On the scientific relation between China and the West: The role of Enrico Fermi, C. N. Yang, T. D. Lee, Abdus Salam, ICRA and ICRANet

A 1 - Matteo Ricci and Xu Guangqi

The relation between Italy and China has profound roots and especially important was the life of Matteo Ricci (Ri Ma To), who arrived in Macau in August 1582, transferred to Nanjing in April 1600 and became an advisor to the imperial court of the Emperor Wan Li. Most prominent was his student Xu Guangqi, who translated in Chinese, guided by Ri Ma To, several classic western books including the *"Euclid's Element"*, but not only mathematics. Matteo Ricci and Xu Guangqi introduced in China sweet potatoes, which improved the daily life of al Chinese. To Xu Guangqi is dedicated a marvelous tomb and monument in the center of Shanghai. This quarter is called *"Xujiahui"* (meaning "Xu family junction", see Fig. 1 and 2) just across the Shanghai National Observatory. In his honor, ICRANet has founded, in order to celebrate this most unique cultural junction between the western and the eastern culture, the Galileo Xu Guangqi meetings (GX meetings).

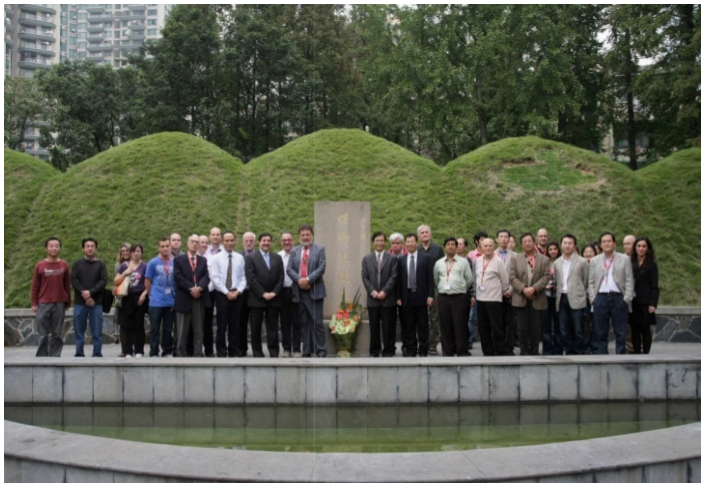

Fig. 1: the 1st Galileo - Xu Guangqi Meeting

Fig 2. the Xujiahui quarter in Shanghai today.

A 2 - The first contacts between China and Italy during the Mao regime

During the Mao regime the return in China of Qian Xue-Shen (Hsue-Shen Tsien) had an enormous impact on the development of China. The long March rocket represented then a definite great progress in China still today leading the technological development of China. Interestingly one of the few invited visitors to this program was Luigi Broglio, the head of the San Marco project: at the time Italy was one of the five countries able to launch a satellite in orbit.

A 3 – Chen-Ning Yang and Tsung-Dao Lee and Enrico Fermi

During the Second World War, Chen-Ning Yang was an undergraduate student in the National Southwestern Associated University, which was formed by the wartime incorporation of National Peking University, National Tsinghua University, and National Nankai University in the Kunming beautiful mountains, escaping from the Japanese invasion of China. From there, in 1945, he won a fellowship to the USA to work with Enrico Fermi at the University of Chicago. There, another very young Chinese student, still undergraduate, was admitted directly to the graduate school by Enrico Fermi: Tsung-Dao Lee. In 1958, they were both awarded the Nobel Prize.

In 1971, the relations between the USA and China start to ease and Yang was the first to set out from the United States, via Canada, and made his way back to China during the cultural revolution.

A 4 - Abdus Salam and Chou En-lai

In the meantime, in 1966, Abdus Salam had joined the President of Pakistan Field Marshal, Ayub Khan in a visit to Beijing meeting Chairman Mao. This was the occasion of the first meetings of Salam with Professor Chuo Pei-Yuan, the Prime Minister of China Chou En-Lai who expressed repeatedly to him, in the following years (See Fig 3), his intense desire to see Chinese Physics coming up to the highest possible level. Salam recalls *"I was deeply impressed with his great interest in Science. When I remarked on this with surprise, the Premier said that he would not be Prime Minister of China if he did not know the leading scientists and their problems"*. It was quite clear that the Chinese Government was placing a very strong emphasis on acquiring science and technology and developing it to the highest level.

Figure 3. Prof Abdus Salam with Prime Minister Chou-En Lai, ICRANet collection.

