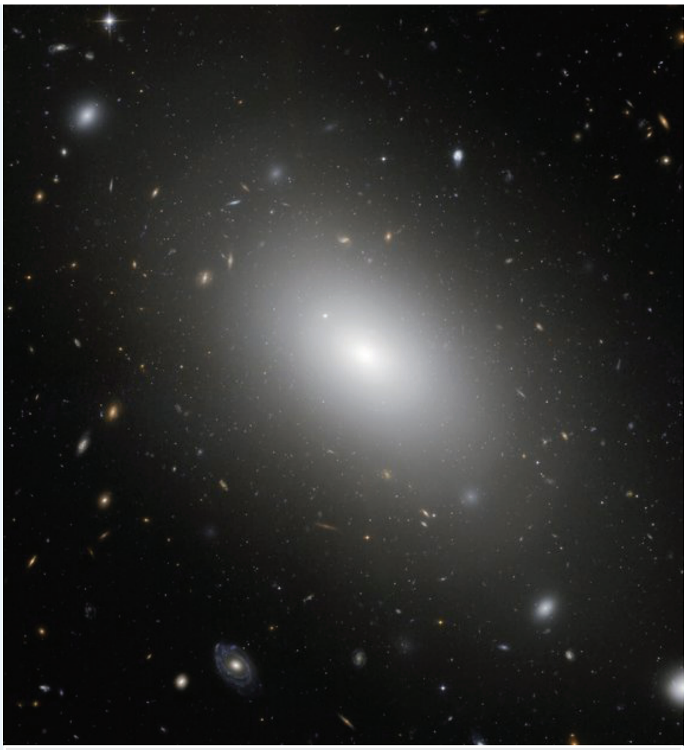
The same structure is present also in the general case. The two potentials Φ and Ψ are connected now to the perturbations to the homogeneous and isotropic universe. Gravitational lensing (i.e. the propagation of relativistic particles like light through the perturbed universe) is governed by the sum of the two gravitational potentials. The motion of non-relativistic particles like galaxies, on the other hand, is due to Ψ alone. Thus by combining weak lensing and clustering measurements we are in principle able to measure the geometry of space time. Standard dark energy models predict that the two potentials Φ and Ψ are identical and that the usual Newtonian potential should be valid also on cosmic scales. Euclid will have the unique chance of testing these predictions to scales of hundreds of megaparsecs and to epochs when the universe was half its present age. If for instance Euclid will find that the potential Φ and Ψ are different, then very likely our current gravitational theory has to be modified, maybe by including a new large-scale force. A similar conclusion would be needed if Euclid finds that the Newtonian potential does not vary simply as the inverse of the distance from a massive object as believed since Newton's time. Alternatively, this could be due to a so far unexpected capability of dark energy to cluster on large scales. In all cases, Euclid has the sensitivity to discover a major new feature in the fundamental laws of the cosmos.

All the considerations above make important assumptions, like that the Universe deviates only very slightly from isotropy and homogeneity. The Euclid data set will also allow to test these assumptions to a very high precision. There are many further cosmological questions that the Euclid data set will help to understand, for example by providing constraints on primordial non-Gaussianities. We will leave discussions of some of these to future issues of the Euclid newsletter -- if you want to know more, you can also have a look at the theory review document http://arxiv.org/abs/1206.1225.

Luca Amendola & Martin Kunz

Euclid and early-type galaxies: an untold story

More than 50 years ago, C. S. Lewis said «The Universe rings true whenever you fairly test it». And it seems that recently the Universe is ringing a lot to physicists. Not only the Nobel prizes recently awarded for providing evidences of the accelerated expansion of the Universe, but also the discovery at CERN of the Higgs(-like) boson, or the recent preliminary results from Planck are shedding a new light on entire physics branches. The synergy of Euclid mission with respect to all other experiments is unique to develop our understanding of what are the fundamental components that constitute our Universe. And if a lot has been told concerning the primary cosmological probes of the mission – the Weak gravitational Lensing (WL) and the Baryonic Acoustic Oscillation (BAO) – less is known about the enormous contribution which it can provide for legacy science. Within the Galaxy and AGN Science Working Group (SWG-GA), which deals with a part of the legacy science in Euclid, a work package (WP 5) in particular has been devoted to passive Early-Type Galaxies (ETGs), i.e. galaxies morphologically classified E/S0 and characterized by old stellar populations and weak or absent star formation.



NGC 1132, a massive nearby elliptical galaxy imaged with HST. Copyright NASA/ ESA/ STScI/ AURA (The Hubble Heritage Team) - ESA/Hubble Collaboration.

