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LISTA DEGLI ABSTRACTS

FISICA ASTROPARTICELLARE

Carlo Baccigalupi (SISSA, Trieste) [Invited Talk]

Planck Mission: challenges and expectations for Cosmology and Particle Physics

L'esperimento Planck per la misura della radiazione cosmica nelle microonde con sensibilità, risoluzione e copertura in frequenza senza precedenti, sta per avere inizio con il lancio imminente del satellite dalla base ESA di Kourou nella Guiana Francese. Il satellite impiegherà circa 2 mesi per giungere nel punto designato per le operazioni situato oltre la Luna, e cominciare le osservazioni, che dureranno almeno 14 mesi. In questo contributo descriviamo lo stato della missione sottolineando la collaborazione internazionale ed il ruolo della comunità Italiana, le sfide e le ricadute scientifiche attese.

Giacomo Bonnoli (Univ. Siena/INFN Pisa)

A MAGIC View of the Very-High Energy gamma-ray Sky

G. Bonnoli on behalf of the MAGIC collaboration

MAGIC is currently the largest single dish Cherenkov telescope operating since September 2004. Since then it has been delivering a wealth of exciting physics results from its observations in the Very High Energy (VHE) region of galactic and extragalactic sky. We present a review of the most recent experimental results obtained using MAGIC.

Alessandro Carosi (INAF-OAR, Roma)

Emission an ground-based observation of high-energy photons from GRB

Gamma Ray Bursts (GRBs) are short and intense pulses of soft gamma rays ($< \text{MeV}$) detected serendipitously for the first time in the late 1960s by Vela satellites. Within the theoretical picture of the fireball model, the electron synchrotron radiation is able to justify the observed sub-MeV emission and, at the same time, others processes like Inverse Compton and neutron pions decay predict a high energy emission component ($> 20 \text{ MeV}$). The observation in the very high energy range is particularly important because it is able to discriminate between the many competing emission models. We investigated the conditions for the emission of photons in the GeV-TeV regime in GRB and the possibility of their detection with the new generation of space based (like FERMI and AGILE) and ground based instruments like the MAGIC telescope.

Milena Dattoli (INAF-IFSI/Univ-INFN, Torino)

Gamma Ray Astronomy with ARGO-YBJ

M. Dattoli for the ARGO-YBJ collaboration

The ARGO-YBJ experiment (YangBajing, Tibet, P.R.China) is an extensive air shower detector made of a single layer of Resistive Plate Counters covering a surface of about 6700 m², consisting of a compact central carpet 74x78m² wide and an external guard ring with coarse coverage. The exploitation of the full coverage approach (93% of active area in the central carpet) and the high altitude location (4300 m a.s.l.) allow ARGO-YBJ to work with an energy threshold as low as few hundreds GeV. ARGO-YBJ can detect showers within a primary energy range partially overlapping that of Cherenkov Telescopes, with the advantages of a

larger field of view and a duty cycle close to 100%. These features make ARGO-YBJ suitable to monitor the gamma ray sky, detecting unexpected events like flaring episodes in Active Galactic Nuclei or high energy Gamma Ray Bursts. In this talk we report ARGO-YBJ results in gamma ray astronomy, in particular the observations of the Crab Nebula and Markarian 421, and the search for high energy tails of Gamma Ray Bursts.

Daniele Gaggero (INFN, Pisa)

Possible interpretations of the high-energy electron + positron spectrum measured by FERMI

Fermi Collaboration

Fermi Large Area Gamma Ray Telescope recently measured the spectrum of the electron+positron component of Cosmic Rays from 20 GeV to 1 TeV with high precision. These measurements are very useful to constrain theoretical models of production and propagation of CRs in the Galaxy and to look for signatures of new physics. In this work we present possible interpretations of Fermi results based either on conventional Galactic cosmic ray diffusive models or by invoking additional local electron-positron primary sources, e.g. nearby pulsars. We also discuss the compatibility of those scenarios with other experimental results, especially those of HESS Cherenkov telescope and PAMELA satellite. We also very briefly discuss the possibility to interpret FERMI and PAMELA data based on Dark Matter annihilation in the Galactic halo.

Anna Maria Nobili (Univ. Pisa)

Verso un test stringente della Relatività Generale nello spazio: il piccolo satellite "Galileo Galilei(GG)"

Many predictions of General Relativity have been successfully confirmed in the Solar System making it the best theory of gravity to date, despite the fact that all attempts at forming a single unified theory together with the Standard Model of particle physics have been unsuccessful. In recent years the discoveries of observational cosmology have led to dark energy in order to account for about 70% of the total mass in the universe; in addition to dark matter, which should account for more than 20%, and whose nature is not understood. It is therefore of great importance to put General Relativity to even more stringent test. Confirming its numerous predictions is useful; more important is to test its founding pillar, which is the Equivalence Principle. We shall discuss the small satellite mission "Galileo Galilei (GG)", the main results of the ongoing ASI funded mission study by Thales Alenia Space and the sensitivity demonstrated with the laboratory prototype at INFN lab in San Piero – Pisa.

Fulvio Ricci (INFN/Univ. La Sapienza, Roma)

La rete di rivelatori interferometrici di Onde Gravitazionali

In questa comunicazione si intende presentare lo stato del rivelatore di Onde Gravitazionali VIRGO e discuterne gli attuali limiti di sensibilità. Si discuteranno inoltre i cambiamenti previsti nel prossimo futuro e si accennerà allo sviluppo a più lungo termine del rivelatore Advanced VIRGO.

Gian Carlo Trinchero (INAF-IFSI, Torino)

The KASCADE-Grande air-shower

G.C. Trinchero and KASCADE-Grande collaboration

KASCADE-Grande at Forschungszentrum Karlsruhe, Germany is a multi-detector extensive air shower experiment. Main parts of the experiment are the Grande array spread over an area of $700 \times 700 \text{m}^2$, the original KASCADE array covering $200 \times 200 \text{m}^2$ with unshielded and shielded detectors, and additional muon tracking devices. The detection of the different components allows us to investigate the energy spectrum, composition, and anisotropies of cosmic rays in the energy range. 10^{16}eV to 10^{18}eV . An overview on the performance of the apparatus and first results will be presented.

FISICA GALATTICA ED EXTRAGALATTICA

Simona Gallerani (INAF-OAR, Roma)

Constraining cosmic reionization with quasar, gamma ray burst and Ly α emitters observations

Gallerani S., Ferrara A., Fan X., Choudhury T. Roy, Salvaterra R., Dayal P.

In the last few years a possible tension has been identified between CMB data and observations of Quasar absorption spectra, the former being consistent with an epoch of reionization $z_{\text{rei}} \sim 11$, the latter suggesting $z_{\text{rei}} \sim 6$. Long Gamma Ray Bursts may constitute a complementary way to study the reionization process possibly probing $z > 6$. Moreover, an increasing number of Lyman Alpha Emitters are routinely found at $z > 6$. I will discuss two physically motivated and detailed reionization scenarios: an Early Reionization Model in which the intergalactic medium (IGM) is reionized at $z_{\text{rei}} \sim 7$, and a Late Reionization Model which predicts $z_{\text{rei}} \sim 6$. Moreover, I will present a semi-analytical model which allows to simulate QSOs/GRBs/LAEs spectra. Synthetic spectra have been analyzed statistically and the theoretical predictions compared with QSOs/GRBs/LAEs observations. I will show that current data favor a highly ionized IGM at $z \sim 6$, thus suggesting an epoch of reionization at higher redshifts. The overall result points towards an extended reionization process which starts at $z \geq 11$ and completes at $z \geq 7$, in agreement with the recent WMAP5 data.

Laura Magrini (INAF-OA Arcetri)

Metals in M33

M33, a low-luminosity late-type spiral galaxy located in the Local Group at a distance of $840 \sim \text{kpc}$, is a beautiful example of disk galaxy quite isolated. Its deep study deserves several surprises, among them: i) a off-center distribution of metals both at present-time both at the epoch of the formation of planetary nebulae progenitors (several Gyr ago); ii) a bimodal behaviour of the metallicity gradients, where giant and bright HII regions show a steeper gradient respect to the global HII region population. Recent observations and models will be presented.

Raffaella Anna Marino (UCM, Madrid, Spagna)

Integral Field Spectroscopy of Nearby Spiral Galaxy NGC5668

Marino, R.A., Gil de Paz, A., Muñoz-Mateos, J.C., Castillo-Morales, A.

Il lavoro che presenterò si basa sull'analisi di un mosaico di $3 \times 2 \text{ arcmin}^2$, ottenuto con PPAK al CAHA 3,5m della galassia spirale NGC5668. Questa galassia è un sistema quasi "Face-On" con strutture multi braccio (Sd), a una distanza di $\sim 25 \text{ Mpc}$. L'analisi include la derivazione di mappe di attenuazione dal gas ionizzato (dal decremento Balmer di $H\beta/H\alpha$), la temperatura elettronica (tramite le linee aurorali di $[\text{OIII}]4363\text{\AA}$ o $[\text{NII}]5755\text{\AA}$) e la densità (dal rapporto $[\text{SII}]6717\text{\AA}/[\text{SII}]6731\text{\AA}$), le abbondanze chimiche, sia dell'ossigeno, usando o il metodo base della Temperatura elettronica o il metodo delle linee intense come R23; (Kewley & Dopita 2002) e dell'azoto (assumendo che $N/O = N^+/O^+$, Pagel et al 1992). Oltre a queste mappe abbiamo estratto anche gli spettri delle regioni HII, gli spettri di queste regioni sono stati paragonati con le predizioni di sintesi di modelli per popolazioni stellari evolute. Inoltre, abbiamo analizzato come le maggiori proprietà del gas, delle stelle e della polvere nella galassia variano con il raggio. Tutti questi risultati sono stati paragonati con l'informazione data dalle immagini di Galex di questa galassia: attenuazione della polvere dall'eccesso nell'IR e l'UV-slope, contenuto in massa delle stelle, e il contenuto totale di polvere.

Ilaria Musella (OA Napoli)

Stellar Archaeology in the Milky Way

Over the past few years the analysis of the SDSS data has led to the discovery of several ultra-faint companions of the Milky Way (MW). The impact of these results has been dramatic: the new systems include fourteen dwarf spheroidal (dSph) galaxies roughly doubling the number known prior to SDSS. dSph galaxies have an important role to provide constraints on Lambda- Cold-Dark-Matter (LCDM) theories of

galaxy formation. These models predict that several hundred small dark halo satellites should surround the halos of large galaxies like the MW and, in particular, that dSphs are the best candidates for the

Mario Pasquato (Univ. Pisa)

Looking for IMBHs in GCs: the mass segregation method

M. Pasquato, M. Trenti, G. de Marchi, M. Gill, D. P. Hamilton, M. Coleman Miller, M. Stiavelli, Roeland P. van der Marel

Intermediate Mass Black Holes (with mass in the 100 - 10000 solar masses range) may be present in the cores of Globular Clusters. While the existence of IMBHs would have implications for galactic formation and evolution and GC dynamics, there has been no definitive detection of such an object to date. I present a new method for fingerprinting the presence of an IMBH which does not require information on the kinematics of GC stars and is applicable to collisionally relaxed GCs. Via two-body interactions, heavy stars sink to the center of a GC over several relaxation times, while lighter stars move to the periphery and preferentially evaporate from the system. N-body simulations show that the presence of an IMBH quenches such a mass segregation. The new method is based on comparing the observed GC mass segregation profile with predictions from N-body simulations with and without an IMBH. I compare a comprehensive set of such simulations to the mass segregation profile of NGC 2298 based on HST/ACS photometry and find that the presence of an IMBH of 300+ solar masses can be rejected to the 3-sigma level. Simulations without an IMBH also correctly predict the present day mass function of NGC 2298.

