C. V. Vishveshwara

The doyen of Indian gravitational physics, C. V. "Vishu" Vishveshwara, passed away from complications of pneumonia on 16 January 2017 in Bengaluru (formerly Bangalore), India. The "black hole man of India," as he was called by the Indian press, will be fondly remembered not only for his seminal contributions to understanding black holes but also for the lectures, popular books, and cartoons he created to educate colleagues and the public about the consequences of Einstein's theory of gravitation. His talks introduced generations of students to a career in science, as did his leadership at the Jawaharlal Nehru Planetarium and the Bangalore Association for Science Education.

Vishu was born on 6 March 1938 in Bangalore. He obtained a BSc in 1958 and an MSc in 1959, both from the University of Mysore. After getting his second master's, also in physics, from Columbia University in 1964, on the advice of his mentor Robert Fuller he moved to the University of Maryland for his PhD. His 1968 dissertation, "The stability of the Schwarzschild metric," was done under the direction of one of us (Misner).

During his time at Maryland, Vishu pursued broad interests that included literature—Hermann Hesse was a particular favorite—and judo; at the Corcoran School of Art, he took classes in drawing, a skill that he would later use to great effect in his popular talks and books. After getting his doctorate, he worked as a postdoctoral fellow and a visiting faculty member at the NASA Goddard Institute for Space Studies, New York University, Boston University, and the University of Pittsburgh before returning to Bangalore in 1976 to join the Raman Research Institute. He moved from there in December 1992 to the Indian Institute of Astrophysics, from which he retired in 2005.

Among Vishu's early classics on black holes is an elegant 1968 paper in which he used Killing vectors to provide a coordinate-invariant distinction between the rotating Kerr and static Schwarzschild black hole solutions and the consequent existence of an entrained region, known as the ergosphere, around a rotating black hole. His thesis on black hole stability under linear perturbations was praised by theoretical physicist Brandon

C. V. Vishveshwara

Carter: "Vishu was one of the first to appreciate [stability] . . . as something of potential astrophysical relevance [and provided] the first convincing proof that at least in one case, namely the Schwarzschild solution, such an equilibrium state can be stable."

Vishu used computer simulations to explore how black holes respond when externally perturbed; he found that any deformation imparted to a black hole relaxes via the emission of gravitational waves whose frequency and decay rate depend only on the black hole mass. Those characteristic waves, later named quasi-normal modes, are like dying tones of a bell struck with a hammer. As the calculations depend critically on the boundary conditions imposed at the black hole horizon, nothing observable could probe deeper into its structure than such ringdown radiations.

Vishu's discovery, which he published in 1970, began a new chapter in how to study black holes. Yet while he was completing his paper, NASA cut short his position at the institute because his work was on a supposedly pointless problem. He found support through Engelbert Schücking, who offered Vishu a position at New York University.

His ringdown paper was cited by the Laser Interferometer Gravitational-Wave Observatory (LIGO) and Virgo collaborations in 2016 in their first report of the detection of gravitational waves and their dynamic black hole sources; LIGO data contained the theoretical signature that Vishu had predicted 46 years earlier. Vishu was elated by the possibility that soon there would be other events where the quasi-normal modes, perhaps the most telling signature of a black hole, would be even more visible in the collision dynamics.

In his three decades at the Raman Research Institute and the Indian Institute of Astrophysics, Vishu explored various problems in classical general relativity with possible astrophysical implications. His books, including *Einstein's Enigma, or, Black Holes in My Bubble Bath* (Springer, 2006), and his public lectures were inspirations to students. He would lace them with subtle humor and his cartoons.

The Jawaharlal Nehru Planetarium in Bangalore is a wonderful testament to Vishu's vision and interest in science communication and education. As its founding director in 1988, Vishu brought together a dedicated team to build a world-class facility. In 1992 he set up the Bangalore Association for Science Education to systematically attract and mentor students from elementary schools, high schools, and colleges for a career in science.

We will miss you Vishu, even as we try very hard to follow your favorite lines from Antonio Machado: "Traveler, there is no path. Paths are made by walking."

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Yoshio Yamaguchi

Yoshio Yamaguchi, an icon of postwar Japanese high-energy physics and a strong advocate of international collaboration, died of pneumonia on 12 August 2016 in Tokyo.

Born on 29 January 1926 in Takefu, Japan, Yamaguchi received his bachelor's degree in physics in 1947 and a doctor of science degree in physics in 1953 from the University of Tokyo. His dissertation was entitled "Phenomenological analysis of meson processes."

AKIKO YAMAGUCHI, 2010

Yoshio Yamaguchi

In 1949 Yamaguchi joined Osaka City University as a cofounder of its particle-physics theory group. His proposal that the newly discovered particles in cosmic-ray collisions are created in pairs led to the eventual understanding of strange particles. Yamaguchi started his international career in 1953 at the University of Illinois at Urbana-Champaign; during his two years there, he proposed a separable nuclear potential.

In 1957 Yamaguchi was invited to the theory division at CERN. At the time, CERN was in its infancy, and the newly created theory division was attracting numerous superb physicists, with whom Yamaguchi had deep and fruitful interactions and developed close, lasting friendships. His experience during that period greatly influenced Yamaguchi's passion for international collaboration throughout the rest of his life.

Yamaguchi played a vital role in evaluating and consulting on experimental programs at CERN. According to local legend, anyone seeking to get a new research experiment approved first had to convince him to support it. His four years at the organization convinced him that experimental study and verification by means of accelerators were crucial to advancing high-energy physics. While at CERN, he also laid the groundwork for a theory on *SU*(3) and other flavor symmetries in particle physics.

After leaving CERN, Yamaguchi went to the Institute for Nuclear Study (INS) at the University of Tokyo as head of the theory group. In 1968 he moved to the university's physics department, where he taught and supervised many students. He was not only an excellent researcher but also a dedicated educator. His enthusiasm for and deep knowledge of high-energy physics inspired many young scientists. As one of his students, I witnessed lively discussions every week during and after his High Energy Physics lectures, which attracted many students and staff members.

Yamaguchi strongly believed that significant progress can be achieved only if experimental and theoretical physics researchers work hand in hand. He made great efforts to establish experimental high-energy physics by introducing high-energy proton accelerators in Japan. He was instrumental in the creation of the National Laboratory for High Energy Physics and of KEK, the High Energy Accelerator Research Organization.

An excellent manager, Yamaguchi returned to the INS as director in 1983 until his retirement in 1986. He was a cofounder and chair of the International Committee for Future Accelerators, which promoted a worldwide network of collaborations. As a member of the Scientific Policy Committee at CERN, he was responsible for, among other things, further promoting international collaborations. He served as president of the Physical Society of Japan in 1986–87. In 1993 he became the first person from Japan to be elected president of the International Union of Pure and Applied Physics. Yamaguchi contributed a great deal to the creation of the Association of Asia Pacific Physical Societies and the Asia Pacific Center for Theoretical Physics.

Yamaguchi had a tasteful knowledge of the culture of Japan and the world, especially of the classical period. He often impressed colleagues with his memory of his many intellectual conversations with them. His talks were full of wit and humor, which was somewhat exceptional for a Japanese person. Some years ago his friends and students had a chance to listen to his stories about physics and physicists from the early days of postwar Japan; the stories were so vivid that they left a lasting impression. Many of us pray sincerely that Yamaguchi's hope and enthusiasm for international collaboration and high-energy physics will inspire the coming generation of researchers in Japan and around the world.

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