MEMORIE DELLA SOCIETÀ ASTRONOMICA ITALIANA
Vol.84 n.3 2013

# X-ray astronomy: towards the next 50 years!

*Milan, October 1-5, 2012*

*editors:* G. Trinchieri, R. Della Ceca, T. Maccacaro, L. Maraschi, G. Pareschi

## TABLE OF CONTENTS

*Index* 457

*Foreword* 464

**Session I: history and legacy of X-ray astronomy**

R. Giacconi
*Considerations on X-ray astronomy* 472

Y. Tanaka
*My early days in X-ray astronomy* 485

J. Trümper
*The history of X-ray astronomy in Germany* 493

K. Pounds, M. Watson
*UK contributions to the development of X-ray astronomy as a major international discipline* 501

J. Bleeker, F. Verbunt
*From zone plate to microcalorimeter* 512

L. Piro
*BeppoSAX: history and legacy* 522

**Session II: stars, neutron stars, pulsars and supernova remnants**

J.H.M.M. Schmitt
*50 (38) years of stellar X-ray astronomy* 532

P. Zhao, J. E. Grindley, J. Hong, M. Servillat, M. van den Berg
*Cataclysmic variables discovered in the Chandra Multi-wavelength Plane Surveys* 540

S. Mereghetti, N. La Palombara, P. Esposito, A. Tiengo
*A new class of X-ray sources: hot subdwarfs with compact companions* 543

A. Odendaal, P. J. Meintjes, P. A. Charles, A. F. Rajoelimanana
*X-ray periodicity in the supersoft X-ray sources CAL 83 and SMC 13* 545

K. Makishima
*From Sco X-1 to magnetars* 547

N. Rea
*Neutron stars with huge magnetic storms* 554

Y.E. Nakagawa, K. Makishima, T. Enoto, T. Sakamoto, T. Mihara, M. Sugizaki, K. Yamaoka, K. Hurley, A. Yoshida, P. Gandhi, M. Tashiro, M. Morii
*Wide-band spectra of magnetar burst and persistent emission* 560

G.L. Israel
*Monitoring magnetar outbursts* 564

M. Marelli, A. De Luca, P. Caraveo
*The X-ray properties of the Fermi/LAT pulsars* 568

D. Salvetti, A. De Luca, P. A. Caraveo, M. Marelli
*Completing the census of Fermi pulsars with X-ray observations* 572

H. Yamaguchi
*Spectroscopic studies of iron emissions from supernova remnants with Suzaku* 574

Y. Hanabata, M. Sawada, H. Katagiri, A. Bamba, Y. Fukazawa
*Detailed X-ray study of the supernova remnant W51C with Suzaku* 580

M. C. Weisskopf
*Monitoring the Crab Nebula with Chandra* 582

D. Dewey
*SN 1987A at high resolution* 586

K.P. Levenfish, A. M. Bykov, M. Durant, O.Y. Kargaltsev, Y. A. Kropotina, G. G. Pavlov, A. M. Krassilchtchikov, Y. A. Uvarov
*Finest persistent structures in the Vela PWN* 588

Y. Terada, A. Harayama, T. Hayashi, T. Dogtani, M. Ishida, A. Bamba, K. Makishima, K. Mukai, Y. Urata, A. Nitta, O. de Jager, P. Chadwick, S. Wagner, D. Buckley, M. S. Tashiro, T. Kouzu, S. Koyama, R. Yamazaki
*X-ray searches for new galactic particle-acceleration sites with Suzaku* 590

E. Costantini, C.P. de Vries
*Characterizing the chemistry of interstellar dust: the X-ray view* 592

A. Sartori, A. De Luca, D. Salvetti, P. Esposito, A. Tiengo, S. Zane, R. Turolla, F. Pizzolato, R. P. Mignani, P. A. Caraveo, S. Mereghetti, G. F. Bignami
*A time-variable, phase-dependent emission line in the isolated neutron star RX J0822–4300* 596

A. Różańska, J. Kałużny, M. Różyczka, W. Krzemiński, I.B. Thompson
*Second neutron star in globular cluster M4* 598

N. Sartore, S. Mereghetti, A. Tiengo, A. De Luca, R. Turolla, F. Haberl
*Ten years of XMM-Newton observations of RX J1856.5-3754* 600