A 5 - The first tour in China and little book

In 1974 through the auspices of Abdus Salam and C. N. Yang, Ruffini, received, while lecturing in Australia, the invitation of the Chinese Academy of Science to visit China. Soon he flew to Hongkong on the 17 of May, his birthday, he crossed the border of China. He was received by a few

distinguished functionaries and gave lectures with young Chinese professors all over many Universities. Inspired by the "*little red book"* of Chairman Mao, they decided to summarize in an equally small book of 184 pages the basic concepts of relativistic astrophysics to be sold at less than one Yuan. The book became very popular, soon translated, sold at least many 100,000 copies and inspired a large number of students to direct their research in the emerging field of relativistic astrophysics (see Fig 4). This signed a *"first wave"* of collaborating with young Chinese scientists and Professors.

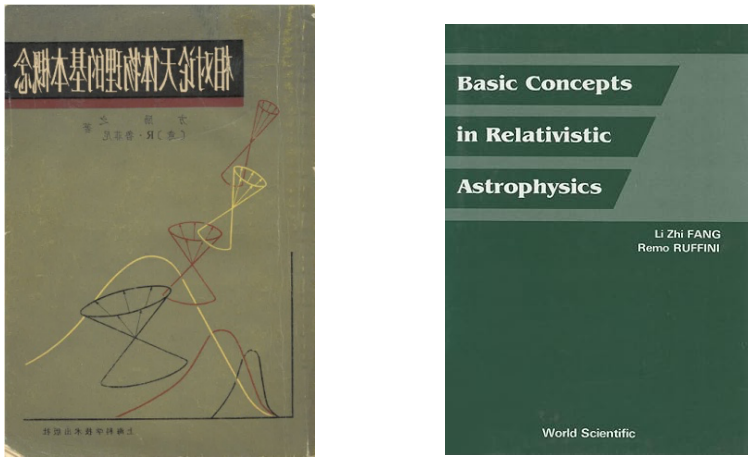

Fig. 4: the English and Chinese versions of the book *"Basic Concepts in Relativistic Astrophysics"*

A 6 - The starting of Marcel Grossmann meeting

In 1975, under the Aegis of Salam, Ruffini, still in Princeton, founded at ICTP the first Marcel Grossman meeting - MG 1 (see Fig.5). In 1979, the second Marcel Grossmann meeting (MG2) took place at ICTP with a large participation of Chinese scientists, including Chuo Pei-Yuan and as a plenary speaker C. N. Yang (see Fig 6).

Fig. 5 MG1 at the center Ruffini, Salam, Lifshitz, Chandrasekhar and Penrose.

Fig. 6: MG2 Paul Dirac listening C. N. Yang at MG2 in Trieste in 1979.

On this occasion, it was decided to hold MG3 in 1982 in China as Salam recalls *"The modalities for this were worked out by Professor Ruffini in a number of Visits to China"*. The main difficulty was that the well-established motto in China was "Friends from all over the world are welcome" had to be extended to *"scientists from all over the world are welcome"*: this should be adopted independently of the existence of diplomatic relations. They had to invent a new travel document: it took the help of the Italian ambassador Sergio Romano to invent a new procedure. Ruffini recalls the most intense discussion he ever had, which took place over one week in a highly guarded compound near Tiananmen Square. He was hosted in a large villa next to Norodom Sihanouk and had detailed discussions every morning with thirteen representatives from the Chinese government, led by Chou Pei-Yuan, the Chairperson of the China Association for Science and Technology and Vice Chairperson of the Chinese People's Political Consultative Conference (Qian Xue-Sen succeeded Chou Pei-Yuan in these two positions). On the last day before departure, a final message from Chinese Foreign Minister Hua Huang reached him. This message recalled the centuries-long good relations between China and Italy and granted permission for two Israelis to enter China and attend the meeting. The permitted travel documents were to be signed by Ruffini and Chinese Ambassador Yue Zhang in Rome. This marked the beginning of a new era in international scientific relations for China. With this document two Israeli Scientists participate to the meeting: Tsvi Piran and G. Tauber. As Salam recalls in the preface of MG3 *"this is the first truly international meeting to be held in China"* and as Chuo Pei-Yuan also recalled *"I believe that we are all taking a significant step toward the creation of a truly international community of scholars"*. This was deeply appreciated by all scientists in China, not only by the astrophysicists. Since was generally applied to all the fields of research. The MG meetings continued every 3 years, see link: https://www.icranet.org/index.php?option=com_content&task=view&id=258

In May 1990, an ambassador sent by Deng Xiao-Ping arrived at Ruffini's office in Rome, requesting his intervention in a sensitive matter between the US and China. Ruffini promptly got involved and contributed to the solution.

