John Peter Huchra

John Peter Huchra, unparalleled observer of galaxies and people and co-discoverer of the pervasive filamentary distribution of galaxies in the universe, died suddenly of a heart attack at his home in Lexington, Massachusetts, on 8 October 2010.

Born in Jersey City, New Jersey, on 23 December 1948, Huchra was proud of being a "Joisey boy" of humble origins. The writings of George Gamow and Fred Hoyle inspired him to study hard in high school, and he gained entry to MIT in 1966. His senior thesis on a theoretical study of globular clusters, done under Icko Iben, formed the basis of his first two papers in the *Astrophysical Journal*. He arrived at Caltech for graduate school in the fall of 1970, reportedly with a pocket protector in his shirt and slide rule on his belt, ready to study theoretical astrophysics. Under the guidance of Wallace Sargent, he became interested in observations, particularly of galaxies. Using the 100-inch Hooker telescope, built in 1917, he studied Markarian galaxies for his thesis.

He went to the Harvard–Smithsonian Center for Astrophysics (CfA) in 1976 and rose to the positions of senior scientist at the Smithsonian Astrophysical Observatory, the Robert O. and Holly Thomis Doyle Professor of Cosmology, and senior adviser to the provost for research policy at Harvard University. He was legendary for the number of nights he spent observing at telescopes. The results were published in 336 papers with more than 33 000 citations.

Over a span of 25 years Huchra worked with Margaret Geller to study the distribution of galaxies. Their 1986 landmark paper, written with student Valérie de Lapparent and entitled "A slice of the universe," transformed current ideas about how matter is distributed in the universe. Using the first results from the partially completed second CfA redshift survey, the paper showed that galaxies are distributed in filaments, sheets, and "frothy" structures, surrounding vast voids.

Those structures trace the unseen distribution of dark matter. Critical to Huchra and Geller's success was the advent of sensitive electronic detectors that made telescope measurements of galaxy redshifts relatively easy. A galaxy's redshift is related to its distance by the Hubble constant H_o, thereby providing the vital third spatial coordinate. Also crucial was their clever

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idea to select a thin slice for a search space, which efficiently revealed the unusual distribution of galaxies with a relatively small sample. Their pioneering work on 1100 galaxies has now been expanded through a worldwide effort to encompass more than 2 million galaxies.

Huchra was a major force behind the Two-Micron All Sky Survey, which produced a catalog of more than a million galaxies in the relatively nearby universe at IR wavelengths; at those wavelengths, the observations were largely unbiased by dust absorption problems.

Another focus of Huchra's research was the precise determination of the Hubble constant. He worked with Marc Aaronson and others in the mid 1980s to estimate its value using the Tully–Fisher relationship for IR galaxies and thereby entered the contentious debate over the value. Later he worked on a decade-long *Hubble Space Telescope* project, led by Wendy Freedman, that achieved the best value at the time (2001) for H_o, 72 ± 8 km s^{-1} Mpc^{-1}. For the book *Our Universe* (Cambridge University Press, 2001), Huchra wrote a wonderful autobiographical sketch, "Mapmaker, mapmaker, make me a map," still available on his CfA webpage.

A leader in the astronomy community, Huchra served as president of the American Astronomical Society from 2008 to 2010 and vice chair of the National Research Council's committee for the 2010 decadal survey of astronomy and astrophysics. The report was dedicated to his memory.

Huchra shared his knowledge and observing skills with students and young scientists in many different settings. His favorite lecture course, which he taught for 20 years, dealt with the principles of astronomical measurements. "For future observers," he wrote, "[the course] is a set of lessons in how not to make really egregious mistakes. For future theorists it is a set of lessons in how much to believe any set of data." At his memorial service in December, many students from his freshman seminar on galaxies and cosmology spoke movingly of his sense of humor, challenging questions, mathematical puzzles, and accessibility.

Because he cared deeply about gender justice, Huchra used his considerable influence to help correct the historical inequality of opportunity and recognition for women in science. He also had a finely honed sense of fair play and often lectured on ethical issues that scientists face. At the time of his death he was preparing a course at Harvard on the topic.

From 1997 until his death, Huchra was the director of graduate studies in the astronomy department. He worked tirelessly to counsel students in academic difficulty. He opened his home to students, especially over holidays, and he relished cooking for them. An avid outdoorsman, he took students hiking in the New Hampshire White Mountains, crossed the Grand Canyon on foot, and canoed down Arctic-bound Canadian rivers.

Those who knew him will remember a few of Huchra's favorite phrases. Huchra would often say that he was so busy counting galaxies, he did not get married until rather late in life. When asked about any problems he might be having, he would inevitably scowl and say good-naturedly, "Don't ask." When queried about a sensitive or controversial issue, he would usually parry with, "We'll discuss that over a few beers." Sadly, there will be no more beers to be shared.

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Oleg Aleksandrovich Lavrentyev

Oleg Aleksandrovich Lavrentyev, regarded as a founding father of Soviet fusion research, died of cardiac arrest on 10 February 2011 in Kharkov, Ukraine.

