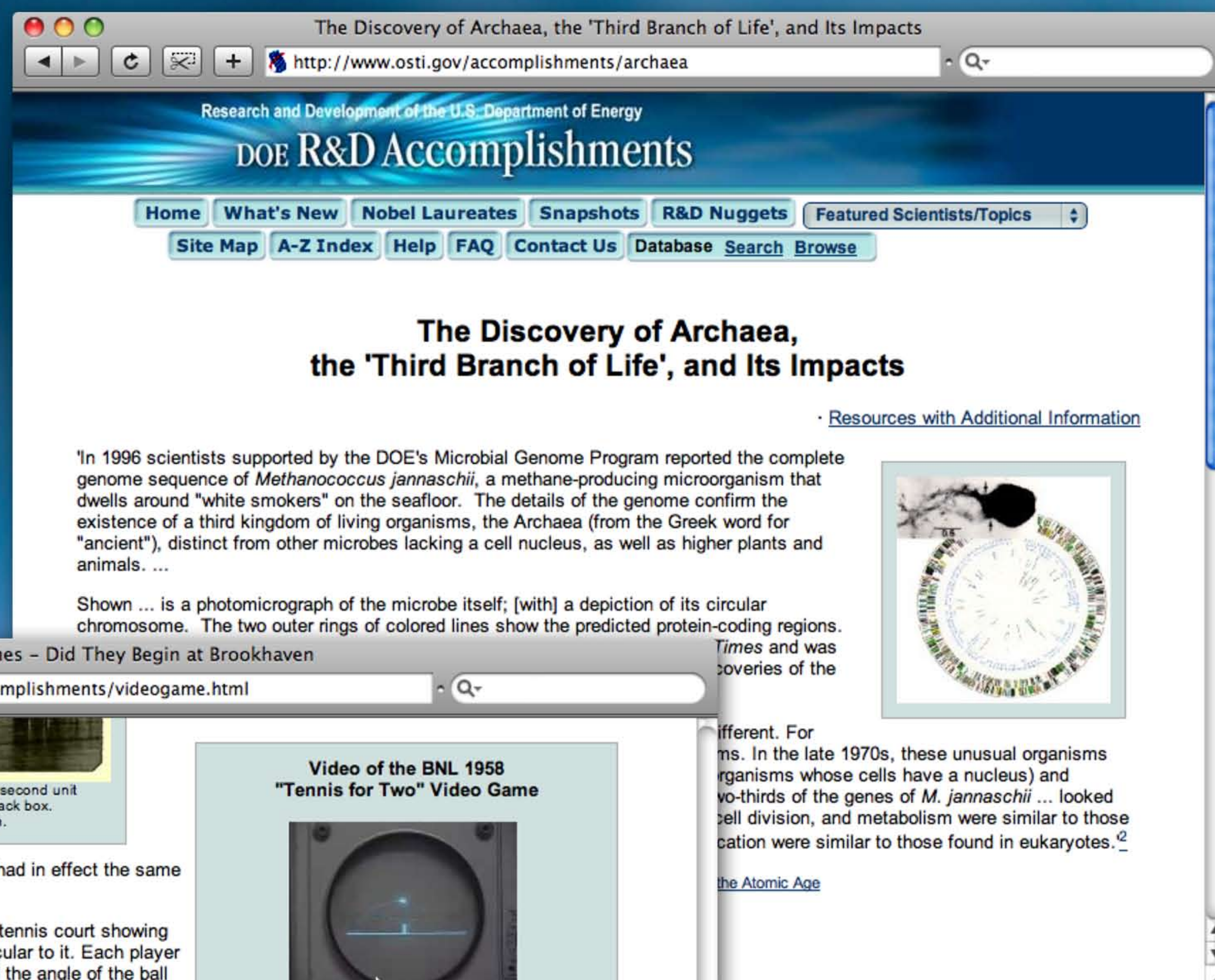


# DOE R&D Accomplishments

Examples from  
a Special Collection

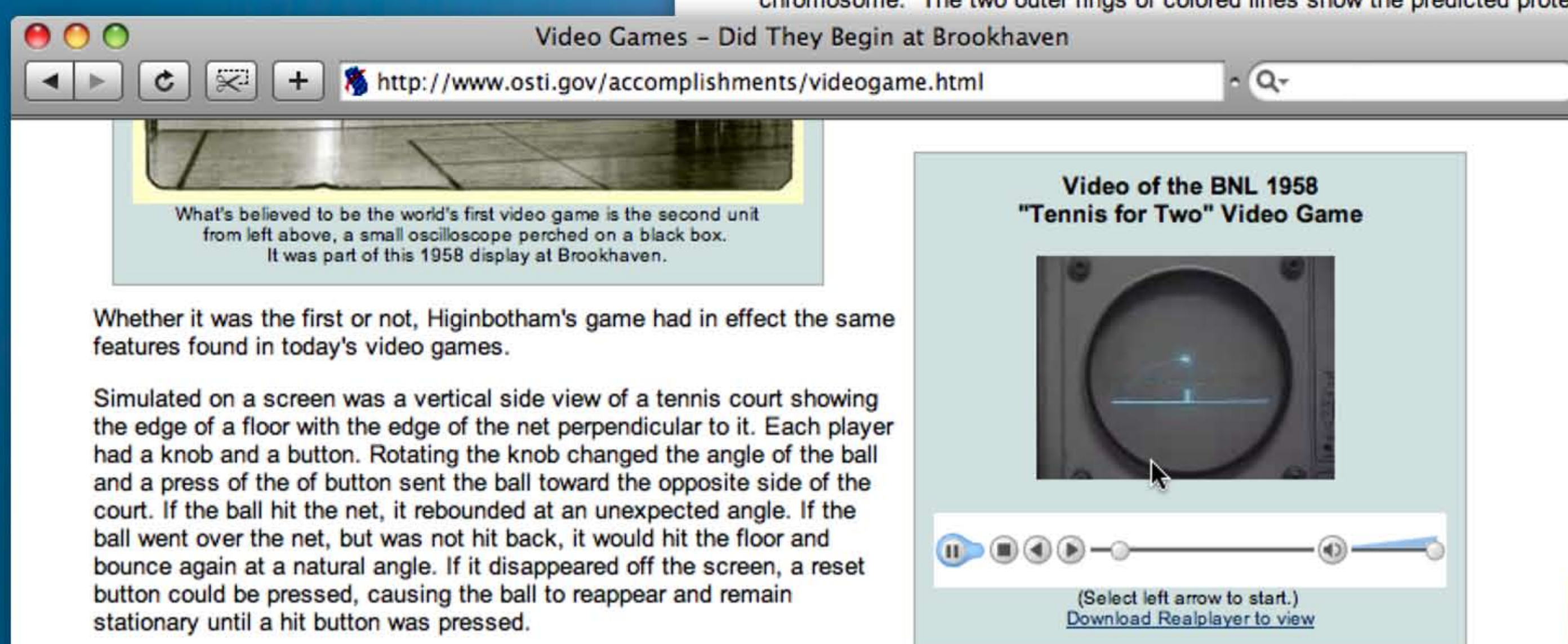



The Discovery of Archaea, the 'Third Branch of Life', and Its Impacts

Resources with Additional Information

In 1996 scientists supported by the DOE's Microbial Genome Program reported the complete genome sequence of *Methanococcus jannaschii*, a methane-producing microorganism that dwells around "white smokers" on the seafloor. The details of the genome confirm the existence of a third kingdom of living organisms, the Archaea (from the Greek word for "ancient"), distinct from other microbes lacking a cell nucleus, as well as higher plants and animals. ...

