中国科学家王瑜被任命为国际相对论天体物理中心(ICRA)主席

王瑜(Yu Wang)教授在 2023 年 2 月 28 日举行的 ICRA 成员大会 (ICRA Assembly Meeting) 上被推选为 ICRA 的新任主席，经过投票和审议，我们正式发布对他的任命。衷心希望贵社能发布新闻报道，如需要更多信息或者安排采访请联系我们。

以下是 ICRA 和王瑜教授的中文简介。并附上王瑜教授和 ICRANet 科学委员会主席、意大利科学院院士 Massimo Della Valle 教授在 ICRA 大会上的发言稿。

我们还附上张照片。

拍摄于 2023 年 3 月 7 日在帕多瓦（意大利）举行的 "2023 年科学与太空专员会议"。从左到右分别是：沈建磊公使参赞（中国驻意大利大使馆公使参赞），Francesco Ubertini 博士（Cineca 主席），Maria Chiara Carrozza 博士（前意大利教育、大学和研究部部长，现国家研究委员会 Consiglio Nazionale delle Ricerche 主席），Anna Maria Bernini 部长（意大利大学和研究部部长），Remo Ruffini 教授（ICRANet 主任）和王瑜教授（新任 ICRA 主席）。

ICRA 和王瑜教授的简介

ICRA 全称是 International Center for Relativistic Astrophysics(国际相对论天体物理中心), 由 Abdus Salam 教授（1979 年诺贝尔奖获得者）, Riccardo Giacconi 教授（2002 年诺贝尔奖获得者），联合罗马大学(Remo Ruffini 教授)，华盛顿大学，斯坦福大学，中国科学与技术大学和梵蒂冈天文台于 1985 年成立，第一任主席为 Remo Ruffini 教授。目前 ICRA 成员增加了阿卜杜勒·萨拉姆国际理论物理中心 (Abdus Salam International Center for Theoretical Physics，简称 ICTP)，世界科学院 (The World Academy of Sciences，简称 TWAS)，生物医学大学 (Università Campus Bio -Medico), 英苏布里亚大学 (Università degli Studi dell'Insubria), 乌迪内大学 (Università degli Studi di Udine)。此外 ICRA 还与法国，阿尔巴尼亚，澳大利亚，智利，哥伦比亚，俄罗斯，哈萨克斯坦，越南，韩国，朝鲜，日本等国大学和研究所签有合作协议。ICRA 的主要任务是促进各个国家天体物理学领域的交流，推动天体物理学的发展。具体参见附件中意大利科学院院士 Massimo Della Valle 教授的演讲稿和以下链接：

http://www.icranet.org/index.php?option=com_content&task=view&id=1301&Itemid=990
https://en.wikipedia.org/wiki/International_Center_for_Relativistic_Astrophysics
https://en.wikipedia.org/wiki/ICRANet

王瑜教授是江苏苏州人，1985 年出生，东南大学物理学学士，中科院紫金山天文台天体物理学硕士，意大利罗马大学天体物理学博士。于 2015 年起在 ICRANet (International Center for Relativistic Astrophysics Network) 从事天体物理学的研究工作，2019 年起同时在意大利国立天文台(INAF)任职，2023 年当选 ICRA 主席。具体经历参见附件中王瑜教授的演讲稿。

ICRA 成员大会祝贺王瑜教授成功当选新一任主席，希望王瑜教授的当选能为 ICRA 带来新的活力，推动深度学习等新技术在天文学和天体物理学的应用，同时也希望王瑜教授进一步拓展 ICRA 的与世界各国，特别是与中国大学和科研机构的交流和合作。

弗朗西斯· 埃弗里特(Francis Everitt)教授，(斯坦福大学，Leland Stanford Junior University，加利福尼亚，美国)

包信和(Xinhe Bao)教授，(中国科学技术大学，University of Science and Technology of China，简称 USTC，合肥，中国)

穆罕默德· 哈桑(Mohamed Hassan)教授，(世界科学院，The World Academy of Sciences，简称 TWAS，里雅斯 特，意大利)

盖伊· 孔索马尼诺(Guy J. Consolmagno, S.J.)教授，(梵蒂冈天文台，Specola Vaticana, 甘多尔福堡, 意大利)

鲍勃· 威廉姆斯(Bob Williams)教授，(空间望远镜研究所，Space Telescope Institute，马里兰，美国)

阿蒂什· 达博尔卡(Atish Dabholkar)教授，(阿卜杜勒· 萨拉姆国际理论物理中心，Abdus Salam International Center for Theoretical Physics，简称 ICTP，里雅斯特，意大利)

