

## **Della Valle Massimo**

**Current Position:** Director for Research at the Capodimonte Astronomical Observatory, Napoli, Istituto Nazionale di Astrofisica (INAF)

**Scientific Work:** The research activity spans several fields in observational Astrophysics: i) Supernovae (local and at high redshifts) ii) measurement of cosmological parameters; iii) Gamma-ray bursts and their afterglows; iv) Supernova/GRB connection); v) Novae (galactic and extragalactic); vi) Distance Scale; vii) Observations of counterpart of GW events (kilonovae). He has authored over 600 publications, including circa 40 invited review talks/papers and 260 papers that have appeared in major international refereed scientific journals.

### **Curriculum**

1976. High School diploma, Brescia.

1983. Laurea in Astronomia, Università di Padova (Summa cum Laude). Supervisor: Prof. L. Rosino.

1984. Fellow at the Asiago Astrophysical Observatory

1985. PhD student at the Byurakan Observatory (ex-URSS). Supervisor: Prof. Ambartsumian.

1988. PhD in Astronomy Università di Padova. Supervisors: Prof. L. Rosino, e M. Capaccioli

1989. Post-Doc at SISSA, Trieste

1990. Fellow at the European Southern Observatory, La Silla, Chile.

1994. Fellow at the European Southern Observatory, Munchen, Germany

1995. Assistant Professor at the Astronomy Dept., Università di Padova.

1999. Associate Astronomer at the Arcetri Astrophysical Observatory

2007. Director for Research and Technology at the Capodimonte Astronomical Observatory, INAF-Naples.

2008-2009 Associate Scientist at the ESO Telescope Division (on leave of INAF-Napoli)

2010 – 2017 Director of the Capodimonte Astronomical Observatory, INAF-Naples

2020 – Professor of Astrophysics, Cattolica University, Brescia

2020- Professor of Astrophysics, Scuola Superiore Meridionale, Federico II, Napoli

### **Publications:**

Author of 602 (257 with referee) scientific papers (15-Ott 2021)

### **Languages:**

Italian, English, Spanish (Fluent). French and German (basic knowledge)

### **Outreach**

Author of about 50 popular papers published on *Astronomia*, *Coelum*, *Le Stelle*, national newspapers and broadcast participations.

### **Highlights**

#### *Supernovae*

In the early '90s he was one of the first collaborators of Saul Perlmutter (Nobel laureate 2011) for the discovery of the accelerating expansion of the Universe through Supernovae<sup>1</sup>. Later he also collaborates with Adam Riess and Brian Schmidt in the follow-up of SNe of particular interest<sup>2</sup> and with Piero Madau, Nino Panagia<sup>3</sup>, Dani Maoz<sup>4</sup> and Filippo Mannucci<sup>5</sup> on the frequency of occurrence of SNe at high and low redshift respectively. More recently he has used the SBF method to calibrate a bona fide sample of SNe-Ia aimed at studying the Ho tension problem<sup>6</sup>.

#### *Novae*

Between 1990 and 1998 in a series of works written in collaboration with Mario Livio<sup>7,8</sup>, he introduced the concept of novae populations, replacing the classical subdivision in morphological classes, with a physical classification. More recently with Bob Williams, Francesca Matteucci and others, he used high-resolution spectroscopic observations to study the follow-up of classic Milky Way novae to

identify for the first time the presence of Lithium in the Nova Cen spectrum 2013<sup>9</sup>. An observation that solves the problem of the existing discrepancy between the measurements of Lithium abundances observed in young stars with the value of the primordial abundance of Lithium recently measured by the Planck satellite. Recently, after taking advantage from the *Gaia* measurement of nova parallaxes, he has review many aspects of nova topic<sup>10</sup>.

### *Optical counterparts of high energy sources and Gamma-Ray Bursts*

Since 1990 he was very active in the identification of the optical counterparts of X sources and their connection with black holes<sup>11,12,13</sup>. In 1999, after the observations of the Peppo-Sax satellite, he was among the first to study the SN-GRB connection<sup>14,15</sup>. This work is still in progress<sup>16</sup>. As member of the Swift follow-up Team, he has coauthored about thirty papers with Neil Geherels, Filippo Frontera, Guido Chincarini, Ken Nomoto and others<sup>17,18,19,20</sup>. In 2006 he has identified a new explosive channel for massive stars associated with "long" GRBs<sup>21</sup>. More recently he continued to explore the possibility of using GRBs as high-z probes of the early universe<sup>22</sup> for measuring the cosmological parameters<sup>23</sup>.