P. Romano, V. Mangano, L. Ducci, P. Esposito, S. Vercellone, D.N. Burrows, J.A. Kennea, H.A. Krimm, N. Gehrels
*From hours to years: Swift's revolutionary view of SFXTs* 602

V. Mangano, P. Romano, C. Ceccobello, R. Farinelli
*IGR J08408−4503 in outburst observed by Swift* 604

V. Mangano, P. Esposito, P. Romano, L. Ducci, S. Vercellone
*Swift monitoring of IGR J16418–4532* 606

H. Inoue
*Precessions of accretion disks in close binaries* 608

A. Nebot Gómez-Morán, C. Motch
*An XMM-Newton view of the Milky Way* 610

## Session III: Galactic black holes and ultraluminous X-ray sources

R. Fender
*Galactic black holes* 612

A. Eckart, K. Mužić, S. Yazici, N. Sabha, B. Shahzamanian, G. Witzel, L. Moser, M. Garcia-Marin, M. Valencia-S., B. Jalali, M. Bremer, C. Straubmeier, C. Rauch, R. Buchholz, D. Kunneriath, J. Moultaka
*The broad band spectral properties of SgrA** 618

T. Enoto and Suzaku Magnetar Team
*Broadband Suzaku observations of magnetars* 622

D. Radhika, A. Nandi, S. Seetha
*Disk-Jet connection in outbursting Black Hole sources* 624

N. La Palombara, S. Mereghetti, L. Sidoli, A. Tiengo, P. Esposito
*Blackbody excess in persistent Be pulsars* 626

J. C. Gladstone
*The sub-classes of ultraluminous X-ray sources* 629

M. Mapelli
*X-ray binaries powered by massive stellar black holes* 635

A. D. Sutton, T. P. Roberts, M. J. Middleton
*Energy dependent variability as a diagnostic of the ultraluminous state: key results* 639

F. Pintore, P. Esposito, S. Motta, L. Zampieri
*A stellar-mass BH in a transient, low luminosity ULX in M31?* 641

A. A. Nucita, F. De Paolis, R. Saxton, A. M. Read, G. Ingrosso, L. Manni
*The high energy view of NGC 6388: hints for an IMBH?* 643

A. A. Nucita, L. Manni, F. De Paolis, G. Ingrosso, D. Vetrugno
*The high energy search for IMBHs in close dSph Milky Way satellites* 645

## Session IV: X-ray background and active galactic nuclei

R. Gilli
*The cosmic X-ray background: abundance and evolution of hidden black holes* 647

A. Moretti, S. Vattakunnel, P. Tozzi, R. Salvaterra, P. Severgnini, D. Fugazza, F. Haardt, R. Gilli
*Spectrum of the unresolved cosmic X ray background* 653

E. Treister, C. M. Urry, K. Schawinski
*The cosmic history of black hole growth* 655

A. Comastri and the XMM-CDFS Team
*The ultra–deep XMM survey in the CDFS: X–ray spectroscopy of heavily obscured AGN* 661

A. Del Moro, D. M. Alexander, J. R. Mullaney, E. Daddi, F. E. Bauer, A. Pope
*New insights on the distant AGN population* 665

L. W. Brenneman on behalf of the NuSTAR AGN Physics Team
*NuSTAR's View of AGN* 669

A. Merloni, A. Bongiorno
*Accreting SMBH in the COSMOS field: the connection to their host galaxies* 675

A. Akylas, I. Georgantopoulos, A. Georgakakis, M. Brightman, K. Nandra
*An online tool for fitting the X-ray background and estimating the contribution of Compton-thick AGN* 679

P. Severgnini, A. Caccianiga, R. Della Ceca
*The density of local Compton-thick AGN* 683

F. Vito, C. Vignali, R. Gilli, A. Comastri, K. Iwasawa, W. N. Brandt, D. M. Alexander, M. Brusa, B. Lehmer, F. E. Bauer, D. P. Schneider, Y. Q. Xue, B. Luo
*The $z > 3$ AGN population in the 4 Ms CDFS* 685

M. J. Page, F. J. Carrera, J.A. Stevens, M. Symeonidis, J. D. Vieira and HerMES
*X-ray and submillimetre observations of star-forming QSOs in the epoch of galaxy formation* 687