Gabriella Raimondo (INAF-OA Teramo)

Using Surface Brightness Fluctuations to study Stellar Populations in Galaxies

The Surface Brightness Fluctuation (SBF) technique is widely adopted in extragalactic Astronomy as distance indicator of galaxies out to about 100 Mpc. SBF studies can also provide information about the unresolved stellar content of early-type galaxies and spiral bulges. The absolute SBF magnitude in a given pass-band is sensitive to different evolutionary stages experienced by stars in the galaxy stellar population. Near-IR SBF magnitudes are sensitive to the evolution of stars within the AGB phase, especially the thermally pulsing AGB, while SBF in the blue and UV are sensitive to bright hot main-sequence stars in young populations as far as to hot horizontal branch and post-AGB stars in intermediate and old stellar populations. Thus, multi-band SBF studies can constrain important evolutionary parameters. In this talk, I compare this capability of the SBF method against other classical tools, as integrated magnitudes and color-magnitude diagrams, typically used for unresolved and resolved stellar systems, respectively, with the aim of identifying the limits and the power of the SBF method. I briefly outline the main results obtained by our group in predicting absolute SBF magnitudes of single-burst stellar populations. Our models agree well with existing SBF data for globular clusters in the Milky Way and Magellanic Clouds and for galaxies. Thanks to the exceptional image quality offered by the ACS camera on board of Hubble Space Telescope, we succeeded in revealing the systematic presence of radial SBF variations within a sample of bright ellipticals. The accuracy of these measurements, coupled with population synthesis techniques, allowed us to study the dominant stellar populations in the targeted galaxies.

Steven N. Shore (Univ. Pisa)

A Study of the Bolometric Properties of Classical Novae in Outburst in the LMC

Walter Del Pozzo (Birmingham), Steven N. Shore (Pisa)

We present the spectroscopic and photometric bolometric analysis of seven LMC novae using groundbased, IUE, and HST observations (N1988 No. 1, 1988 No. 2, 1990 No. 1, 1990 No. 2, 1991, 1992, and 1995) and comparisons with Galactic novae. Turnoff times are estimated using N III-V and He II ionization evolution (with the exception of the recurrent nova 1990 No. 2 all are between about 40 and 150 days).

Reddening and distances obtained by different calibrations are compared. Finally, we estimate filling factors and the redistributed maximum fraction of the luminosity in the visual, which is $L(V)/L(bol) \sim 1/4$.

Alessandro Spagna (INAF-OA Torino)

A new kinematic survey (from SDSS-DR7 and GSC-II) to study the stellar populations in the Milky Way

A. Spagna, B. Bucciarelli, M.G. Lattanzi, P. Re Fiorentin, R. Smart

The growing awareness of the importance of the 'fossil records' in the Milky Way Galaxy in constraining galaxy formation theory is reflected by the increasing number of new ground-based and space-born surveys designed to unravel the formation history of the Galaxy. In this context, we present a new catalog which includes high-quality proper motions for stars from the Seventh Data Release of the Sloan Digital Sky Survey combined with multiepoch positions from the database used for the construction of the Guide Star Catalog II. By means of the SDSS photometric and spectroscopic data, which provide radial velocities and from which we estimated stellar atmospheric parameters (effective temperature, surface gravity, and metallicity), we estimate photometric distances for a sample of FGK dwarfs that we adopted as tracers of the seven dimensional space distribution (kinematic phase distribution plus chemical abundance) of the Milky Way stellar populations within a few kiloparsecs from the Sun. The properties of this new GSCII-SDSS-based catalog, as well as preliminary results of its application to the study of the galactic disk and halo, are discussed.

Enrica Bellocchi (IEM-CSIC, Spagna) [poster]

VLT-VIMOS integral field spectroscopy: kinematics of LIRGs and uLIRGs

E. Bellocchi, S. Arribas, L. Colina

The kinematics of a sample of 42 (Ultra)Luminous Infrared Galaxies [(U)LIRGs] at low redshift ($\langle z \rangle = 0.022$) will be analysed thanks to the Integral Field Spectroscopy and in particular with VIMOS instrument on the VLT. This technique allows us to get a very detail analysis of these objects, concerning their physical structure and kinematics (of different gas phases, e.g., neutral and ionized), as it provides with 3D information (i.e. each spectrum comes from a different region of the observed galaxy). Studying the characteristics of these sources at low redshift allow us a better understanding the interrelated physical processes involved, and the implications for high- z since they are more numerous at cosmological distances than locally. As preliminary steps, the data reduction and post-reduction have been performed using the EsoRex pipeline (by ESO) and IDL and IRAF scripts (creating the final data cube). In the next steps we are going to study the line profiles of these spectra (e.g., H $_{\alpha}$) in order to extract the relevant emission line information (central wavelength, FWHM and flux intensity), followed by the modeling of the observed velocity fields and dynamical mass estimates of these sources.

ASTROFISICA ALLE VARIE LUNGHEZZE D'ONDA

Leslie Hunt (INAF-OA Arcetri)[Invited Talk]

Astrofisica nell'infrarosso

Dust obscures 75% of the total star formation in the universe, and half the energy and most of the photons in the universe come from the infrared spectral region. This talk will focus on (mainly extragalactic) themes that illustrate the importance of IR wavelengths for probing dust-enshrouded starbursts and the physics of the interstellar medium, and for measuring stellar mass at high redshifts. Recent results from Spitzer and future perspectives with Herschel and JWST will be reviewed.

Roberto Gilmozzi (ESO, Germania)[Invited Talk]

Giant optical/near IR telescopes of the future

Three next generation extremely large telescopes are currently in their phase of detailed design: the 21m Giant Magellan Telescope, the 30m Thirty Meter Telescope, and the 42m European Extremely Large

Telescope. If financed, they could have first light towards the end of the next decade. I will review the status of the projects, with special emphasis on the E-ELT. I will also discuss the E-ELT's science case, ranging from imaging and spectroscopy of extra solar planets to the direct dynamical measurement of the acceleration of the expansion of the universe.

Emanuele Pace (Univ. Firenze)[Invited Talk]
Nuovi Rivelatori e Tecniche nell'Astrofisica dell'ultravioletto

Tbd

Marco Feroci (INAF-IASF, Roma)[Invited Talk]
Astrofisica X e Gamma

Dopo piu' di dieci anni dalla dismissione dell'ultimo osservatorio gamma, EGRET a bordo della missione ComptonGRO, l'Astronomia nella banda >50 MeV è tornata ad essere accessibile grazie al lancio dei satelliti AGILE nel 2007 e GLAST (Fermi) nel 2008, che offrono migliore risoluzione angolare e maggiore esposizione dei loro predecessori. Il tracciatore gamma a bordo della piccola missione italiana AGILE è complementato da un imager in raggi X duri, che osserva simultaneamente lo stesso campo. In questa presentazione illustrerò i risultati principali ottenuti dagli esperimenti a bordo della missione AGILE nei primi due anni di operazioni in orbita.

Paolo Ventura (INAF-OAR, Roma) [Invited Talk]
New star formation scenarios in stellar systems

The presence of multiple populations observed in some galactic and extra-galactic clusters is examined on the basis of the idea that repeated episodes of star formation might account for the observational evidences.

FISICA STELLARE

Annalisa Calamida (ESO, Germania)
Stroemgren photometry of Galactic Globular Clusters. II Metallicity distribution of red giants in Omega Centauri

Calamida, Bono, Stetson, et al.

We present new intermediate-band Stroemgren photometry based on ~ 300 u,v,b,y images of the globular cluster Omega Cen. Optical data were supplemented with new multiband near-infrared (NIR) photometry (350 J,H,K images). The final optical-NIR catalog covers a region of more than $20' \times 20'$ across the cluster center. By adopting different Stroemgren metallicity indices we estimate the photometric metallicity for ~ 4000 RGs, the largest sample ever collected. The metallicity distributions show multiple peaks ($[\text{Fe}/\text{H}]_{\text{phot}} = -1.73 \pm 0.08, -1.29 \pm 0.03, -1.05 \pm 0.02, -0.80 \pm 0.04, -0.42 \pm 0.12, \text{ and } -0.07 \pm 0.08$ dex) and a sharp cut-off in the metal-poor tail ($[\text{Fe}/\text{H}]_{\text{phot}} \leq -2$ dex) that agree quite well with spectroscopic measurements. We identify four distinct sub-populations, namely metal-poor ($[\text{Fe}/\text{H}] \leq -1.49$), metal-intermediate ($-1.49 < [\text{Fe}/\text{H}] \leq -0.93$), metal-rich ($-0.95 < [\text{Fe}/\text{H}] \leq -0.15$) and solar metallicity ($[\text{Fe}/\text{H}] \sim 0$). The last group includes only a small fraction of stars ($8 \pm 5\%$) and should be confirmed spectroscopically. Moreover, using the difference in metallicity based on different photometric indices, we find that the $\sim 19\%$ of RGs are candidate CN-strong stars. This fraction agrees quite well with recent spectroscopic estimates and could imply a large fraction of binary stars.

Alessandra Di Cecco (Univ. Roma Tor Vergata)

Absolute age and chemical composition of the old, metal-poor GC M92

A.Di Cecco, G. Bono, A. Calamida, M. Monelli, R. Buonanno, P.B. Stetson

We provide accurate estimates of the absolute age of M92 using deep and wide multiband photometry collected with ground-based (CFHT) and space (HST) telescopes. Moreover, we use the difference in luminosity between the red giant branch bump and the horizontal branch to constrain the iron and the alpha-element abundances of this cluster.

Marco La Cognata (LNS-INFN, Catania)

First Experimental Measurement of the $^{18}\text{O}(p,\alpha)^{15}\text{N}$ Reaction at Astrophysical Energies

M La Cognata, A Mukhamedzhanov, C Spitaleri, R E Tribble

The $^{18}\text{O}(p,\alpha)^{15}\text{N}$ reaction is of primary importance in several astrophysical scenarios, including fluorine nucleosynthesis inside AGB stars and oxygen and nitrogen isotopic ratios in meteorite grains. A change in ^{18}O p-induced destruction rate would affect ^{15}N yield, which is eventually burnt to fluorine during the third dredge-up. In A+B as well as in MS grains the $^{14}\text{N}/^{15}\text{N}$ ratio turns out to be much lower than expected. Extra-mixing phenomena can change the isotopic composition of the outermost stellar layers when grains form. Thus a measurement of the low energy region of the $^{18}\text{O}(p,\alpha)^{15}\text{N}$ reaction cross section can be crucial to reduce the nuclear uncertainty on theoretical predictions. To this aim the Trojan Horse Method has been applied to the $^{18}\text{O}(d,\alpha)^{15}\text{N}$ three-body reaction to deduce the $^{18}\text{O}(p,\alpha)^{15}\text{N}$ cross section at the astrophysically relevant energies. In this work an improved, higher-resolution experimental study of the two low-lying resonances in the $^{18}\text{O}(p,\alpha)^{15}\text{N}$ excitation function (20 and 90 keV corresponding to the 8014 and 8084 keV levels in ^{19}F) is given and results discussed. The reaction rate is also evaluated to estimate the consequences of the present measurement on astrophysics.

