obituaries

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Stanley Sweet Hanna

Nuclear physicist Stanley Sweet Hanna, who retired from the physics faculty of Stanford University in 1991, died on 27 December 2012 in Palo Alto, California.

Born in Sagaing, Burma, on 17 May 1920, Stan was the third child of missionary parents. At age 14 he was sent to the US for his education. He attended Denison University, where he was elected to Phi Beta Kappa and graduated in 1941 with a bachelor of arts degree.

Stan then entered graduate school at the Johns Hopkins University, but during World War II his graduate training was interrupted while he served one year in the US Army at the Los Alamos Laboratory. After returning to his graduate study, he earned a PhD in physics in 1947 under Gerhard Dieke. He became an instructor and later an assistant professor at Johns Hopkins until 1955, when he joined the research faculty staff at Argonne National Laboratory. In 1958–59 he spent a year at Oxford University as a Guggenheim fellow, and in 1963 he joined the physics faculty at Stanford, where he taught and conducted research for the rest of his career.

Stan's work was characterized by his outstanding capacity for experimental innovation. That was especially evident in his use of the Mössbauer effect to discover the nuclear Zeeman splitting in iron-57. His interpretation of that spectral feature led to a determination of the magnetic moment of the nucleus's excited state and gave the direction and magnitude of the hyperfine field that was unexpectedly opposite to the magnetic field's direction. Stan observed the first nuclear Zeeman splitting of tin-119, a "nonmagnetic" atom, in a magnetic alloy. He extended his study of hyperfine fields to implanted ions and free ions. He utilized large decoupling fields to preserve nuclear alignment and to measure nuclear *g*-factors.

Stan broke new ground in using large sodium iodide crystals to study gamma rays from giant resonances in a number of nuclei. Those studies resulted in the determination of resonant

Stanley Sweet Hanna

structures of intermediate width, constancy of the angular distributions, and isospin splitting in the resonances and in the detection of quadrupole radiation. He introduced the use of polarized protons to obtain definitive measurements of electric quadrupole and dipole resonances and their configurations.

In his study of analog states, Stan was the first to observe $\Delta T = 2$ isospin resonances and their radiative decay. He developed the method of producing polarized beta-emitting nuclei by using a polarized gas-jet target in a nuclear reaction. He employed the pion charge-exchange reaction to excite analog giant resonances in light nuclei and to show convincingly the existence of isospin splitting.

Producing such a large number and variety of essential contributions clearly distinguished Stan as a leader in the field of nuclear physics. His achievements were recognized worldwide with many awards from and visiting professorships at universities and institutions abroad. He received two Alexander von Humboldt Awards, one from the Max Planck Institute for Nuclear Physics in Heidelberg, Germany, in 1977 and the other from Marburg University in Marburg, Germany, in 1989. Among the foreign institutions he taught at were the Weizmann Institute of Science in Rehovot, Israel, in 1969–70; Osaka University in Japan in 1972; and the Centre de Recherches Nucleaires in Strasbourg, France, in 1984.

At conferences worldwide, Stan presented more than 100 invited lectures based on his 167 refereed journal articles. His abiding leadership was recognized when he was elected chairman of the American Physical Society's division of nuclear physics in 1976–77. He also served on the society's executive committee in 1979–82.

The appreciation that Stan's colleagues and graduate students had for him was expressed during the retirement symposium held at Stanford in honor of his 70th birthday in 1991. A *zeitschrift* based on the symposium and including other relevant papers was published in 1994.

Throughout his long career, Stan gave generously of himself to all with whom he interacted. As an adviser, role model, confidant, and friend, he saw each person as an individual, acknowledging strengths, helping overcome weaknesses, giving encouragement, and enthusiastically praising success. Having thus touched the lives and careers of so many students and colleagues, Stan has left a lasting legacy to be cherished by those who knew him.

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Adilet Imambekov

A rising star in the field of quantum many-body physics, Adilet Imambekov died on 18 July 2012 at age 30 while climbing Khan Tengri mountain in Kazakhstan. Despite his youth, Adilet made key contributions to the field of strongly correlated systems; in particular, he devised a new conceptual framework for describing universal dynamics of one-dimensional quantum systems. Adilet's work was distinguished by a combination of deep physical insight, mathematical rigor, and elegance.

