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4. None of the material should be assumed to be original.

## Special Note

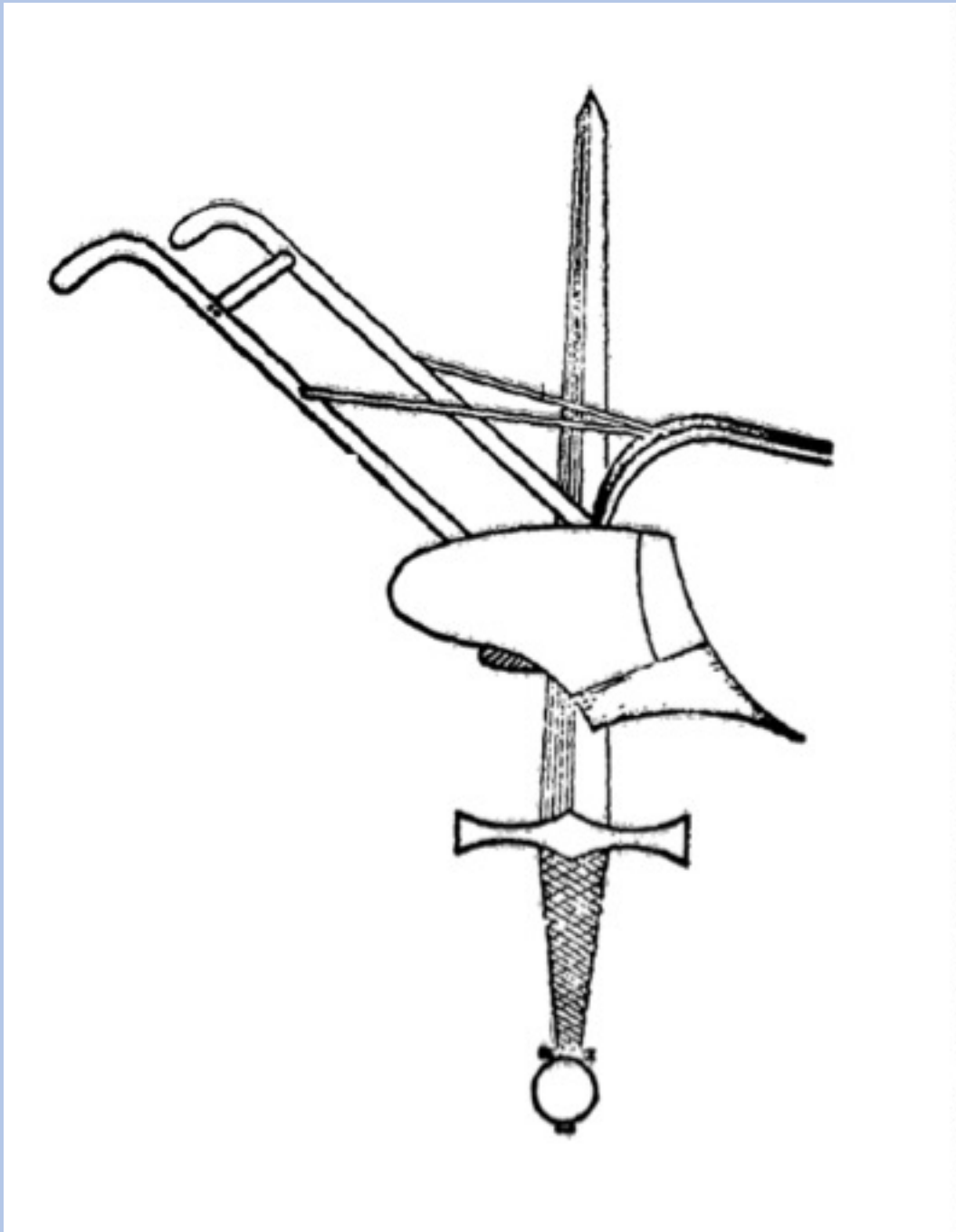
Norbert T. Rempe prepared this presentation as a private individual, not for profit. This work was *NOT* sponsored by any private organization or government agency.

# A heterodox perspective on Teller, Plowshare, Gnome & Radiation

by

**Norbert T. Rempe**  
**Carlsbad, NM, USA**  
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Presented to  
Carlsbad Section  
American Nuclear Society  
January 28, 2022



## Perils of Modern Living

by Harold P. Furth,

*New Yorker*

Nov. 10, 1956

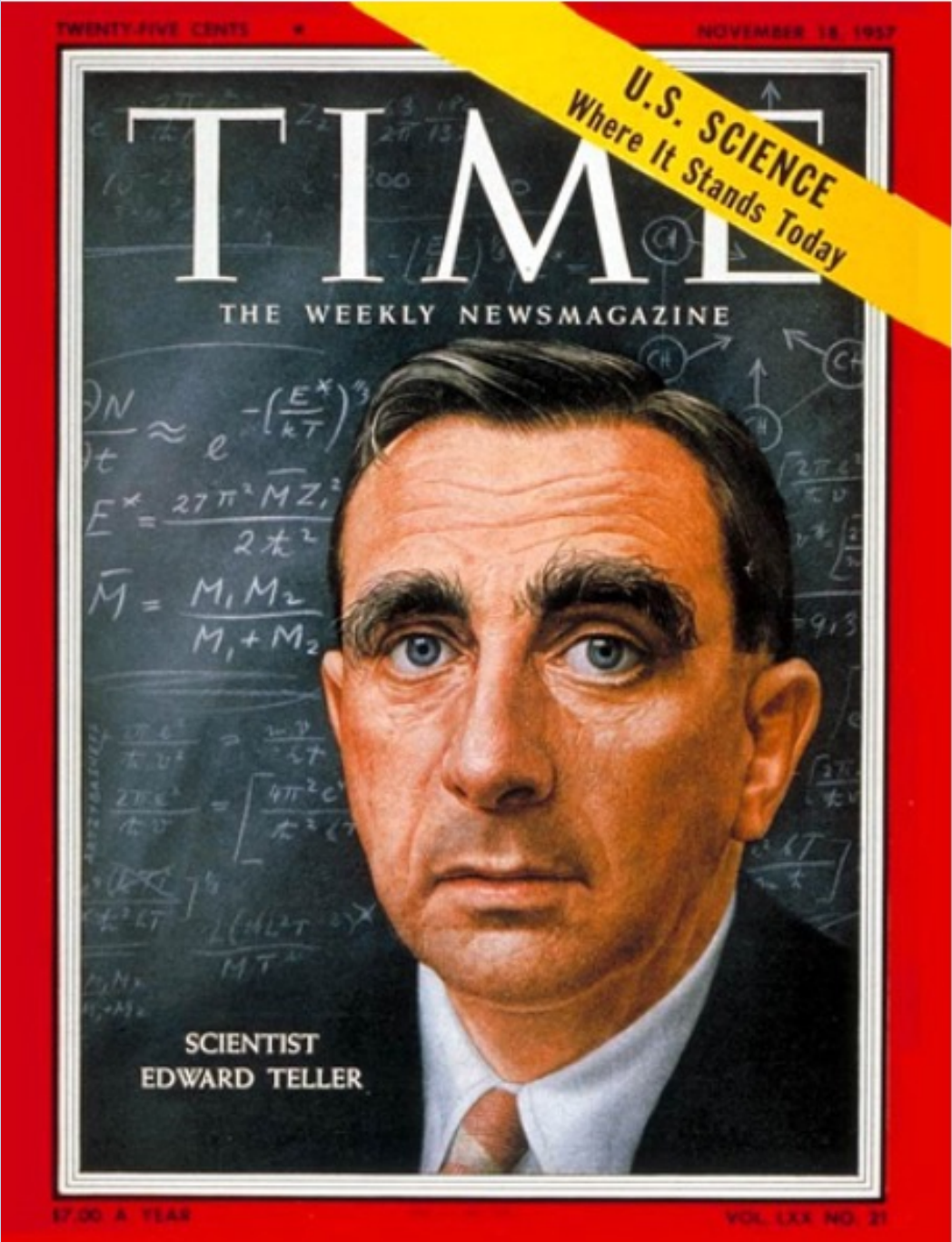
Well beyond the tropostrata  
There is a region stark and stellar  
Where, on a streak of anti-matter  
Lived Dr. Edward anti-Teller.

Remote from Fusion's origin,  
He lived unguessed and unawares  
With all his antikith and kin,  
And kept macassars on his chairs.

One morning, idling by the sea,  
He spied a tin of monstrous girth  
That bore three letters: A. E. C.  
Out stepped a visitor from Earth.

Then, shouting gladly o'er the sands,  
Met two who in their alien ways  
Were like as lentils. Their right hands  
Clasped, and the rest was gamma rays.

November 18, 1957



- **Each added amount of radiation causes damage to the health of human beings all over the world and causes damage to the pool of human germ plasm such as to lead to an increase in the number of seriously defective children that will be born in future generations.**
- **As scientists we have knowledge of the dangers involved and therefore a special responsibility to make these dangers known.**
- **We deem it imperative that immediate action be taken to effect an international agreement to stop the testing of all nuclear weapons.**

Key points from petition originated by Dr. Linus Pauling

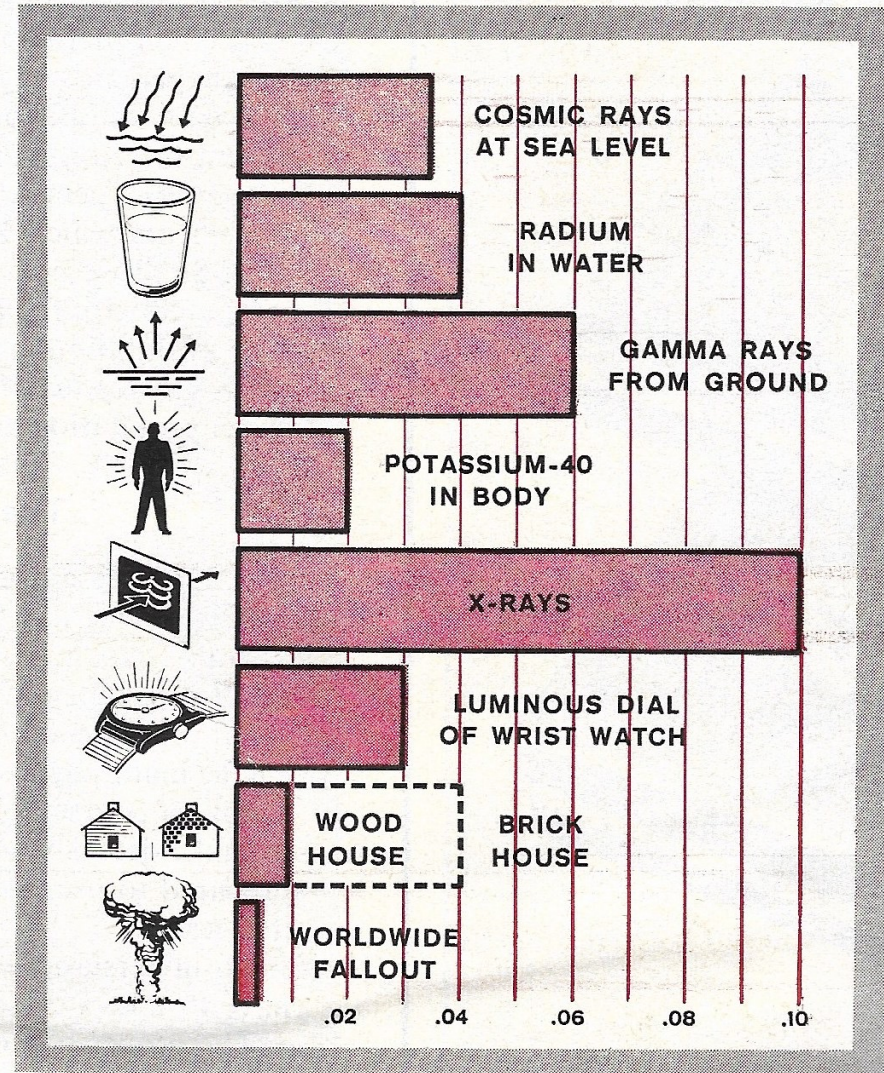
Signed by 11,021 scientists

Submitted to the U.N. January 15, 1958



Source: Teller & Latter:

*The compelling need for nuclear tests, LIFE, Feb. 10, 1958*



RADIATION DANGER to the average person from various sources is shown in chart in roentgens per year (*figures at bottom*). Wood house, for instance, gives off .01 roentgen, brick house (*dotted line*) .04. Present nuclear fallout is only .003.