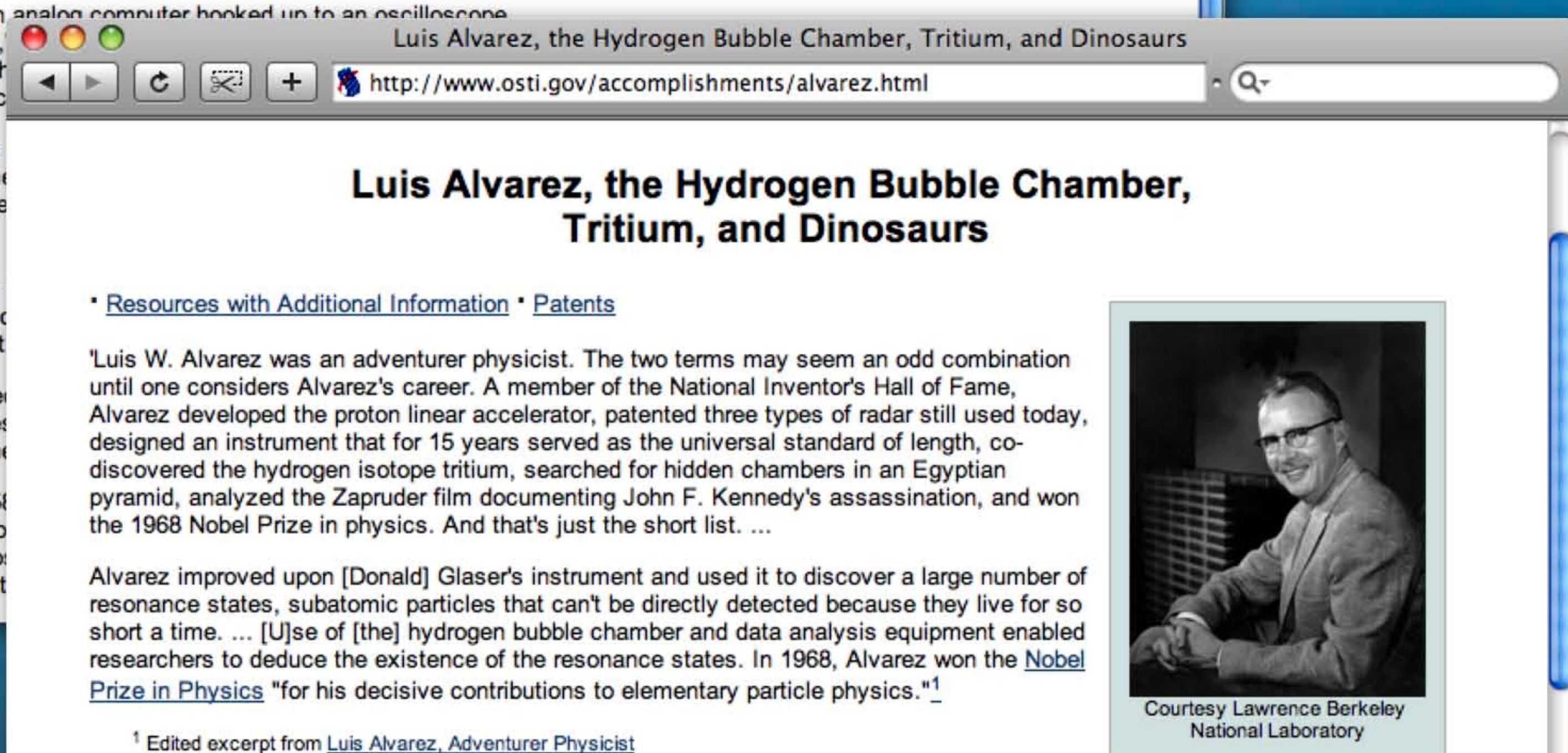

Shown ... is a photomicrograph of the microbe itself; [with] a depiction of its circular chromosome. The two outer rings of colored lines show the predicted protein-coding regions.



Video Games - Did They Begin at Brookhaven

Whether it was the first or not, Higinbotham's game had in effect the same features found in today's video games.

Simulated on a screen was a vertical side view of a tennis court showing the edge of a floor with the net perpendicular to it. Each player had a knob and a button. Rotating the knob changed the angle of the ball and a press of the button sent the ball toward the opposite side of the court. If the ball hit the net, it rebounded at an unexpected angle. If the ball went over the net, but was not hit back, it would hit the floor and bounce again at a natural angle. If it disappeared off the screen, a reset button could be pressed, causing the ball to reappear and remain stationary until a hit button was pressed.