The ETGs are important for our understanding of the Universe in part because a large fraction of all stars in the Universe reside in them today and they are the most massive of all galaxies. They are deceptively simple in appearance but when studied in detail a wealth of complexity become apparent.

Many are the open questions concerning the ETG formation and evolution. One of the most pressing and still under debate concerns the understanding of the detailed mechanisms that quench the star formation in massive galaxies, thus forming passively-evolving systems, as well as the ability of current galaxy formation models to predict massive old galaxies at $z>1$. Another very debated issue is the smaller size ($R_e \leq 1$ kpc) and the much higher internal mass densities of high-z ETGs compared to their counterparts with the same mass at $z\sim0$. Many other studies concerning the metallicity evolution with redshift, the role of environment in driving the evolution of these systems, the accurate estimate of the age of early-type galaxies, and their possible use as cosmic chronometers to trace the relative age evolution of the Universe and measure (in a complementary way) its expansion rate, have been thus far only been thoroughly addressed at $z<1$; however, all these studies point toward the evidence that $z>1$ ETGs will play a key role in answering all these questions.

Unfortunately, at the moment only the tip of the iceberg of high-z ETGs has been unveiled. Despite many efforts, spectroscopically only a few dozen of massive and passive ETGs have been observed and studied at z>1.5, due to their faintness in the visible bands and their very low surface density that makes them extremely rare objects, hard to be detected in small surveys (c.f. Figure 2).

One of the great advantages of Euclid is that it will be able to cover this gap. By mapping 15,000 square degrees, it will allow us to identify about ≈8×10^6 of these galaxies with stellar masses exceeding 4×10^{10} M_{sun} at *z>1.5* based on photometric selection criteria. Euclid spectroscopy will provide rest-frame optical spectra for a subsample of these ETGs. The main current activity of WP5, done in collaboration with the Organisational Unit for spectroscopic measurements (OU-SPE), the Organisational Unit for near-IR spectroscopy (OU-SIR) and many other OUs and SWGs, is actually to investigate the best photometric selection methods for ETGs and assessing the capability of Euclid spectroscopy to identify and study these galaxies spectroscopically. The preliminary results are promising, and the photometric and spectroscopic Euclid dataset will allow to study ETG formation and evolution with an unprecedented statistic, which will be increased by almost two orders of magnitude compared to the actually available datasets. This is one of the reasons why the Euclid legacy science represents an astrophysical treasure, even compared to other planned missions such as JWST, which can compete in performances, but not in area coverage and in the identification of the most luminous and massive old galaxies at *z>1*.

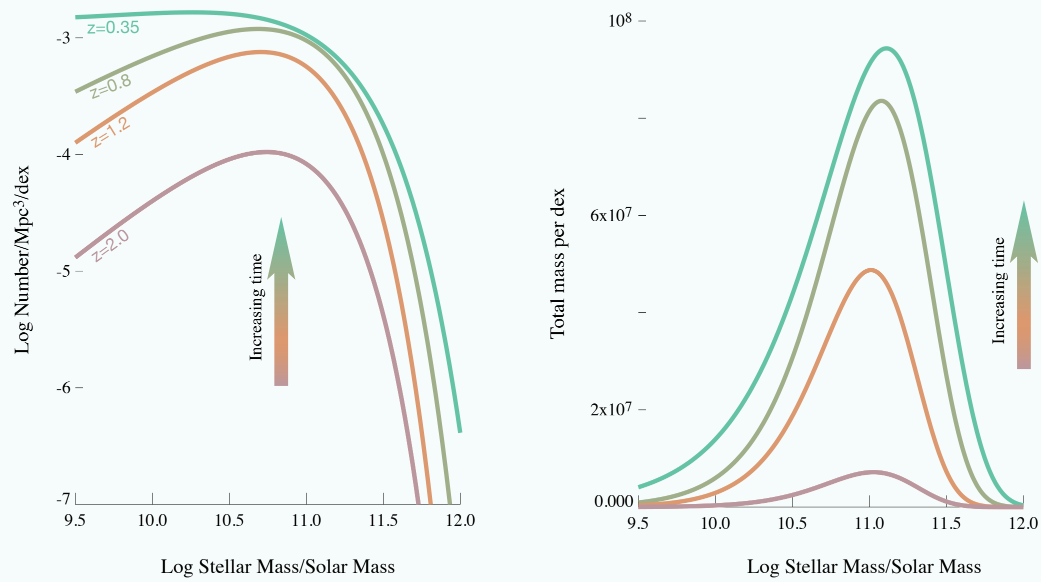


Figure 2: Left: The build-up of the stellar mass function of quiescent galaxies, based on data from the UltraVISTA survey presented in Muzzin et al (2013) and Ilbert et al (2013). As time goes on, the number of quiescent galaxies rises, but also note the rarity of massive such galaxies. Right: The total mass of stars in decadal bins in mass, now on a linear scale, illustrating the importance of massive quiescent galaxies. The figure is illustrative in nature, see the papers for full details.