### *Electromagnetic counterparts of gravitational wave sources*

As active member of the international collaborations ePESSTO (extended Public ESO Spectroscopic Survey for Transient Objects) and ENGRAVE (Electromagnetic counterparts of gravitational wave sources at the Very Large Telescope) and GRAWITA Italian team (GRAvitational Wave Inaf TeAm), he collaborated on the identification and study of the first electromagnetic counterpart of a gravitational wave source, GW 170817<sup>24, 25, 26</sup> and to the study of the compact remnant<sup>27,28</sup>. In 2019, in collaboration with Fabrizio Tamburini and Bo Thidè has measured the spin of the Black Hole in M87<sup>29</sup>

## **References**

1. *Discovery of a Supernova explosion at half the age of the Universe* Perlmutter, S., Aldering, G., Della Valle, M. et al. 1998, Nature, 391, 51
2. *A light echo from type Ia SN 1995E*, Quinn, J., Garnavich, P., Li, W., Panagia, N., Riess, A., Schmidt, B., Della Valle, M. 2006, ApJ, 652, 512
3. *On the evolution of the cosmic supernova rate* Madau, P., Della Valle, M., Panagia, N. 1998, MNRAS, 297, L17

4. *Nearby supernova rate from Lick Observatory*, Maoz, D., Mannucci, F., Li, W., Filippenko, A., Della Valle, M., Panagia, N. 2011, MNRAS, 412, 1508
5. *The Supernova rate for unit of mass* Mannucci, F., Della Valle, M., Panagia, N. et al. 2005, A&A, 403, 907
6. *A new measurement of the Hubble constant using type Ia supernovae calibrated with surface brightness fluctuations*, Khetan, N. et al. 2021, A&A, 647, 72
7. *The calibration of Novae as distance indicators*, Della Valle, M., Livio, M. 1995, ApJ, 452, 704
8. *The spectroscopic differences between disk and thick disk/bulge novae*, Della Valle, M., Livio, M. 1998, ApJ, 506, 818
9. *Early optical spectra of Nova Cen show the presence of Lithium*, Izzo, L., Della Valle, M., Mason, E., Matteucci, F., Romano, D. Williams, R.E 2015, ApJ, 808,L14
10. *Observations of Galactic and Extragalactic Novae*, Della Valle, M. and Izzo, L. 2020, A&Arv, 28, 3
11. *Evidence for a Black-Hole in the X-ray nova Muscae 1991* Della Valle, M., Jarvis, B., West, R. 1991, Nature, 353, 50
12. *The optical counterpart of the superluminal source GR= J1655-40*, Bailyn, C., Orosz, J., Girard, T., Jogee, S., Della Valle, M. et al. 1995, Nature, 374, 701
13. *Bright radio emission from an ultraluminous stellar-mass microquasar in M31*, Middleton, M. et al. 2013, Nature, 493, 187
14. *Evidence for supernova signatures in the spectrum of the late-time bump of the optical afterglow of GRB 0212111*, Della Valle, M., Malesani, D., Benetti, S. et al. 2003, A&A, 406, L33
15. *Supernova and GRB connection: Observations and Questions*, Della Valle, M. 2006, GAMMA-RAY BURSTS IN THE SWIFT ERA: Sixteenth Maryland Astrophysics Conference. AIP Conference Proceedings, Volume 836, pp. 367-379
16. *Signatures of a jet cocoon in early spectra of a supernova associated with a gamma-ray bursts*, Izzo, L., de Ugarte Postigo, A., Thoene, C. Kann, A. , Della Valle, M. et al. 2019, Nature, 565, 324
17. *The association of GRB 060218 with a supernova and the evolution of the shock wave*, Campana, S. et al. 2006, Nature, 442, 1008
18. *Broadband observations of the naked-eye GRB 080319B*, Racusin, J. et al. 2008, Nature, 455, 183
19. *The unusual gamma-ray burst GRB 101225A explained as a minor body falling onto a neutron star*, Campana, S. et al. 2011, Nature, 480, 69
20. *The metamorphosis of Supernova 2008D/XRF 080109: a link between supernovae and GRB/SNe*, Mazzali, P., Valenti, S., Della Valle, M. et al. 2008, Science, 321, 1185

