# Working with Luis Alvarez
# APS Forum on History of Physics
# May 3, 2011 (Alvarez' 100th Birthday)
# Anaheim CA

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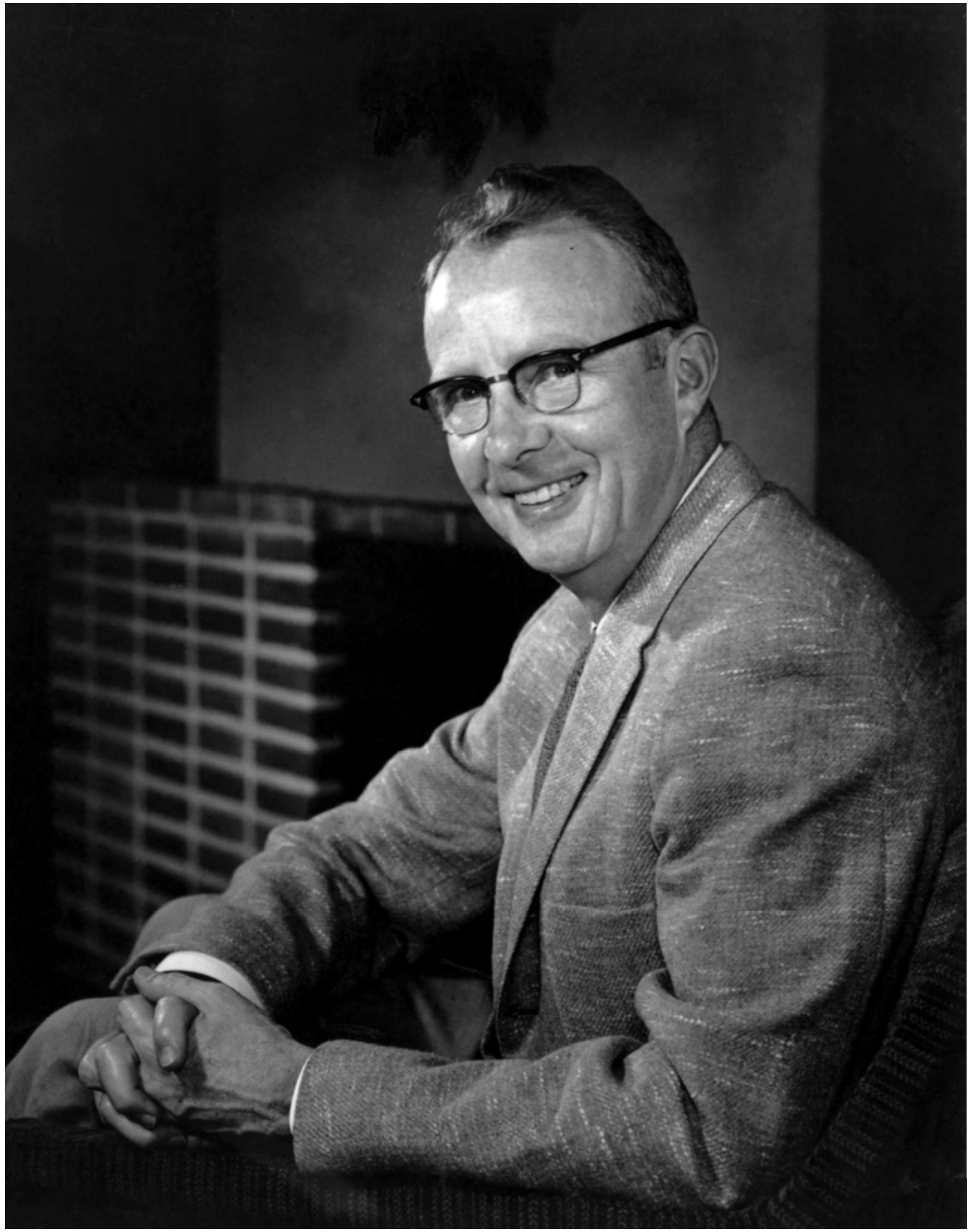
Presentation available at www.ArtRosenfeld.org

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# Discovering Alvarez

*Selected Works of Luis W. Alvarez, with Commentary by His Students and Colleagues*