The Nuclear Bomb Tests . . .

*Is Fallout Overrated?*

# FALLOUT AND DISARMAMENT

*The PAULING-TELLER Debate*

*As Presented on*

**KQED-TV SAN FRANCISCO**

**Feb. 20, 1958**





This alleged damage which the small radioactivity is causing—supposedly cancer and leukemia—has not been proved, to the best of my knowledge, by decent and clear statistics. It is possible that there is damage. It is even possible, to my mind, that there is no damage; and there is the possibility, further, that very small amounts of radioactivity are helpful.

March 1960

**POPULAR MECHANICS** MARCH 1960  
WRITTEN SO YOU CAN UNDERSTAND IT VOL. 113 NO. 3

# We're Going to Work Miracles

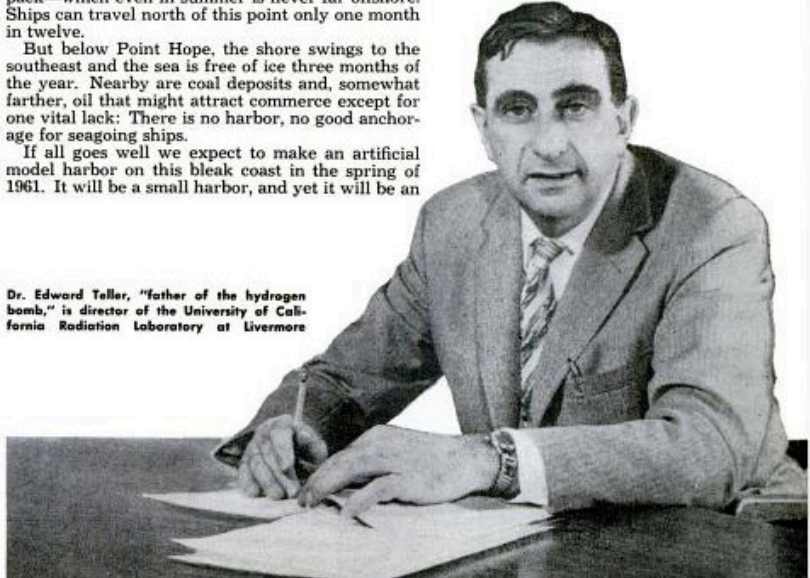
*The atom's power is ready to unlock a treasure chest of arctic oil, dig open an Alaskan harbor, open the spigot for Colorado's shale . . .*

*By Dr. Edward Teller*

**W**HEN YOU LOOK AT A MAP of Alaska, you will observe Point Hope, at the northwest corner, projecting out into the Arctic Ocean. Above Point Hope the shore is exposed to the polar ice pack—which even in summer is never far offshore. Ships can travel north of this point only one month in twelve.

But below Point Hope, the shore swings to the southeast and the sea is free of ice three months of the year. Nearby are coal deposits and, somewhat farther, oil that might attract commerce except for one vital lack: There is no harbor, no good anchorage for seagoing ships.

If all goes well we expect to make an artificial model harbor on this bleak coast in the spring of 1961. It will be a small harbor, and yet it will be an

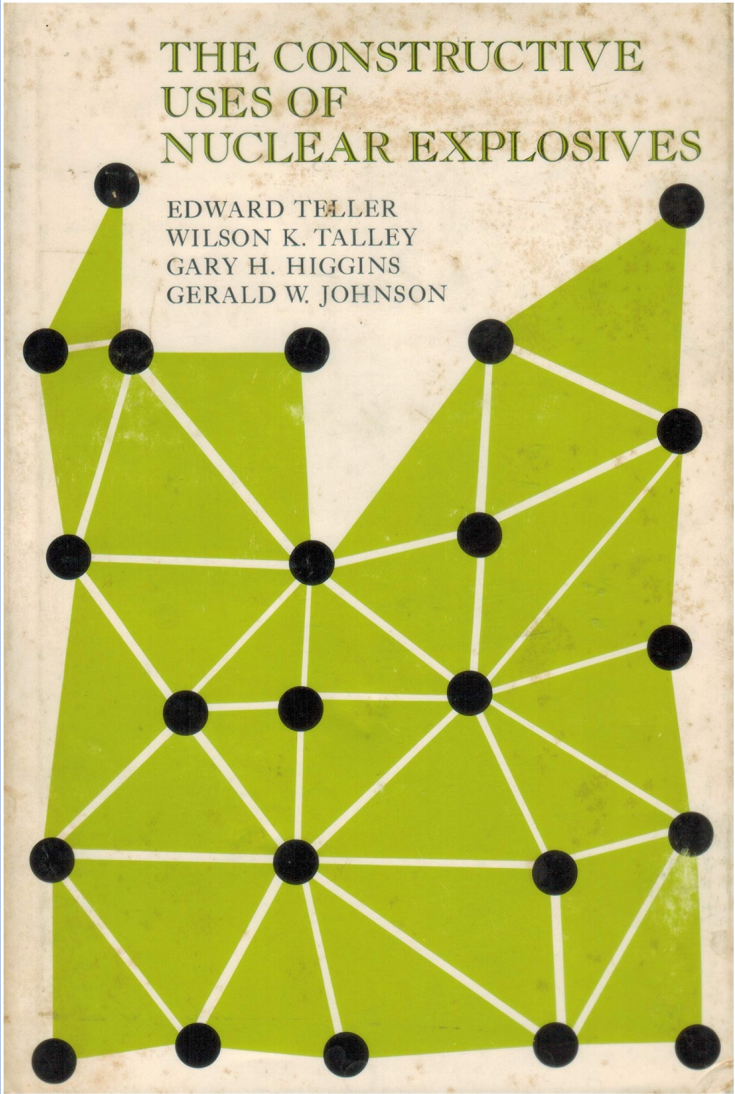


Dr. Edward Teller, "father of the hydrogen bomb," is director of the University of California Radiation Laboratory at Livermore

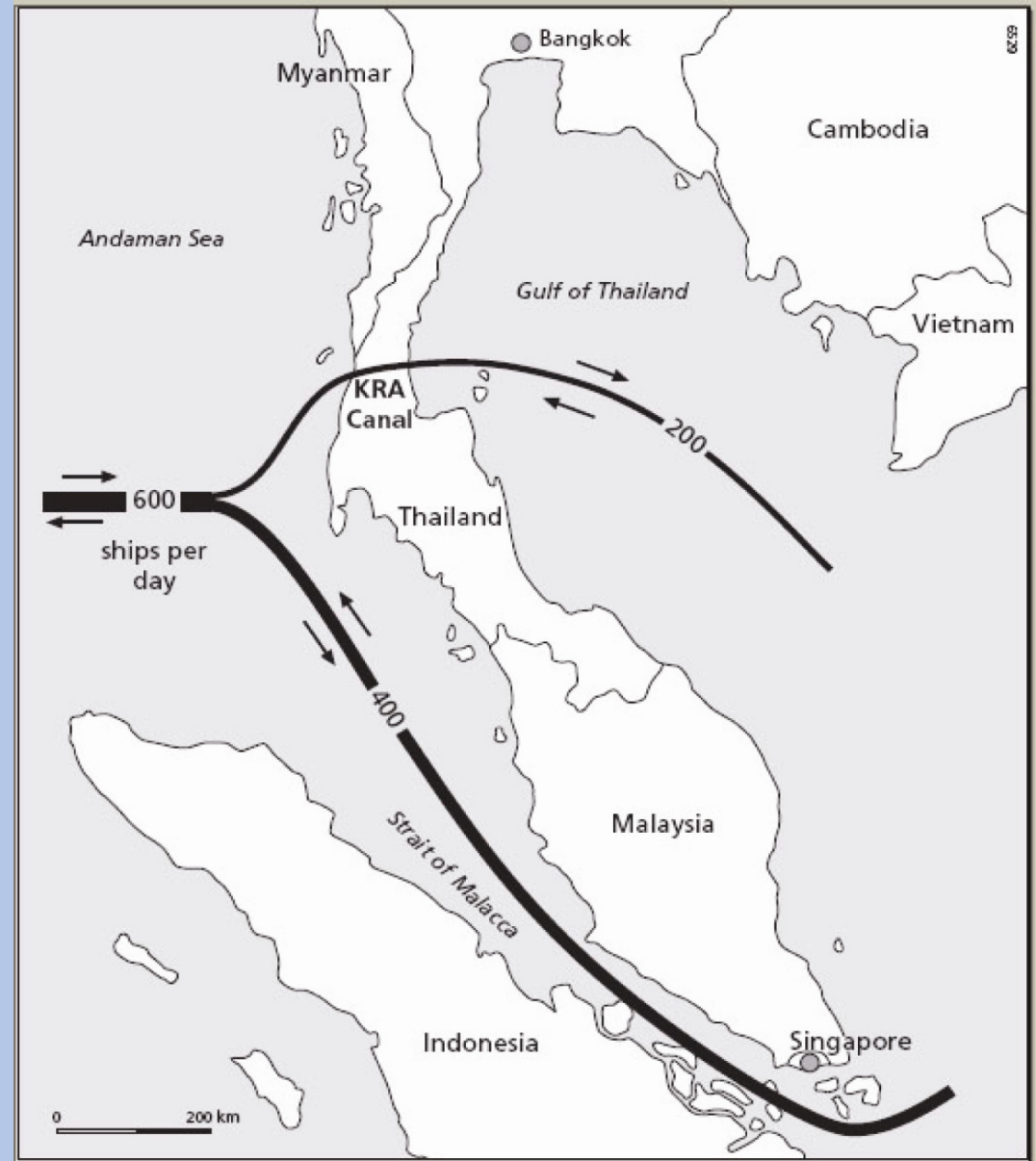
1968

**THE CONSTRUCTIVE USES OF NUCLEAR EXPLOSIVES**

EDWARD TELLER  
 WILSON K. TALLEY  
 GARY H. HIGGINS  
 GERALD W. JOHNSON









**Suez Canal**

**Israel canal  
plan**

# Original name: Project **Pecos Bill**



AN INTERIOR SEAWAY FOR NORTHERN AFRICA  
J. B. F. Champ1in\*  
Westinghouse Electric Corporation Environmental Systems  
J. W. Poston, J. A. Lake  
Georgia Institute of Technology  
1970