A 7 - The establishment of ICRA

The establishment of ICRA came with the creation of ICRA at the University La Sapienza of Rome in 1985, so the creation of ICRA (see Fig 7).

Fig. 7: ICRA founding members: University of Rome "La Sapienza", University of Washington at Seattle, Space Telescope Institute, Stanford University, International Centre For Theoretical Physics (ICTP), University of Science and Technology of China (USTC).

Many Chinese graduate students started to visit ICRA and one of them, Feng Long-Long, translated in Chinese the book *"Gravitation and Spacetime"* by Ruffini and Ohanian in 2006. The same book, published in English in 1994 (second edition) and in 2013 (third edition), has been also translated in Korean (see Fig. 8). This marked the second wave, when every student and Professor in China could adopt that book for studying and teaching.

Fig. 8: the book *"Gravitation and Spacetime"* by Ruffini and Hans Ohanian in its Chinese, English and Korean versions.

Still in this **third wave**, the review *"Electron-positron pairs in physics and astrophysics, from heavy nuclei to black holes"* Physics Report Vol. 487 (2010) 1, published by Ruffini, Vereshchagin and Xue, summarizing the work on self-accelerating electron-positron plasma, developed in collaboration with Jim Wilson at Lawrence Livermore National Laboratory.

Fig. 9: Jim Wilson, Francis Everitt, Remo Ruffini and Thibault Damour in the Vallée des Marveilles, Nice.

A 8 - The foundation of ICRANet

In 2005 the founding members of ICRANet were Armenia, Italy, Stanford University, University of Arizona in Tucson and Vatican City State (see Fig. 10). Riccardo Giacconi (see Fig. 11), just awarded the Nobel Prize in Physics in 2002, was appointed Chairman of the ICRANet Scientific Committee. This was the starting of the **fourth wave**, characterized by the new *"West-East"* encounters in the Galileo - Xu Guangqi meetings.

Fig. 10: A serene special moment with his holyness Pope Jhon Paul II and Cardinal Agostino Casaroli. Prof. Giorgio Coyne, first left, promoted the entrance of the Specola Vaticana in ICRA and the Vatican City State.

Fig. 11: Prof. Remo Ruffini, Prof. Hagen Kleinert and Prof. Riccardo Giacconi in the underground floor of ICRANet building celebrating Giacconi Nobel Prize.

Fig. 12 Prof. Jing Yi-Peng, on the right of Prof. Ruffini in the first row at GX1 meeting.

The 1st Galileo - Xu Guangqi meeting has been held on October 26-30, 2009 in Shanghai, chaired by Ruffini's former student Jing Yi-Peng (see Fig. 12), who was soon nominated Academician and soon after became the youngest academician in the field of astronomy in China; the 2nd Galileo - Xu Guangqi Meeting on July 12-18, 2010 in Ventimiglia and Nice, the 3rd Galileo - Xu Guangqi Meeting on October 12-16, 2011 in Beijing, in front of the tomb of Matteo Ricci), the 4th Galileo - Xu Guangqi Meeting on May 4-8, 2015 in Beijing, the 5th Galileo - Xu Guangqi Meeting on June 25 -30, 2017 in Chengdu (China) and the 6th Galileo - Xu Guangqi Meeting on April 19 -24, 2024 in Hengyang (China).

Fig. 13: GX2 meeting, July 2010, Villa Hanbury, Ventimiglia.

Fig. 14: GX2, July 2010 in front of Nice Observatory.

It was during this "fourth wave" that Prof. Ruffini met again, at Tsinghua University, C. N. Yang and delivered to him and to T.D. Lee the Marcel Grossmann award (see Fig. 15, 16 and 17). C.N Yang was awarded *"for deepening Einstein's geometrical approach to physics in the best tradition of Paul Dirac and Hermann Weyl" and* T.D. Lee for *"for his work on white dwarfs motivating Enrico Fermi's return to astrophysics and guiding the basic understanding of neutron star matter and fields"*.

C. N. Yang and T. D. Lee established two intense programs, promoting tens of thousands Chinese students to go to the USA to take their PhD in American Universities. These programs, in due time, created one of the most powerful contribution to the development of science and contributed to the augmentation of wealth on the planet.

Fig. 15: C.N. Yang receiving the 14th Marcel Grossmann award.