EDITED BY

W. Peter Trower

# RECENT DEVELOPMENTS IN PARTICLE PHYSICS

by

LUIS W. ALVAREZ

The Lawrence Radiation Laboratory Berkeley, California

Nobel Lecture, December 11, 1968

When I received my B. S. degree in 1932, only two of the fundamental particles of physics were known. Every bit of matter in the universe was thought to consist solely of protons and electrons. But in that same year, the number of particles was suddenly doubled. In two beautiful experiments, Chadwick showed that the neutron existed, (1) and Anderson photographed the first unmistakable positron track. (2) In the years since 1932, the list of known particles has increased rapidly, but not steadily. The growth has instead been concentrated into a series of spurts of activity.

Following the traditions of this occasion, my task this afternoon is to describe the latest of these periods of discovery, and to tell you of the development of the tools and techniques that made it possible. Most of us who become experimental physicists do so for two reasons; we love the tools of physics because to us they have intrinsic beauty, and we dream of finding new secrets of nature as important and as exciting as those uncovered by our scientific heroes. But we walk a narrow path with pitfalls on either side. If we spend all our time developing equipment, we risk the appellation of "plumber", and if we merely use the tools developed by others, we risk the censure of our peers for being parasitic. For these reasons, my colleagues and I are grateful to the Royal Swedish Academy of Science for citing both aspects of our work at the Lawrence Radiation Laboratory at the University of California—the observations of a new group of particles and the creation of the means for making those observations.

As a personal opinion, I would suggest that modern particle physics started in the last days of World War II, when a group of young Italians, Conversi, Pancini, and Piccioni, who were hiding from the German occupying forces, initiated a remarkable experiment. In 1946, they showed (3) that the "mesotron", which had been discovered in 1937 by Neddermeyer and Anderson (4) and by Street and Stevenson (5), was not the particle predicted by Yukawa (6) as the mediator of nuclear forces, but was instead almost completely unreactive in a nuclear sense. Most nuclear physicists had spent the war years in military-related activities, secure in the belief that the Yukawa meson was available for study as soon as hostilities ceased. But they were wrong.