Livio Lamia (LNS-INFN, Catania)

Improved results on extraction of $^{11}\text{B}(p,\alpha)^8\text{Be}$ S(E)-factor through the indirect Trojan Horse Method

L. Lamia^{a,b}, C. Spitaleri^{a,b}, S. Romano^{a,b}, N. Carlin^c, S. Cherubini^{a,b}, V. Crucillà^{a,b}, M.G. Del Santo^c, M. Gulino, G.G. Kiss^g, V. Kroha^e, S. Kubono^f, M. La Cognata^{a,b}, C. Li^d, M.G. Munhoz^c, R.G. Pizzone^a, S.M.R. Puglia^{a,b}, Q. Wen^d, G.G. Rapisarda^{a,b}, M.L. Sergi^{a,b}, E. Somorjai^g, F. Souza^c, A. Szanto de Toledo^c, G. Tabacaru^h, S. Tudisco^a, A. Tumino^{a,b,+}, Y. Wakabayashi^f, H. Yamaguchi^f

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Boron plays a significant role together with lithium and beryllium in the framework of light-elements Li, Be and B depletion in stellar environments as possible probes for internal stellar structure. Because their different fragility against (p,α) destruction, Li, Be and B are mainly burned in correspondence of internal temperatures ranging from $2 \cdot 10^6$ K to $5 \cdot 10^6$ K. At these temperatures, the Gamow peak for these reactions is fixed between 6-10 keV's, making difficult the direct cross section measurements at astrophysically relevant energies. This work is deeply focused on a very recent analysis of the $^{11}\text{B}(p,\alpha)^8\text{Be}$ reaction, studied through the indirect Trojan Horse Method (THM) applied to the $2\text{H}(^{11}\text{B}, \alpha)^8\text{Be}$ one. This approach allows to measure the $^{11}\text{B}(p,\alpha)^8\text{Be}$ S(E)-factor just in the region of the relevant Gamow peak (about 10 keV) where both electron screening and extrapolations could influence the available direct data. The experimental approach as well as the comparison with the direct data at higher energies will be

shown. The extraction of the bare $S(E)$ -factor at energies corresponding to the Gamow peak will be also shown and discussed.

Sebastiana Puglia (INFN-Univ. Catania)

Study of the $^{10}\text{B}(p, \alpha)^7\text{Be}$ reaction through the Trojan Horse Method

Puglia S.M.R.^{1,2}, Romano S.^{1,2,3}, Spitaleri C.^{1,2,3}, Carlin N.⁴, Cherubini S.^{1,3}, Del Santo M.G.⁴, Gulino M.^{1,2}, Kroha V.⁵, Kubono S.⁶, La Cognata M.^{1,2}, Lamia L.^{1,2}, Li C.⁶, Pizzone R.G.¹, Qungang W.⁵, Rapisarda G.G.^{1,2}, Sergi M.L.^{1,2}, Somoryai E.⁸, Souza F.⁴, Szanto de Toledo A.⁴, Tudisco S.¹, Tumino A.⁹, Wakabayashi Y.⁶, Wen Q.⁶, Yamaguchi H.⁶

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Boron abundances in stellar atmospheres, as well as berillium and lithium ones, can give useful hints for non-standard transport processes discrimination in stars. They can also be relevant for understanding several astrophysical processes (e.g. primordial nucleosynthesis and spallation reactions in ISM). A comprehensive study of boron abundances can therefore confirm or not the presence of non-standard mixing processes in stellar envelopes. For this reason nuclear processes producing or depleting boron isotopes abundance need to be studied at astrophysical energies. The $^{10}\text{B}(p,\alpha)^7\text{Be}$ reaction is the main responsible for the ^{10}B destruction in stellar interior. In the Gamow window this p-capture process takes places mainly through a resonant state of the compound ^{11}C nucleus at ≈ 10 keV. The $^{10}\text{B}(p,\alpha)^7\text{Be}$ reaction was indirectly studied through the Trojan Horse Method (THM) applied to the $2\text{H}(^{10}\text{B},\alpha)^7\text{Be}n$ reaction. The experiment was performed at the Laboratori Nazionali del Sud in Catania. The astrophysical $S(E)$ -factor for the $^{10}\text{B}(p,\alpha)^7\text{Be}$ reaction was extracted from the three body cross section at low neutron moment, and was compared with direct data. The results will be discussed, will be pointed out the presence of the resonance at 10 keV.

Maria Letizia Pumo (INAF-OA Padova)

SN 2008ha and SN 2008S: is there a role for the super-asymptotic giant branch stars?

Pumo M.L., Turatto M., Zampieri L.

It is widely accepted [e.g. 7] that stars having initial masses $> 8M_{\odot}$ end their life as core-collapse supernovae (CC-SNe). In spite of the importance of these explosive events in astrophysics, there are still basic questions to be answered, linked to the extreme variety of behaviours and energetics and related to the uncertainties in the modelling of stellar evolution [e.g. 5,7]. In particular the exact nature of the CC-SN progenitors having the required properties to reproduce the different observational features is far from being well-established [e.g. 5]. This is even more so for the two recent faint transients SN2008S and SN2008ha, whose nature is still ambiguous and intensely debated [e.g. 4]. In recent works [1,6], CC-SNe events triggered by electron-capture reactions (ec-SNe) involving super-AGB stars have been speculated to produce these transients. In the light of recent super-AGB stars models [2,3], we discuss in detail the relevance of ecSNe from super-AGB progenitors in connection with the two aforementioned events. 1. Botticella et al. arXiv:0903.1286v2 2. Pumo 2006, PhD thesis 3. Siess 2007, A&A, 476, 893 4. Smartt et al, arXiv:0809.0403v2 5. Turatto et al. 2007, AIPC, 937, 187 6. Valenti et al. arXiv:0901.2074v1 7. Woosley et al. 2002, RvMP, 74, 1015.

Maria Letizia Sergi (LNS-INFN, Catania)

Study of reaction $^{17}\text{O}(p,\alpha)^{14}\text{N}$ via the Trojan Horse Method for application to ^{17}O nucleosynthesis

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The role of oxygen in astrophysics is related to different problems as novae nucleosynthesis and gamma-ray astronomy. Among the three stable oxygen isotopes, ^{17}O is the rarest one, with a solar system abundance of $3.8 \cdot 10^{-4}$ in mass fraction. It is nevertheless quite important in several astrophysical domains where the knowledge of the $^{17}\text{O}(p,\alpha)^{14}\text{N}$ is crucial. While the nuclear reaction rate $^{16}\text{O}(p,\gamma)^{17}\text{F}(\beta^+)^{17}\text{O}$ governing ^{17}O production are well known a more precise evaluations of the nuclear path involving ^{17}O are needed. In particular, the importance of the $^{17}\text{O}(p,\alpha)^{14}\text{N}$ reaction in stellar nucleosynthesis come from its occurrence in the CNO cycle in which it acts as a feedback into the main part of the cycle. The stellar temperature ranges of primary interest amount to $T=0.01-0.4$ GK thus the $^{17}\text{O}(p,\alpha)^{14}\text{N}$ reaction cross section have to be precisely known at very low energy, in the center-of-mass energy range $E_{c.m.}=0.017-0.37$ MeV. The $^{17}\text{O}(p,\alpha)^{14}\text{N}$ reaction was studied through the Trojan Horse Method applied to the $2\text{H}(^{17}\text{O}, \alpha)^{14}\text{N}$ one and the results will be shown.

Emanuele Tognelli (Univ. Pisa)

Modelli aggiornati di pre-sequenza principale

Emanuele Tognelli, Pier Giorgio Prada Moroni, Scilla Degl'Innocenti

Presentiamo un database di isocrone e modelli stellari aggiornati per le fasi evolutive dalla pre-sequenza principale all'ingresso in ZAMS, in un ampio intervallo di metallicità ($Z = 0.0002 - 0.03$) e di masse (0.20 - 6.0 M_{\odot}) assumendo diversi valori di elio primordiale e di arricchimento elio/metalli. Gli aggiornamenti eseguiti sul codice (tabelle di opacità, equazione di stato, modelli di atmosfera) hanno consentito di ottenere isocrone teoriche realistiche da utilizzare per il confronto con le osservazioni disponibili per ammassi stellari molto giovani (1 - 20 Myr). Verranno presentati anche i confronti con tracce evolutive e isocrone già presenti in letteratura.

Felicia Troisi (Univ. Roma Tor Vergata)

Deep and accurate NIR photometry of the globular cluster 47 Tucanae

We plan to present deep NIR color-magnitude diagrams (CMDs) of the globular cluster 47 Tuc. This cluster presents a very high central density and accurate photometry in the innermost regions is challenging even for optical space images. By taking advantage of J, K band images collected in very good seeing conditions with MAD@VLT, we obtained CMDs ranging from evolved red HB stars down to a few magnitudes below the turn-off region. We also plan to perform a detailed comparison with similar CMDs based on J and K images collected with SOFI@NTT and with HAWK-I@VLT.

Michele Cignoni (Univ. Bologna)[poster]

Star formation histories of SMC fields observed with HST/ACS

M. Cignoni, E. Sabbi, A. Nota, M. Tosi, S. Degl'Innocenti, P. G. Prada Moroni, L. Angeretti, Lynn Redding Carlson, J. Gallagher, M. Meixner, M. Sirianni and L. J. Smith

Within the framework of a large coordinated HST effort to study the star formation processes and history of several fields in the SMC, we present preliminary results on the history of NGC 602 and NGC 346, a couple of very young clusters. In particular, we explore the characteristics of the many candidate pre main sequence (PMS) stars. We combine a new set of PMS stellar tracks for the metallicity $Z = 0.004$ with a stellar population synthesis model that takes into account all evolutionary phases. The best star formation is searched by comparing observed and synthetic CMDs.

Giuliano Giuffrida (ASDC-ASI, Roma)[poster]

Reconstruction of Gaia BP/RP Spectra in crowded fields

G. Giuffrida, R. Buonanno, L. Pulone, G. Iannicola, M. Castellani

With an expected catalogue of 1 billion of MW stars in addition to a huge number of extragalactic and solar system's objects, Gaia mission will drastically change our vision of the sky. The photometric cameras will supply low resolution spectra (from 3 to 29 nm/pixel) in two bands, BP (300-660 nm) and RP (650-1000 nm) for all targets with magnitude $G < 20$. This means that a large fraction of observed stars will be crowded. In this context, the development of an algorithm for the deblending of crowded images is a fundamental task and a real challenge. We present a new approach based on the "shape parameters" : the spectra are described by 4+4 parameters obtained by spline decomposition.

Corinne Rossi (Univ. La Sapienza, Roma) [poster]

On the evolutionary state of IRAS F18187+6304

C.Rossi, S.Gaudenzi, A.Frasca, L.Spezzi, R.Nesci, S.Sclavi, A.Mikaelian, K.Gigoyan

The bright IRAS source F18187+6304 is a high galactic latitude star presenting a complex phenomenology difficult to classify: A strong infrared excess reveals the presence of circumstellar dust and gas. The optical spectrum is characterized by continuum and absorption lines typical of early K-type giants plus a few emission lines, the strongest being the NaI-D doublet. The sparse optical photometry did not show strong variations during the last 50 years. Between 2007 and 2008 the optical spectrum remained stable while the BVR photometric bands showed a luminosity increase of about 0.4 magnitudes. From a high resolution spectrum we measured the heliocentric radial velocity as low as +25 Km/s and discovered a complex NaI-D structure resembling that of some T Tauri stars. From the literature, the proper motion is practically zero. This star is far from any star forming region and not associated with interstellar nebulosity. All these characteristics make this object an intriguing case of difficult interpretation, without excluding a post main sequence nature of a binary star.