保罗· 博因顿(Paul Boynton)教授，(华盛顿大学，Washington University，西雅图，美国)

欧吉尼奥· 古列尔梅利(Eugenio Guglielmelli)教授，(生物医学大学，Università Campus Bio - Medico, 罗马，意大利)

安杰洛· 塔利阿布(Angelo Tagliabue)教授，(英苏布里亚大学，Università degli Studi dell'Insubria, 瓦雷泽，意大 利)

罗伯托· 皮顿(Roberto Pinton)教授，(乌迪内大学，Università degli Studi di Udine, 乌迪内, 意大利)

马尔切拉· 加尔加诺(Marcella Gargano)教授，(大学和研究部，Ministry of University and Research，意大利)

雷莫· 鲁菲尼(Remo Ruffini)教授，(国际相对论天体物理中心，International Center for Relativistic Astrophysics Network，简称 ICRA，意大利)

Speech of Prof. Massimo Della Valle
Chairperson of ICRANet Scientific Committee

The International Center for Relativistic Astrophysics (ICRA): from the birth of Relativistic Astrophysics to the discovery and comprehension of Gamma-Ray Bursts to the new era of Black Hole physics and Artificial Intelligence

Link to oral presentation: https://drive.google.com/file/d/19E-o25b6ItY8xyU9ojO1lbIn80sQukjm/view

Fundamental contributions to the early development of Relativistic Astrophysics were the discoveries of the mass-energy formula of a Kerr black hole by Christodoulou-Ruffini-Hawking (1970-1971), the black hole in Cygnus X1, and the binary X-ray sources (Giacconi and Ruffini) in 1975. Giacconi was Nobel laureate in 2002.

In this first period, in which Prof. Ruffini was a member of the Institute for Advanced Studies (IAS), Assistant Professor at Princeton University, and visiting Professor at Stanford University, three volumes have been published, in addition to the paper R. Ruffini, J. A. Wheeler, *Introducing the Black Hole*, Physics Today 24, 1, 30 (1971):

- M. Rees, R. Ruffini and J. A. Wheeler, *Black Holes, Gravitational Waves and Cosmology*, Gordon and Breach Science Publishers, 1974;

- H. Gursky, R. Ruffini, *Neutron Stars, Black Holes and Binary X-Ray Sources*, D. Reidel Publishing Company, 1975;

- R. Giacconi, R. Ruffini, *Physics and Astrophysics of Neutron Stars and Black Holes*, Cambridge Scientific Publishers, 1978.

Following these contributions, Ruffini was invited to the Yuakawa Hall in Japan and published the book H. Sato, R. Ruffini, *Black holes*, Chuo Koron Sha, Tokyo, 1976. He was also invited to the University of Nedlands in Perth, fostering research in relativistic astrophysics in both centers. The invitation to visit China started on May 17, 1979, under the indication of Abdus Salam (Nobel laureate in 1979). This early visit was then followed by a visit of Edoardo Amaldi and Ruffini, meeting the USTC representatives, including the founder (Yan Jici). These events promoted a vast collaboration with Professor Fang Li Zhi and the publication in 1983 of the book *Basic Concepts In Relativistic Astrophysics* by the World Scientific Publishing Company, translated into many languages.

The foundation of ICRA was on June 17, 1985. The current Members are:

- ICTP “Abdus Salam International Center for Theoretical Physics” (Trieste, Italy);
- TWAS Third World Academy of Sciences (Trieste, Italy);
- Leland Stanford Junior University (Stanford, California (U.S.A.);
- “Space Telescope Institute” in Baltimore (Maryland, U.S.A.)
- Specola Vaticana di Castel Gandolfo (Città del Vaticano);
- the “Università Campus Bio-Medico” (Roma, Italy)
- the “Università degli Studi dell’Insubria” (Varese, Italy)
- the “Università degli Studi di Udine” (Udine, Italy)
- the “University of Science and Technology of China”
- Washington University (Seattle, U.S.A.)

One of the first initiatives of ICRA has been the promotion of cryogenics detectors of gravitational waves in Italy and the development of a series of international meetings. These included the Italian-Korean Meetings, held since 1987 every two years alternatively in Korea and Italy, and, most important, the Marcel Grossmann (MG) Meetings. The Marcel Grossmann Meetings (on Recent Developments in Theoretical and Experimental General Relativity, Gravitation, and Relativistic Field Theories), since 1975, have been organized every three years to provide opportunities for discussing recent advances in gravitation, general relativity, and relativistic field theories, emphasizing mathematical foundations, physical predictions and experimental tests. These meetings have seen the participation of more than a thousand scientists each, with proceedings published by World Scientific in three or four volumes.