The physics community had to endure less than a year of this nightmarish

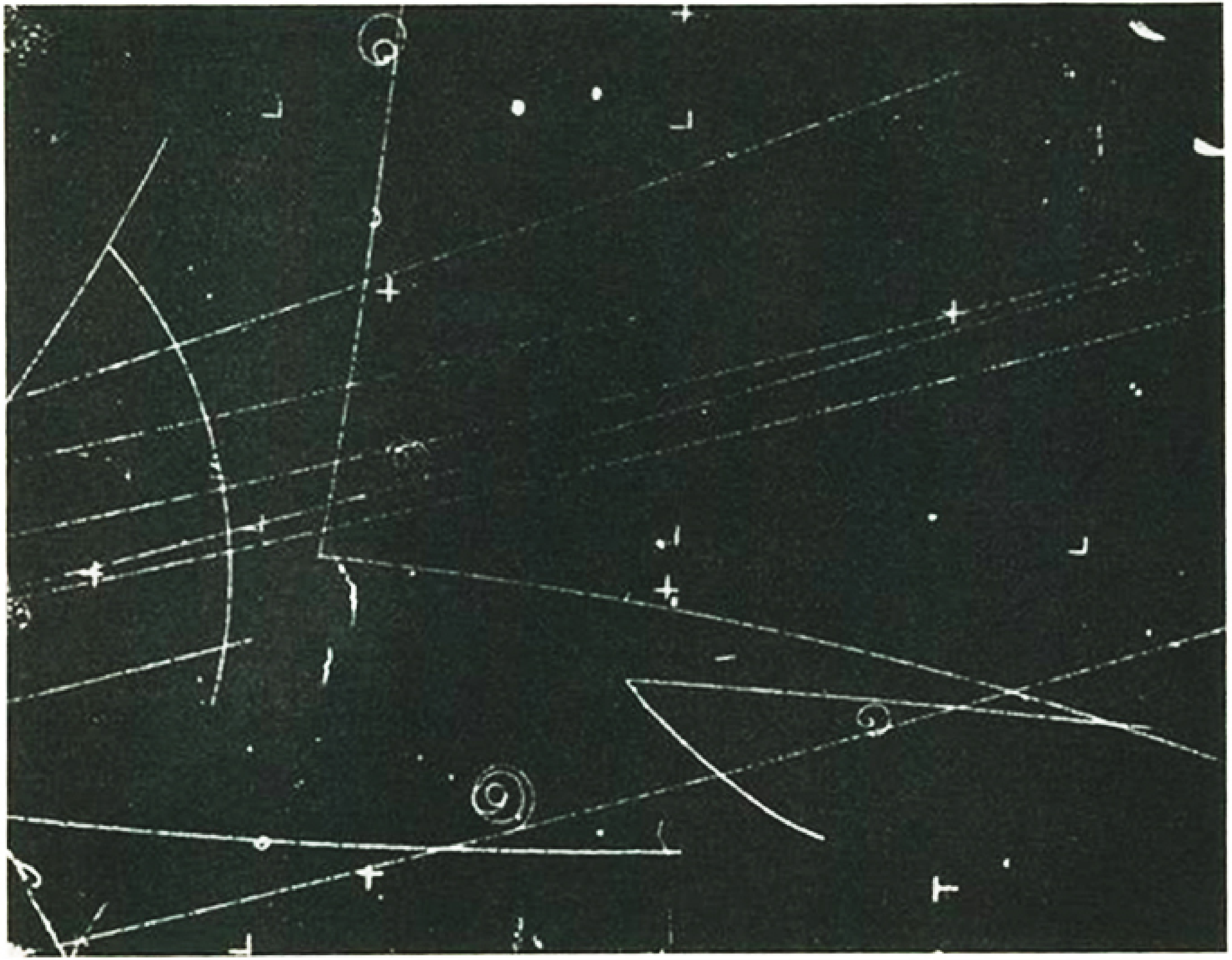


Fig. 1.
Caption: $\pi^- + p \rightarrow K^0 + \Lambda$.