Luciano Terranegra (INAF-OA Capodimonte) [poster]

Preliminary results on a new stellar activity index from the Ca II IR triplet for the GAIA mission

L. Terranegra, M. Oliviero, V. Andretta, M.T. Gomez

Using data available in different spectroscopic databases, we present preliminary results on the calibration against the classical Ca II R' _HK index, of a new activity index for solar-type stars, derived from observations in the Ca II IR triplet, and suitable for adoption in the analysis of GAIA data.

Luca Zampieri (INAF-OA Padova) [poster]

Iron core collapse and electron-capture SNe: their connection with sub-luminous Type II-P SNe

M.L. Pumo, L. Zampieri, M. Turatto

It has been suggested that the peculiarities of a fraction of the so-called sub-luminous Type II-P SNe can be interpreted in terms of core-collapse SNe events triggered by electron-capture reactions (so-called electron-capture SNe), involving progenitors which develop degenerate NeO cores such as the super-AGB stars. However an alternative interpretation, in which the progenitors are massive stars (> 15 solar masses) with extended envelopes, has been proposed. So far, no clear picture has emerged and both scenarios remain possible. With the aim of clarifying the nature of the sub-luminous Type II-P SNe progenitors, we are comparing the properties of iron core-collapse and electron-capture SNe, in order to see if they are compatible with the observations. To this end, we are developing a specifically tailored radiation hydrodynamics Lagrangian code (originally written for studying fallback in the aftermath of the explosion), that enables us to simulate the evolution of the main observables in SN events. The code features and some preliminary results will be presented.

Rosario Aldo Zappalà (Univ. Catania)[poster]

Production of s-nuclei in massive stars: impact of convective overshooting

M.L. Pumo, A. Bonanno, R. A. Zappalà

Although the mechanism of nucleosynthesis of s-elements in massive stars ($M_{\text{ZAMS}} > 13M_{\odot}$) seems to be well known, there are some open questions. In particular the consequences of the poorly modelled convection for the production of s-elements remain to be investigated in detail [1,2,3,4]. In a previous work [3] we have pointed out that there are enhancements of about a factor 2-3 in the production of s-nuclei when overshooting is inserted in stellar models having $M_{\text{ZAMS}}=25M_{\odot}$ and $Z=0.02$. In the light of these results, we are exploring the role of the convective overshooting on the production of s-nuclei in stellar models having different initial masses and metallicities ($15 < M_{\text{ZAMS}}/M_{\odot} < 30$; $10^{-5} < Z < 0.04$). Preliminary results will be presented. 1. Costa et al. 2006, *A&A*, 447, 641; 2. Kappeler 1999, *PrPNP*, 43, 419; 3. Pumo et al. 2006, *Mem SAIt Suppl*, 9, 263; 4. The, El Eid, Meyer 2000, *ApJ*, 533, 998.

FISICA DEI SISTEMI PLANETARI ED ASTROMETRIA

Fabrizio Bernardi INAF-IASF, Roma – Univ. Pisa)

Near Earth Asteroids long term impact monitoring: difficult but necessary

F. Bernardi, A. Milani, S.-R. Chesley, M.-E. Sansaturio, G.-B. Valsecchi and O. Arratia

The current impact monitoring systems cover up to 80-100 years in the future. There are two main difficulties in extending this time span: the chaotic effects of repeated close approaches and the non gravitational perturbations as the Yarkovsky perturbation. We have selected as case study the asteroid (101955) 1999 RQ36. The secular evolution of the Minimum Orbital Intersection Distance for (101955) is such that collisions with the Earth are in principle possible between 2100 and 2230. We have run impact monitoring for (101955) up to the year 2200 by using two methods: Monte Carlo and Line Of Variations sampling. The total Impact Probability (IP) can be estimated at 0.00092. The divergence of impacting orbits is moderate until 2060, grows by 4 orders of magnitude as a result of close approaches between 2060 and 2080, then again grows moderately until the 2162 encounter with the Earth and decreases afterwards. The consequence of this complex dynamics is that a realistic deflection procedure could be performed only before the 2080 encounter, more easily before 2060. If this object had been discovered after 2080, deflection would be more difficult. This example suggests that impact monitoring extended to a time span exceeding one century might be necessary.

Maria Teresa Capria (INAF-IASF, Roma)

Osservazione di corpi minori del sistema solare da Terra e dallo spazio

Argomento del talk sono le caratteristiche dei corpi minori (comete e asteroidi) osservati da Terra e dallo spazio per mezzo di strumenti a bordo di sonde spaziali. Si fa l'esempio di Rosetta e altre missioni, e si illustrano brevemente le sinergie tra i due tipi di osservazione.

Giovanni Federico Gronchi (Univ. Pisa)

Orbit determination with the 2-body integrals

G.F. Gronchi, L. Dimare, A. Milani

Con le nuove tecnologie di osservazione dei surveys della prossima generazione, come Pan-STARRS e LSST, il numero di piccoli corpi celesti rilevati ogni notte aumenterà in modo considerevole. Si è quindi rinnovato l'interesse nello studio dei metodi di determinazione orbitale. Presenterò un nuovo metodo per calcolare delle orbite preliminari per oggetti del sistema solare usando gli integrali primi del problema di Keplero. Questo metodo è pensato appositamente per le osservazioni astrometriche moderne, per cui spesso l'informazione contenuta nelle osservazioni ci permette di calcolare soltanto due posizioni angolari del corpo osservato e le loro derivate temporali ad un tempo dato. Chiamiamo 'attribuibile' questo insieme di dati. Dati due attribuibili di uno stesso oggetto a due tempi diversi, possiamo usare gli integrali del momento angolare e dell'energia per scrivere un sistema di equazioni polinomiali per la distanza topocentrica e la velocità radiale ai due tempi. Gli strumenti standard della Geometria Algebrica permettono di definire un algoritmo per il calcolo delle soluzioni. Inoltre possiamo usare la sovrabbondanza di dati per testare l'ipotesi che i due attribuibili appartengano allo stesso oggetto (problema del linkage).

Giuseppe Lanzafame (INAF-OACT, Catania)

2D SPH simulations of a single planet migration in a protoplanetary disc

Vincenzo Costa, Valerio Pirronello, Gaetano Belvedere, Antonino Del Popolo, Diego Molteni, Giuseppe Lanzafame

Migration of protoplanets inside an accretion disc of a forming star is the most probable scenario for planetary system formation according to current models. Unsolved problems exist concerning migration times and mechanisms. We report here the results of a 2D hydrodynamic study within an SPH scheme, analysing migration of an Earth-like or a Jupiter-like planet inside an inviscid sub-Keplerian accretion disc, as a function of the initial specific angular momentum of the infalling accretion disc matter. Particle capture by the protoplanet causes a rapid migration, within a few orbits, for the Earth like planet, and about 10^4 orbits for the Jupiter like planets. The effect of a planet pseudo-atmosphere is also discussed.

Mario G. Lattanzi (INAF-OA Torino)

From Gaia to SIM-Lite: Terrestrial planet detection with muas astrometry

M. G. Lattanzi (INAF-OATo), A. Sozzetti (INAF-OATo), S. Casertano (ST ScI)

The recently concluded SIM double-blind test campaign aimed at gauging the ability to characterize terrestrial mass planets orbiting nearby stars in multiple-component systems using a combination of the proposed astrometric space mission SIM-Lite and ground-based radial velocity (RV) observations. We discuss the outcome of the analysis carried out by our Team to model planetary orbits using astrometric+RV data focusing in particular on: 1) a study of the correlation between the presence of false positives in multiple-component configurations and the existence of long-period companions, and 2) an assessment of the regimes of signal-to-noise ratio and orbital period for which the combination of astrometric and radial-velocity measurements is most effective.

Simone Marchi (Univ. Padova)

Extrasolar planet taxonomy: implications for the formation of hot planets

The extrasolar planets (EPs) so far detected are very different to the planets in our own Solar System. Many of them have Jupiter-like masses and close-in orbits (the so-called hot planets, HPs), with orbital periods of

only a few days. We present a new statistical analysis of the observed EPs, focusing on the origin of the HPs. Among the several HP formation mechanisms proposed so far, the two main formation mechanisms are type II migration and scattering. In both cases, planets form beyond the so-called snow line of the protoplanetary disc and then migrate inwards due to angular momentum and energy exchange with either the protoplanetary disc or companion planets. Although theoretical studies produce a range of observed features, no firm correspondence between the observed EPs and models has yet been established. In our analysis, by means of principal component analysis and hierarchical cluster analysis, we find convincing indications for the existence of two types of HPs, whose parameters reflect physical mechanisms of type II migration and scattering.

Giampaolo Piotto (Univ. Padova)

Prospettive per la ricerca dei pianeti extrasolari in Italia

Prospettive per la ricerca dei pianeti extrasolari in Italia. Dopo la prima scoperta di un pianeta extrasolare all'inizio degli anni novanta, il raffinarsi delle tecniche di indagine e l'utilizzo di diverse metodologie di ricerca ha permesso di identificare centinaia di pianeti al di fuori del sistema solare e di decine di sistemi planetari. Nel talk presenterò una breve rassegna delle principali tecniche di ricerca, dei risultati raggiunti e delle nuove prospettive per il prossimo decennio, soffermandomi in particolare sui progetti che vedono più direttamente coinvolta la comunità astronomica italiana. In particolare, verrà descritta la missione PLATO (Planetary Transits and Oscillations of stars) che è stata selezionata dall'ESA nell'ambito del programma Cosmic Vision 2015-2025. Il lancio del satellite è previsto per il 2017. Nel talk verrà illustrato il progetto attuale e discusse le sue potenzialità scientifiche.

Alessandro Rossi (ISTI-CNR)

Influence of the YORP effect on the spin rate distribution of the NEO population

A Rossi, F. Marzari, D.J. Scheeres

Two major mechanisms are suspected to alter the rotation rates and states of Near Earth Objects (NEO) once they get into planet crossing orbits: close encounters with the planets and the YORP effect. The YORP effect is due to the reflection and reemission of light by an irregularly shaped asteroid and leads to a net thermal torque acting on that body. The overall change of NEO spin rate due to these two effects is evaluated by using a Monte Carlo model. The steady state cumulative distribution of NEO spin rates obtained from our simulation nicely reproduces the observed one, once our results are biased to match the diameter distribution of the sample of objects included in the observational database. The excellent agreement strongly suggests that YORP is responsible for the concentration of spin at low rotation rates. In fact, in the absence of YORP the steady state population significantly deviates from the observed one. The spin evolution due to YORP is also so rapid for NEOs that the initial rotation rate distribution of any source population is quickly relaxed to that of the observed population. This has profound consequences for the study of NEO origin since we cannot trace the sources of NEOs from their rotation rate only.

Alessandro Sozzetti (INAF-OA Torino)

On the frequency of giant planets in the metal-poor regime

A. Sozzetti (INAF-OATo), G. Torres (CfA), D.W. Latham (CfA), R.P. Stefanik (CfA), S.G. Korzennik (CfA), A.P. Boss (CIW), B.W. Carney (UNC), J.B. Laird (BGSU)

We present an analysis of three years of precision radial velocity measurements of 160 metal-poor stars observed with Keck/HIRES. We report on variability and long-term velocity trends for each star in our sample. We identify several long-term, low-amplitude radial-velocity variables worthy of follow-up with direct imaging techniques. We place lower limits on the detectable companion mass as a function of orbital period. None of the stars in our sample exhibits radial-velocity variations compatible with the presence of Jovian planets with periods shorter than the survey duration (3 yr). The resulting average frequency of gas giants orbiting metal-poor dwarfs with $-2.0 < [\text{Fe}/\text{H}] < -0.6$ is $f_p < 0.67\%$. By combining our dataset with the Fischer & Valenti (2005) uniform sample, we confirm that the likelihood of a star to harbor a planet more

massive than Jupiter within 2 AU is a steeply rising function of the host's metallicity. However, the data for stars with $-1.0 < [\text{Fe}/\text{H}] < 0.0$ are compatible, in a statistical sense, with a constant occurrence rate $f_p \sim 1\%$. Our results usefully inform theoretical studies of the process of giant planet formation across two orders of magnitude in metallicity.