The forthcoming times are surely fascinating; and Euclid will be a precious help to keep our ears open and alert also to the "ring" of the remarkable and still elusive early-type galaxies.

Michele Moresco

Updates from the Science Working Groups

Weak Lensing SWG

Since Newsletter 2 in November the WLSWG has continued to explore the Euclid weak lensing science and support the instrument, and ground-segment teams. An important activity has been in support of the calibration working group, in specifying calibration strategies and observations needed to achieve the shape and photometric measurements required for cosmic shear. Questions that are now being addressed are on the exact specification of star fields needed to calibrate the PSF and strategies to calibrate noise bias effects in weak lensing (http://xxx.lanl.gov/abs/1204.5147). Several workpackages have made significant progress: the PSF measurement work package (lead by Lance Miller), is working on wavefront models of the PSF; the intrinsic alignment work package (lead by Benjamin Joachimi) has begun to focus on physical models of this systematic as well as possible ground-based observations to help measure the effect; the photometric redshift work package (lead by Hendrik Hildebrandt and Filipe Abdalla) has begun to compile a comprehensive document containing the ground-based spectroscopic survey requirements. We also welcomed several new members of the EC into the WLSWG, and we look forward to working with them all to make Euclid weak lensing science a success. At the annual Leiden meeting the WLSWG will have a splinter session, to which anyone interested in the weak lensing aspects of Euclid is welcome to attend.

Tom Kitching, Henk Hoekstra, Karim Benabed

Galaxy Clustering SWG

Work on defining the galaxy clustering work-packages has continued, with further emphasis on dovetailing with the Science Ground Segment, especially with OU-LE3 packages. The definition of the workflow of tasks from the instrument, to the ground segment, to the GC specific analyses has continued. Specific investigations included evaluating the impact on clustering measurements of removing the NISP Compensation Mechanism Unit, which was originally introduced to compensate for motion introduced by angular momentum conservation during instrument rotations. We are currently working with the SGS to perfect the flow-down of Galaxy Clustering requirements through to the Level-3 data products. At the forthcoming Consortium Meeting in Leiden we plan to hold two splinter sessions of GCSWG, one dedicated to short presentations and one on the work packages.

Luigi Guzzo, Will Percival

Galaxy & AGN Evolution SWG

The main activity in GAEv-SWG has been through the work package activities starting up. We now have 11 work packages active and a key activity here has been to gather an overview of the simulations we need to assess and carry out our scientific efforts. The SWG has been growing steadily, with a particular spurt when the NASA affiliated scientists joined earlier in the year. The SWG now has a total of 132 members and we look forward to meeting up with many of them in our splinter session in Leiden.

Jarle Brinchmann, Andrea Cimatti, David Elbaz

Milky Way and Resolved Stellar Populations SWG

All has been rather quiet in the MW SWG over the last months. We are looking forward to kick starting our discussions again at the Leiden meeting in May.

Annette Ferguson took over from Mike Irwin as co-chair of the MW SWG in mid-March, and we would like to take this opportunity to thank Mike for all he has done during his period in this position.

Mike Irwin, Eline Tolstoy

SN & Transients SWG

The main focus of the Euclid supernova and transients SWG activity in recent months has been to revise the Additional Survey Document. It contains a summary of the science drivers that will constitute a significant improvement over what is achievable in the pre-Euclid era. The top-level requirements are explicitly laid out, and projected science outcomes based on the implementation of our preferred survey implementation (dubbed the "AAA" survey) are detailed.

In order to plan and monitor progress, we have set up internal scientific workpackages -- which will see a ramping up of activity in the coming months. Active liaising with the pipeline and calibration groups are underway. Additionally, several Transient SWG team members have been refining simulations to allow for meaningful FoM comparisons with the Dark Energy Survey for example. A document listing the detailed investigation under different assumptions is available on the Redmine wiki.

We are looking forward to stimulating discussions at the upcoming Leiden meeting, and further development of general survey strategies of the mission in 2013!