# Nuclear Sites in Colorado and New Mexico



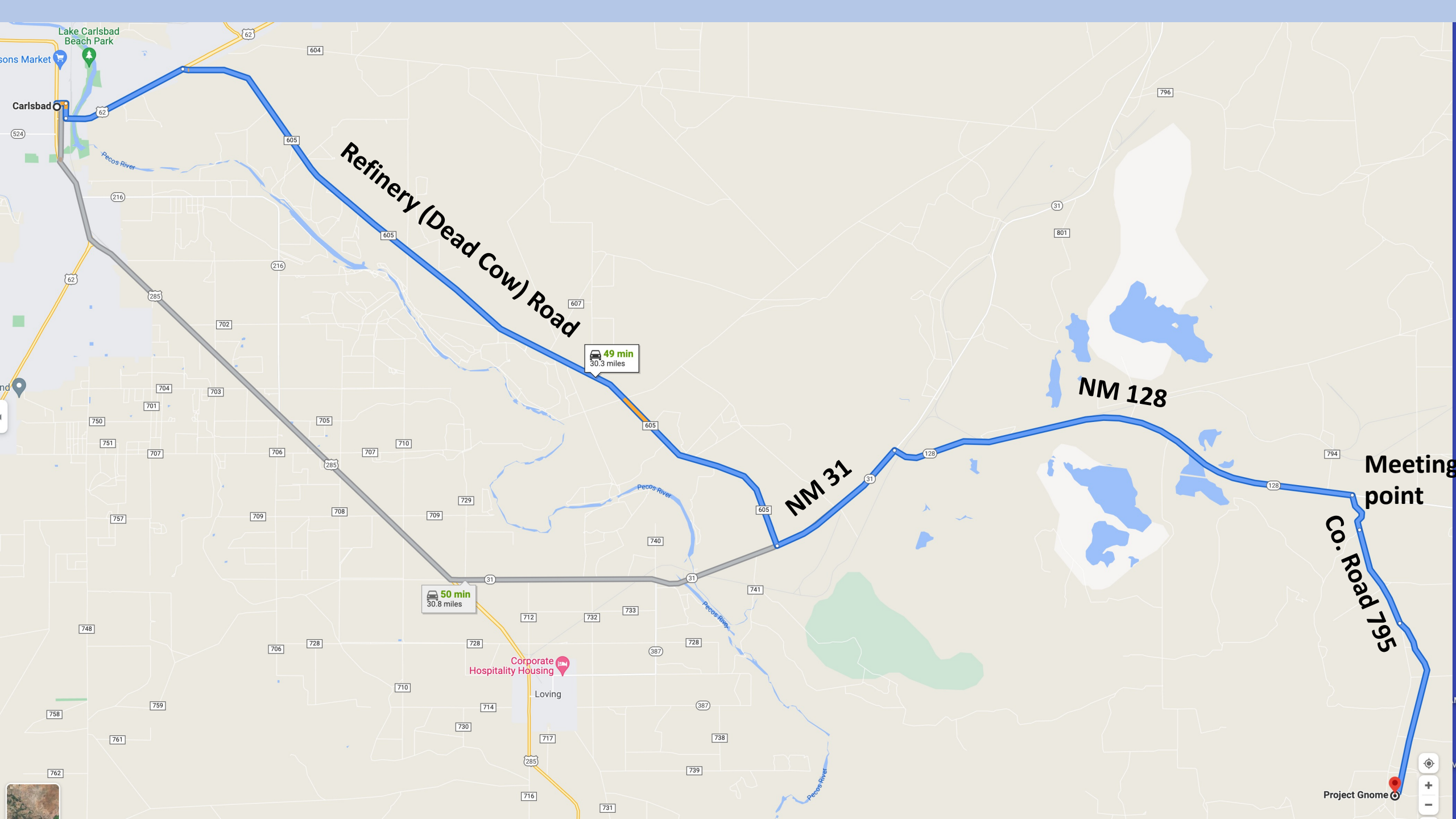
Ground Zero, visitors 40 years later



Gnome cavity and waste repository



no radionuclide migration in 60 years



Refinery (Dead Cow) Road

NM 31

NM 128

Meeting point  
Co. Road 795

49 min  
30.3 miles

50 min  
30.8 miles

Corporate Hospitality Housing

Loving





Jal Hwy

Mebey Ranch Rd

Meeting point

128

Jal Hwy

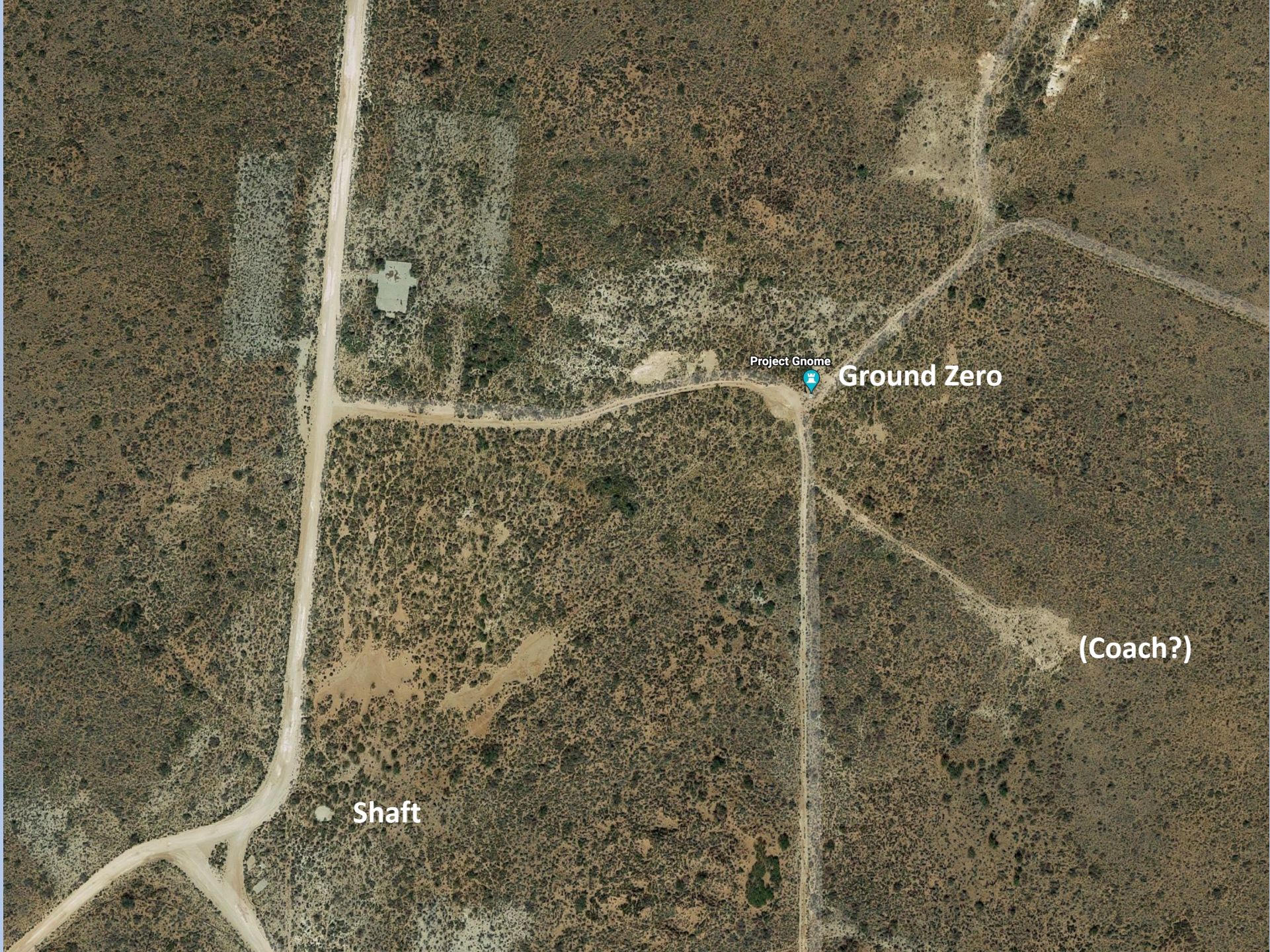
128

Cameron Rd

Mebey Ranch Rd

Mebey Ranch Rd





Project Gnome

Ground Zero

(Coach?)

Shaft

**February 10-16, 1959**

# **Pre-Gnome high-explosive seismic tests**

**1200' deep shot hole**

**Total 3.56 tons pelletized TNT, 1.6 g/cm<sup>3</sup>**

**Three scaling shots: 190 lbs., 760 lbs., 6260 lbs.**

**Analysis of the data concluded that particle velocities and acceleration from a shot of 9 KT of TNT at the Gnome site, 46,000 feet from the nearest potash mine, would be less than those recorded 90 feet from a routine 75-pound dynamite blast in a potash mine.**

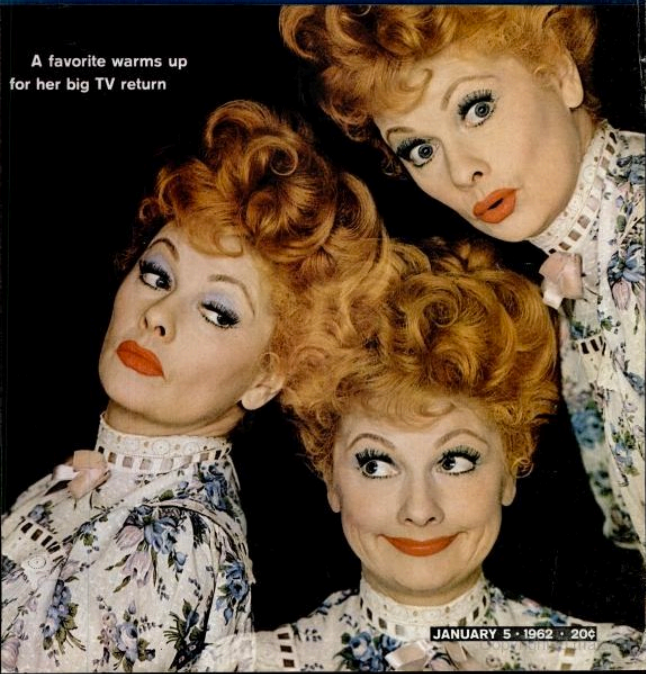
**LIFE**

Is the U.N. Useless?

CHARITIES: PLAIN AND FANCY

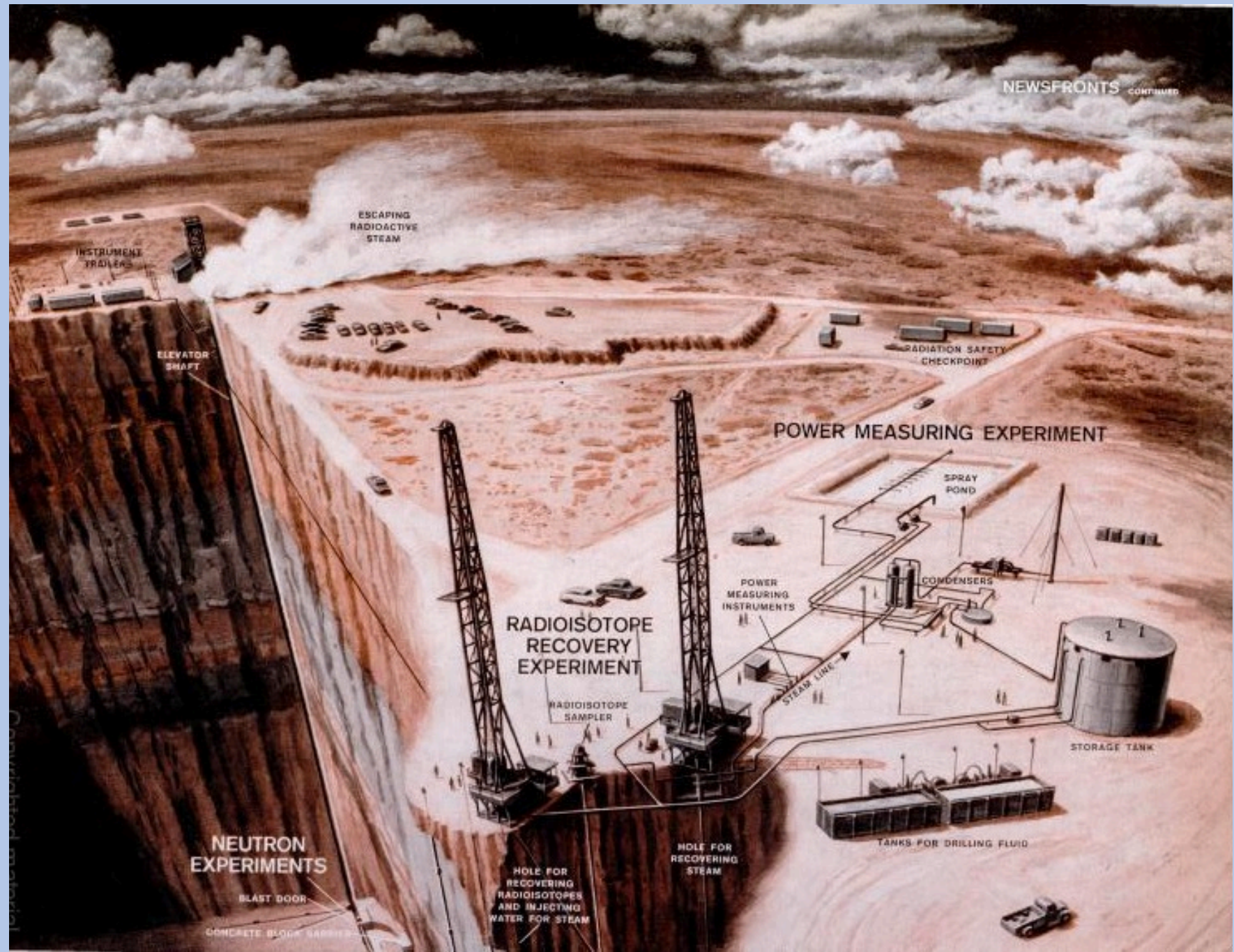
LUCY IS BACK!