Giuseppe Lanzafame (INAF-OA Catania)[poster]

Evolution of the orbit of an asteroid type body within a protoplanetary accretion disc: 3D SPH simulations

V. Costa, V. Pirronello, G. Belvedere, A. Del Popolo, D. Molteni, G. Lanzafame

Migration of protoplanets within an accretion disc of a forming star seems to be the basic scenario for planetary systems formation. Many details concerning the dragging mechanisms, times and the dominant physical interactions between the protoplanets and the accretion disc are still debated.

We report here the results of a study based on 3D Smoothed Particle Hydrodynamic (SPH) simulations, concerning the evolution of the orbital parameters of an asteroid type body embedded in an inviscid accretion disc, with an initially tilted orbit. Both rapid periodic variations of the tilt angle between the fragment angular momentum and the disc mean angular momentum, and a slow (about 0.1% for each orbit) monotonic decrease are observed.

ASTROFISICA DELLE ALTE ENERGIE

Lorenzo Amati (INAF-IASF, Bologna)

Gamma-Ray Burst nell'era di Fermi/GLAST

Nonostante gli enormi progressi osservativi e teorici degli ultimi 10 anni, siamo ancora lontani da una completa comprensione del fenomeno dei lampi gamma (Gamma-Ray Bursts, GRB). Riassumerò l'attuale stato osservativo, i principali scenari interpretativi e i problemi aperti più rilevanti, con particolare enfasi al contributo che sta fornendo, e che fornirà nei prossimi anni, il satellite Fermi/GLAST a questo campo di ricerca di grande interesse per l'astrofisica moderna.

L. Angelo Antonelli (INAF-OAR, Roma)

The INAF Contribution to Next Generation Cherenkov Telescopes

On behalf of a larger INAF collaboration

In the last decade, thanks to the new generation experiments, Very High Energy ($E > 50$ GeV) gamma-ray astrophysics has grown into a mature branch of astronomy having increased the number of discovered

sources by about a factor of 10. These recent advances of TeV γ -ray astronomy have shown that the 10 GeV – 100 TeV energy band is crucial to investigating the physics prevailing in extreme conditions found in remote cosmic objects as well as to testing fundamental physics. Relying on its large experience in this field and motivated by the recent challenging results from TeV astronomy, the VHE INAF community asked a group of them to write a White Paper to summarize the status and future of Cherenkov telescopes for γ -ray astronomy. In this talk we want to present this document in which we review both the scientific topics and potential developments of the field and we point out both the interests and the capacities (scientific and technical) of the VHE astrophysics community in INAF.

Stefano Ciprini (Univ. Perugia & INFN)

First results on Fermi LAT observations of AGNs

The Fermi Gamma-ray Space Telescope (formerly GLAST, launched June 11, 2008) is opening a new era for gamma-ray extragalactic astronomy. The Large Area Telescope (LAT), the main instrument on board Fermi, with its wide field of view ($>2\text{sr}$), large effective area, unprecedented sensitivity in the energy band from 20 MeV to more than 300 GeV, and the nominal all-sky survey observation mode, is optimal to monitor the restless extragalactic gamma-ray sky represented by AGNs. In the first months of science operation the LAT has already detected more than one hundred high confidence gamma-ray sources located away from the galactic plane ($|b|>10$). Most of them are associated with blazars, where their gamma-ray properties are summarized in this contribution.

Graziella Pizzichini (INAF-IASF, Bologna)

Lampi Gamma rivelati da HETE-2

F. Munz, E. Maiorano, G. Pizzichini per il team HETE

Il Satellite HETE-2, dedicato ai Lampi Gamma (Gamma-Ray Burst, GRB), negli anni dal 2000 al 2006 ha rivelato centinaia di eventi e ne ha localizzati 84, con una precisione anche di alcuni minuti d'arco e un ritardo anche di un solo minuto. La bassa soglia in energia degli strumenti ha reso HETE-2 particolarmente adatto alla rivelazione dei GRB di tipo "X-Ray Flash" e "X-Ray Rich" e piu' in generale allo studio della parte "molle" dello spettro. Stiamo contribuendo alla versione finale del catalogo e proseguiamo nello studio statistico degli eventi.

Giuseppe Greco (Univ. Bologna)

Further Analysis of Full-Resolution Optical Observations of the Naked-Eye GRB 080319B [poster]

G. Greco, C. Bartolini, A. Guarnieri, A. Piccioni, G. Beskin, S. Bondar, S. Karpov, E. Molinari

We present preliminary results of the full-resolution analysis (0.13 s exposure time without a gap between two consecutive frames) of the GRB 080319B observed by the TORTORA optical monitoring system. The temporal properties of the prompt optical emission suggest a short lived periodic activity of the internal engine.

Stefano Ciprini (Univ. Perugia & INFN)[poster]

The new gamma-ray and flaring blazar PKS 1502+106 discovered by Fermi LAT

The discovery by the Large Area Telescope (LAT) onboard the Fermi Gamma-ray Space Telescope of high-energy gamma-ray emission from the distant blazar PKS 1502+106 is reported. First results on these gamma-ray observations are outlined in conjunction with radio to X-ray data obtained during a simultaneous multifrequency campaign triggered by this early LAT discovery.

Stefano Ciprini (Univ. Perugia & INFN)[poster]

SSC and time-dependent modelling of blazars emission

A time-dependent synchrotron self-Compton (SSC) leptonic model, developed with some analytical formulations and a numerical code is presented. This SSC emission model, developed with some analytical formulations and a numerical code, allow to investigate quantitatively the multi-wavelength spectral variability of blazars, providing estimates for physical parameters and the bolometric power, trough fits of the spectral energy distribution.

COSMOLOGIA

Luciano Lorenzi

Steps towards the expansion center cosmology

The expansion center model (ECM) claims the observational falsification of the Cosmological Principle, from the historic RFR effect to the discovery of a cosmic dipole pointed towards the center of the huge void of Bahcall & Soneira. Consequently, we need a new cosmology ! To this end, the distance r in light-space and the Hubble flow as expanding cosmic medium from a point are discussed to analyse the new anisotropic Hubble law; then three Einstein's Universes are presented within a newtonian framework with expansion center. Indeed, the topic of the paper is addressed to deal with a new concordance cosmogony, including the LNH Dirac context, where a gravitation deflation with angular momentum conserved is able to easily explain the cosmic inflation and the Big Bang Hubble law, while Gamow's primordial nucleosynthesis, according to the observed abundance-curve, might have new physical chances. In conclusion, three alternative final cosmic fates of the expansion center Universe are analysed. Curiously the chance of Big Crunch comes back to be likely.

Davide Pietrobon (UNiv. Roma2 – ICG Portsmouth)

Primordial Non-Gaussianity in CMB map seen through Needlets

D.Pietrobon, P.Cabella, A.Balbi, G.DeGasperis, N.Vittorio

We look for a non-Gaussian signal in the WMAP 5-year temperature anisotropy maps by performing a needlet-based data analysis. We use the foreground-reduced maps obtained by the WMAP team through the optimal combination of the W, V and Q channels, and perform realistic non-Gaussian simulations in order to constrain the non-linear coupling parameter f_{NL} . We apply a third-order estimator of the needlet coefficients skewness and compute the χ^2 statistics of its distribution. We obtain $-80 < f_{\text{NL}} < 120$ at 95% confidence level, which is consistent with a Gaussian distribution and comparable to previous constraints on the non-linear coupling. We then develop an estimator of f_{NL} based on the same simulations and we find consistent constraints on primordial non-Gaussianity.

Roberto Buonanno (SAIt-Univ. Tor Vergata, Roma)[Invited Talk]

La Scienza al bivio del '600

I grandi rivolgimenti dell'astronomia del XVII secolo, le osservazioni di Galileo e le sintesi di Keplero, sono intervenuti in un mondo nel quale la visione del mondo andava cambiando da tempo. Come sempre avviene il processo di ricerca era caotico con contrasti fra gli studiosi e all'interno di molti di loro. La figura del gesuita Athanasius Kircher, studioso di astronomia, di egittologia, di musica, di lingue antiche, di magnetismo, di ottica, di esegesi biblica e infiniti altri argomenti, sembra costituire il compendio della conoscenza di un'epoca che partiva dall'aristotelismo, passava per il neoplatonismo e l'ermetismo per giungere alla scienza moderna.

DIDATTICA DELL'ASTRONOMIA

Giuseppe Cutispoto (INAF-OA Catania)**Attività Didattica dell'INAF OA Catania****G. Cutispoto, G. Leto, G. Strazzulla, F. Zuccarello**

Negli ultimi anni l'attività didattica dell'INAF Osservatorio Astrofisico di Catania (con la collaborazione del Dip. di Fisica e Astronomia dell'Università di Catania) si è articolata sulle seguenti iniziative: 1) Visite scolastiche presso le sedi di Catania e di Serra la Nave (oltre 100 scuole per un totale di circa 4000 studenti nel 2008); 2) Conferenze e Corsi di Aggiornamento (circa 2700 partecipanti nel 2008); 3) Progetto Lauree Scientifiche (circa 50 studenti nel 2008); 4) Concorso di disegno.

Maria Teresa Fulco (INAF-OA Capodimonte)**Public Outreach & Education presso l'Osservatorio di Capodimonte**

L'INAF-Osservatorio Astronomico di Capodimonte è impegnato in un vasto programma di didattica e divulgazione rivolto alle scolaresche e al pubblico generico. La presentazione si focalizzerà su due progetti didattici realizzati dall'Osservatorio negli anni scolastici 2007/2008 e 2008/2009: 1. "L'Astronomia fai da te". Tale progetto didattico-educativo è finalizzato alla realizzazione "in casa" di uno specchio astronomico da 20 cm di diametro a partire da un kit prodotto dall'Osservatorio. 2. "Lo Scaffale della Scienza : dalla lettura all'apprendimento". Tale progetto prevede, da parte degli studenti, la lettura di un testo narrativo che permetta approfondimenti contenutistici in campo scientifico e la partecipazione a conferenze presso l'Osservatorio Astronomico su argomenti pertinenti la fisica e l'astrofisica, derivati da spunti tematici reperibili nella lettura proposta.

Giulia Iafrate (INAF-OA Trieste)**Un Progetto Didattico per le Scuole Medie sviluppato nell'ambito dell'Osservatorio Virtuale Europeo: EuroVO-AIDA/WP5****G. Iafrate, M. Ramella e il team EuroVO-AIDA/WP5**

Presentiamo i risultati preliminari di EuroVO-AIDA/WP5, un progetto europeo che ha lo scopo di permettere al pubblico, in particolare agli studenti tra i 14 e i 18 anni, l'accesso telematico ai dati dell'Osservatorio Virtuale (EuroVO). Abbiamo sviluppato una versione semplificata dei software professionali Aladin (CDS) e Virgo/Stellarium (ESO) e li abbiamo utilizzati in scuole pilota assieme a insegnanti e studenti in sei moduli didattici aventi per soggetto la sfera celeste, le stelle e le galassie. Abbiamo raccolto le impressioni degli utenti e i problemi riscontrati, che terremo in considerazione per lo sviluppo della versione finale dei software e del materiale didattico.

