

In Memoriam

Yuval Ne'eman 1925-2006

Yuval Ne'eman, distinguished theoretical physicist, soldier, politician, university president, and Israeli minister of science, died on 26 April 2006 in Tel Aviv, Israel.

Yuval was born in Tel Aviv in 1925; his parents descended from families that in the 19th century arrived in that part of the Ottoman Empire that later became Israel. He carried the name of his great-grandfather, who was one of the first watchmakers in the region and who installed the first clock on the Jaffa clock tower built by the Ottoman Sultan Abdul Hamid II in 1906.

Except for a few years with his parents in Egypt, Yuval spent most of his childhood in Tel Aviv. He graduated from high school at age 15, received an engineering degree from the Technion-Israel Institute of Technology in Haifa at the age of 20, and then started working at the family water-pump factory. At age 15 he also enlisted in the Haganah, the Jewish underground organization that later became the Israeli army. When Israel declared its independence on his 23rd birthday, Yuval was an infantry officer fighting the invading Egyptian army. After the war ended, he advanced in the military, reaching the rank of colonel, and was put in charge of military planning and later promoted to deputy head of military intelligence.

His true intellectual passion was always physics. He studied engineering primarily to satisfy the family wish of continuing to produce water pumps for most of the Jewish and Arab farmers in the country. But an encounter with a Hebrew translation of Arthur Eddington's book *The Nature of the Physical World* (Cambridge U. Press, 1928) re-ignited his never-ending love affair with theoretical physics.

Yuval studied at a military college and later became the Israeli military attaché in London in 1958. Because of the geographical proximity of Israel's embassy to Imperial College London, the busy diplomat had the opportunity to attend classes on symmetries in particle physics, dominated at Imperial by Abdus Salam.

The chance encounter between the senior Israeli intelligence officer and the deeply religious Pakistani led to Yuval's PhD thesis, in which he discovered the $SU(3)$ symmetry theory of the hadrons. His thesis, which he completed in 1961 at age 36, provides anecdotal evidence that the prominence of extremely young theoretical physicists relates to their scientific, not biological, age.

Soon after Yuval's paper was published, Murray Gell-Mann, the great leading light of particle physics for two decades, independently published the same $SU(3)$ discovery, coining the term *The Eightfold Way*. A lifetime friendship between Murray and Yuval began with their first meeting and was fueled both by their mutual scientific tastes and by their truly encyclopedic interest in an incredible variety of subjects.

After Yuval, the "fresh PhD," returned to Israel in 1962, he began a series of lectures that attracted to particle physics a group of senior physicists, including Harry Lipkin and Sydney Meshkov, and young students, including David Horn, the late Joe Dothan, and me. For a short time beginning in 1962, Yuval

served as the director of a research institute of the Israel Atomic Energy Commission and led his own small particle-physics research group. But in 1963, he joined Gell-Mann at Caltech as a postdoctoral fellow. The discovery of the O^- particle at Brookhaven National Laboratory in 1964 established $SU(3)$ symmetry as the true queen of particle physics, and the novice physicist was flooded with job offers.

During the early 1960s, Yuval was toying with various mathematical elements of his theory and published, among other papers, a discussion with Haim Goldberg on the mathematical building blocks of hadrons. Gell-Mann and George Zweig's clear statement of the theory of quarks, which came later, is widely considered to be the introduction of the idea of quarks, a fact that always bothered Yuval, who felt that much of the idea had already been included in his work with Goldberg. The truth, as is usual in such cases, is somewhere in the middle: The Goldberg-Ne'eman paper did not present the full picture, but it certainly included important elements of the quark idea.

Yuval again returned to Israel in 1965 to create the physics department at the new Tel Aviv University. He later became president of the university and established several of its leading schools and faculties. As his students started particle-physics groups in other Israeli institutions, a remarkable presence of Israeli theorists emerged on the global scene starting in the late 1960s.

Yuval's scientific career continued till his last days. He contributed to supergravity, general relativity, cosmology, several mathematical topics, and, of course, particle physics. In parallel, he served during the 1970s as senior assistant to the minister of defense and was the founding head of Israel's space agency. He actively helped dissident Soviet scientists and assisted many of them in securing academic positions in Israel.

Despite having grown up in a somewhat left-of-center political background, Yuval objected to the terms of the 1979 Israeli-Egyptian peace agreement. He founded and led a new political party (Tehiya, Hebrew for revival) and, opposing Prime Minister Menachem Begin, was elected to the Israeli parliament. He served as a member of parliament from 1981 to 1990, spending part of that time as minister of science. Yuval then retired from active political life, but he never changed his views and firm beliefs.

Yuval's interests and intellectual passions embraced the history, archaeology, geography, and culture of Israel, but he was equally at home with European history and traditions, linguistic issues, military matters, and any subject at the interface between science and society. Contrary to the anticipated image of a soldier and a politician at the end of the political spectrum, he was an exceptionally kind and gentle person, good hearted, and always equipped with interesting tales, anecdotes, facts, and observations on any subject. An extraordinary person, he lived an extraordinary life.

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