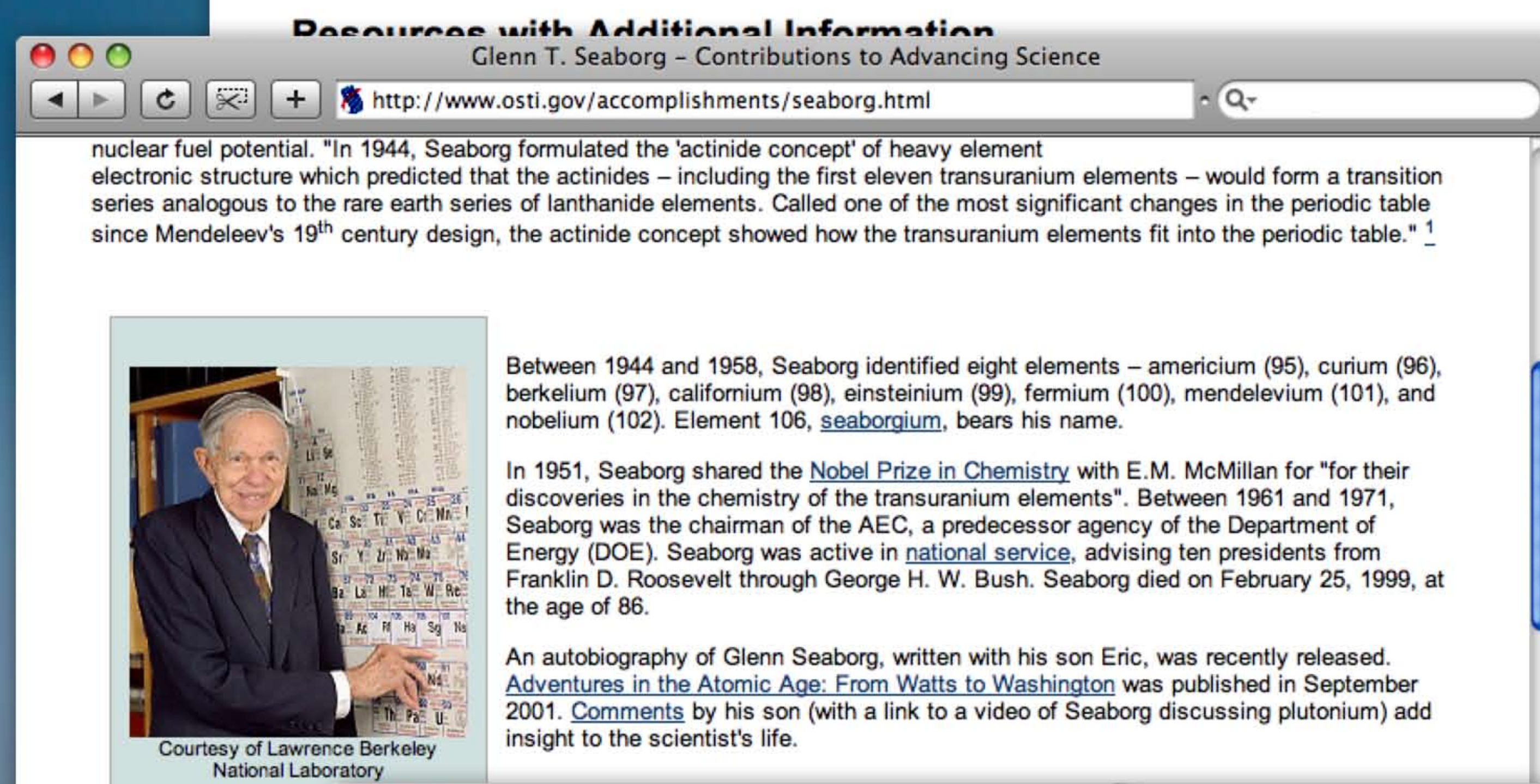



Luis Alvarez, the Hydrogen Bubble Chamber, Tritium, and Dinosaurs

Resources with Additional Information Patents

Luis W. Alvarez was an adventurer physicist. The two terms may seem an odd combination until one considers Alvarez's career. A member of the National Inventor's Hall of Fame, Alvarez developed the proton linear accelerator, patented three types of radar still used today, designed an instrument that for 15 years served as the universal standard of length, co-discovered the hydrogen isotope tritium, searched for hidden chambers in an Egyptian pyramid, analyzed the Zapruder film documenting John F. Kennedy's assassination, and won the 1968 Nobel Prize in physics. And that's just the short list. ...