21. *An Enigmatic long-lasting GRB not accompanied by a bright supernova*, Della Valle, M., Chincarini, G., Panagia, N. et al. 2006, *Nature*, 444, 1050
22. *GRB 090423 at a redshift of  $z \sim 8.1$*  Salvaterra, R., Della Valle, M., Campana, S. et al. 2009, *Nature*, 461, 1258
23. *Measuring cosmological parameters with GRBs*, Amati, L. & Della Valle, M. 2013, *IJMPD*, 22, 14
24. *Multi-messenger Observations of a Binary Neutron Star Merger*, Abbott et al. 2017, *ApJL*, 848, L12
25. *A kilonova as the electromagnetic counterpart to a gravitational-wave source*, Smartt et al. 2017, *Nature*, 551, 75
26. *GW170817: implications for the local kilonova rate and for surveys from ground-based facilities*, Della Valle, M. et al. 2018, *MNRAS*, 481, 4355
27. *Observational evidence for extended emission to GW170817*, van Putten, M. & Della Valle, M. *MNRAS*, 482, L46
28. *Multi-messenger extended emission from the compact remnant in GW 170817*, van Putten, M., Della Valle, M., Levinson, A. 2019, *ApJ*, 876, L2. 2
29. *Measurement of the spin of the M87 black hole from its observed twisted light*, Tamburini, F., Thidè, B., Della Valle, M. 2020, *MNRAS*, 492, L22

### **Sabbatical leaves (1-4 months)**

1994, 1996, 1997, 1999, 2003, 2005. Visiting Scientist, European Southern Observatory, Garching.

1995, 1997, 2000, 2002, 2004. Visiting Scientist, Space Telescope, Science Institute, Baltimore.

1998, 2001, 2003. Visiting Scientist, European Southern Observatory, Santiago.

2006. Visiting Scientist, Department of Astronomy, Graduate School of Science, University of Tokyo, Japan

2006, 2007. Visiting Scientist, KAVLI Institute, Santa Barbara, California University

2007. Visiting Scientist, Aspen Center for Physics

2007. Visiting Scientist, Dark Cosmology Center, Niels Bohr Institute, Copenhagen

2007. Visiting Scientist, Queen's University, Belfast, UK

2018. Visiting Scientist, at the IAA (Instituto de Astrofisica de Andalucia)

2019. Visiting Scientist, at the European Southern Observatory, Munchen

2022. Research Fellow, Department of Physics at Ariel University, Israel

## Teaching

1989. Lecturer at the SISSA (Trieste): "The Cosmological Distance Ladder"

1992. Visiting Professor, Centro de Astrofisica da Universidade do Porto, Portugal:  
"The Late Stages of the Stellar Evolution" (grad. level).

Assistant Professor for Esercitazioni di Astronomia I (Padova, Astronomy Dept.  
a.a.1993/94; 1994/95; 1995/96; 1996/97).

Assistant Professor for Laboratorio di Fisica II (Padova Astronomy Dept. a.a.  
1995/96).

Assistant Professor for Astrofisica (Padova Astronomy Dept. a.a. 1996/97).

Lecturer of Astronomia Generale (Padova Physics Dept. a.a. 1996/97; 1997/98)

Lecturer at the Physics Dept. Ferrara University for "Tecniche Osservative in  
Astronomia" (a.a. 2002/03; 2003/04; 2005/06; 2006/2007; 2007/2008).