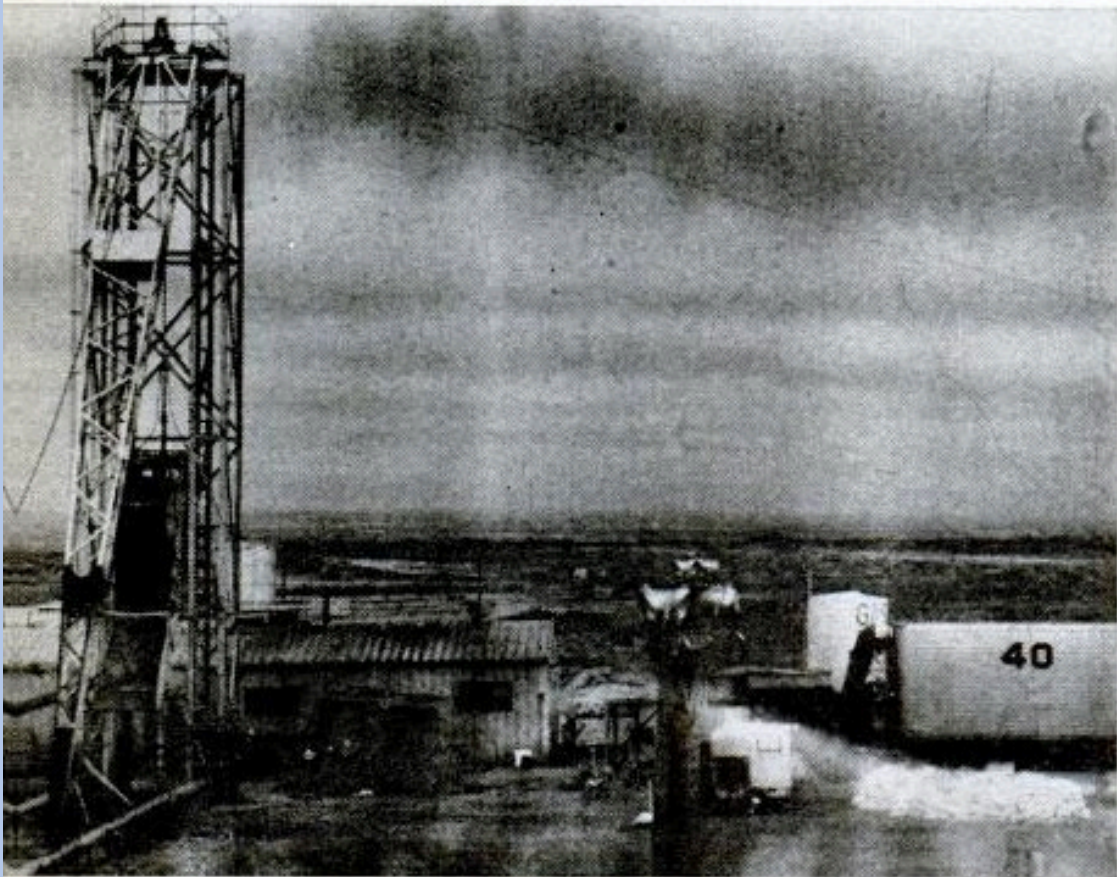
A favorite warms up  
for her big TV return



JANUARY 5 • 1962 • 20¢

January 5, 1962

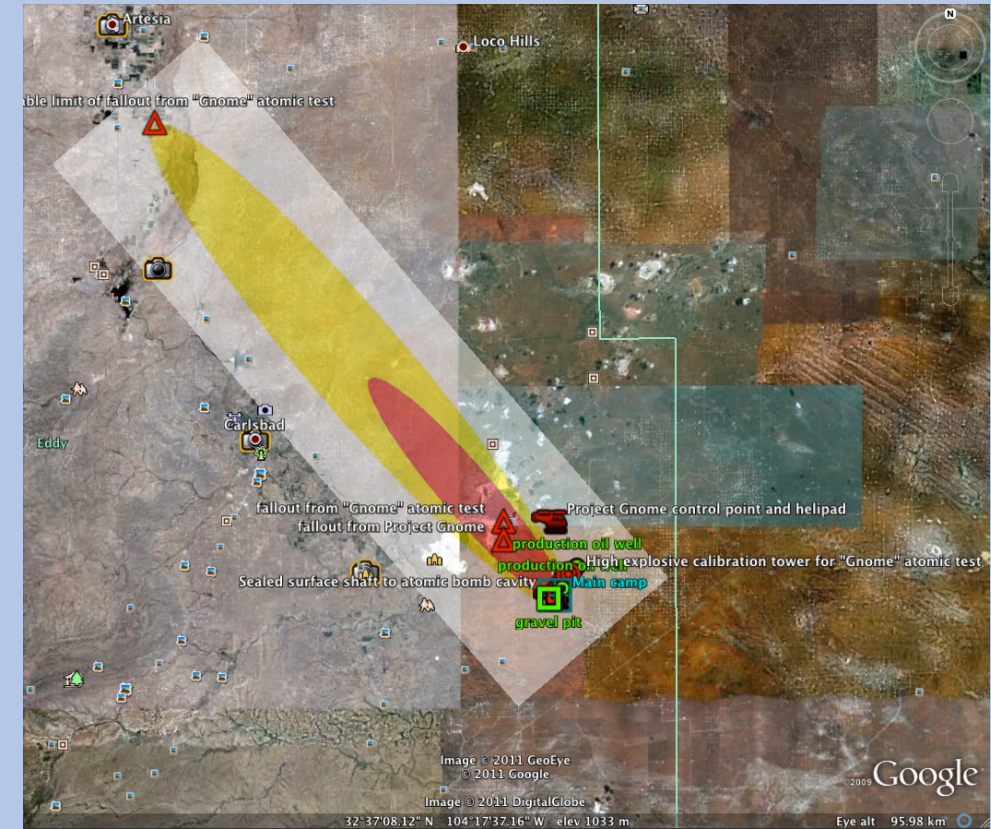


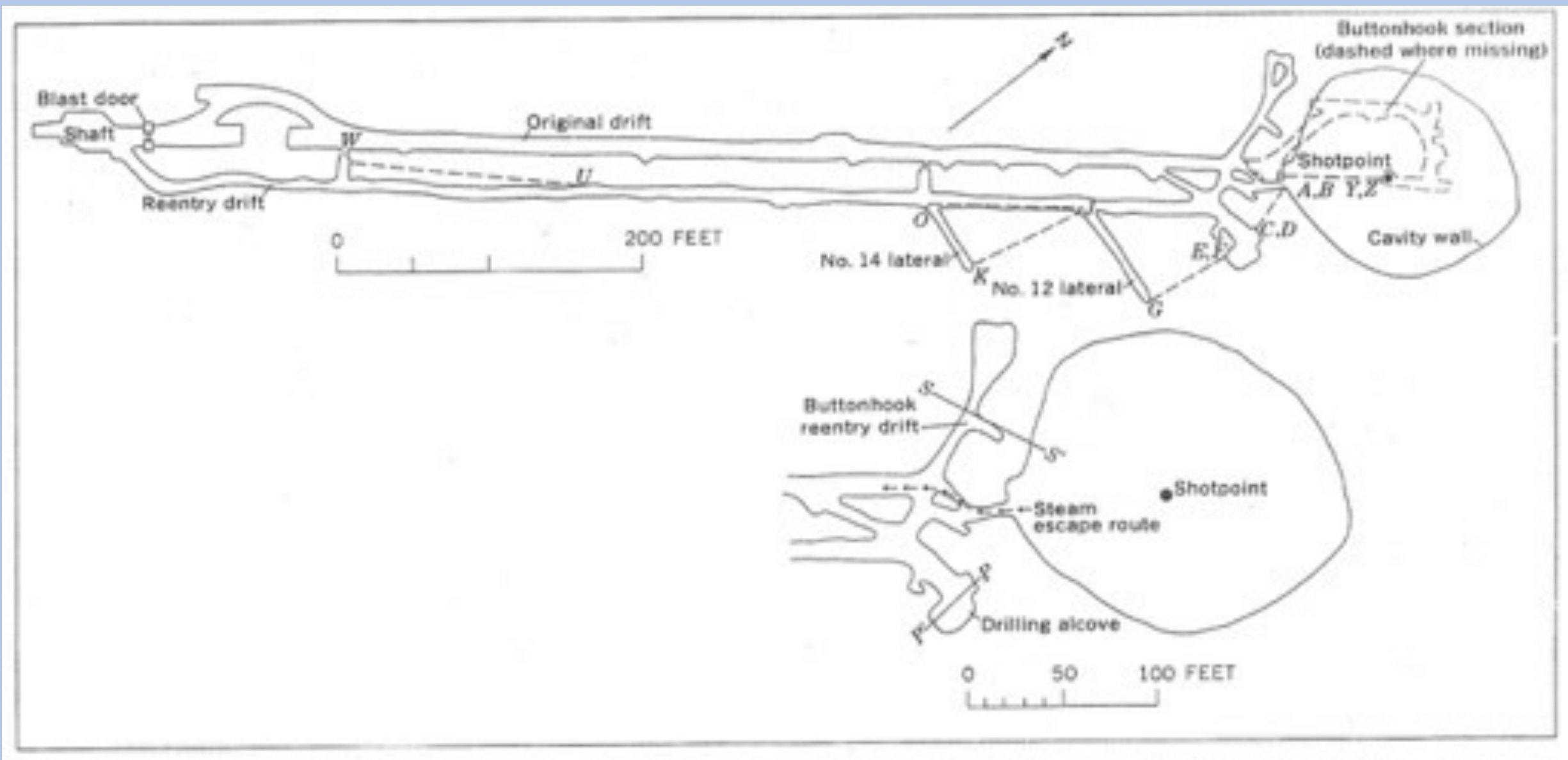


**GNOME SITE** was shot 1,400 feet from Ground Zero just before (*above*) and after (*below*) shock wave. Blast permanently raised ground two feet.