Alvarez improved upon [Donald] Glaser's instrument and used it to discover a large number of resonance states, subatomic particles that can't be directly detected because they live for so short a time. ... [U]se of [the] hydrogen bubble chamber and data analysis equipment enabled researchers to deduce the existence of the resonance states. In 1968, Alvarez won the Nobel Prize in Physics "for his decisive contributions to elementary particle physics." ...



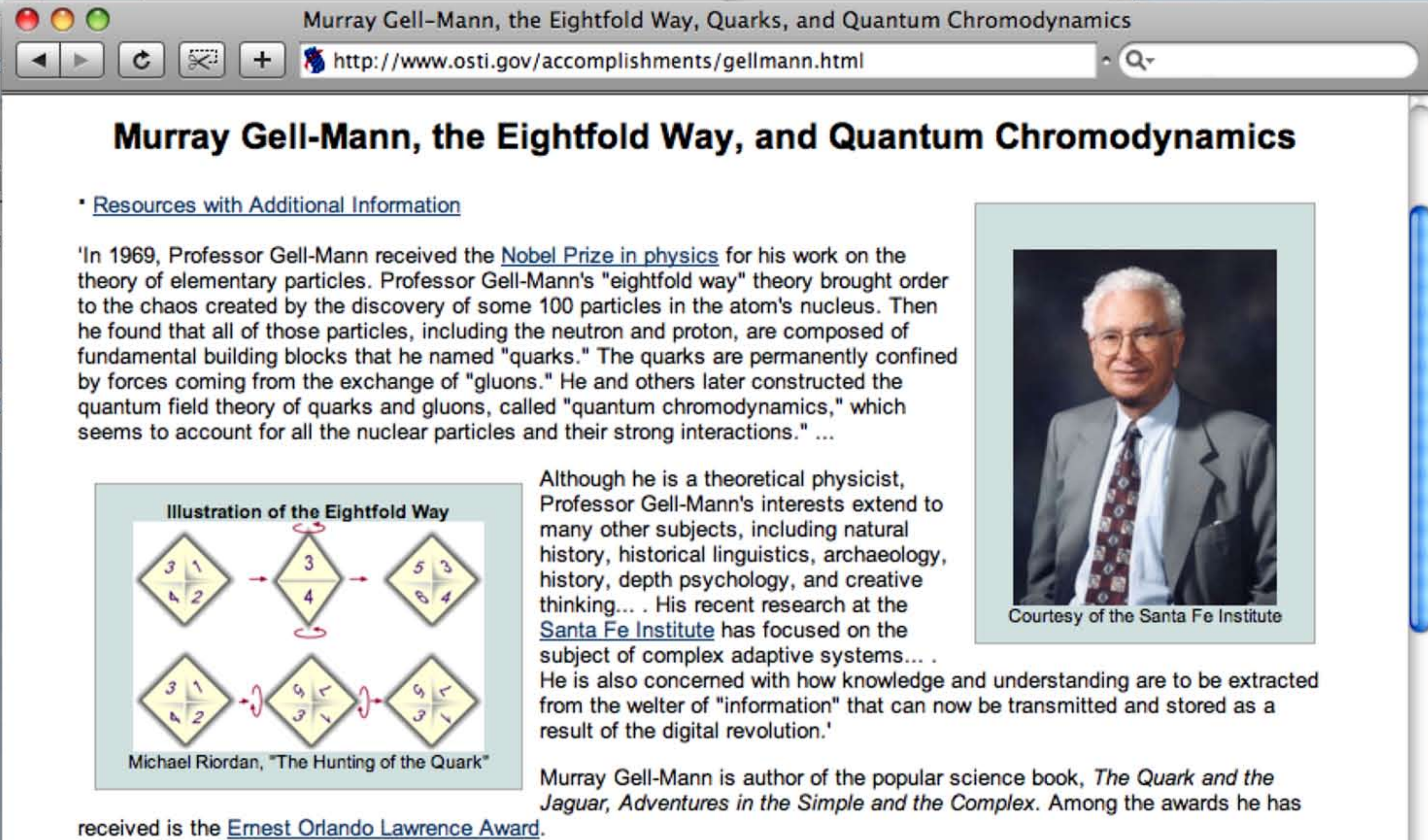

Glenn T. Seaborg - Contributions to Advancing Science

nuclear fuel potential. "In 1944, Seaborg formulated the 'actinide concept' of heavy element electronic structure which predicted that the actinides - including the first eleven transuranium elements - would form a transition series analogous to the rare earth series of lanthanide elements. Called one of the most significant changes in the periodic table since Mendeleev's 19<sup>th</sup> century design, the actinide concept showed how the transuranium elements fit into the periodic table." ...