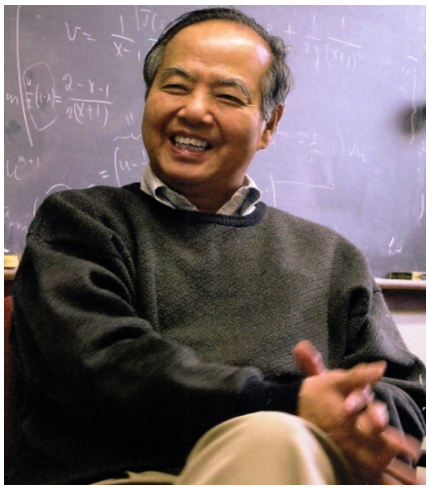

Fig. 16: Tsung-Dao Lee at the MG14 award

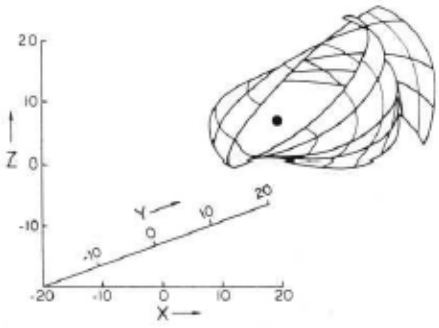

Fig. 17: Left: Equations for a family of geodesics in a Kerr black hole and their graphical representation (M. Johnston and R. Ruffini, 1974). Right: TEST, sculpture by A. Pierelli, photo by S. Takahashi.

A 9 - C. N. Yang on Fermi at MG14 award ceremony

Enrico Fermi was, of all the great physicists of the 20th century, among the most respected and admired. He was respected and admired because of his contributions to both theoretical and experimental physics, because of his leadership in discovering for mankind a powerful new source of energy, and above all, because of his personal character. He was always reliable and trustworthy. He had both of his feet on the ground all the time. He had great strength, but never threw his weight around. He did not play to the gallery. He did not practice one-up-manship. He exemplified, I always believe, the perfect Confucian gentleman.

Fermi from 1950 to 1951 was a Member of the General Advisory Committee (GAC) of the Atomic Energy Committee (AEC) chaired by Oppenheimer. He then resigned with a quote: "*You know, I don't always trust my opinions about these political matters*".

In the fall of 1954 Fermi was critically ill. Murray Gell-Mann and I went to the Billwigs Hospital to see him for a last time. He was thin, but not sad. He was reading a book full of stories about men who had succeeded, through shear willpower, to overcome fantastic obstacles and misfortunes.

As we bade goodbye and walked towards the door of his room, he said: *"Now I have to leave physics to your generation."*

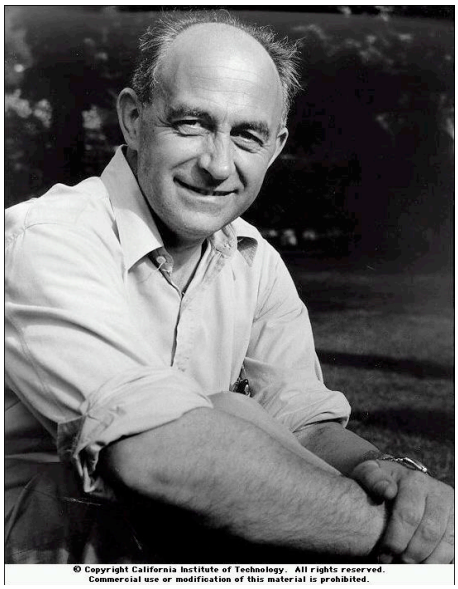

Fig. 18: Enrico Fermi, courtesy of C. N. Yang.

A 10 - Cultural commitment of ICRANet in the near East

The foundation of ICRANet in 2005 coincided with expanding activities in Central Europe and Middle East. The first step was the development of the activities based in Armenia, following the establishment of the ICRANet Seat in Yerevan with a series of international conferences held there (see figure 19) covering scientific collaborations in all fields of Relativistic Astrophysics, especially with the MAGIC collaboration well documented in the scientific report. At the same time an activity started in Belarus based around the scientific heritage of Ya. B. Zeldovich which

manifested in a center, economically supported by the Academy of Science open in 2017. Scientific results were presented in a series of Zeldovich meetings which had a strong revitalizing effect in the entire area with participation of scientists from 38 countries including 5 scientists from Ukraine (Bohdan Novosyadlyj, Oleg Zaslavskii, Alexander Zhuk, Volodimir Pelykh, Elena Panko). The occurrence of the war started in 2022 lead to the decision, requested by the representative of Italy, to avoid any contact with the Belarusian Government. This was immediately implemented and only the assistance of the scientists who had significant collaborated in the previous 5 years was maintained and the Zeldovich meeting was held in 2023 in Armenia. Professor Ruffini had been invited to Iran to deliver lectures in Iran in 1978. He visited the University of Shiraz and met there Yousef Sobouti. No matter the many political changes ICRANet has kept close contacts with the ABS Institute for Advanced Study, collaborating with students and professors reaching important scientific results. In all these activities the contact with Israel were kept active: the MG 8 meeting in was held in Jerusalem at the Hebrew University where all Einstein Manuscript are kept. During this is entire activities almost daily scientific exchanges occurred between Ruffini and Tsvi Piran at the Hebrew University in Jerusalem was the first Israeli citizen to officially visit China at MG3 aforementioned.