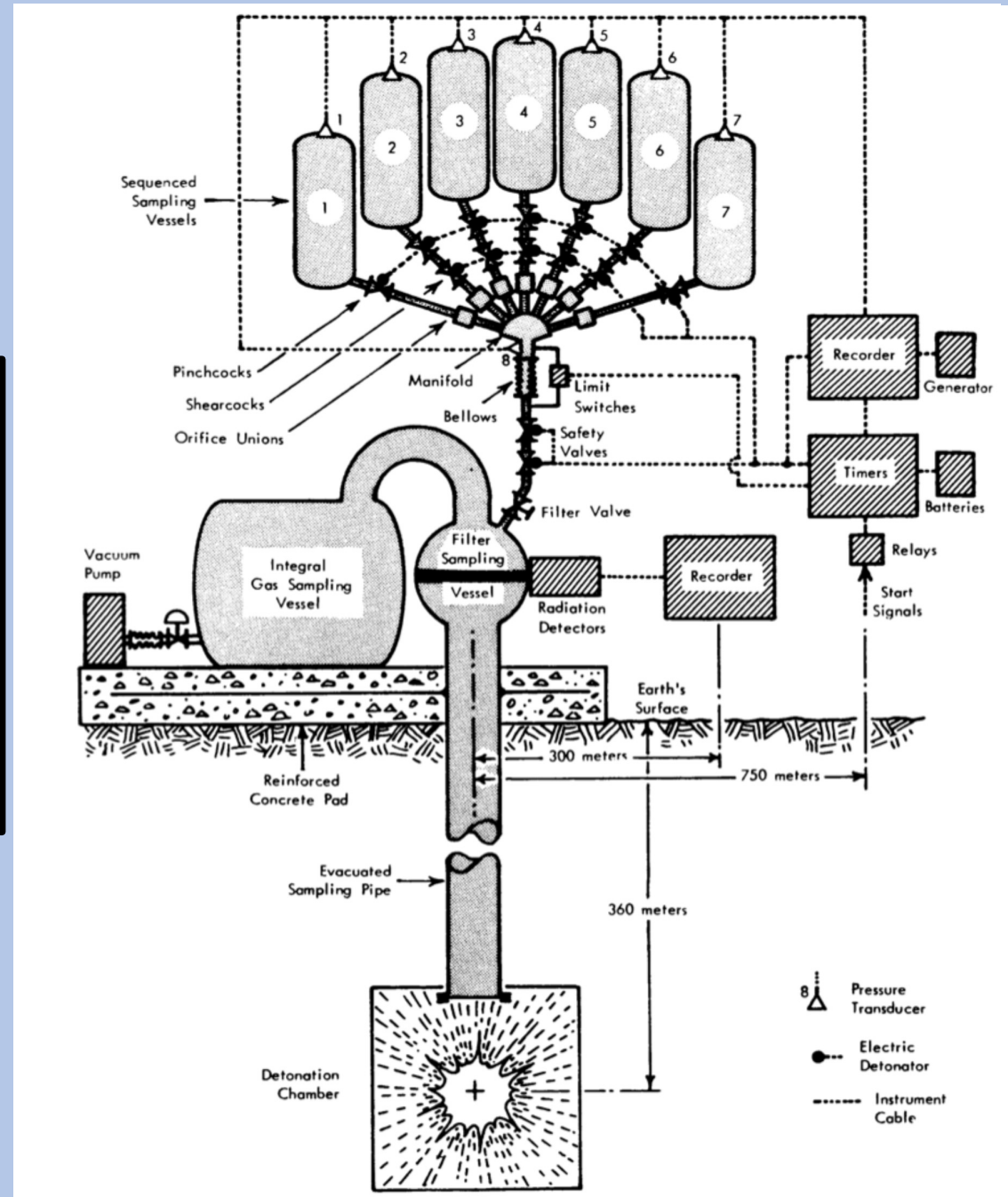


# Aerial photo of Gnome venting steam



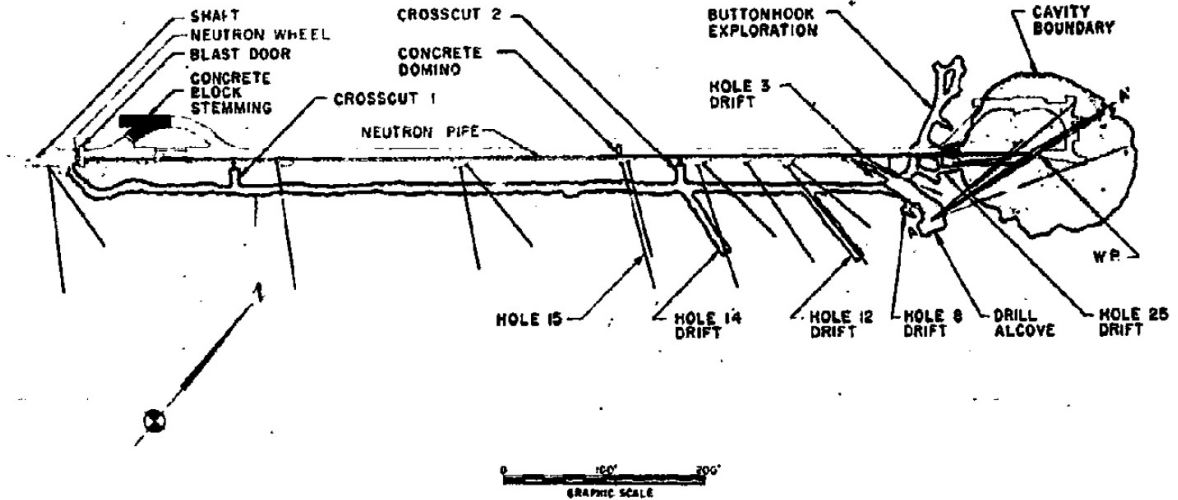


A pipe was drilled from the surface to the blast chamber, and samples of material placed at the bottom, including aluminum, thorium, and mixtures of nitrogen with hydrogen, oxygen, or carbon. The heat of the bomb would vaporize the material and drive it up the tube before they could be destroyed by the blast, into catcher chambers in a shed on the surface, made of reinforced concrete to contain any explosive energy that leaked through the pipe.<sup>[La]</sup> A zinc amalgam coating was also applied to the bottom of the tube as a tracer, to see if the vaporized segment of the pipe would be jetted up the drill hole when it was vaporized by the gamma rays, in the moments before the blast wave destroyed it.<sup>[CTD62]</sup>

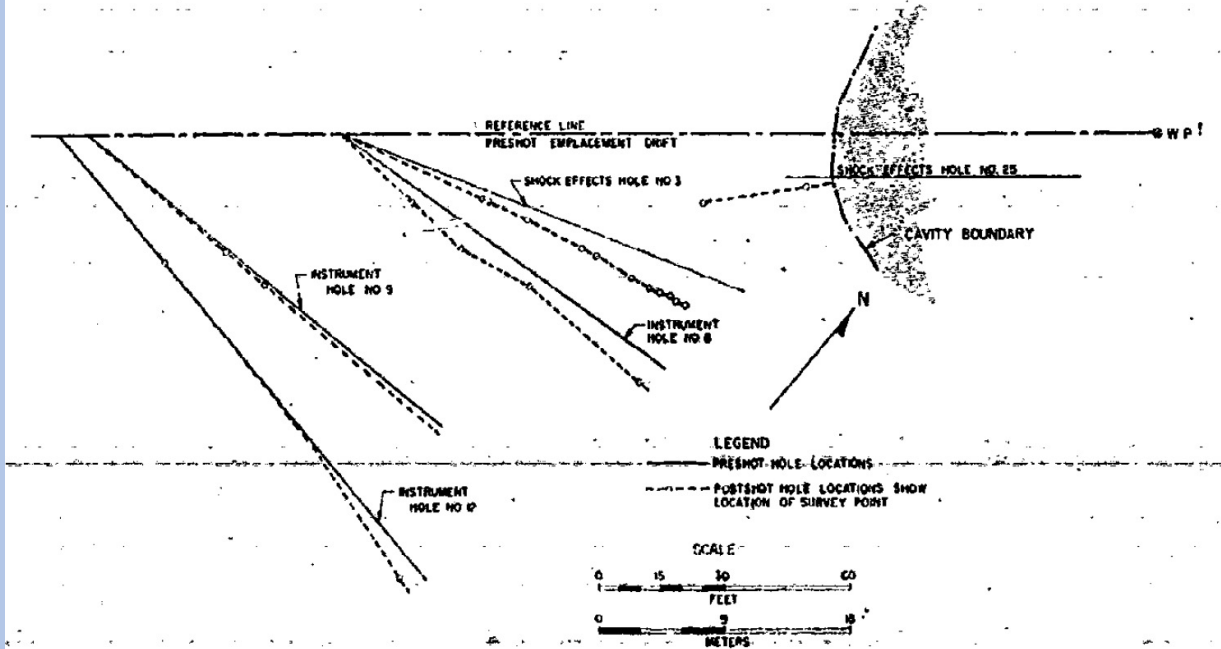




**Fig. 1—Vertical section through Gnome environment (schematic).**



**Fig. 2—Post-shot underground exploration (pre-shot tunnel is shown in light line).**



**Fig. 3—Permanent displacement of pre-shot drill holes.**

ARTICLES

- 28 **WORLD RESOURCES AND THE WORLD MIDDLE CLASS**, by Nathan Keyfitz  
Economic development means entry into the middle class. Can it be done within the limits of resources?
- 36 **A NATURAL FISSION REACTOR**, by George A. Cowan  
Two billion years ago in Africa a vein of uranium ore "went critical." The fission products are still there.
- 48 **INTERACTIONS BETWEEN HORMONES AND NERVE TISSUE**, by Bruce S. McEwen  
Steroid hormones secreted by the gonads and the adrenals are traced to cells in the brain.

GEORGE A. COWAN ("A Natural Fission Reactor") heads the nuclear-chemistry division of the Los Alamos Scientific Laboratory. He writes: "I became involved with

based on the study of nuclear explosions. I am just now greatly intrigued by the information that can be obtained from a fossil reactor, particularly by the possibility that the Oklo investigation will demonstrate an acceptably safe pattern for the permanent disposal of plutonium."

"In the design of fission reactors man was not an innovator but an unwitting imitator of nature"



"I (first) thought it was a phony" (Los Alamos Monitor, July 14, 2002)