We have also given particular attention to writing textbooks on Relativistic Astrophysics, including *Gravitation and Spacetime* by H. Ohanian and R. Ruffini, translated into Chinese, Italian, and Korean.

The most important activity from both the teaching and research point of view has been the establishment of the IRAP Ph. D. Program, giving origin to so many as Ph. D.

To this new era was the involvement of Professor Ruffini in guaranteeing the completion of the SAX as President of the Scientific Committee of the Italian Space Agency (ASI). The most significant discovery of the Beppo SAX satellite has been the association of gamma-ray bursts to supernovae, which has been followed, since then, by Ruffini and his group, using all the knowledge initially acquired in Princeton on black holes, finally reaching the fundamental origin of this largest energy source in the Universe, originating from the Christodoulou-Ruffini-Hawking mass-energy formula. The collaboration of professors and young graduate students from Argentina, Brazil, and Colombia has been relevant for understanding GRBs and dark matter in galaxies. These young researchers have become affirmed professors in their countries of origin and currently lead the field of relativistic astrophysics in Latin America.

A new group of graduate students included Carlo Luciano Bianco, who guaranteed the orthodoxy of all the relativistic treatments and reorganized and optimized all the numerical codes [see, e.g., Ruffini, Bianco, Chardonnet, et al., ApJ 555 (2001) L107; ApJ 581 (2002) L19; Bianco & Ruffini, ApJ 605 (2004) L1; ApJ 620 (2005) L23; ApJ 633 (2005) L13; ApJ 644 (2006) L105], and Jorge Rueda, who fostered the formulation of the Induced Gravitational Collapse (IGC) paradigm [see, e.g., Rueda & Ruffini, ApJ, 758 (2012) L7]. Soon after, they were followed by the work of Wang Yu on understanding the gamma-ray flares in GRBs [see, e.g., Ruffini, Wang, Aimuratov, et al., ApJ 852 (2018) 53]. These three researchers soon became ICRANet Faculty and helped to develop the IRAP-PhD, gradually leading to the idea of binary-driven hypernovae (BdHNe) that characterizes the physics of black holes.

The IGC concept led to the formulation of the BdHN model of long GRBs [see, e.g., C. L. Fryer, J. A. Rueda, and R. Ruffini, ApJ (2014); L. Becerra et al., ApJ (2015); C. L. Fryer et al., Phys. Rev. Lett. (2015)]. The BdHN model, in continuous progress, has addressed the supernova explosion in a binary system with a companion neutron star [see, e.g., L. Becerra et al., Ap.J. (2016); L. Becerra et al., ApJ 871 (2019); L. M. Becerra et al., Phys. Rev. D (2022)]. Similarly, the GRB high-energy (GeV) emission has been explained by the "inner engine" paradigm [see R. Ruffini et al., ApJ (2019)]. The "inner engine" induces an intense electric field which makes possible the extraction of the rotational energy of the black hole via quantum and electro dynamical processes [see, e.g., J. A. Rueda and R. Ruffini, EPJC 80 (2020) 300; R. Moradi et al., A&A 649 (2021); J. A. Rueda, R. Ruffini, and R. P. Kerr, ApJ (2022)].

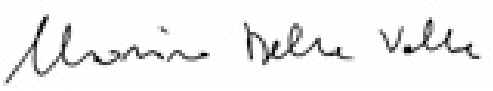
At the times of his Princeton and Stanford activities, Ruffini developed a profound collaboration with Thibault Damour and Jim Wilson on vacuum polarization around Kerr-Newman black holes, publishing their fundamental papers in 1975 and 2000. Xue She-Sheng and Gregory Vereshchagin extended and summarized this research in an article published in 2010 in Physics Reports: Electron-

positron pairs in physics and astrophysics: from heavy nuclei to black holes. Both of them are currently ICRANet professors.

Rahim Moradi and Fatemeh Rastegar Nia, the younger members of the ICRANet Faculty, have finally applied the knowledge acquired from these works, after many years of development, to the newly explored regime of ultra-relativistic overcritical electro dynamical fields. The most recent contribution has been the fundamental role of the classical and quantum electro dynamical process to extract the rotational energy of the Kerr black hole [see F. Rastegarnia et al., EPJC 82 (2022) 778; R. Moradi et al., Phys. Rev. D 104 (2021) 063043].