On June 14, 2023, Ruffini led a delegation, including Chinese leading scientists Shuang-Nan Zhang - chief scientist of the HXMT mission, and Di Li - chief scientist of the FAST mission, to discuss with Armenia President Vahagn Khachaturyan on supporting scientific cooperation between Europe, China, and Middle East. A proposal was advanced for an ICRANet center in the Armenian quart of Jerusalem still of current interest close to the Hebrew University of Jerusalem. This proposal is still ongoing.

Fig.19 Wednesday, June 14, Group photo with the President of Armenia. From the left to the right: Alexei Starobinsky, Narek Sahakyan, Shuang-Nan Zhang, Remo Ruffini, Vahagn Khachaturyan (President), Di Li, Tsvi Piran, Paolo Soffitta, Vahram Dumanyan (Adviser to the President Khachaturyan) and Ashot Saghyan.

A 11 - The Binary driven Hypernova (BdHN)

The understanding of the GRBs within the binary driven hypernova model (BdHN). It was again characterized by the participation of many of the 137 graduate students educated in our Ph.D. program at the University of Nice and at the University of Rome La Sapienza, including Rahim Moradi, Li Liang, Wang Yu, Jorge Rueda, Christian Cherubini and many others. The contributions both of Wang Yu and Li Liang on the spectral analysis was essential and the collective contributions of all participants succeeded to identify the inner engine of GRBs and their seven episodes (see details in MG3 in page 4).

Fig. 20: Chris Fryer, Los Alamos National Laboratories, USA

Fig. 21: Chris Fryer signing the wall of ICRANet undergorund.

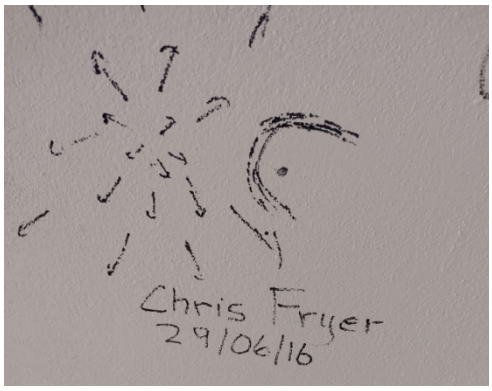

Fig. 22: Chris Fryer, led with ICRANet scientists, the Binary Driven Hypernova Model of gamma ray burst (GRBs).

Fig. 23: From left to right: Remo Ruffini, Carlo Bianco, Giovanni Pisani, Marco Muccino, Wang Yu, Jorge Rueda, Milos Kovacevic and Izzo Luca.

Fig. 24 illustrates ICRANet's longstanding and uninterrupted relationship with China. A professor at Peking University recognized his younger self in a photo taken during Ruffini's visit forty years ago.

Fig. 24: Presentation at Peking University on the new discoveries by ICRANet.

A 12 - The Sixth Galileo Xu Guangqi meeting in Henyang (2024)

It came nevertheless as a big surprise the popularity that the six waves of books and articles have created in the young scientists and researchers in China, as Prof. Ruffini saw only a few weeks ago on the 6th Galileo- Xu Gungqi meeting, held from April 19 to 23, 2024 in Hengyang (China). On that occasion, he enjoyed the seventh wave, meeting 700 young scientists sharing emotions, pictures and discussions with the participation of the Mayor of Hengyang, Mr Zhu Jian (See Fig. 25 and 26).

Fig. 25: the group photo of the meeting, showing the ICRANet participants and, Ruffini in the middle.

Fig. 26: On the occasion of the GX6 meeting, a dinner on the 22 of April was offered in honor of Ruffini by the Mayor of Hengyang Zhu Jian at the presence of 3 members of the Chinese Academy of Sciences: Rong-Gen Cai, Yue-Liang Wu and Zhong-Can Ouyang and Wenbin Lin, local organizer of the GX6 meeting.

There, the Mayor Zhu Jian recalled the Chinese invention of paper and explosive powder, which has occurred on the beautiful river of the town of Henyang, some thousands of years earlier: at the time the explosive powder was used for fireworks and only later in Europe was used for guns. The paper, when introduced in Europe, influenced profoundly the culture and economy.