Rubina Kotak, Isobel Hook, Charling Tao, Enrico Cappellaro

Galaxy Clusters SWG

In the context of the Galaxy Clusters Science Working Group it has been submitted for publication a detailed forecast analysis on the capability of the Euclid photometric galaxy cluster survey to constrain the total neutrino mass and effective number of neutrino species (Costanzi et al. 2013, JCAP).

Observations of the large-scale cosmic structures represent one of the most valuable tools to constrain neutrino properties via their effects on background evolution and growth of structures: relativistic neutrinos affect the CMB anisotropies, and, at low redshift when they become non-relativistic, neutrinos suppress matter density fluctuations at small scales. The evolution of the galaxy cluster population and their clustering are sensitive both to the background history and to the growth of matter perturbations. Thanks to the huge volume and large redshift range probed ($0.2<z<2$), Euclid photometric survey will detect a large number of clusters (~100.000 with a S/N>3) allowing us to improve the current constraints on neutrino mass by about an order of magnitude.

The paper shows that with reasonable assumptions, combining Euclid galaxy cluster and Planck CMB forecasted information, gives an upper limit on the effective number of neutrino species of $N_{eff}<3.14$(95% CL), and on the total neutrino mass of $\sum m_\nu < 0.040$ eV, which would be sufficient for a 2 sigma detection of neutrino mass even in the minimal normal hierarchy scenario.

These results highlight the potential of the Euclid galaxy cluster survey in constraining neutrino properties, and emphasize the key relevance of a robust measurement of cluster masses, e.g. from weak lensing within the Euclid survey, in order to fully exploit the cosmological information carried by such survey. In general, our analysis confirms the important role that the Euclid cluster survey will play in complementing the primary cosmology probes, galaxy clustering and weak lensing.

Matteo Costanzi and Barbara Sartoris

Theory SWG

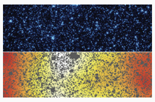
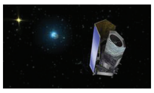
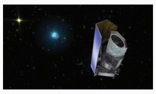
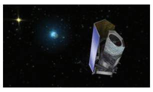
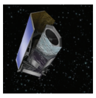
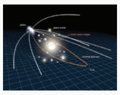
The work within the theory SWG is now shared among ten work packages, which cover a wide range of science topics relevant for Euclid, from the physics of the dark sector to isotropy and homogeneity of the Universe, statistical methods, new observational developments and more. A list of the work packages can be found here: http://euclid.roe.ac.uk/projects/thswg/wiki/Work_packages. The review document (arXiv:1206.1225) is currently being revised for publication in Living Reviews in Relativity, and a new iteration will start in the summer. Theory telecons are taking place on every third Friday in a month at 15:30 CET (and more telecons take place for specific work packages). All members of Euclid are welcome to participate -- or come to our splinter meetings at the Euclid consortium conference in Leiden!

Luca Amendola, Martin Kunz

Curious about more acronyms?

The Euclid Consortium maintains a comprehensive list of acronyms You can also find a selection of these and links to the master list on the Acronym Buster page. Discover what SCMP, BSS and ICE and FOG and many other acronyms stand for. This is very useful for making sense of acronym laden text, but do not use it to increase your acronym usage.

Euclid related Press-Releases

	NASA Goddard Team to Participate in Dark Energy Mission	NASA Goddard
	Penn Cosmologists Join Euclid Space Telescope Mission	The University of Pennsylvania
	JPL to Lead U.S. Science Team for Dark Energy Mission	Jet Propulsion Laboratory
	NASA Officially Joins ESA's 'Dark Universe' Mission	NASA
	UMKC Assistant Professor Selected for NASA Science Team	University of Missouri-Kansas City
	Princeton researchers join dark energy mission	Princeton University
	Galaxies déformées : publication d'un nouveau relevé géant du ciel	CEA, Saclay

What is happening in the coming months & years

April 24, 2013	Internal review kick-off, Garching, Germany.
May 13-16, 2013	Euclid consortium meeting in Leiden, the Netherlands.
June 2013	Kick-off for the SVM contract.
September 9-12, 2013	LSST @ Europe
September 16-18, 2013	Synergistic Science with Euclid and the SKA meeting, Oxford
October 2013	System requirements review.
Q1 2014	Instrument Preliminary Design Review (PDR)
May 5-9, 2014	Euclid consortium meeting in Marseille, France.
June 8-12, 2015	Euclid consortium meeting in Lausanne, Switzerland.
Q3/Q4 2017	Flight model delivery
Q2 2020	Launch.

For more information see the Euclid calendar on the internal Euclid Consortium website: http://internal.euclid-ec.org/

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