On this background, I am delighted to add my clear voice of support to the candidacy of Prof. Wang Yu as the new President of ICRA. He assured us to continue the great tradition of research of ICRA. He has made significant contributions internationally and is at the forefront of the scientific research in relativistic astrophysics, on the physics and astrophysics of black holes, both in theory and data and spectral analysis, also in collaboration with Liang Li, a junior Professor in ICRANet. Wang Yu is also now fostering the techniques of artificial intelligence in astrophysics, which promise to be at the center of the new era of research in the knowledge of our Universe.

Prof. Massimo Della Valle



马西莫·德拉瓦莱 (Massimo Della Valle)教授的报告
国际相对论天体物理中心网络(ICRANet)科学委员会主任

国际相对论天体物理中心(ICRA): 从相对论天体物理学的诞生到伽马射线暴的发现和理解，再到黑洞物理学和人工智能的新时代

报告链接: https://drive.google.com/file/d/19E-o25b6ItY8xyU9ojO1lbIn80sQukjm/view

相对论天体物理学的早期发展包含季米特里奥斯·赫里斯托祖卢(Demetrios Christodoulou)，雷莫·鲁菲尼 (Remo Rufini) 和史蒂芬·霍金(Stephen Hawking) 建立的以他们名字命名的克尔黑洞的 Christodoulou-Ruffini-Hawking 质能公式 （1970-1971 年）、里卡尔多·贾科尼(Riccardo Giacconi) 和雷莫·鲁菲尼在天鹅座 X1 号黑洞以及 X 射线双星的工作（1975 年）。里卡尔多·贾科尼因 X 射线天文学的贡献于 2002 年获得了诺贝尔奖。

在这一段时期，雷莫·鲁菲尼是普林斯顿高等研究院（ Institute for Advanced Studies, 简称“IAS” ）的成员、普林斯顿大学的助理教授和斯坦福大学的访问教授，除了 1971 年在 Physics Today 上发表的“介绍黑洞(Introducing the Black Hole)”一篇论文外，还出版了三卷书籍:

- M. Rees, R. Ruffini and J. A. Wheeler, Black Holes, Gravitational Waves and Cosmology（黑洞引力波与宇宙学）, Gordon and Breach Science Publishers, 1974;
- H. Gursky, R. Ruffini, Neutron Stars, Black Holes and Binary X-Ray Sources（黑洞与 X 射线双星）, D. Reidel Publishing Company, 1975;

• R. Giacconi, R. Ruffini, Physics and Astrophysics of Neutron Stars and Black Holes（中子星与黑洞的物理学与天体物理学）, Cambridge Scientific Publishers, 1978.

在做出这些贡献之后，雷莫·鲁菲尼应邀前往日本的汤川纪念馆(Yuakawa Hall)，并在 1976 年出版了《黑洞》一书。他还受邀前往珀斯的西澳大学，在这两个研究中心促进了相对论天体物理学的研究。1979 年 5 月 17 日，阿卜杜勒·萨拉姆(Abudu Salam，1979 年诺贝尔奖获得者）邀请他前往中国。此次早期访问后，雷莫·鲁菲尼与埃多阿尔多·阿马尔迪(Edoardo Amaldi) 一起再次到访中国，共同会见了中国科学与技术大学的代表，包括创始人严济慈。

ICRA 成立于 1985 年 6 月 17 日。目前的成员有:

• 阿卜杜勒·萨拉姆国际理论物理中心（Abdus Salam International Center for Theoretical Physics，简称 ICTP，里雅斯特，意大利）

• 世界科学院 (The World Academy of Sciences，简称 TWAS，里雅斯特，意大利)

• 斯坦福大学 (Leland Stanford Junior University，加利福尼亚，美国)

• 空间望远镜研究所 (Space Telescope Institute，马里兰，美国)

• 梵蒂冈天文台 (Specola Vaticana, 甘多尔福堡, 意大利)

• 生物医学大学 (Universit à Campus Bio-Medico, 罗马，意大利)

• 英苏布里亚大学 (Universit à degli Studi dell'Insubria, 瓦雷泽，意大利)

• 乌迪内大学 (Universit à degli Studi di Udine, 乌迪内, 意大利)

• 中国科学技术大学 (University of Science and Technology of China, 简称 USTC，合肥，中国)

• 华盛顿大学 (Washington University，西雅图，美国)