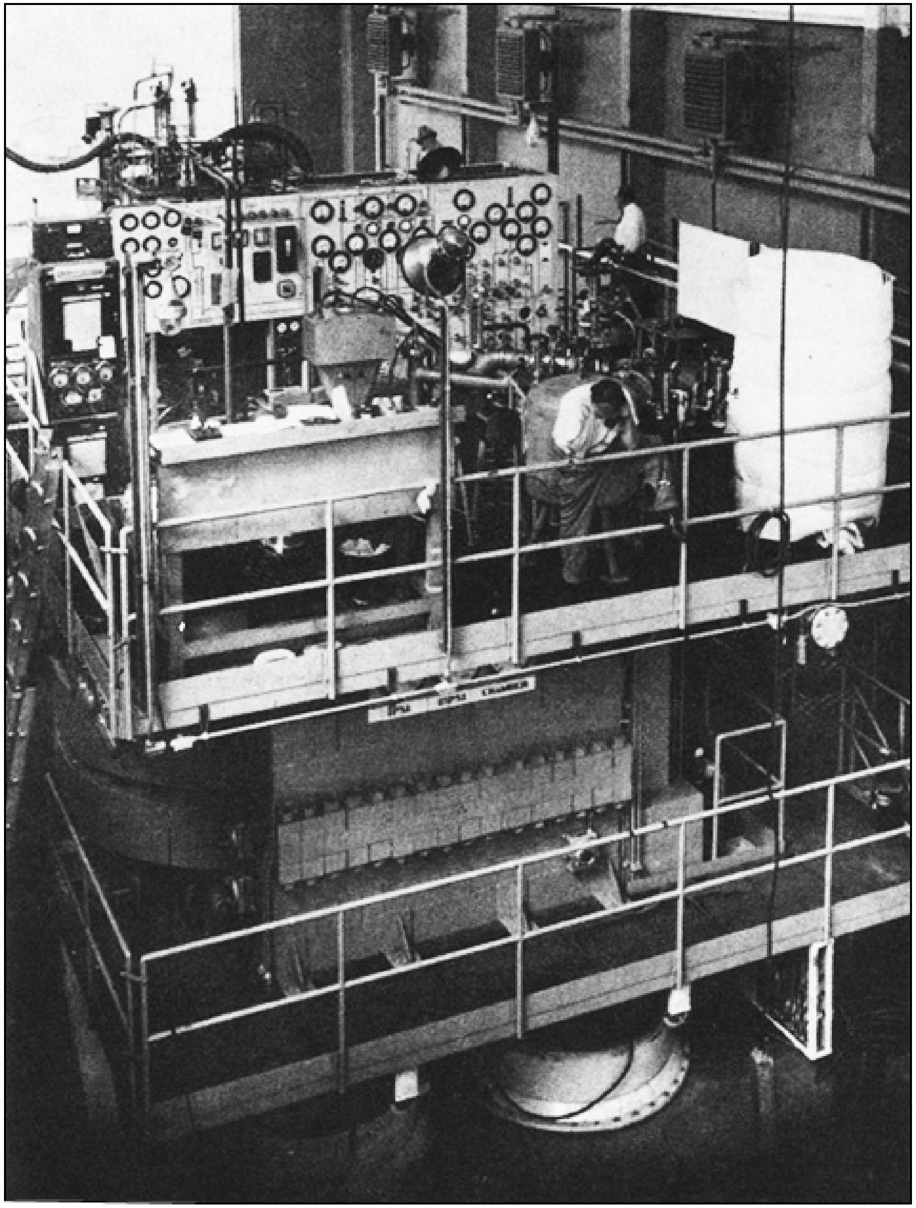


**Fig. 7.**
**72 inch bubble chamber in its building.