A 13 - The lecture of May 17, 2024, at Princeton University (USA)

Here was announced the possibility that the explosion of the Supernova in 1054 was generated by a GRB, such a new idea gave a credible explanation to series of historical events previously not understood. The event had been admired first by the Indian in America, and in Europe on July 3, with cataclysmic consequences all over the Mediterranean (see fig 27) and, only on the very early part of the day of July 4, in China.

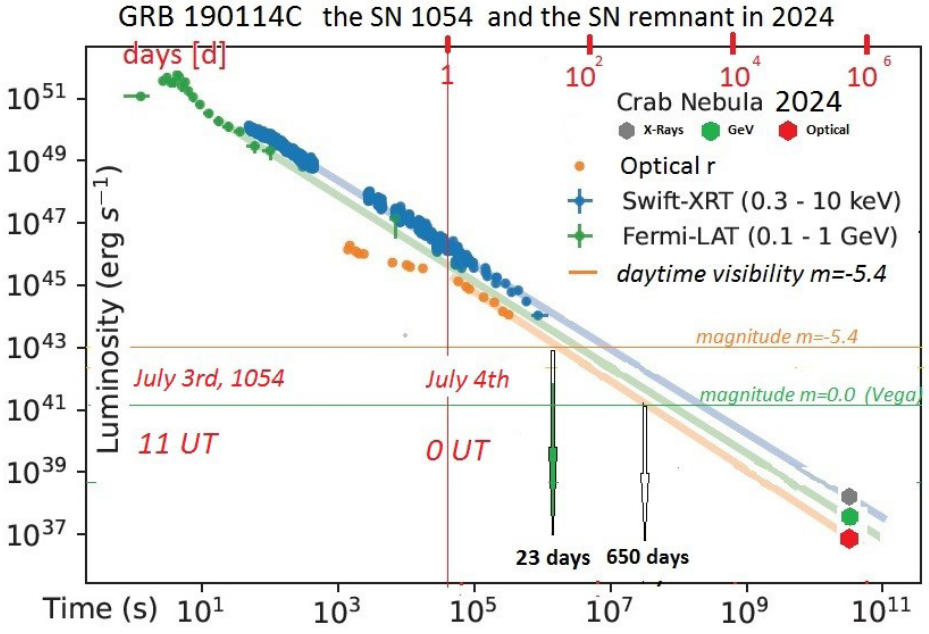

Fig. 27: The space time over 1000 years of the CRAB Pulsar and the CRAB Nebula

The guest star was gracefully followed by the Astronomers of the *"celestial Empire"*, as well as from Korea and Japan up to 150 days.

Prof. Ruffini enjoyed presenting these results only few days later at Princeton University (USA) on the day of his 82th birthday (see Fig. 31), to the Faculty of the physics department. The tape of Ruffini lecture can be found in: http://www.kaltura.com/tiny/e871e

Fig. 28: Demetrios Christodoulou discussing his thesis in front of the Committee composed of Eugene Wigner, Remo Ruffini, John Wheeler and David Wilkinson.

Fig. 29: Ruffini on December 6, 1972 receiving the Cressy Morrison award of the New York Academy of Science.

Fig. 30: Riccardo Giacconi receiving from the king of Sweden the Nobel Prize in 2022.

On this occasion, it was recalled that the starting point of the physics of Black Holes was the collaboration of Ruffini with John Archibald Wheeler and their first student Demetrios Christodoulou (see Fig. 28), coming from Greece at the age of 16, completing his undergraduate, graduate and Ph.D at the age of 19 and presenting his thesis with the introduction of the Black Hole irreducible mass with Ruffini. It was also recalled the Cressy Morrison award attributed to Ruffini while in Princeton University for the discovery of the first black hole in the galaxy Cygnus x 1 (see Fig. 29) as well as the Nobel Prize to Riccardo Giacconi (see Fig. 30) for the X-ray astronomy. In the acceptance speech of the award presented by the king of Sweden, prof. Giacconi recalled the fundamental contributions of Ruffini and his students.

The visit to Princeton gave the occasion to meet again Professor Frans Pretorius and the LIGO team, exchanging recent results and opening a new dialogue on detecting gravitational wave signals.