ICRA 最早的一个倡议是在意大利推广引力波的低温探测器，以及开展一系列国际会议。其中包括意大利-韩国会议，自 1987 年起每两年在韩国和意大利轮流举办，以及最重要的马塞尔格罗斯曼会议 (Marcell Grossmann Meeting)。自 1975 年以来，马塞尔格罗斯曼会议每三年组织一次，为讨论广义相对论、引力和相对论场论的最新进展提供机会，强调数学基础、物理预测和实验测试。这些会议每次都有超过一千名科学家参加，会议论文集由世界科学出版社出版，通常为三到四卷。

ICRA 还特别关注编写相对论天体物理学的教科书，包括汉斯·奥哈尼安 (Hans Ohanian) 和雷莫·鲁菲尼所著的《引力与时空》(Gravitation and Spacetime) 一书，已被翻译成中文、意大利语和韩语。

从教学和研究角度来看，ICRA 最重要的活动是成立了国际相对论天体物理博士项目 (International Relativistic Astrophysics PhD Program, IRAP)，培养了来自世界各国的许多博士生。

在这个新时代中，雷莫·鲁菲尼作为意大利航天局科学委员会 (Scientific Committee of the Italian Space Agency) 主席，参与并保证了 SAX

卫星项目的完成。Beppo-SAX 卫星最重要的发现是将伽玛射线暴与超新星联系起来，自此以后，雷莫·鲁菲尼及其团队利用最初在普林斯顿获得的所有有关黑洞的知识，基于 Christodoulou-Ruffini-Hawking 质能公式，最终找到了这个宇宙中最大能源的根本起源。来自阿根廷、巴西和哥伦比亚的教授和年轻的研究生的合作对于理解星系中的伽玛射线暴和暗物质非常重要。这些年轻的研究人员已成为他们原籍国家的著名教授，目前在拉丁美洲领导相对论天体物理学领域的研究。

一批新的研究生加入了团队，其中包括卡罗·卢西亚诺·比安科(Carlo Luciano Bianco)，他确保了所有相对论处理的正确性，并重新组织和优化了所有的数值代码[参见 Ruffini, Bianco, Chardonnet, et al., ApJ 555 (2001) L107; ApJ 581 (2002) L19; Bianco & Ruffini, ApJ 605 (2004) L1; ApJ 620 (2005) L23; ApJ 633 (2005) L13; ApJ 644 (2006) L105]；还有豪尔赫·鲁埃达 (Jorge Rueda)，他促进了引力诱导坍缩(Induced Gravitational Collapse, 简称IGC)范式的制定[参见 Rueda & Ruffini, ApJ, 758 (2012) L7]。不久之后，王瑜的研究开始致力于理解伽马射线暴中的伽马射线闪耀现象[参见 Ruffini, Wang, Aimuratov, et al., ApJ 852 (2018) 53]。这三位研究人员很快成为了 ICRANet 的教职工，并帮助发展了 IRAP-PhD 项目，逐步建立了致力于黑洞物理的双星驱动超新星(Binary-driven hypernovae，简称BdHNe)的模型。

引力诱导坍缩的概念引导了长持续时间伽马射线暴的双星驱动超新星模型的制定[参见 C. L. Fryer, J. A. Rueda, and R. Ruffini, ApJ (2014); L. Becerra et al., ApJ (2015); C. L. Fryer et al., Phys. Rev. Lett. (2015)]。BdHN模型正在不断发展中，并针对伴星是中子星的双星系统的超新星爆发进行

研究[参见 L. Becerra et al., Ap.J. (2016); L. Becerra et al., ApJ 871 (2019); L. M. Becerra et al., Phys. Rev. D (2022)]。类似地，伽马射线暴高能 (GeV) 辐射被“中心引擎”范式所解释[参见 R. Ruffini et al., ApJ (2019)]。“中心引擎”通过量子电动力学过程诱导出强烈电场，使得黑洞的旋转能量得以释放[参见 J. A. Rueda and R. Ruffini, EPJC 80 (2020) 300; R. Moradi et al., A&A 649 (2021); J. A. Rueda, R. Ruffini, and R. P. Kerr, ApJ (2022)]。

雷莫·鲁菲尼在普林斯顿和斯坦福大学活动期间，他与提波·达穆尔 (Thibault Damour) 和詹姆斯·威尔逊 (Jim Wilson) 在克尔-纽曼黑洞周围的真空极化方面开展了深入的合作，并在 1975 年和 2000 年发表了他们的基础论文。薛社生 (She-Sheng Xue) 和格里戈里·韦雷申奇金 (Gregory Vereshchagin) 于 2010 年在物理报告(Physics Reports)上发表的文章“天体物理中的正负电子对：从重原子核到黑洞 (Electron-positron pairs in physics and astrophysics: from heavy nuclei to black holes)”扩展和总结了这项研究。他们两人目前都是 ICRANet 教授。