Lecturer at the Physics Dept. Ferrara University for "Tecniche Osservative in  
Astronomia" and "Supernovae", PhD course (a.a. 2009/2010)

Adjunct Professor at the International Center for Relativistic Astrophysics Network,  
65122, Pescara

Lecturer at the Physics Dept., Ferrara Università: "Tecniche Osservative in  
Astronomia" (a.a. 2002/03; 2003/04; 2005/06; 2006/2007) and PhD courses (a.a.  
2009/2010)

Lecturer in PhD schools: *Nova Populations* 2003, Elba; *Novae and Supernovae* 2005,  
Sorrento; *The empirical grounds of SN-GRB connection* 2005, L'Aquila; *Supernovae*  
2005, SISSA, Trieste; *SNe and GRBs: selected topics*: 2006, Angra dos Reis, Brasil;  
*The Distance Ladder* 2007, Padova; *Supernovae and Gamma-ray Bursts* 2007, San

Servolo, Venezia; *Gamma-ray Bursts as Cosmological Tools* 2009, Seoul; *Explosive phenomena in stars*, 2010, Université Sophia Antipolis, Nice; *GRB and SNe* 2011, Les Houches; *Supernovae and Gamma-ray Bursts*, 2011, Université Sophia Antipolis, Nice; *Gamma-ray Bursts 2012*, Napoli; *Cataclysmic Variables*, 2012, Teramo; *Nova and Supernova Explosions* 2014, Les Houches; *Supernovae and Cosmology*, 2017, Ajaccio; *Supernovae from an Observational perspectives*, 2019, INFN Catania.

### **Seminars in important Scientific Institutes (last ten years)**

Astronomy Department Tokyo University; KAVLI Institute Santa Barbara, University of California; Beijing KAVLI Institute; Hubble Space Telescope Institute, Baltimore; Munich Join Colloquium ESO Garching; Aspen Center for Physics; Niels Bohr Institute, Copenhagen; Institute for Advanced Study of Princeton; Queen's University in Belfast; University Sophia Antipolis, Nizza; CBPF Rio de Janeiro; University of Massachusetts Amherst; Instituto de Astrofisica de Andalucia; Annecy-le-Vieux, Université de Savoie.

### **Coordinator of research projects and scientific-technological programs and participation in scientific and technological programs of great national and international importance**

He has coordinated 39 and participated in 185 scientific proposals that were then carried out with the major ground-based telescopes (e.g. ESO-VLT and ESO-NTT, Gemini, LBT) and from Space (Swift, HST, XMM-Newton, Chandra). He is currently involved in the Euclid<sup>a</sup>, Athena, THESEUS<sup>b,c</sup> and Hermes<sup>d</sup> space missions (as member of scientific working groups). He is also involved in three different ground based experiments: the Lunar Gravitational-wave Antenna project<sup>e</sup> aimed at studying the feasibility of installing a Gravitational wave on the Moon and the Global Argon Dark Matter Collaboration (GADMC)<sup>e</sup>. He is in the Science Board of SOXS (son of X-Shooter). This spectrograph (+ imaging) was selected in 2015 out of 20 worldwide proposals by ESO, to equip NTT and provide the community with a strategic follow-up tool up of the transients revealed by LSST, the large 8.4m surveys telescope that will start operating in the same years (2021 - 2022)<sup>f</sup>.

(a) Euclid: Superluminous supernovae in the deep survey;

<https://www.aanda.org/articles/aa/pdf/2018/01/aa31758-17.pdf>

(b) The time domain astronomy with THESEUS satellite;

<https://arxiv.org/abs/2104.09533>

(c) Exploration of the high-z universe enabled by THESEUS;

<https://arxiv.org/abs/2104.09532>

(d) GrailQuest and Hermes: hunting for GWs electromagnetic counterparts and probing spacetime quantum foam;

<https://arxiv.org/pdf/2101.07119.pdf>

(e) Lunar Gravitational-wave Antenna;

<https://iopscience.iop.org/article/10.3847/1538-4357/abe5a7/pdf>

(f) The SOXS instrument and its significance in the future of La Silla

<https://zenodo.org/record/3245282#.YLOxueuxXUY>

He has coordinated and continues to coordinate several research programs funded by the Ministry of Education, University and Research (PRIN-MIUR and PRIN INAF).

#### **Experience in the evaluation of the results of National and International research.**

Member of the Time Allocation Committee for ESO, HST and Subaru telescopes.

Referee for A&A, ApJ, MNRAS, AJ, PASP, Nature, Science, Advances in Space Research.