Vincenzo Millucci (Univ. Siena)**Siena 2009...la Didattica dell'Astronomia celebra 500 anni**

L'Università degli Studi di Siena ha più di 750 anni di vita, ma per secoli sono stati coltivati soltanto studi giuridici e medici. La Facoltà di Scienze MFN è stata istituita nel 1964 e la Laurea in Matematica nel 1971. Da allora, insieme a docenti di Scienze Naturali, abbiamo iniziato una costante ricerca di collaborazione con insegnanti per esperienze didattiche anche in campo astronomico. Importante è stato il contributo di astrofili ben preparati che, con un'associazione autonoma, hanno realizzato due Osservatori, il maggiore dei quali opera con un primario da 53 cm. La Facoltà ha realizzato dapprima, negli anni 1990-2000, un Osservatorio nel Chianti, grazie al restauro di un'antica torre longobarda, e poi quello ora in uso presso il Dipartimento di Fisica, offrendo alla città un elemento in più nel panorama dell'Orto de' Pecci, una valle verde ben conservata non lontana dalla Piazza del Campo. Gli studenti del Corso di Laurea in Fisica possono apprendere le basi della Meccanica Celeste, ma anche le tecniche di acquisizione elettronica delle immagini e della loro elaborazione. La competenza maturata dal tecnico responsabile della strumentazione permette di partecipare ad esperienze

internazionali sulle osservazioni di pianeti extrasolari. Queste attività hanno suscitato interesse anche da parte di studenti delle Scuole Medie Superiori ai quali sono dirette iniziative di orientamento formativo. Utili, al riguardo, sono gli stages, di uno o più giorni che è possibile organizzare presso un Centro Didattico sull'Amiata, di proprietà della Provincia di Siena (Riserva Naturale del Pigelleto) e che coinvolgono anche gli allievi della Scuola per la Formazione degli Insegnanti (SSIS - Siena). Ma l'Orto de' Pecci è anche il luogo in cui studenti e cittadini vengono invitati a riscoprire il cielo, rinnovando l'invito che Alessandro Piccolomini rivolgeva all'amata Laudomia Forteguerra, nei primi anni del 1500. Le dedicò un libro, il *De Coelo*, con la speranza che "anche le fanciulle" si avvicinassero allo studio della Scienza degli Astri!! Nell'anno dell'Astronomia 2009, è un piacere ricordare questo non trascurabile evento!!

Maria Elena Dilaghi Pestellini

Trentacinque anni di attività didattica e divulgativa per la Società Astronomica Italiana

Un breve excursus su quello che abbiamo fatto in questi anni per ricordare a tutti quelli che ci hanno aiutato e lavorato con noi, e per far vedere ai giovani che dovrebbero proseguire nel futuro cosa e quanto c'è ancora da fare. L'entusiasmo che sempre ci accompagna in queste manifestazioni dovrebbe essere di stimolo a proseguire ed ampliare le attività. Senza fare un lungo elenco delle attività già svolte, mi limiterò a dare delle idee che possano fare da spunto per il futuro e per le nuove leve (ci sono alcuni insegnanti che sono veramente motivati), per poter ancora comunicare, specialmente agli alunni, il nostro vivo entusiasmo per una disciplina sempre affascinante.

Guido Risaliti (INAF-OA Arcetri)

La Didattica ad Arcetri: Planetario, conferenze e visite per studenti

Verranno presentate le iniziative "didattiche" dell'Osservatorio di Arcetri rivolte a studenti di scuole superiori, con enfasi sul ruolo del Planetario, la cui attività scientifica è gestita dall'Osservatorio. Le attrezzature della struttura e la partecipazione del personale scientifico dell'Osservatorio permettono di coprire un'ampia serie di argomenti dalla geografia astronomica, all'astronomia medievale, a lezioni di astrofisica moderna, con la partecipazione di circa 15000 studenti l'anno. Le visite all'Osservatorio prevedono anch'esse percorsi sia storici che legati all'astrofisica moderna, e riguardano migliaia di studenti ogni anno. Infine le conferenze per le scuole superiori, gestite dalla manifestazione "Pianeta Galileo" permettono l'approfondimento di temi specifici di astrofisica nelle scuole toscane.

Anna Roselli (Museo Storia Nat. Del Med., Livorno)

Didattica a Livorno: il Museo di Storia Naturale e il Centro di Educazione Ambientale

Anna Roselli, Francesca Manenti

Il Museo di Storia Naturale del Mediterraneo con il suo Centro di Educazione Ambientale è impegnato ormai da anni nel portare avanti programmi di insegnamento in vari campi della scienza compreso quello astronomico, proponendo programmi di didattica e divulgazione rivolti all'utenza scolastica ed agli adulti. La didattica astronomica al Museo di Storia Naturale si svolge al Planetario e nel Laboratorio di Fisica dove, alle lezioni frontali, si affiancano esperienze pratiche.

Stefano Sandrelli (INAF-OA Brera)

Viaggio al centro della Galassia

A partire dall'anno scolastico 2006-07 l'OABrera offre a circa 40 studenti delle scuole superiori lombarde una nuova tipologia di stage, simile a un gioco di ruolo, di circa 50 ore. Al termine dello stage gli studenti compilano un questionario di valutazione dell'iniziativa. Lo stage, coordinato dalla associazione no profit Odisseospace, offre agli studenti un percorso che si snoda tra enti di ricerca (INAF-OAB e INAF-IASF Milano) e industrie spaziali (Thales Alenia Space e MediaLario), offrendo ai partecipanti una panoramica significativa

della professione di astronomo. Il primo giorno dello stage, gli studenti vengono suddivisi in 6 gruppi. Ogni gruppo ha a disposizione un determinato budget finanziario per realizzare una missione spaziale. Identificati gli elementi di base intorno ai quali progettare una missione spaziale, gli studenti seguono approfondimenti teorici presso gli enti di ricerca attraverso lezioni e laboratori interattivi e approfondimenti tecnici attraverso apposite visite alle industrie spaziali, dove gli studenti toccano con mano gli aspetti pratici della realizzazione di un satellite spaziale.

Maria Torrisi (Ass. Urania, Genova)

A Genova la chiamano "Scuola di Cielo"

Iniziati quasi per scommessa nel 1999, gli interventi dell'Associazione Urania nelle scuole d'infanzia hanno ottenuto da subito inaspettati entusiastici consensi non solo da parte dei bambini ma anche degli insegnanti e dei genitori. Lo scopo era ed è quello di abituare le giovani menti a una visione critica del mondo che li circonda attraverso l'analisi degli oggetti e dei più semplici fenomeni celesti. Niente, quindi, nozionismo ma guida alla scoperta passo passo del perché. I risultati dicono che ne valeva proprio la pena.

Pietro Cerchiara (Ist. Tecnico per Geometri) [POSTER]

Introduzione all'Astrofisica nelle Scuole

Viene presentato un breve corso introduttivo all'astrofisica, rivolto ad adolescenti delle classi prime degli istituti tecnici. Il corso si propone di: - educare ad un corretto approccio nello studio di un problema scientifico; - far comprendere che la scienza è universale ed in continua evoluzione; - far comprendere che la scienza coinvolge sovente diversi campi d'indagine; - far comprendere che il mondo nel quale si vive è solo una piccola parte di qualcosa molto più esteso. Il corso ha come obiettivi: - inquadrare correttamente il mondo nel quale si vive, dalla Terra fino ai confini dell'Universo; - conoscere l'evoluzione delle basilari conoscenze fisiche dell'Universo; - conoscere i più recenti metodi d'indagine dell'Universo. I contenuti proposti sono: - il sistema solare; - le stelle; - le galassie; - le origini dell'Universo; - metodi d'indagine dell'Universo. Il corso consiste in una presentazione Power Point, opportunamente integrata da fasi di dialogo con i partecipanti; può avere durata variabile dalle 2 alle 4 ore, in base alla reale possibilità di approfondimento della presentazione.

FISICA SOLARE E PLASMI SPAZIALI

Gianna Cauzzi (INAF-OA ARcetri)

Heating in chromospheric network - an H-alpha and CaII comparison

G. Cauzzi, K. Reardon, R. Rutten, H. Uitenbroek, A. Tritschler

The picture of the solar chromosphere provided by the Hydrogen-alpha line is very complicated, much more so than by filtergrams in the Ca II H & K lines. But which of these more accurately represent the actual structuring of the chromosphere? We use simultaneous H-alpha and Ca II 8542 imaging spectroscopy observations from IBIS trying to disentangle the various contributions to the observed spectral profiles. We address in particular the evidence of chromospheric heating in and around network elements as provided by different parameters of the two lines.

Dario Del Moro (Univ. Roma Tor Vergata)

Imaging Spectropolarimetry with IBIS: evolution of AR11005

Del Moro, D., Viticche', B., Berrilli, F., Egidi, A., Vantaggiato, M., Piazzesi, R., Stangalini, M

We present new observations and analysis of the solar photosphere and chromosphere carried out with the Interferometric Bidimensional Spectrometer (IBIS) at the NSO Dunn Solar Telescope. Full Stokes profiles in the FeI 617.3 line and Stokes I in the CaII 854.2 were acquired with high spatial and spectral resolutions

for more than one hour. The dataset allows us to study the evolution of a magnetic feature associated to AR11005. Here we search for possible correlations between photospheric and chromospheric events examining the magnetic flux density evolution and wave propagation in the solar atmosphere.

Maurizio Ternullo (INAF-OA Catania)
The Butterfly Diagram Internal Structure

Maunder's "butterfly diagram" is, in its original form, an array of short lines in a time-latitude diagram, each line merely representing the presence of a spotgroup. Replacing Maunder's lines by the amount of solar photosphere covered with spots results in a diagram formed by a few number of small, heavenly spotted portions ("knots"), making it assume a "leopard skin" aspect. Knots are the signature of photospheric regions, tightly limited in latitude, each one being highly active for a short time. The cycle may be described as a sequence of knots activations and extinctions. Even though knots show the overall tendency to appear at lower and lower latitudes as the cycle goes on, a knot may activate at a latitude either lower or higher than previous ones, in a way which could be named a "latitudinal flip-flop". That accounts for the alternance of poleward/equatorward drifts of the spot zone, described by this author for cycles 20 through 22. The examination of knot distribution inside the "butterfly wings" suggests that -- at any cycle and at any hemisphere -- two (or more) "activity waves".

Gaetano Zimbardo (Univ. della Calabria)
A new mechanism for heating the solar corona

The solar corona heating represents one of the long standing problems of solar physics. In addition, both remote and in situ observations of heavy ions (alpha particles, oxygen, and so on) show that these ions have temperatures larger than protons, in a ratio which is approximately more than mass proportional. Here we propose a new model for explaining both solar corona heating and the observations of more than mass proportional heating of heavy ions. The energization mechanism is, essentially, the ion reflection off quasi-perpendicular collisionless shocks in the corona and the subsequent acceleration by the motional electric field $E = -V \times B$. The acceleration due to the electric field is perpendicular to the magnetic field, in agreement with Soho/UVCS observations, and is more than mass proportional with respect to protons, because the heavy ion orbit is mostly upstream of the quasi-perpendicular shock foot. On the other hand, a number of issues need to be investigated, like the reflection rate of heavy ions and the presence of a sufficient number of collisionless shocks in the solar corona.