Between 1944 and 1958, Seaborg identified eight elements - americium (95), curium (96), berkelium (97), californium (98), einsteinium (99), fermium (100), mendelevium (101), and nobelium (102). Element 106, seaborgium, bears his name.

In 1951, Seaborg shared the Nobel Prize in Chemistry with E. M. McMillan "for their discoveries in the chemistry of the transuranium elements". Between 1961 and 1971, Seaborg was the chairman of the AEC, a predecessor agency of the Department of Energy (DOE). Seaborg was active in national service, advising ten presidents from Franklin D. Roosevelt through George H. W. Bush. Seaborg died on February 25, 1999, at the age of 86.

An autobiography of Glenn Seaborg, written with his son Eric, was recently released. *Adventures in the Atomic Age: From Watts to Washington* was published in September 2001. Comments by his son (with a link to a video of Seaborg discussing plutonium) add insight to the scientist's life.

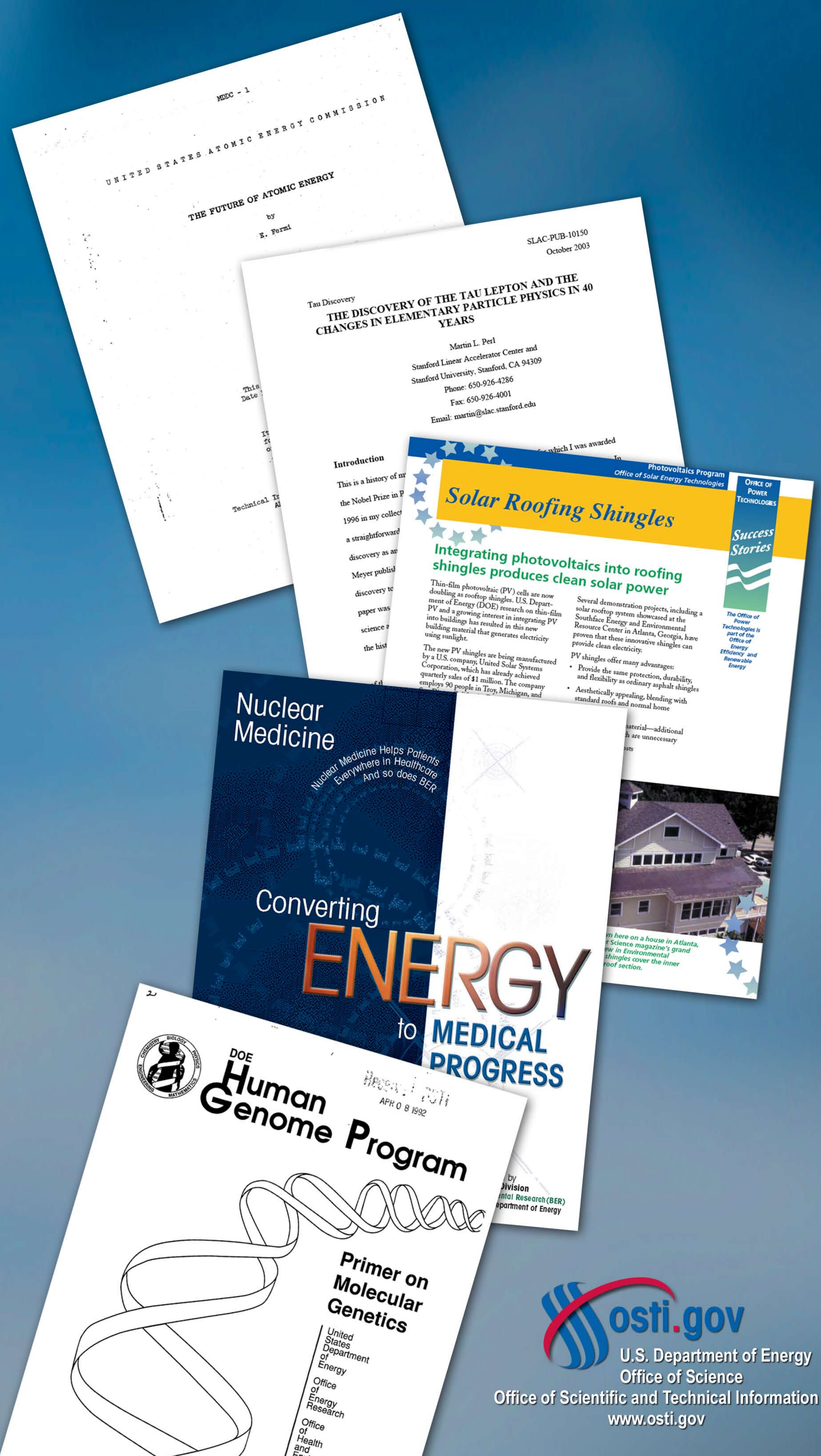

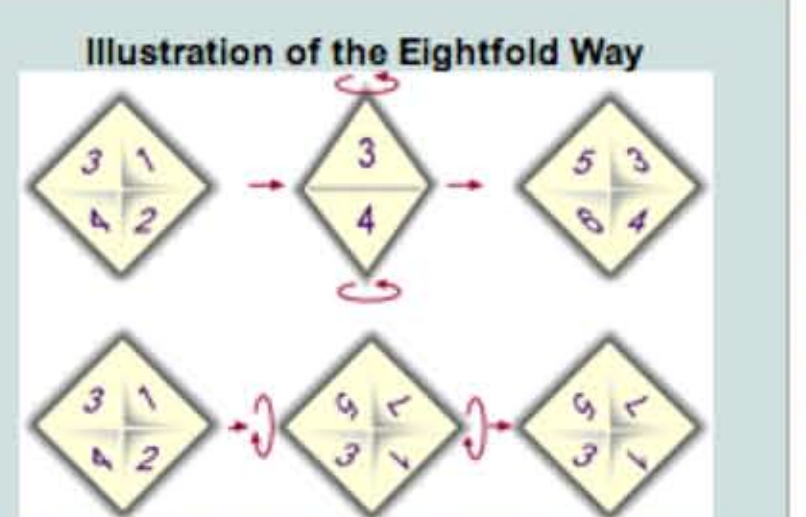


Murray Gell-Mann, the Eightfold Way, Quarks, and Quantum Chromodynamics

Resources with Additional Information