M. Cappi, F. Tombesi, M. Giustini
*Ultra-fast outflows (aka UFOs) from AGNs and QSOs* 691

W. Ishibashi, T. J.-L. Courvoisier
*The physical origin of the X-ray variability scaling in accreting black holes* 695

A. M. Lohfink, C. S. Reynolds, R. F. Mushotzky, M. A. Nowak
*Tackling the soft X-ray excess in AGN with variability studies* 699

B. De Marco
*Soft X-ray lags and the correlation with black hole mass in radio quiet AGN* 703

H. Noda, K. Makishima, K. Nakazawa, S. Yamada
*Model-independent decomposition of broad-band Suzaku spectra of AGNs into primary continua and secondary components* 707

A. Zoghbi
*Fe Kα X-ray light echoes in AGN* 711

B. Balmaverde, A. Capetti, P. Grandi, E. Torresi, M. Chiaberge, J. Rodriguez Zaurin, G. R. Tremblay, D. J. Axon, S. A. Baum, G. Giovannini, P. Kharb, F. D. Macchetto, C. P. O'Dea, W. Sparks
*Extended soft X-ray emission in 3CR radio galaxies at $z < 0.3$: High Excitation and Broad Line Galaxies* 715

R. Fanali, A. Caccianiga, P. Severgnini, R. Della Ceca, M. Dotti, E. Marchese
*The relationship between X-ray emission and accretion in X-ray selected AGNs* 717

**Session V: relativistic jets and gamma-ray bursts**

G. Ghisellini
*High redshift blazars* 719

M. Huarte-Espinosa, E. G. Blackman, A. Hubbard, A. Frank
*Mass loading and knot formation in AGN jets by stellar winds* 725

A. Janiuk, S. Charzyński, P. Mioduszewski
*Accretion and outflow in the gamma ray bursts from black hole binary systems* 727

S. Vercellone and The AGILE Team
*The SWIFT knife: the unique SWIFT long-term monitoring program on 3C 454.3* 729

L. Foschini, E. Angelakis, G. Bonnoli, V. Braito, A. Caccianiga, L. Fuhrmann, L. Gallo, G. Ghirlanda, G. Ghisellini, D. Grupe, T. Hamilton, S. Kaufmann, S. Komossa, Y. Y. Kovalev, A. Lahteenmaki, M. L. Lister, K. Mannheim, L. Maraschi, S. Mathur, B. M. Peterson, P. Romano, P. Severgnini, G. Tagliaferri, J. Tammi, F. Tavecchio, O. Tibolla, M. Tornikoski, S. Vercellone
*Basic properties of Narrow-Line Seyfert 1 Galaxies with relativistic jets* 731

B. Kapanadze, S. Kapanadze
*Swift/XRT observations of high-energy selected BL Lacertae source PKS 2155-304* 733

M. Ohno, Y. Hanabata, T. Kawano, K. Takaki, R. Nakamura, Y. Tanaka, Y. Fukazawa, H. Ueno, M. Tashiro, Y. Terada, W. Iwakiri, T. Yasuda, M. Asahina, S. Kobayashi, A. Sakamoto, Y. Ishida, S. Sugimoto, M. Akiyama, N. Ohmori, M. Yamauchi, Y. E. Nakagawa, S. Sugita, K. Yamaoka, M. Kokubun, T. Takahashi, Y. Urata, P. Tssai, K. Nakazawa, K. Makishima and the Suzaku-WAM team
*All-sky observations by Suzaku wide-band all-sky monitor* 735

## Session VI: galaxies and clusters of galaxies

E. Pointecouteau
*The Sunyaev-Zeldovich effect* 737

F. Gastaldello, L. Di Gesu, S. Ghizzardi, S. Giacintucci, M. Girardi, E. Roediger, M. Rossetti
*Sloshing cold fronts in the IC1860 group* 743

P. Tozzi
*A scientific case for future X-ray astronomy: galaxy clusters at high redshifts* 747

Y. Wang
*Central gas entropy excess in galaxy groups and galaxy clusters* 752

Y. Shimoda, M. Kawaharada, K. Sato, T. Ohashi, Y. Ishisaki, I. Mitsuishi, H. Akamatsu, M. S. Tashiro
*Metal abundances in the ICM associated with a medium-redshift cluster of galaxies MS 1512.4+3647 observed with Suzaku* 756