ICRANet 的年轻成员拉希姆·莫拉迪 (Rahim Moradi) 和法特梅·拉斯特加尼娅 (Fatemeh Rastegar Nia)，经过多年的研究，终于将从这些工作中获得的知识应用于相对论超临界电磁场的新探索领域。最近的一项贡献是经典和量子电动力学过程在提取克尔黑洞的旋转能量中起着基本作用[参见 F. Rastegarnia et al., EPJC 82 (2022) 778; R. Moradi et al., Phys. Rev. D 104 (2021) 063043]。

在这样的背景下，我非常高兴能够支持王瑜教授作为 ICRA 新任主席的候选人，他肯定会继续 ICRA 的杰出研究传统。他在相对论天体物理学

方面做出了重要的国际贡献，他与ICRANet的年轻教授李亮合作，在黑洞物理和天体物理学方面处于理论和数据及光谱分析的前沿。王瑜正在推动人工智能技术在天体物理学中的应用，这有望成为我们了解宇宙的新时代研究的核心。

马西莫·德拉瓦莱教授

Link to the presentation: https://drive.google.com/file/d/1W0tJu6hhhQ55JVIhfYKv4NAoDrncb0Cj/view

Speech of Prof. Wang Yu

Dear ICRA members and dear colleagues,

There is a District called Xuhui in the center of Shanghai. Many universities and institutes, including the Shanghai Astronomical Observatory, are located there. The name "Xuhui" comes from Xu Guangqi, an essential figure in Chinese modern science and a pioneer in the cultural exchange between China and the West during the 16th century. Xu Guangqi was greatly influenced by his teacher Matteo Ricci, an Italian priest and scholar who introduced Western classical astronomy to China in a systematic way. This event marked the beginning of the astronomical exchange between China and Italy.

The roots of ICRA's relationship with China can be traced back to a time before ICRA was established. Back in 1978, Prof. Remo Ruffini paid his first visit to China and conducted a tour of several Chinese universities. Driven by his passion for science and with the support of esteemed scientists like Prof. Abdus Salam and Prof. Chou Peiyuan, as well as the support from the University of Rome and the Italian government, Prof. Remo Ruffini successfully brought the third Marcel Grossmann meeting to Shanghai, China, in 1982. The meeting drew over 300 scientists from more than 30 countries. This was a historic event as it marked the first time that China hosted a large-scale international scientific meeting.

Starting from 2019, ICRA has been organizing the Galileo - Xu Guangqi Meetings. These meetings aim to commemorate the origins of modern scientific research in both the East and the West, as well as to review recent developments in relativistic astrophysics. The first Galileo - Xu Guangqi Meeting was held in Xuhui District, Shanghai.

I had the pleasure of meeting Prof. Remo Ruffini for the first time at the third Galileo - Xu Guangqi Meeting held in Beijing in 2011. At that time, I was a master's student and had the opportunity of giving a presentation on gamma-ray bursts and cosmic strings. The following year, in 2012, I started my PhD study supervised by Prof. Remo Ruffini at the University of Rome. My doctoral program is the International Relativistic Astrophysics PhD Program (IRAP PhD), established and co-sponsored by ICRANet. The program focuses on advancing research in relativistic astrophysics and provides a unique opportunity for international collaboration and exchange of ideas. At the end of 2014, I moved from Rome to Pescara, where ICRANet is headquartered, and I have been working at ICRANet since then.

One of our primary research focuses at the University of Rome and ICRANet is developing a physical theory for gamma-ray bursts (GRBs) based on binary star evolution. This model's original concept was introduced by Prof. Jorge Rueda and Prof. Remo Ruffini in 2012, during my first year in Italy.

Although GRBs were discovered around 50 years ago, their origin remains a subject of debate. From an observational standpoint, the most significant clue to understanding GRB's origin is the discovery of their association with supernovae in 1998. Consequently, the supernova component played an essential role in our model-building process. In 2017, I worked with my colleagues at ICRANet to perform a statistical analysis of X-ray flares observed several hundred seconds after GRBs trigger. We found that most flares exhibit thermal radiation. Utilizing a formula derived by Prof. Carlo Bianco, we calculated that most of the thermal radiation occurred at a radius of 10^12

cm and that the radiating body expands at a mild-relativistic speed. Our hydrodynamical simulation confirms that the supernova ejecta heated by the GRB main burst produces such thermal radiation. This discovery allowed us to unveil the contribution of supernova ejecta to GRBs for the first time and provided a more comprehensive physical picture for future GRB studies. In 2018, with colleagues such as Dr. Mile Karlica and Prof. Jorge Rueda, we found that the central pulsar continuously injects energy into the ejecta, in addition to the main burst heating the ejecta in the first seconds. As a result, we introduced the multipolar radiation of newborn pulsars in GRB studies. Today, our GRB model is becoming mature. We collaborated with Prof. Massimo Della Valle this year to summarize the different roles played by supernovae in our model.