Born on 2 September 1981, Adilet grew up in Zhambyl (now Taraz) and Almaty, Kazakhstan. His extraordinary abilities were evident by age 14, when he won national physics and mathematics competitions, then attended one of the former Soviet Union's best science high schools, Kolmogorov Lyceum in Moscow. Adilet became the first student in 14 years to graduate with highest

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Adilet Imambekov

honors. As a physics Olympiads competitor, he took first-place prizes in the 1997 and 1998 National Russian Olympiads and received a gold medal at the 1998 International Physics Olympiad.

Adilet continued his studies at the Moscow Institute of Physics and Technology. In his junior year, he passed several Landau Theoretical Minimum exams. He then received his basic theoretical physics training as a member of the Laudau Institute's theoretical group.

After going to Harvard University in 2002 for his PhD studies, Adilet joined the group of one of us (Demler) and concentrated on many-body physics of cold atoms. His first work, which still serves as a guide for new experiments, predicted numerous exotic states for bosons with nonzero spin in an optical lattice.

With his unique ability to fuse ideas from solid-state physics, atomic physics, and mathematics, Adilet was able to make progress in difficult problems when other attempts failed. His approach to the problem of interference between low-dimensional Bose condensates provides a good example. Adilet came up with a beautiful mapping of the problem at hand onto a seemingly unrelated one of statistical properties of random surfaces. His work became instrumental for the interpretation of subsequent experiments in which a new universal dynamical phenomenon, prethermalization, was demonstrated.

Adilet uniquely combined mathematical intuition with deep insight into the physics of quantum phenomena. He went to Yale University to work with another of us (Glazman) as a postdoc in 2007 and became interested in the dynamics of 1D quantum fluids, conventionally described by the widely known Luttinger liquid theory. In simplifying the problem, the standard theory artificially imposes symmetry that distorts a fluid's true dynamic response functions; Adilet's contributions were essential to building a theory free of such artificial assumptions. He combined the existing perturbative results with his own analysis of an integrable Lieb–Liniger model and foresaw the emerging universal dynamic properties of a fluid.

Less than a year later, Adilet built what he called the nonlinear Luttinger liquid theory, which universally describes low-energy excitations of a fluid made of particles with a generic, nonlinear dispersion relation. The theory's beauty is in its simplicity and versatility. It answered the existing questions about the dynamic responses while also providing a platform for tackling other, more difficult issues. While Adilet was making big strides toward developing a theory of quantum quenches and a kinetic theory of nonlinear Luttinger liquid, he joined Rice University as a junior faculty member in 2009.

Remarkably, Adilet's demeanor did not change despite the challenges of being a tenure-track faculty member. He remained warm and open. He quickly forged collaborations with his Rice colleagues and ventured into, for him, a new area of solid-state optics.

Adilet pursued his interests with utmost commitment. For example, when he began graduate school at Harvard, he became fascinated with climbing, mountaineering, and endurance sports. He started training nearly every day, which included running along the Charles River and rock climbing in New Hampshire when possible. Within a few years, he conquered two challenging mountains in Alaska and China and became rather well known among climbers. He also twice qualified for the Boston Marathon, and in May 2012 he won his only Ironman triathlon competition.

Each of us cherished every opportunity to talk to or collaborate with Adilet. He had a wonderful sense of humor and often brightened even the most challenging and confusing physics topic with an unexpected joke.

Adilet's commitment and love of life inspired many of his friends to pursue their own dreams. He showed by example that little is impossible if you are dedicated. Before going on his last trip to Kazakhstan, Adilet was talking to one of us about how one should attempt to get the most valuable result in the most intellectually challenging problem rather than concentrating on getting every paper published: "There is simply too little time," he said. Indeed, Adilet was given very little time. But it was enough for him to make long-lasting contributions to physics and to deeply affect the lives of those who were fortunate enough to know him.

Dmitry Abanin
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Waterloo, Ontario, Canada
Leonid Glazman
Yale University
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Eugene Demler
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Akira Tonomura

Akira Tonomura, a Hitachi fellow who developed electron holography and a group director at the RIKEN Advanced Science Institute, passed away in Hidaka, Japan, on 2 May 2012 after his fight against pancreatic cancer.

Tonomura was born on 25 April 1942 in Hyogo Prefecture, Japan. He graduated from the department of physics at the University of Tokyo in 1965 and immediately joined the Central Research Laboratory of Hitachi Ltd. Tonomura was motivated to join the lab because of Hiroshi Watanabe, who, with a single electron micrograph, proved the Bohm–Pines plasma oscillation theory by using electron energy-loss spectroscopy. On

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