I. Mitsuishi, N. Y. Yamasaki, Y. Takei
*X-ray properties of the starburst-driven outflow in NGC 253* 758

A. Negri, S. Pellegrini, L. Ciotti
*Disk dynamics and the X-ray emission of S0 and flat early-type galaxies* 762

S. Pellegrini, J. Wang, G. Fabbiano, D-W. Kim, N.J. Brassington, J.S. Gallagher, G. Trinchieri, A. Zezas
*AGN activity and the extended hot ISM in the compact radio elliptical NGC 4278* 764

S. Posacki, S. Pellegrini, L. Ciotti
*The effects of flattening and rotation on the temperature of the X-ray halos of elliptical galaxies* 766

P. Tzanavaris, T. Fragos, M. Tremmel, L. Jenkins, A. Zezas, B. D. Lehmer, A. Hornschemeier, V. Kalogera, A. Ptak, A. R. Basu-Zych
*XSINGS: probing X-ray binaries in galaxies* 768

## Session VII: future missions and technological concepts

P. Predehl on behalf of the eROSITA Team
*eROSITA* 770

T. Takahashi
*The ASTRO-H Mission* 776

L. Stella (on behalf of the LOFT Team)
*LOFT: the Large Observatory For x-ray Timing* 782

P. Romano, P. Esposito, E. Bozzo, C. Ferrigno, V. Mangano
*Supergiant Fast X-ray Transients with LOFT* 788

S. S. Murray, S. Borgani, S. Campana, O. Citterio, W. Forman, R. Giacconi, R. Gilli, M. Paolillo, G. Pareschi, A. Ptak, P. Rosati, P. Tozzi, M. Weisskopf, and the WFXT Team
*Wide Field X-ray Telescope (WFXT)* 790

R. Petre and the NASA X-ray Mission Concepts Study Team
*AXSIO and the NASA X-ray Mission Concepts Study* 798

A. Vikhlinin
*SMART-X, "Square Meter, Arcsecond Resolution Telescope for X-rays"* 805

P. Gorenstein
*High angular resolution X-ray astronomy in the next 50 years* 811

M. M. Civitani, S. Campana, O. Citterio, P. Conconi, G. Pareschi, G. Tagliaferri, G. Parodi
*High angular resolution optics for the next generation of wide field X-ray telescopes beyond e-Rosita* 817

L. Proserpio, S. Basso, M. Civitani, O. Citterio, P. Conconi, M. Ghigo, G. Pareschi, B. Salmaso, D. Spiga, G. Tagliaferri
*Segmented glass optics for next generation X-ray telescopes* 819

M. Gubarev, B. Ramsey, S.O'Dell, R. Elsner, K. Kilaru, C. Atkins, D. Swartz, J. Gaskin and M. Weisskopf
*Flight programs and X-ray optics development at MSFC* 821

E. Virgilli, F. Frontera, V. Liccardo, V. Valsan *on behalf of the LAUE collaboration*
*A lens for hard X-/soft γ-rays: the LAUE Project* 823

D. Götz and J. Osborne on behalf of the MXT Instrument Science Team
*MXT: a light X-ray telescope for X-Gamma-Ray Burst afterglow observations* 825

M. Jackson, on behalf of the PoGOLite collaboration
*Balloon-borne hard X-ray astronomy with PoGOLite: Opening a new window on the universe* 827

M. Barbera, A. Collura, F. Gastaldello, U. Lo Cicero, N. La Palombara, A. Tiengo, S. Varisco
*Investigation on the status of the XMM-Newton EPIC T and M filters after more than 10 years of operation* 829

A. Paizis, S. Mereghetti, D. Götz, M. Fiorini, M. Gaber, R. Regni Ponzeveroni, L. Sidoli, S. Vercellone
*GOLIA: an INTEGRAL archive @INAF-IASF Milano* 831

G. Branduardi-Raymont, S. F. Sembay, J. P. Eastwood, D. G. Sibeck, J. A. Carter, A. M. Read and the AXIOM Collaboration
*X-ray imaging of the Earth's magnetosphere* 833

C. M. Urry
*Planning for future X-ray astronomy missions* 835