**

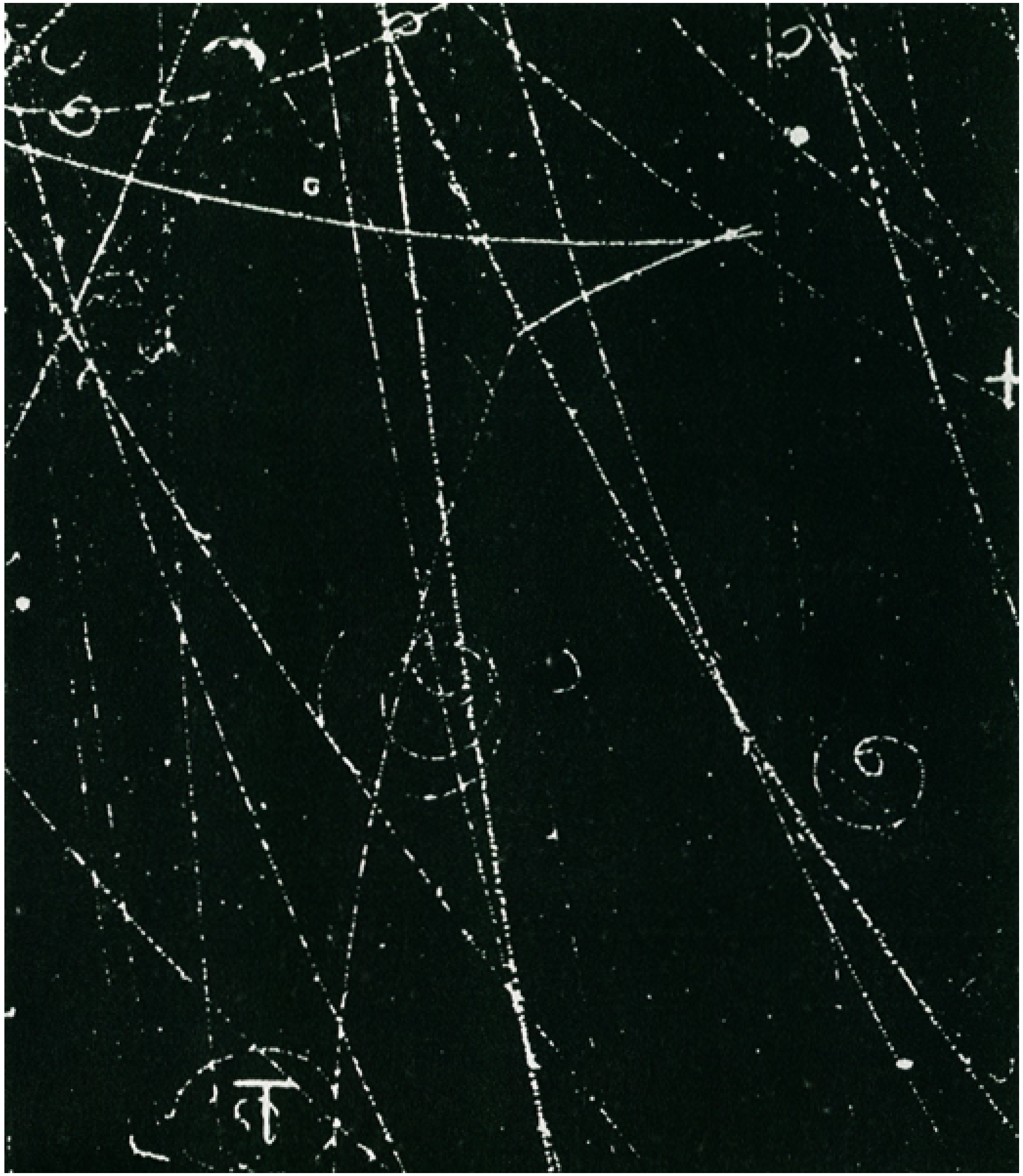


Fig. 10.
Muon Catalysis (with gap).