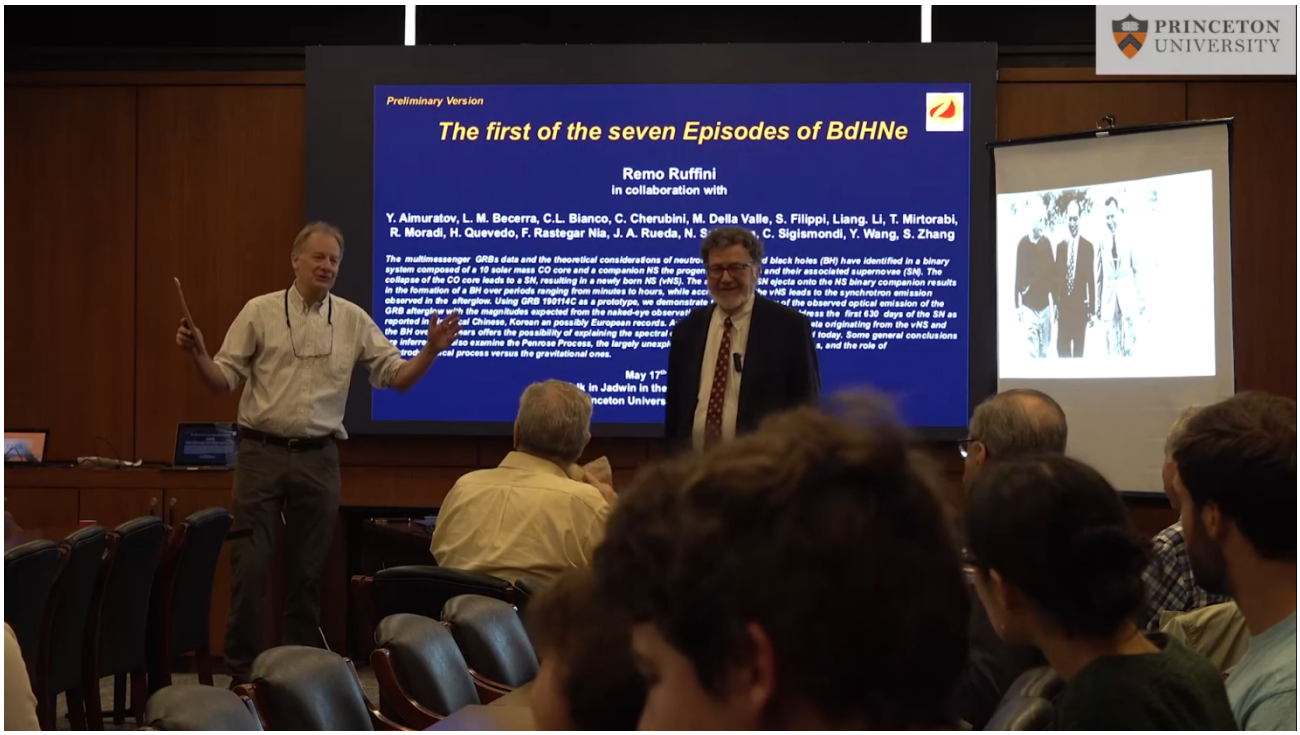

Fig 31: Lyman Page introducing in the Joe Henry room Princeton University, New Jersey, Ruffini on May 17, 2024. See link: http://www.kaltura.com/tiny/e871e

A 14 - What is the vision today?

We have given above the profound roots of ICRANet's success in the multiyear collaboration in China. In view of the above and the indications of the interest of the Chinese government to open new international centers in China, we are considering opening an institute in China, either by joining ICRANet directly as a member or through other joint collaborations. At the same time, we are considering the admission of new universities as members: the University of Tartu, where our joint Ph.D. student with Prof. Einasto, Daniela Calzetti, who has been nominated as a member of the US Academy of Sciences; and the Industrial University of Santander in Colombia, addressing the demands of the many scientific collaborations extending from Panama to the entire Latin and South America. This will possibly include Princeton University in view of ongoing new activities. We are also strengthening relations with both Stanford University and the University of Arizona in Tucson. Contact will continue with Kazakhstan, France, Germany, and Bremen, in view of the current positive results. Through and with Armenia, we are going to act positively in the entire Middle East region to assist the local scientific communities to overcome this extremely difficult period and provide support through their experienced scientists.

Specifically, ICRA, a member of ICRANet, plans to expand its membership in Europe, Africa, and Asia. One of its major goals is to strengthen the JIRA Ph.D program, of which one of the founding institutions is the University of Science and Technology of China (USTC), by admitting more international students. This plan is supported by the ICRANet Faculty and by all 85

institutions with signed collaboration agreements. In recent months, the University of D'Annunzio has applied to join ICRA and has already contributed two three-year fellowships to the JIRA Ph.D program. Two African universities, Tripoli and Tunis El Mana, are planning to sign collaboration agreements with ICRA. Additionally, the JIRA Ph.D program is ready to receive students from Kazakhstan.