Salvo Guglielmino (INAF-OA Catania) [poster]
High-Resolution Observations of Interactions occurring in a site of Magnetic Flux Emergence from the Photosphere to the Corona

S.L. Guglielmino(1), L.R. Bellot Rubio(2), F. Zuccarello(1), P. Romano(3), and S. Domiguez Vargas(4)

(1)-Dipartimento di Fisica e Astronomia - Università di Catania Via S.Sofia 64, 95123 Catania, Italy. (2)-IAA-CSIC Instituto de Astrofísica de Andalucía - Granada, Spain. (3)-INAF-Osservatorio Astrofisico di Catania - Italy. (4)-IAC Instituto de Astrofísica de Canarias - La Laguna (Tenerife), Spain

Interactions occurring at a site where new flux emerges where an old flux system is already present can lead to the appearance of several phenomena, as flux cancellation, reconnection events, and even flaring. We analyze high-resolution observations of a small-scale flux emergence event occurred in NOAA 10971, observed simultaneously by the Hinode satellite and the Swedish Solar Telescope in La Palma Island during a joint campaign. G-band, H α , and Ca II H images, Fe I and Na I magnetograms show that the emerging region seen in the photosphere is associated with Ca II brightenings and a H α chromospheric surge. Moreover, EUV raster scans and XRT filtergrams show cospatial brightenings. Comparing our results with recent 3D simulations, we interpret our observations in the context of the low-altitude magnetic reconnection model, suggesting that interactions between the emerging flux and the pre-existing magnetic field can explain the observed coupling.

Francesco Palermo (Univ. Pisa) [poster]

Possible magnetospheric Kelvin-Helmholtz vortices detected by THEMIS near the post-noon magnetopause

F. Palermo, F. Califano, O. Le Contel

We report on possible magnetospheric Kelvin-Helmholtz (KH) vortices detected by THEMIS near the post-noon magnetopause. Oscillations of the magnetic field and of the ion velocity with a period around 7 minutes are measured. Minimum variance analysis (MVA) seems to indicate that the oscillations could correspond to surface waves propagating along the magnetopause. In the MVA frame, the magnetic field and ion velocity data display vortex-like signatures. Yet ion spectrograms show no magnetosheath/magnetosphere plasma mixing and these vortices appear as purely magnetospheric vortices. Numerical simulations of the KH instability are presented to support this possibility.

Fatima Rubio Da Costa (Univ. Catania) [poster]

Integrated Ly-alpha intensity emission on ribbon flares

F. Rubio da Costa; L. Fletcher; N. Labrosse; F. Zuccarello

The collisional thick target electron beam model assumes that the chromospheric flare heating and enhanced radiation arises as a result of energy deposition and ionization by a beam of electrons accelerated in the corona. In previous works, the Ly-a radiation was estimated to be about two orders of magnitude stronger than its pre-flare average value. These changes in irradiance were found to lie between the values predicted by the F1 and F2 flare models. Moreover, the analysis of other events showed that the Ly-a peaks were synchronous with hard X-ray emission. We have analysed two flares observed by TRACE in Ly-a in order to deduce their morphology, temporal evolution, radiative outputs and compare these results with data obtained in the X-range (SXT and HXT on Yohkoh) and with magnetograms (MDI/SOHO). These observational data and the results obtained by a theoretical study of the intensity of the radiation emitted by hydrogen lines, contribute to our understanding of chromospheric emission during flares. The planned Extreme Ultraviolet Imager selected for the Solar Orbiter mission should have a Lyman alpha channel, and our work can help in designing observational flare studies with this or a similar instrument

Francesca Zuccarello (Univ. Catania) [poster]

The Italian Contribution to the Design Phase of the European Solar Telescope: current status and future steps

F. Zuccarello¹, M. Belluso², F. Berrilli³, G. Bonanno², V. Carbone⁴, G. Cauzzi⁵, F. Cavallini⁵, M. Centrone⁶, R. Cirami⁷, M. Comparato¹, G. Consolini⁸, I. Coretti⁷, S. Criscuoli⁶, D. Del Moro³, P. Di Marcantonio⁷, A. Egidi³, I. Ermolli⁶, S. Esposito⁵, F. Giammaria⁹, F. Giorgi⁶, E. Landi Degl'Innocenti¹⁰, F. Manni¹¹, M. Munari², E. Pietropaolo⁹, M. Pucillo⁷, K. Reardon⁵, P. Romano², P. Santin⁷, S. Scuderi², D. Spadaro²

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The EST (European Solar Telescope) is a 4-m class telescope, four times larger than any existing high resolution solar telescope. It is planned with the highest priority among the ground-based, medium term (2016-2020) new projects in the ASTRONET Roadmap. The EST will be equipped with a suite of instruments to perform spectropolarimetric and imaging observations of the solar disc at high spatial and temporal resolution in the range UV-NIR. These instruments will measure fundamental astrophysical processes at their intrinsic scales in the Sun's atmosphere, to establish the mechanisms of magnetic field generation and removal, and of energy transfer from the surface to the upper solar atmosphere and eventually to the whole heliosphere. The conceptual design study, which has been funded by EU within the FP7 programme, started on February 2008. In this poster we summarize the Italian participation to the EST project, which includes the detailed design of various subsystems affecting the opto-mechanical structure, the suite of post-focus instruments, the data handling, and the control system.

STORIA DELL'ASTRONOMIA

Ileana Chinnici (INAF-OA Palermo)[Invited Talk]

Astrum2009. Astronomia e strumenti: il patrimonio storico dell'astronomia italiana da Galileo ad oggi

Sarà presentata l'esposizione che si terrà ai Musei Vaticani, Sala Polifunzionale, dal 16 ottobre 2009 al 16 gennaio 2010. La mostra, organizzata dall'INAF in collaborazione con la Specola Vaticana e i Musei Vaticani, ha lo scopo di far conoscere e valorizzare il ricco patrimonio storico dell'astronomia italiana - strumenti, libri, carte - conservato in larga parte negli Osservatori Astronomici, che testimonia l'eccellenza della tradizione astronomica nel nostro Paese.

Alberto Dal Guerra (Univ. Pisa)[Invited Talk]

L'Individuazione della casa natale di Galileo Galilei

La casa natale di Galileo fu individuata nella Casa Ammanniti nel quartiere S. Andrea di Pisa circa 50 anni fa da un medico pisano, professor Giorgio Del Guerra, studioso di Storia della Medicina e della Storia di Pisa. Questa breve comunicazione vuole ripercorrere le tappe della ricerca a partire dalle prime indicazioni della fine ottocento fino alla localizzazione finale.

Mauro D'Onofrio (INAF-OA, Padova)[Invited Talk]

Questions of Modern Cosmology

D'Onofrio M., Burigana C.

Presentazione del libro: *Questions of Modern Cosmology* edito da Springer attualmente in corso di stampa. Si tratta di un progetto dei due curatori per l'Anno Internazionale dell'Astronomia. Il libro è articolato in interviste/domande rivolte a 40 scienziati di tutto il mondo sui nodi cruciali della moderna cosmologia e su questioni relative alla sociologia della scienza ai giorni nostri. Il volume verrà presentato dai due curatori.

Claudio Luperini (Univ. Pisa)[Invited Talk]

Galileo al Museo degli strumenti per il Calcolo

Presentazione della mostra che aprirà il 25 settembre 2009 presso il Museo degli Strumenti per il Calcolo di Pisa. All'interno del percorso espositivo, che illustrerà la storia del calcolo automatico e la storia della Cattedra di Fisica Sperimentale dell'Università di Pisa attraverso gli strumenti e notizie sui primi professori, verranno presentate tre ricostruzioni di invenzioni galileiane: il Compasso Geometrico e Militare (in scala 6:1), il Pulsilogium e l'Orologio a pendolo.

Andrea Martocchia (INAF-IASF, Roma)

GRB 080319b AND SN1054

A. Martocchia, V. F. Polcaro

A typical SN Type IIp model can fit the SN1054 explosion light curve when data coming from European sources are also considered. Though a detailed study of these texts reveals a number of problems in their precise datation, it is likely that they actually describe the observation of an unusual celestial event which occurred in a day near to the one of the Pope Leo IX death (April 19th, 1054). In particular, they seem to show that a very bright transient celestial phenomenon, lasting about 30 min, was observed. We already suggested that this Medieval testimonies were due to a very short and bright light flash in the first phase of the SN precursor collapse. The discovery of a similar flash in GRB 080319b brought us to consider this hypothesis more deeply. We thus scaled the intensity of the GRB 080319b to the typical energy of a Type IIp SN and to a distance of 1.83 kpc, in order to evaluate the intensity of a similar flash in the SN1054. We then took this value as input of the atmospheric optical effects simulation code "HaloSim3", using the point-like source option for the dates and sites reported in European texts connected with the SN1054 event, and in various atmospheric conditions. The results are remarkably similar to the effects reported in Medieval chronicles.

Anna M. Nobili (Univ. Pisa& INFN, Italy)

Galileo e la prescoperta di Nettuno

During the years 1610-1613 Galileo discovered the four largest moons of Jupiter, charted their nightly positions and even found that he was able to predict their future positions with a high degree of accuracy. Late in the year 1612, the planet Neptune drifted into the same field of view as Jupiter. On two occasions Galileo indicated the location of what he thought was an ordinary star. In fact, though, it was not a star; it was the planet Neptune: the first known sighting of the distant planet – 234 years before its official discovery in 1846! In early January 1613, Neptune approached close to Jupiter and remained in the field of view throughout the month. A possible additional observation of Neptune by Galileo occurred on January 6, 1613 when Neptune was very close to Jupiter and could be observed as accurately as its satellites. Galileo's observing notebooks, now preserved at Biblioteca Nazionale in Florence, Italy, show his observing innovations, improving accuracies and a couple of startling astronomical discoveries. Modern ephemeris calculations show that, more than of just historical interest, his work still has important implications for present-day astronomy.

Luisa Pigatto (INAF-OA Padova)èInvited Talk]

L'orologio lunisolare, l'orologio planetario Jacopo e Giovanni Dondi e la cultura astronomica nella Padova del Trecento

Nel 1344 Ubertino da Carrara, principe di Padova, fece erigere sull'alta torre d'ingresso della sua reggia uno straordinario orologio meccanico. Infatti, oltre alle 24 ore temporarie, l'orologio era in grado di fornire la posizione del Sole lungo i dodici segni dello zodiaco nel corso dell'anno, le relative posizioni della Luna e il ciclo delle fasi. Si trattava dunque di un orologio lunisolare la cui realizzazione si basava su una perfetta conoscenza del moto annuo e mestruo dei due luminari. L'inventore della grande macchina da torre era Jacopo Dondi, insigne medico del suo tempo ed esperto astronomo. Nel 1364 il figlio Giovanni, anch'egli medico e astronomo insigne, completava, dopo sedici anni di lavoro, il suo orologio planetario: oltre alle ore del giorno e alle posizioni del Sole e della Luna, la nuova straordinaria macchina era in grado di indicare, per ogni ora del giorno e per ogni giorno dell'anno, le posizioni degli altri cinque pianeti allora noti (Mercurio, Venere, Marte, Giove e Saturno). In questo contributo si illustra la dottrina astronomica che sta alla base della costruzione dei due orologi e l'uso astrologico strettamente legato alla professione del medico di quei tempi.