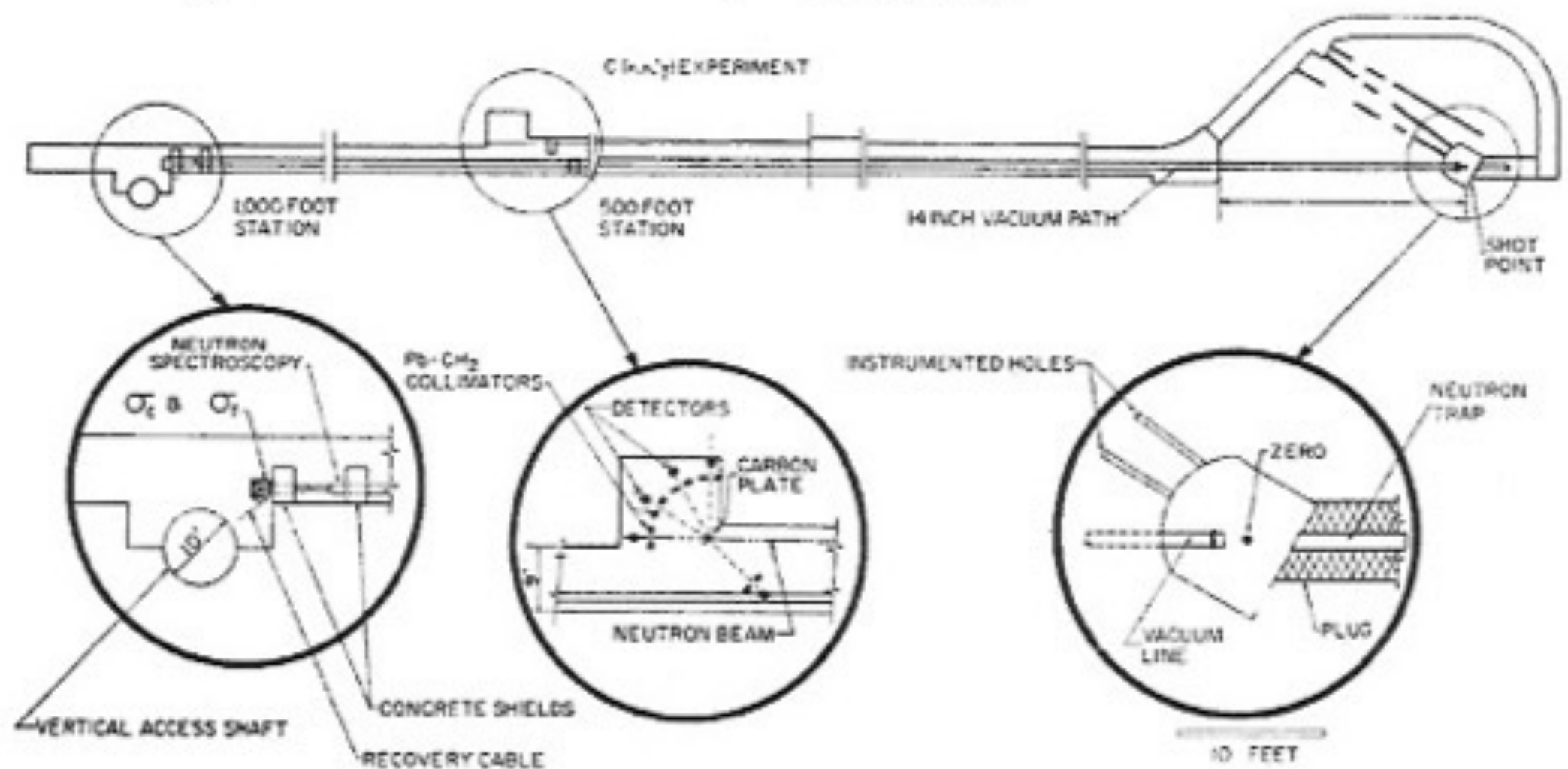


FIGURE 6. NEUTRON EXPERIMENTAL ARRANGEMENT FOR GNOME

Elevation

-2,380

-2,350

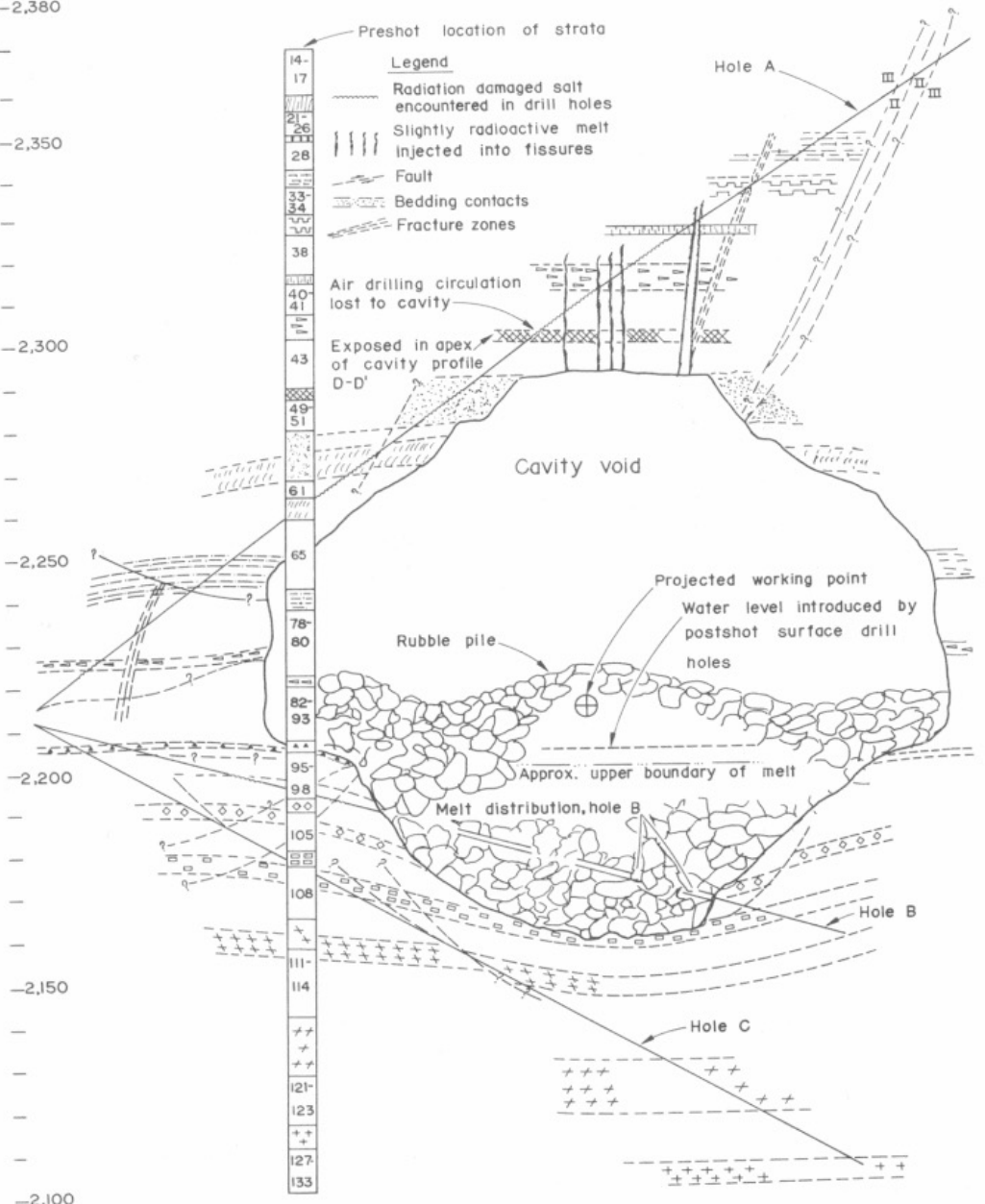
-2,300

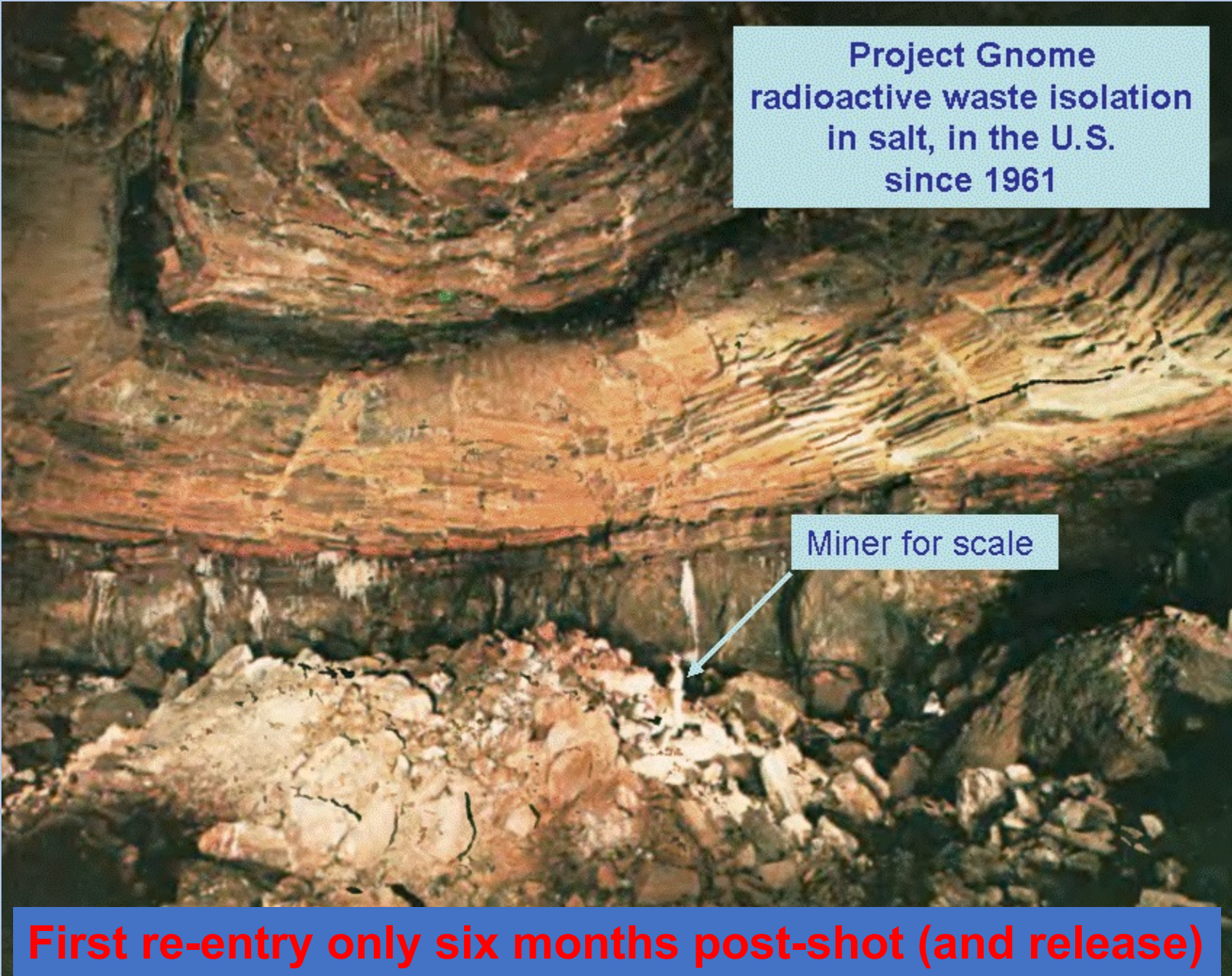
-2,250

-2,200

-2,150

-2,100



A photograph of a salt cavern interior. The cavern walls are composed of layered, reddish-brown salt rock. The floor is a rough, uneven surface of broken salt rock. A miner is visible in the lower center of the frame, providing a sense of scale. The lighting is dim, highlighting the textures of the rock.

Project Gnome  
radioactive waste isolation  
in salt, in the U.S.  
since 1961

Miner for scale

**First re-entry only six months post-shot (and release)**

National Academy of Sciences  
Division of Earth Sciences

**International Conference on Saline Deposits**  
Houston, November 1962

Began with an extensive field trip, including **underground tours** of several potash mines  
and  
**the explosion cavity of project GNOME**, near Carlsbad, New Mexico

>60 geologists and geochemists, including 21 from 10 foreign countries

The Modesto Bee,  
December 11, 1962,  
p. B-2



### Tour Of Gnome Cavity

Dr. Gary Higgins, left, director of the Plowshare division of the Lawrence Radiation Laboratory, and Dr. John S. Kelly, director of the atomic energy commission's division of peaceful nuclear explosives, yesterday toured the nuclear explosion cavity left by Project Gnome, an experiment in the use of nuclear blasts for peaceful purposes, near Carlsbad, New Mexico. The tour marked the first anniversary of the Gnome explosion. The visitors, including newsmen, found the cavity was 107 degrees.