As one of ICRA's founders, Abdus Salam, said at the Nobel Banquet, "The creation of Physics is the shared heritage of all mankind. East and West, North and South have equally participated in it." For decades, ICRA and ICRANet have been committed to promoting scientific exchange and collaboration between China and the West. Looking to the future, amidst the complex international landscape, we will stay true to our original aspirations and create a broader environment of mutual respect and cooperation, contributing to the collective scientific progress and well-being of humanity.

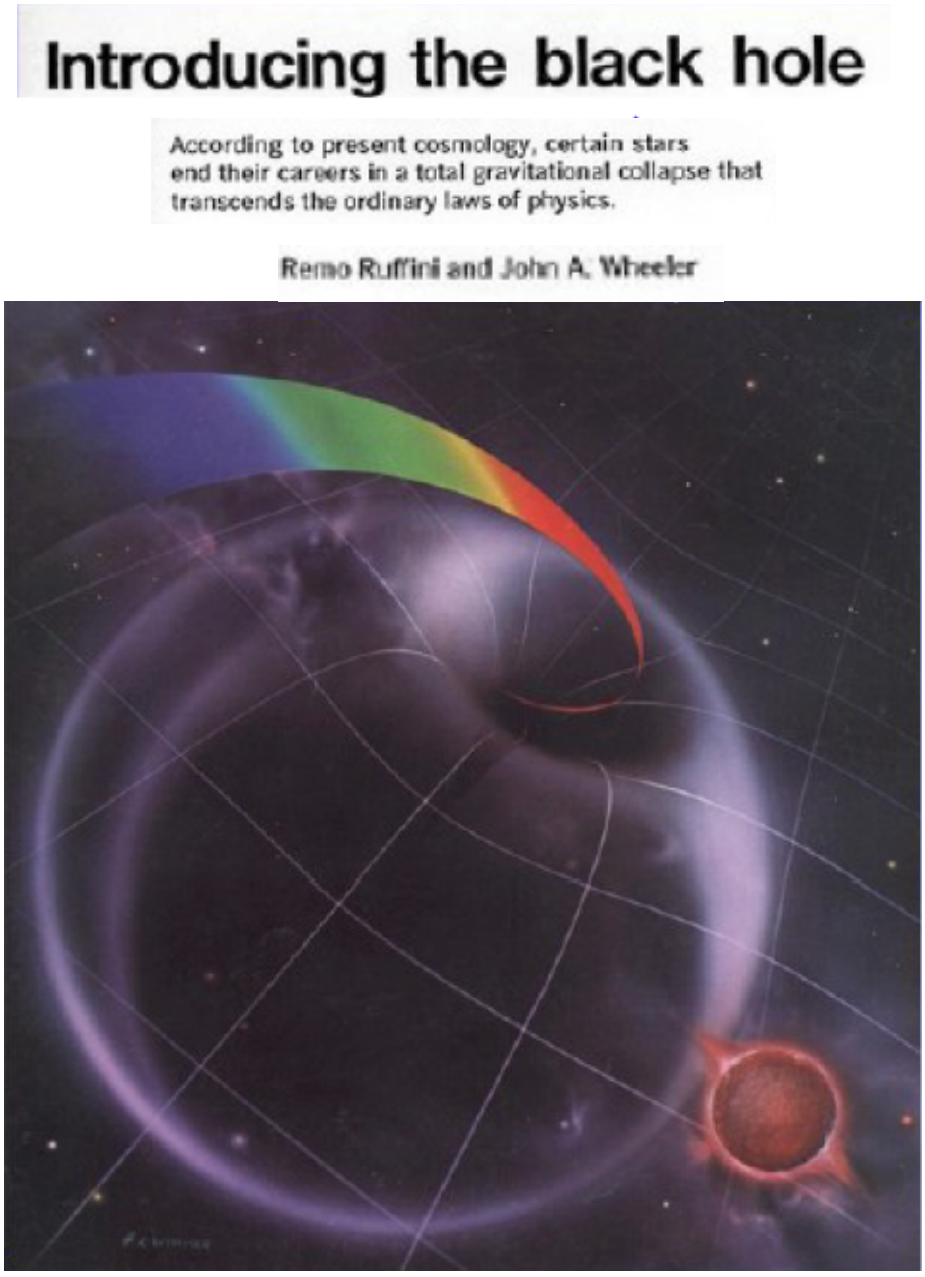

Fig. 32: figurative representation of a Black Hole in action.