In 2017, 18, and 19 he served as referee for proposals of the ERC 2018 Starting, Consolidator, Advanced and Synergy Grant Calls.

He has been a reviewer for both science proposals and “Appointments and Promotions” committees for the following Institutions:

i) Chilean National Science and Technology Commission; ii) United States-Israel Binational Science Foundation;

iii) Open University of Israel;

iv) Italian Evaluation of Research Quality (VQR);

v) PRIN-MIUR 2015;

vi) Aerospace Engineering Department at Khalifa University, Abu Dhabi; vii) Liverpool John Moore University;

viii) Weizmann Institute of Science, Tel Aviv;

ix) National Research Foundation, South Africa.



## **Other Activities**

Coordinator of the Observing Service Mode at the European Southern Observatory (1990-1993).

Coordinator of the Target of Opportunity policy at the European Southern Observatory (1990-1993).

Member of the Target Opportunity committee of IUE (until the shut down, ~ 1996)

Coordinator of the Research Unity at the Padova/Asiago Observatory (1997-2000)

Member of the IAU working group on SNe

Member of the SWIFT follow-up team

Member of the SWIFT Nova-CV team

Member of the Ligo/Virgo electromagnetic follow up team  
Member of the Science Board of SOXS+NTT

Member of the "Academic PhD Board" for the SSM of Federico II University, Napoli.

## **Honors**

Member of IAU and Società Astronomica Italiana

Member of "Ateneo di Brescia - Accademia di Scienze Lettere ed Arti"

Awarded the "Brescia per la Ricerca Scientifica", 2018, Brescia University

Cavaliere "Al merito della Repubblica Italiana", 2013

Asteroid: 325455 (Della Valle).

**Languages:** Italiano, Inglese e Spagnolo (fluent). Francese e Tedesco (basic knowledge)

## **Outreach:**

- Author of dozens of papers published in Astronomy, Coelum, Le Stelle

and national newspapers.

- For the occasion of the bicentennial foundation of the Capodimonte Observatory (1812-2012), he has created the "Museum of Astronomical Instruments" composed of 110 pieces distributed over an exhibition space of about 500m<sup>2</sup>, thanks to the

generous budget provided by INAF and Campania region. The museum was inaugurated on November 4, 2012, in the Capodimonte Observatory.

-Member of the scientific committee of numerous Art/Science exhibitions, such as:

i) *The Temple of Urania* realized at the State Archives of Naples, 24 May- 29 September 2012.

ii) *The Factories of Heaven* in the framework of "Futuro Remoto" initiative: one of the most important and consolidated European scientific and technological dissemination events held in Naples since 1987.

iii) *Paleocontemporanea*: Fragments of transcendence in artistic representation from pre-Christian civilizations to contemporary, first edition of the art exhibition developed in the historical and cultural sites of the Collina di Capodimonte: National Archaeological Museum of Naples, Catacombs of Naples, Capodimonte National Museum and INAF- Capodimonte Astronomical Observatory, 2013.

iv) *Viaggiatori del Cosmo* from Giordano Bruno to the first trip to the Moon by Ernesto Capocci, Astronomical Observatory of Capodimonte, 13 March-30 April 2015, extended to 31 May 2015 (with patronage of Accademia dei Lincei). The exhibition was enriched by the anastatic reprint of selected works by Ernesto Capocci: *Report of the First Journey to the Moon made by a woman in the year of grace 2057* (typography Cottrau, Naples 1857) eight years ahead of Jules Verne's most famous novel *De la Terre à la Lune*; *Framework of the Solar Planetary System* (Printing House of Iride 1853); *Dialogues on Comets* (typography of Giornale del Regno delle due Sicilie, 1825).

- He has published the book: *"Che il Diavolo benedica i Pulcinella"* Scientific Chronicles "and non" of Naples in the years immediately after the reign of Gioachino Murat. In collaboration with Mauro Gargano and Emilia Olostro-Cirella. Tullio Pironti publisher, Naples 2015.

- He has recently published the book *"Supernova"* in the Piero Angela series *Viaggio nell' Universo*, Agosto, 2019, Corriere della Sera.