In the meanwhile, we are developing machine learning for astrophysics. I personally divide the applications of machine learning in astrophysics into three levels. The first level involves machines performing tasks that humans can do, but better. The second level involves machines performing tasks that humans cannot do. The third level involves machines telling humans how they perform these tasks. Currently, most astronomical applications fall into the first level. My colleague and I have worked on calculating the redshift of SDSS spectra, which is also a first-level application. In addition, we assisted our Chinese colleagues in developing the basis of a neural network that reconstructs the neutrino signal based on the electromagnetic radiation. The third level implies that machines can generalize natural laws and express the laws. Currently, the third level is still a significant challenge. Therefore, we are attempting to approach the third level through a combination of human and machine intelligence. Humans propose theories, and machines verify them with data. In our attempt to test the unified model of AGN, we have found that the distinguishing features of different types of AGNs are not limited to the viewing angle. We are currently conducting further experiments in this direction.

ICRA has been actively strengthening its ties with China over the past few years. Before the outbreak of the pandemic, we regularly visited Chinese universities on an annual basis. Even during the pandemic, we successfully launched a doctoral program in collaboration with USTC with Prof. Yefei Yuan and Prof. Yifu Cai. With China having recently lifted pandemic restrictions, we anticipate that our communications will become more frequent. As a Chinese, I possess certain advantages in the understanding of the Chinese research, the Chinese way of thinking, and the working methods of the Chinese government. I wish I could first help implement the cooperation agreements we have already established with a number of Chinese universities, and secondly, expand ICRA's collaborations with more Chinese institutions, as well as with companies and local governments.

ICRA has always been committed to promoting international scientific exchanges. In the face of an increasingly divided global environment, ICRA is aware that it must take on even greater responsibilities, while also surmounting significant challenges. We are having a meeting of representatives from Italy, Vatican, United States, China and TWAS, as well as many colleagues from Iran, Belarus, and other countries. Today, we are discussing in a peaceful and friendly atmosphere, which looks common as usual, actually it is valuable. Science, as our common lofty ideal, and our way of thinking, links us all. In 1982, the Marcel Grossmann meeting in Shanghai opened a door for communication between Israel and China. ICRA can continue this trend, if there are any opportunities, of using science as the unifying medium to spread our friendly atmosphere from this meeting room to our wider society.

Thank you and my best wishes,

Yu Wang

国际相对论天体物理中心，中国，和我

王瑜 (Yu Wang)
国际相对论天体物理中心
2023 年 2 月 28 日

亲爱的国际相对论天体物理中心的成员们，
亲爱的同事们，
大家好:

徐汇区，位于上海市中心，是上海科学教育文化核心区。上海的大部分高校和科研机构，包括上海天文台，都位于徐汇区。在 16 世纪中国，中西文化交流和中国近代科学技术的先驱之一徐光启生活在这里，这就是“徐汇区”名字的由来。对徐光启影响最大的人是他的老师——利玛窦 (Matteo Ricci)，一位来自意大利的神父和学者。他们一起系统地把西方古典天文学引入了中国，这可能是中国和意大利在天文学上交流的起始。

国际相对论天体物理中心 (International Center for Relativistic Astrophysics，简称 ICRA) 与中国的联系可以追溯到 ICRA 成立之前。雷莫·鲁菲尼（Remo Ruffini）于 1978 年第一次访问中国，在许多大学做巡回讲座。之后在雷莫·鲁菲尼的努力下，同时还获得了阿卜杜勒·萨拉姆 (Abudu Salam)、周培源等科学家和罗马大学、意大利政府等机构的支持，于 1982 年成功将第三届马塞尔格罗斯曼会议（Marcell Grossmann