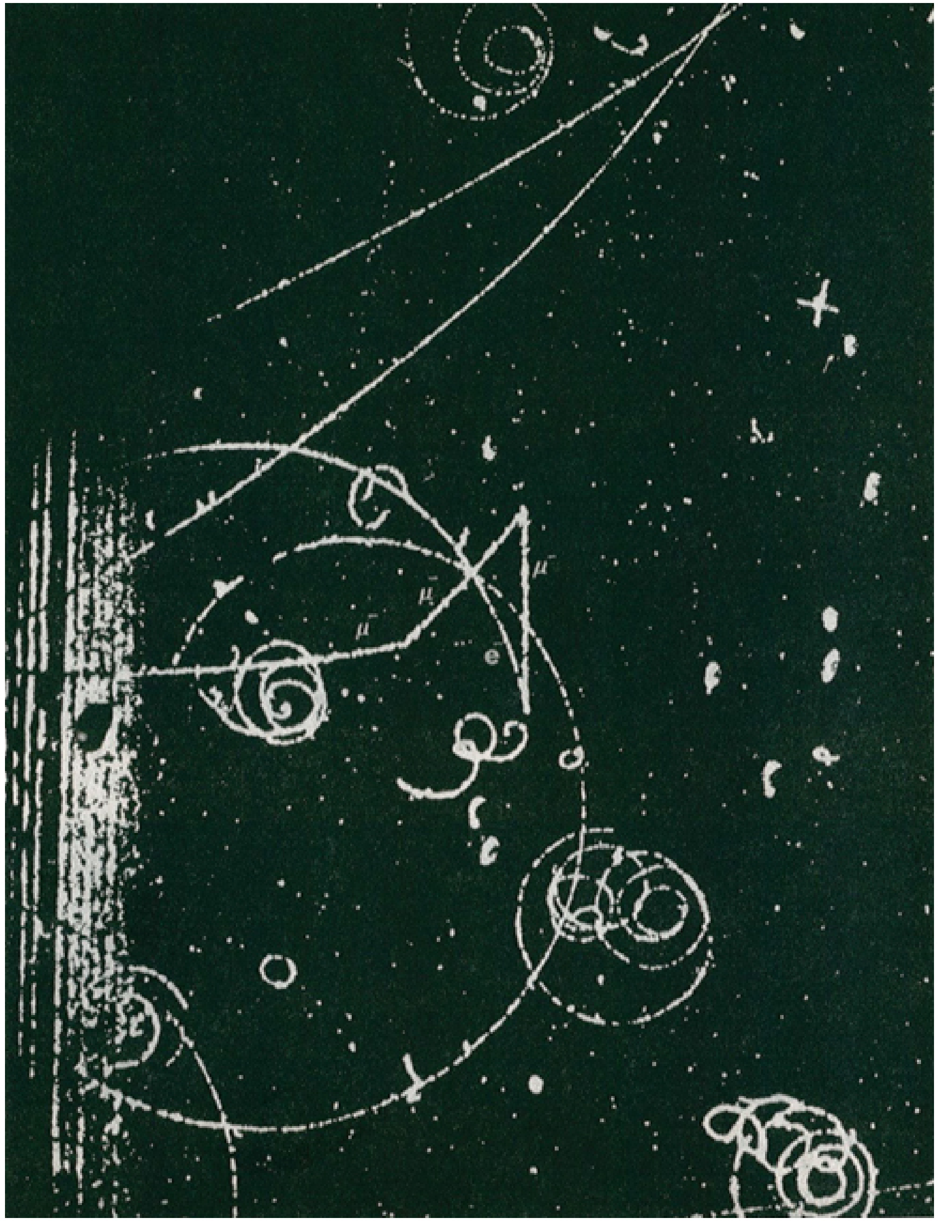
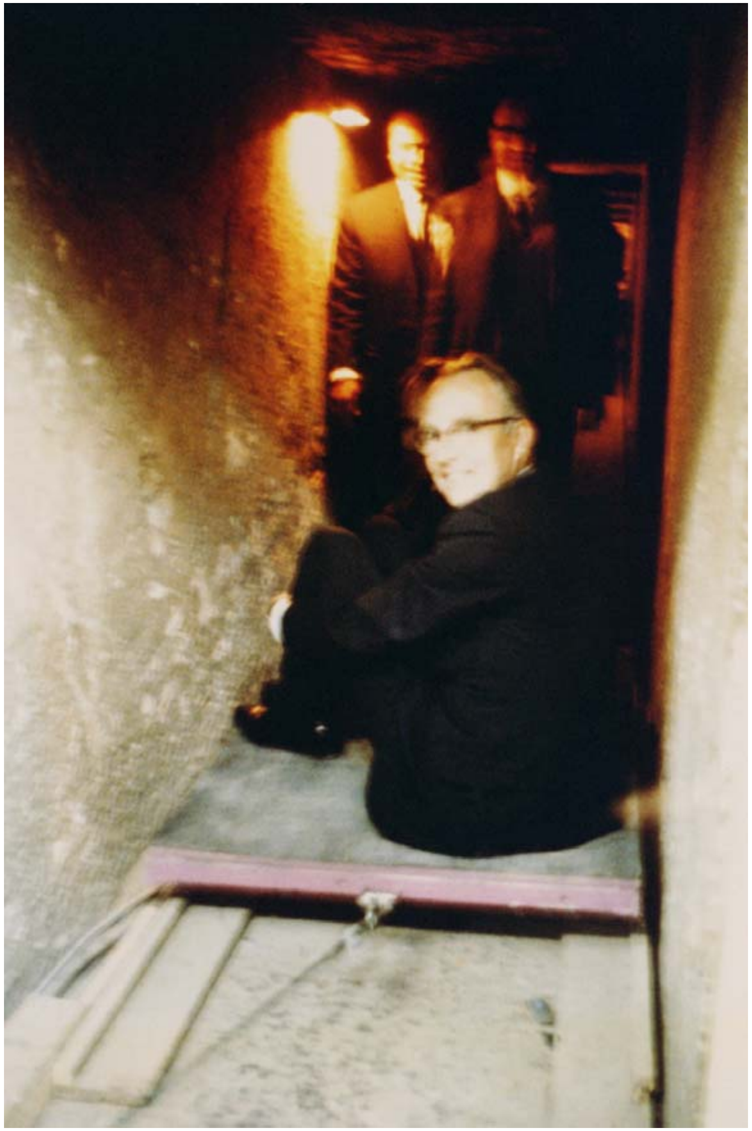


Fig. 11.
Double Muon Catalysis.



"A physicist examines the Kennedy assassination film," by Luis W. Alvarez

*American Journal of Physics* , September 1976, Volume 44, Issue 9, pp. 813


The motion picture film of the Kennedy assassination taken by Abraham Zapruder was one of the most important exhibits examined by the Warren Commission. The author uses the tools of the physicist to draw some conclusions that escaped the notice of the Commission and its expert FBI photointerpreters. Among the subjects treated are (1) the timing of the gun shots, (2) a theoretical and experimental investigation of the ''backward snap'' of the President's head immediately after he was killed—yielding the surprising result that it was consistent with a shot fired from the rear, (3) the speed at which the camera was running, and (4) a previously undetected deceleration of the President's automobile just before the final shot. The emphasis throughout is not on the assassination but rather on the application of elementary physics principles to the solution of practical problems.