Lavrentyev was born on 7 July 1926 in Pskov, Soviet Union. He became interested in nuclear physics in his youth after reading a book about it, but his

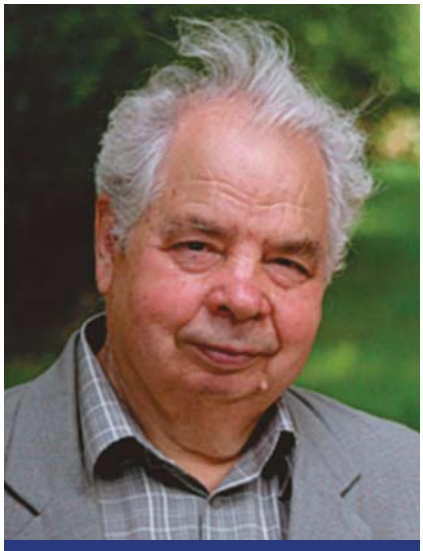
quest to learn more was put on hold after the outbreak of World War II. In 1944, with only an eighth-grade education, he crossed the front line and volunteered in the Soviet army as an artilleryman. After the war he continued service in the army as a signalman on Sakhalin Island until July 1950. In the army's library on the island, Lavrentyev read all the books he could find on math, physics, and chemistry. He learned about the atomic bomb and attempts to create a hydrogen one.

Lavrentyev sent a letter to the Kremlin saying, "I know the secret of the hydrogen bomb." An officer sent by the Kremlin to interrogate Lavrentyev gave him two weeks to put his ideas in writing. In two weeks during July 1950, he secretly wrote the report, in which he confidently declared that a hydrogen bomb could be made with lithium-6 deuteride and initiated by a huge pulse of neutrons from a nuclear fission bomb to create tritium and facilitate deuterium–tritium thermonuclear fusion reactions.

In the report, Lavrentyev also advocated developing, for peaceful applications, a nuclear fusion reactor in which spherical electrostatic grids would accelerate and confine plasma. The proposal, made independently before others published their work on the topic, initiated the Soviet program on controlled thermonuclear fusion research. Lavrentyev's report, which Andrei Sakharov reviewed positively, inspired Sakharov and Igor Tamm to consider using magnetic fields for fusion reactors.

Lavrentyev enrolled in Moscow State University in August 1950. During an accelerated program of study, he proposed an "electromagnetic trap" that would confine plasma by electrostatic plugging of magnetic cusps.

Several months elapsed before government officials finally contacted Lavrentyev about the report. The nuclear weapons program, overseen by secret police chief Lavrenti Beria, provided him with an apartment and a tutor. But in 1953, before Lavrentyev graduated, Joseph Stalin died, and Beria was executed. People wrongly associated Lavrentyev with Beria, which led to Lavrentyev's being ostracized and not receiving a promised job at the nuclear weapons development laboratory (now the Kurchatov Institute).



Oleg Aleksandrovich Lavrentyev

In April 1956 Lavrentyev was hired by the Kharkov Physical-Technical Institute (now the Kharkov Institute of Physics and Technology) in Ukraine, where he worked his entire career. In 1966, under the direction of Boris Safronov, he completed his *Kandidat* dissertation—on electromagnetic traps—at the institute.

Lavrentyev built small electromagnetic traps, but he was unable to construct a bigger machine after his supervisor, Anatoly Kalmykov, died and funding was cut. Although he never received adequate financial support, Lavrentyev was still able to pursue his research on a low budget.

Lavrentyev developed the theory of plasma confinement and heating in electromagnetic traps; it included the lifetime of ions diffusing in velocity space over the potential barrier and the reduction of the potential barrier by electron space charge in the gaps between the anodes. He analyzed the collisionless heating of ions during electron-beam injection and determined the electron loss rates by diffusion across and along the magnetic field and in velocity space over the electrostatic potential barrier of the cathodes. In his Jupiter 2M experiment, Lavrentyev and his group measured the predicted potential well and demonstrated that electron cross-field diffusional losses were nearly classical.

In 2004 Lavrentyev was awarded a doctor of sciences degree by the Kharkov National University for his thesis "Electrostatic and electromagnetic traps of high-temperature plasma." In his later years, he designed a 4-GW "Elemag" thermonuclear reactor, a powerful neutron source for materials testing. He devised a mechanism to directly convert electron thermal energy into electricity and demonstrated it at low currents. Five students earned their *Kandidat* degrees under his leadership. He wrote or cowrote more than 100 scientific articles and had 30 inventions. He was named the 2003 Honored Worker in Science and Technology of the Ukraine and was awarded the 2004 K. D. Sinelnikov Prize of the Ukrainian Academy of Sciences for excellence in plasma physics.

Lavrentyev will be remembered for his innovative vision, patient persistence, gentle manner, and kindness, and for inspiring the field of nuclear fusion research in the Soviet Union.

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