"In 1969, Professor Gell-Mann received the Nobel Prize in physics for his work on the theory of elementary particles. Professor Gell-Mann's "eightfold way" theory brought order to the chaos created by the discovery of some 100 particles in the atom's nucleus. Then he found that all of those particles, including the neutron and proton, are composed of fundamental building blocks that he named "quarks." The quarks are permanently confined by forces coming from the exchange of "gluons." He and others later constructed the quantum field theory of quarks and gluons, called "quantum chromodynamics," which seems to account for all the nuclear particles and their strong interactions." ...

Although he is a theoretical physicist, Professor Gell-Mann's interests extend to many other subjects, including natural history, historical linguistics, archaeology, history, depth psychology, and creative thinking. ... His recent research at the Santa Fe Institute has focused on the subject of complex adaptive systems. ... He is also concerned with how knowledge and understanding are to be extracted from the welter of "information" that can now be transmitted and stored as a result of the digital revolution.



THE FUTURE OF ATOMIC ENERGY

THE DISCOVERY OF THE TAU LEPTON AND THE CHANGES IN ELEMENTARY PARTICLE PHYSICS IN 40 YEARS

Solar Roofing Shingles

Integrating photovoltaics into roofing shingles produces clean solar power

Nuclear Medicine

Converting ENERGY to MEDICAL PROGRESS

DOE Human Genome Program

Primer on Molecular Genetics