AP Wirephoto

# Nuclear Fracking Experiments

Dec. 10, 1967, 1292m, 29kt



Sept. 10, 1969, 2568m, 43kt

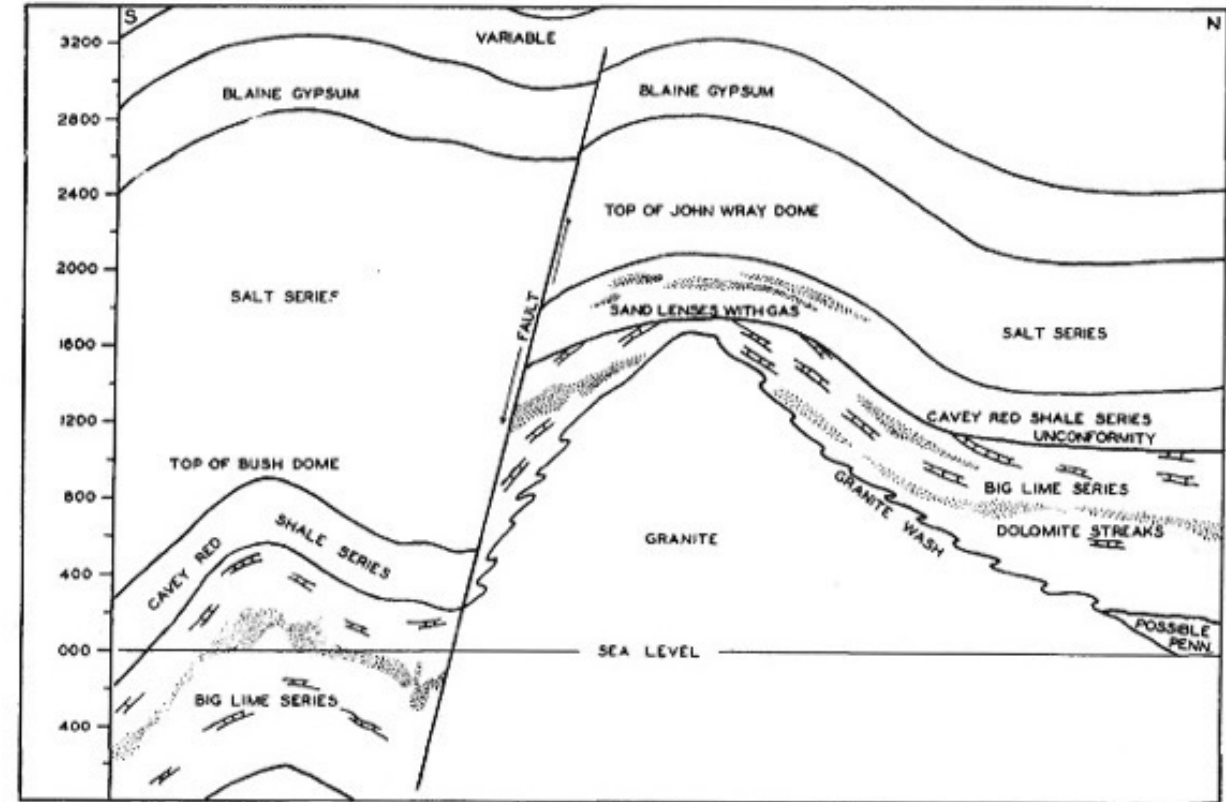
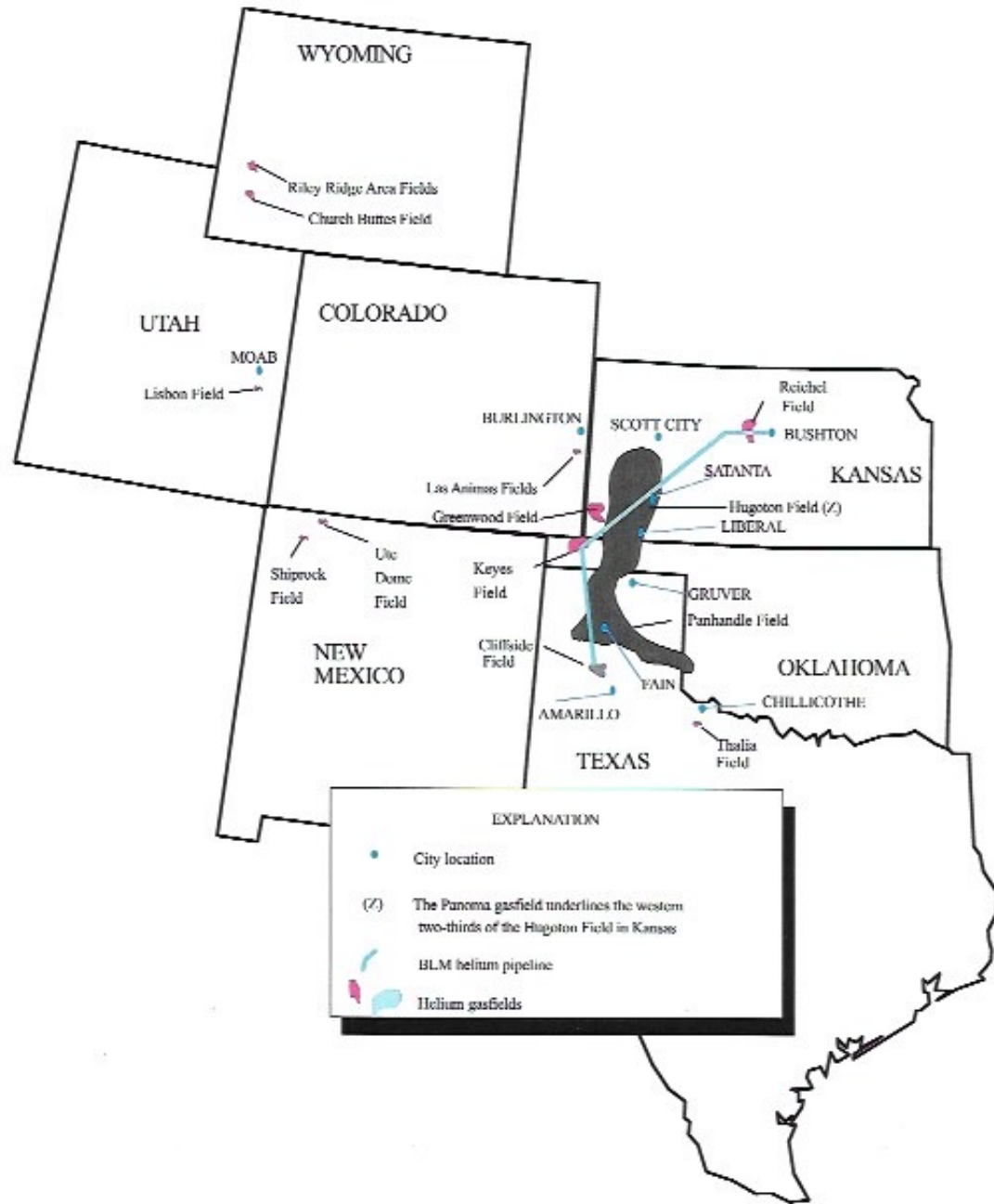


May 17, 1973, 1729-2039m, 3x30kt





# Hugoton natural gas field, principal U.S. He-source



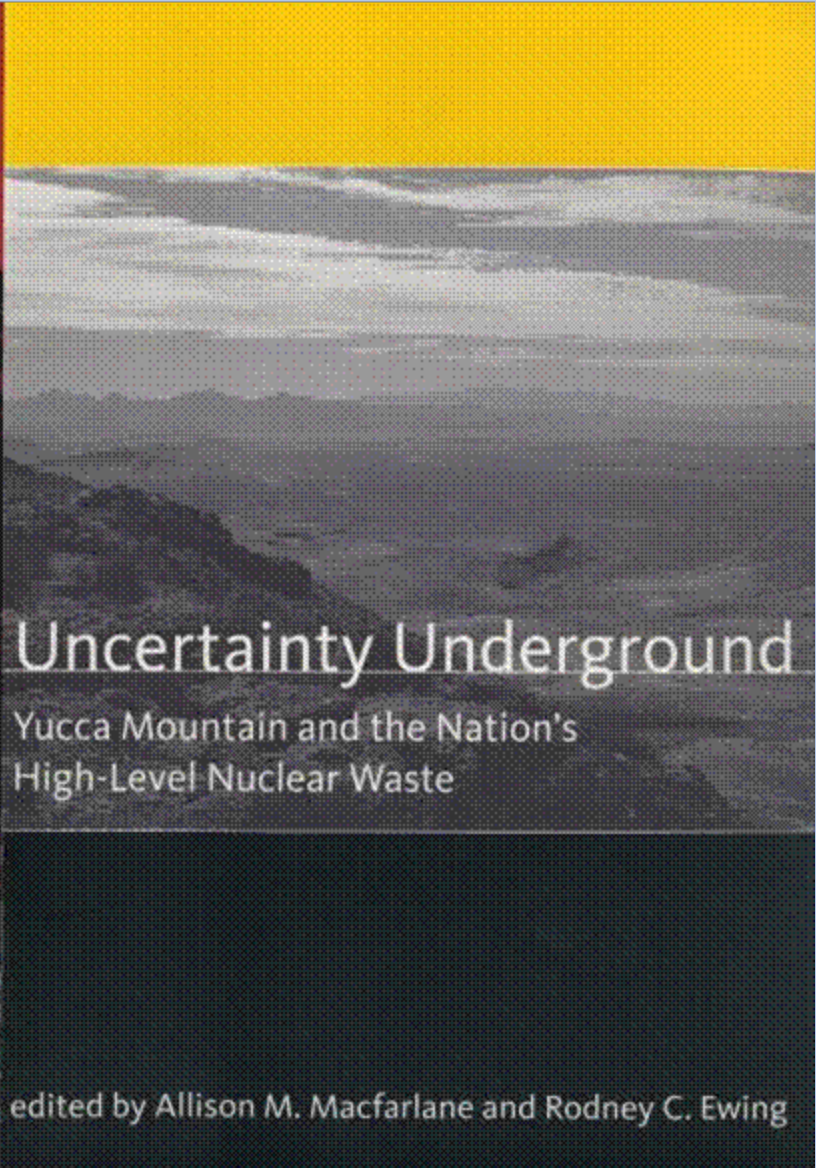
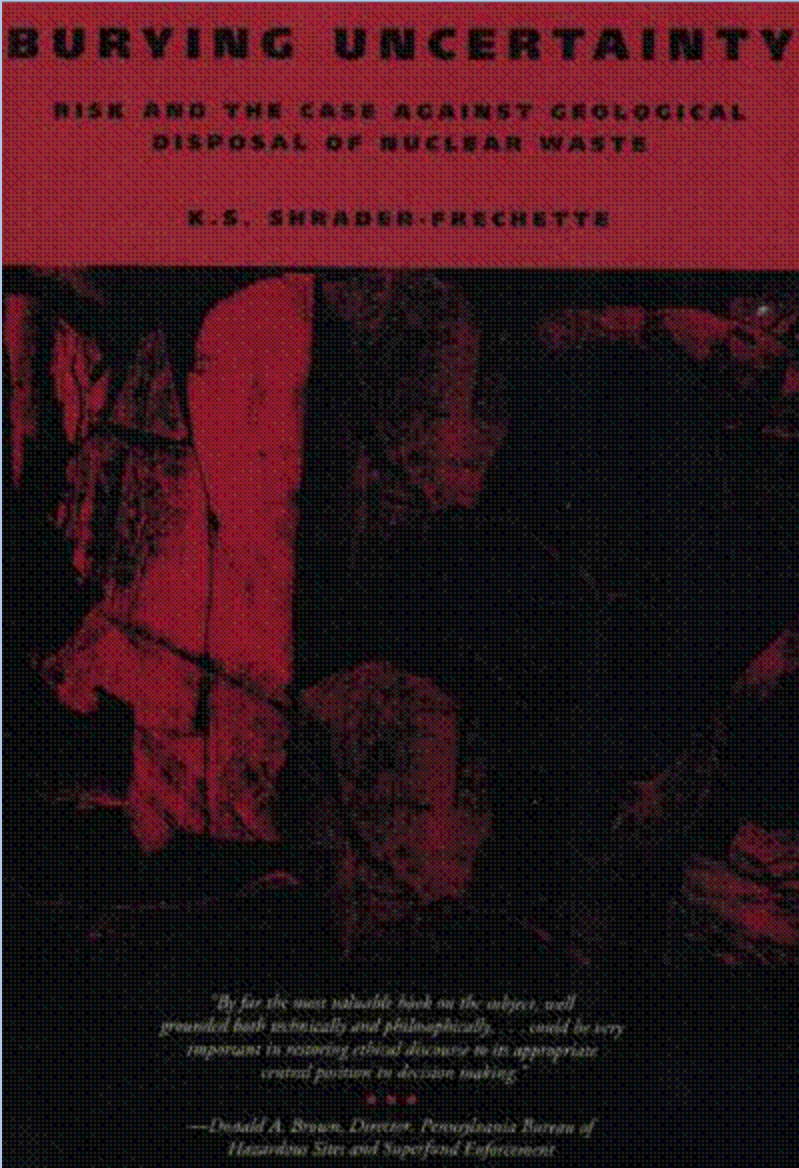
In the spring of 1962, President Kennedy visited Berkeley... I took the opportunity... to make a remark to the president about the extent of misinformation circulating about the great dangers of small doses of radioactivity. I was about to point out that some evidence indicated that **amounts of radiation in slight excess of background radiation might be beneficial**. Before I could do so, the president interrupted me to observe, “Dr. Teller, **if you are trying to convince me that radiation is good for me, you will fail.**” In this case, as in many others, President Kennedy demonstrated more talent as a politician than as a scientist.