Matteo Realdi (Univ. Padova)

The role played by the "de Sitter effect" in the rise of modern relativistic cosmology

The early developments of relativistic cosmology (1917-1930) represent a remarkable chapter in the history of the modern view of the universe. New ideas, discoveries and controversies appeared in those years, when the theoretical world-models proposed by Einstein and de Sitter were first compared to astronomical observations. In this framework, the so-called "de Sitter effect" played a fundamental role in contributions that several scientists offered during the 1920's in theoretical and observational cosmology. The de Sitter effect is a redshift-distance relation obtained through the metric of the de Sitter empty universe. Such a puzzling effect foreshadowed a non-static picture of the universe. Predictions and confirmations of an appropriate redshift-distance relation marked the tortuous process towards the change of viewpoint from the 1917 picture of a static universe filled by stars to the 1930 model of an expanding universe filled by galaxies. The interest in the de Sitter effect and the variety of contributions addressed to the cosmological question during the 1920's permitted the development of cosmology from speculation to an empirical science, and inaugurated the modern approach of cosmologists to the comprehension of the universe as a whole and its properties.

Pierluigi Selvelli (INAF-OA Trieste)

I cannocchiali nei quadri di J. Bruegel e P. Rubens

P. Selvelli e P. Molaro

We have investigated the nature and the origin of the telescopes depicted in three paintings of J. Bruegel the Elder, completed between 1609 and 1618. The spyglass that appears in the painting dated 1608-1612 represents one of the early instruments, prior to those made by Galileo, and is attributable to either Lipperhey or Sacharias Janssen. Instead, the two telescopes made of several draw-tubes which appear in the two paintings of 1617 and 1618, are more sophisticated and may represent early examples of Keplerian telescopes.

Lucia Tomasi Tongiorgi (Univ. Pisa)[Invited Talk]

Il Cannocchiale e il Pennello. Nuova Scienza e nuova arte nell'età di Galileo

Presentazione della mostra che si terrà a Palazzo Blu di Pisa, dal 9 maggio al 20 luglio 2009. La mostra, a cura di Lucia Tomasi Tongiorgi e Alessandro Tosi, intende raccontare, attraverso opere provenienti da prestigiose collezioni pubbliche e private, la stretta relazione che si viene a creare tra la nuova scienza galileiana e la cultura figurativa nell'Europa del XVII secolo, con inedite incursioni nella letteratura e nella musica.

Valeria Zanini (INAF-OA Padova)

Lo spettroscopio a visione diretta e le ricerche astrofisiche sul finire dell'800 all'Osservatorio Astronomico di Padova

Nel 1870 la Commissione Italiana per l'osservazione dell'eclisse totale di Sole prevista per il dicembre di quell'anno acquistò uno spettroscopio a visione diretta di Hofmann, che fu successivamente assegnato all'Osservatorio Astronomico di Padova. Lo strumento aveva in origine una dispersione totale di 10° e il suo cannocchialino spettroscopico forniva un ingrandimento pari a 4. Successivamente Giuseppe Lorenzoni, quarto direttore dell'Osservatorio padovano, lo modificò per renderlo più idoneo alla spettroscopia solare, sostituendo la lente collimatrice con una di 30 cm di focale e portando di conseguenza l'ingrandimento del cannocchialino a 17. In questo modo egli poté sfruttare sia l'intera apertura dei prismi spettroscopici che quella dell'obiettivo del rifrattore al quale lo spettroscopio era applicato. All'unicum costituito da cannocchiale e spettroscopio Lorenzoni diede il nome di 'telespettroscopio', e questo strumento venne da lui utilizzato per tutti gli anni '70 del XIX secolo per compiere studi di astrofisica solare.

STRUMENTI E TECNICHE PER L'ASTROFISICA

Donata Bonino (INAF-OA Torino)

Statistical techniques for interferometric signal analysis

D. Bonino, M. Gai, L. Sacerdote

When doing fringe tracking, the presence of phase disturbance due to atmospheric turbulences may affect the signal parameters values that become instable. Algorithms aimed at fringe parameters identification are based on interferometric models that have to be carefully adapted to the interfered beams, hence including variability sources. However, all information have to be extracted from the collected signals, and how to do this is subject of researches. We show the results of the application of some statistical techniques to real interferometric signals. With the time series analysis we examine the composition of signals before and after the combination, separating pure random effects and peculiar features from trends, while with the multivariate regression analysis, we are able to isolate noise components due to the interference physical process. We finally highlight how some statistical techniques could be useful for quality tests both for instrumental performances and for signals characterization.

Deborah Busonero (INAF-OA Torino)

Micro-Arcsec Space Mission – Implications of the monitoring, diagnostic and calibration of the instrument response in the data reduction chain

The goals of high angular precision experiments rely on the limiting performance associated to the selected instrumental configuration and observing conditions. In particular, variation of the instrumental response over the field, with wavelength and in time, are potentially critical. Appropriate modelling of the astrometric response is required for optimal definition of the data reduction and calibration algorithms, in order to ensure high sensitivity to the astrophysical source parameters and in general high accuracy.

The measured signal profile is affected by optics, attitude, detector response and operations. Its definition (forward analysis) is comparably straightforward from sufficiently detailed design data. The inverse problem (backward analysis) of disentangling both astrophysical and instrumental parameters from the set of science and auxiliary data is much more challenging.

We describe selected topics in the framework of the astrometric instrument modelling for the Gaia mission, evidencing their role in data analysis and for definition of the Reference Frame at micro-arcsecond level.

Roberto Capuzzo Dolcetta (Univ. La Sapienza, Roma)[Invited Talk]

Supercalcolo e dinamica di sistemi stellari

La meccanica celeste e la dinamica stellare costituiscono due capitoli complementari, classici e fondamentali dell'astronomia e astrofisica che stanno vedendo sviluppi notevolissimi grazie alla rapida evoluzione dei mezzi di calcolo. E' al giorno d'oggi possibile seguire con simulazioni di alta precisione, necessaria quando si tratta di sistemi in cui le collisioni gravitazionali giocano un ruolo rilevante, l'evoluzione di sistemi stellari come gli ammassi globulari composti da un milione di stelle. In questa presentazione verranno discusse anche alcune moderne architetture computazionali basate sull'uso delle schede.

Luca Del Zanna (Univ. Firenze)[Invited Talk]

Simulazioni di plasmi relativistici

Nella mia presentazione discuterò alcuni aspetti di Astrofisica delle Alte Energie e dei metodi numerici comunemente impiegati per le simulazioni di plasmi relativistici, sia in regime di relativita' speciale che generale. In particolare verranno mostrate applicazioni numeriche in ambienti diversi, dalle pulsar wind nebulae (PNNe) ai getti di GRBs.

Paolo Di Marcantonio (INAF-OA Trieste)

A new arrival at the VLT: the commissioning of the X-shooter spectrograph

P. Di Marcantonio on behalf of the X-shooter team

Starting from October 2009 a new ESO/VLT instrument will be offered to the astronomical community worldwide: the X-shooter spectrograph. It is the first second generation VLT instrument, built as a collaborative effort of several European Institutes (with INAF playing a prominent role, co-pi R. Pallavicini) and ESO. The main features of X-shooter are the high efficiency and the unique capability to cover in one "shot" a very broad spectral range, from U to K bands, making the instrument appealing for cutting-edge science. The present paper will report on the commissioning periods just held in Paranal and on the efforts spent to meet all foreseen stringent requirements.

Daniele Gardiol (INAF-OA Torino)

Modelling the Gaia Instrument

The ESA-Gaia astrometric mission, which launch is foreseen spring 2012, is expected to provide measurements with unprecedented accuracies. To meet this goal a realistic model of the many components of the payload as well as the data processing is fundamental to produce realistic simulations and to verify the performances of both the instrument and the software data reduction pipeline. I will give a sample of the most relevant challenges related to the current Gaia Instrument Modelling.

Giuseppe Murante (INAF-OA Torino)[Invited Talk]

Structure formation in Extragalactic Astrophysics and Cosmology: numerical approaches

I will review the most common N-Body approaches to structure formation, namely direct, PM, P3M and Tree-codes for gravitation and Eulerian and Lagrangian methods for hydrodynamics. I will describe an important example of sub-grid parametrization of pertinent astrophysical processes, the star formation and feedback schemes. Then I will focus on the open problems in gasdynamic treatment in Eulerian and Lagrangian schemes and on some proposed solutions.

Marco Stangalini (Univ. Roma Tor Vergata)

MCAO for European Solar Telescope: first results

We analyse the efficiency of wavefront reconstruction in the MultiConjugate Adaptive Optics system for the European Solar Telescope (EST). We present preliminary results derived from numerical simulations. We study a 4 meter class telescope with multiple deformable mirrors conjugated at variable heights. Along with common issues, difficulties peculiar to the solar case have to be considered, such as the low contrast and extended nature of the natural guide features. Our findings identify basic requirements for the EST Adaptive Optics system and show some of its capabilities.

Paolo Colombetti (Univ. Torino)[poster]

A multiparametric HPGe-NaI acquisition system for very low gamma activity measurements of astromaterials

C. Taricco, N. Bhandari, P. Colombetti, I. Mariani, N. Verma, G. Vivaldo

The study of long-term solar activity variations is of great interest and requires the use of proxy data to cover the last centuries. In the Laboratory of Monte dei Cappuccini in Torino (IFSI-Torino, INAF) for many years we have been studying radioisotopes in meteorites, because their production is related to galactic cosmic ray flux and can therefore give information about heliospheric magnetic field variations. We have developed very sensitive gamma detection techniques, in particular to measure Ti-44 ($t_{1/2}=59.2$ yrs) activity in meteorites (Taricco et al., 2007); this radioisotope is an ideal index to reveal the imprint of solar activity variations on the centennial scale. The recent improvements of the spectrometer and the results obtained by the new multiparametric acquisition system are described.

Pierre Henry (Oss. Parigi, Francia)[poster]

Bicoherence as a diagnostic for non-linear three-wave interactions.

Henri, P. (1,2), Califano, F. (1), Briand, C. (2)

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The *bicoherence* (also called "normalised cross-bispectrum") is an estimator of the phase-locking between three signals of frequencies f_1 , f_2 and $f_3=f_1+f_2$. It is used for detection of non-linear quadratic interactions such as three-wave coupling [Kim & Powers (1979), Lagoutte et al. (1989)]. The use of bicoherence for observations of electric field waveforms (from SWAVES experiment onboard STEREO mission) gives evidence for coupling of electrostatic fluctuations of high and low frequencies in the solar wind, in this case identified as the Langmuir electrostatic decay [Henri et al. (2009)].

We review some general properties of bicoherence, its "variance" and the differences between Fourier based and Morlet wavelet-based bicoherence. The use of bicoherence is discussed both for SWAVES observations and results of Vlasov-Poisson simulations of Langmuir electrostatic decay.

Francesca Zuccarello (Univ. Catania)[poster]

The Italian Contribution to the EST project

F. Zuccarello and the EST team

The EST (European Solar Telescope) is a 4-m class telescope, four times larger than any existing high resolution solar telescope. It is planned with the highest priority among the ground-based, medium term (2016-2020) new projects in the ASTRONET Roadmap. The EST will be equipped with a suite of instruments to perform spectropolarimetric and imaging observations of the solar disc at high spatial and temporal resolution in the range UV-NIR. These instruments will measure fundamental astrophysical processes at their intrinsic scales in the Sun's atmosphere, to establish the mechanisms of magnetic field generation and removal, and of energy transfer from the surface to the upper solar atmosphere and eventually to the whole heliosphere. The conceptual design study, which has been funded by EU within the FP7 programme, started on February 2008. In this poster we summarize the Italian participation to the EST project, which includes the detailed design of various subsystems affecting the opto-mechanical structure, the suite of post-focus instruments, the data handling, and the control system.