Meeting）带到了中国上海，这是中国第一次举办大型国际科学会议，与会的 300 多位科学家来自 30 多个国家。

ICRA 从 2019 年开始组织伽利略--徐光启会议。会议旨在回顾东西方现代科学研究的根源和联系，报告并促进相对论天体物理学的现代进展。第一届伽利略--徐光启会议在上海徐汇区举办。我与雷莫·鲁菲尼在 2011 年北京举办的第三届伽利略--徐光启会议上第一次见面，那时我是一个硕士生，在会上作了一个伽马暴与宇宙弦的报告。2012 年，我来到意大利罗马大学读博士，导师正是雷莫·鲁菲尼。提供我博士岗位和奖学金的是由国际相对论天体物理中心联合网络 (International Center for Relativistic Astrophysics Network，简称 ICRANet)发起和联合赞助的国际相对论天体物理博士项目 (International Relativistic Astrophysics PhD Program, IRAP)。2014 年底我从罗马搬到了 ICRANet 的总部所在地佩斯卡拉，工作至今。

在罗马大学和 ICRANet，我们的一个工作重心是建立基于双星演化的伽马暴的物理理论，模型的原始概念由豪尔赫·鲁埃达 (Jorge Rueda) 和雷莫·鲁菲尼在 2012 年，也就是我来到意大利的第一年提出。因为我本来就有 GRB 的背景知识，所以可以很顺利的融入团队一起工作。伽马暴发现距今大约有 50 年时间，但至今它的起源仍然在争论中。从观测上来讲，1998 年发现伽马暴与超新星成协可能是至今最重要的理解 GRB 起源的线索。在与卡罗·比安科 (Carlo Bianco)，豪尔赫·鲁埃达，拉希姆·莫拉迪 (Rahim Moradi) 等同事的努力下，我们从观测和理论上研究了超新星在伽马暴中的作用，为之后其他伽马暴的研究提供了更为完整的物理图像。之后与米莱·卡尔利卡 (Mile Karlica)，豪尔赫·鲁埃达等同事进一步把超新星爆发后诞生的脉冲星的多极距辐射纳入了伽马暴的图像中。如

今，我们的伽马暴模型日趋成熟，今年我们与马西莫·德拉瓦莱(Massimo Della Valle)一起总结了我们的研究成果。

同时我们把资源不断投入到天体物理的机器学习领域。我个人将机器学习在天体物理学中的应用划分为三个层次。第一层是机器能够完成人类能够完成的任务，并且做得比人类更好。第二层是机器能够完成人类无法完成的任务。第三层是机器能够告诉人类它是如何完成任务的。我和同事们引入机器学习分析斯隆数字化巡天收集的光谱数据，我们的网络在精确度和适用性上都优于传统的自动化流程，也优于斯隆数字化巡天官方采用的机器学习模型。我们也与中国同行在引力波与中微子方向引入了深度学习进行研究。以上都是第一层次的工作。我们正在努力通过人机结合来接近第三个层次，即人提出理论，然后机器通过数据验证理论。我们尝试了对活动星系核的统一模型进行检测，结果表明观测角度似乎并不是区分不同活动星系核类型的唯一特征。我们正在进行更多的尝试。

ICRA 这些年来一直在加强与中国的联系，疫情之前我们每年都会拜访不少中国的高校和研究所。即时在全球疫情期间，我们也成功开展了与中国科学与技术大学合作的博士项目。中国于 2023 年初开放疫情管制，相信我们的交流会比之前更加频繁。我来自中国，对中国的科研，对中国人的思维方式和中国政府的运作的理解有着一定的优势。希望我的加入首先能帮助实际执行之前我们与多所中国大学签订的合作协议，其次拓展 ICRA 与更多的中国科研机构的合作，甚至与企业和地方政府的开展合作。

ICRA 一直致力于世界各国科研的交流，在这个越来越分化的社会环境下，ICRA将会遇到更多的困难，但同时ICRA也必须承担更多的责任。我们的与会人员有来自意大利的代表，有来自梵蒂冈的代表，有来自美国的代表，有来自中国的代表，还有来自世界科学院的代表，我们还有来自伊朗，白俄罗斯等等国家的同事正在参与会议。今天来自不同国家的我们在和平友善的气氛下开会讨论，虽然看起来从来就是这样，但其实这是难能可贵的。科学，作为我们共同的、崇高的理想，也是我们的思维方式，把我们关联到一起。1982年的马塞尔格罗斯曼会议为当时没有建交的中国和以色列的交流开了一扇门，今天 ICRA 如果有机会，仍然可以将科学作为纽带，把我们友好的气氛从这个会议中扩散出去，为社会贡献一些自己力所能及的良好影响。

谢谢大家的支持。

致以最真挚的祝福

王瑜


Conferenza delle Addette e degli Addetti Scientifici e Spaziali