Source: Edward Teller, *Memoirs*, Perseus 2001

# Cottage Industry in Uncertainty

1993 University of California

2006 MIT



**There is always a certain uncertainty  
with these (Plowshare) tests,  
and Las Vegas specializes in uncertainty.  
But...the dangers from nuclear tests are  
completely negligible, compared with  
the dangers inherent  
in activities in Las Vegas.**

Teller at Plowshare Symposium, quoted in Nuclear News March 1970

## What have I learned?



George A. Cowan, 1920-2012

- Not a single occupationally irradiated colleague of mine at Los Alamos has died of leukemia or any other type of cancer, problems frequently associated with low-level radiation.
- Strangely, the elevated exposures most of us have experienced over the years may have been beneficial rather than harmful.
- I believe in a nonlinear response to cell damage by radiation.
- Unreliable anecdotes underlie most estimates of possible damage from chronic low-level exposure.

From Chapter 41 of *From Manhattan Project to the Santa Fe Institute – The Memoirs of George A. Cowan*, UNM Press, 2010

1995  
ISBN 0-944838-96-0

Has  
radiation protection  
become a  
Health Hazard

Gunnar Walinder

Nuclear Training & Safety Center, Nyköping, Sweden  
Medical Physics Publishing, Madison WI , USA

# UNDER- EXPOSED

---

What If Radiation  
Is Actually  
**GOOD**  
for You ?

by Ed Hiserodt

*Laissez Faire Books*  
a division of the Center for Libertarian Thought, Inc.  
LITTLE ROCK, ARKANSAS

2005

ISBN 0-930073-35-5



# Precautionary Principle

In Action

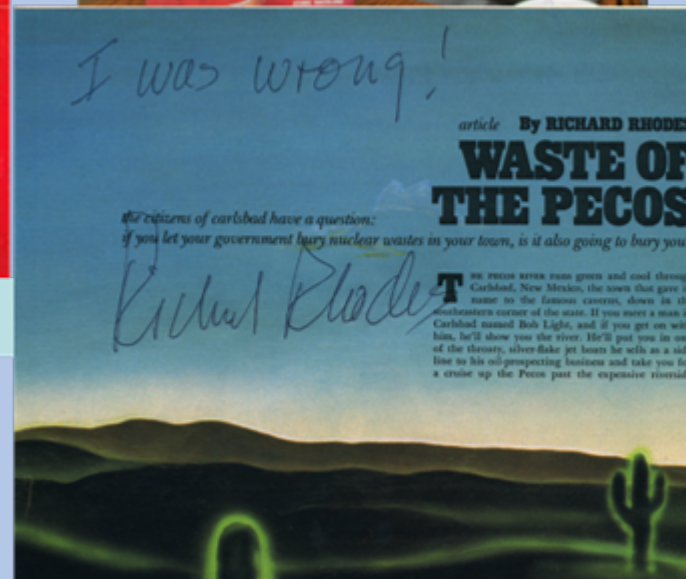
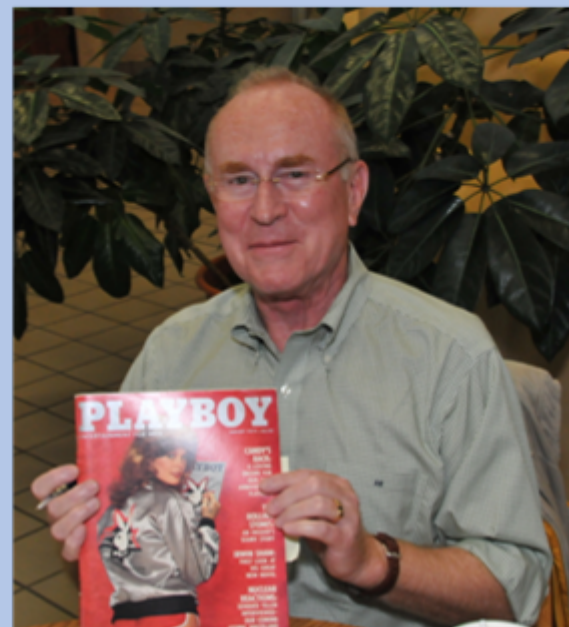
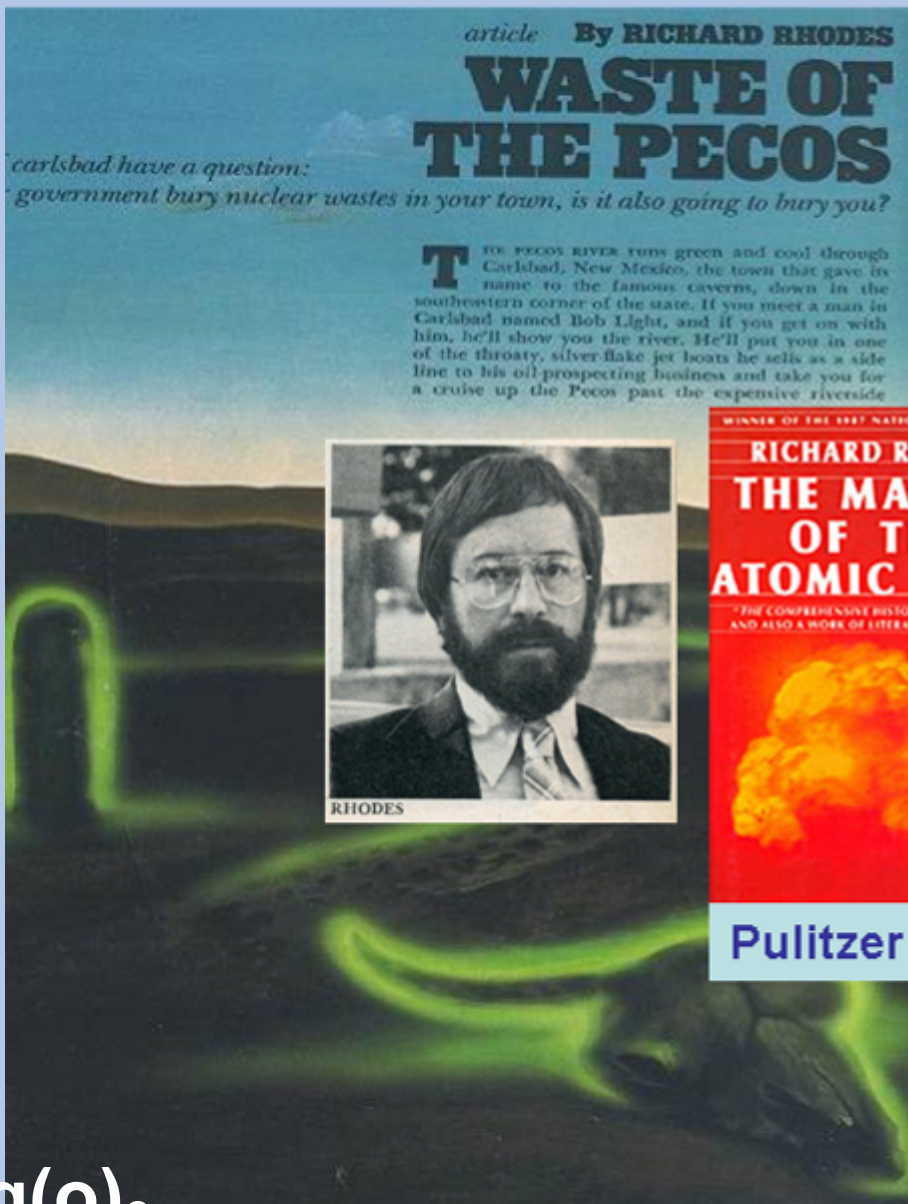


Anneken Hendriks, Amsterdam, executed 1571



August 1979

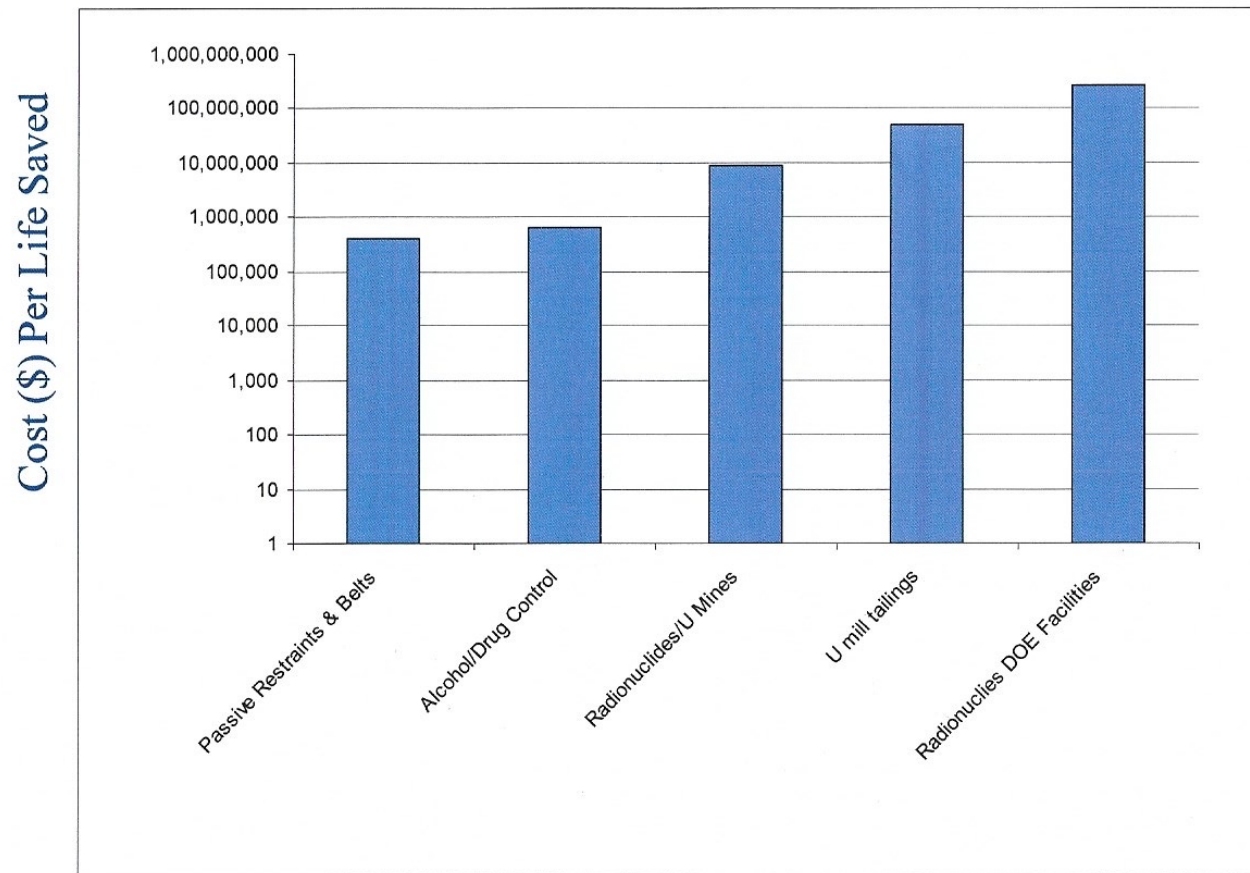
August 2009



ng(o)<sub>3</sub>

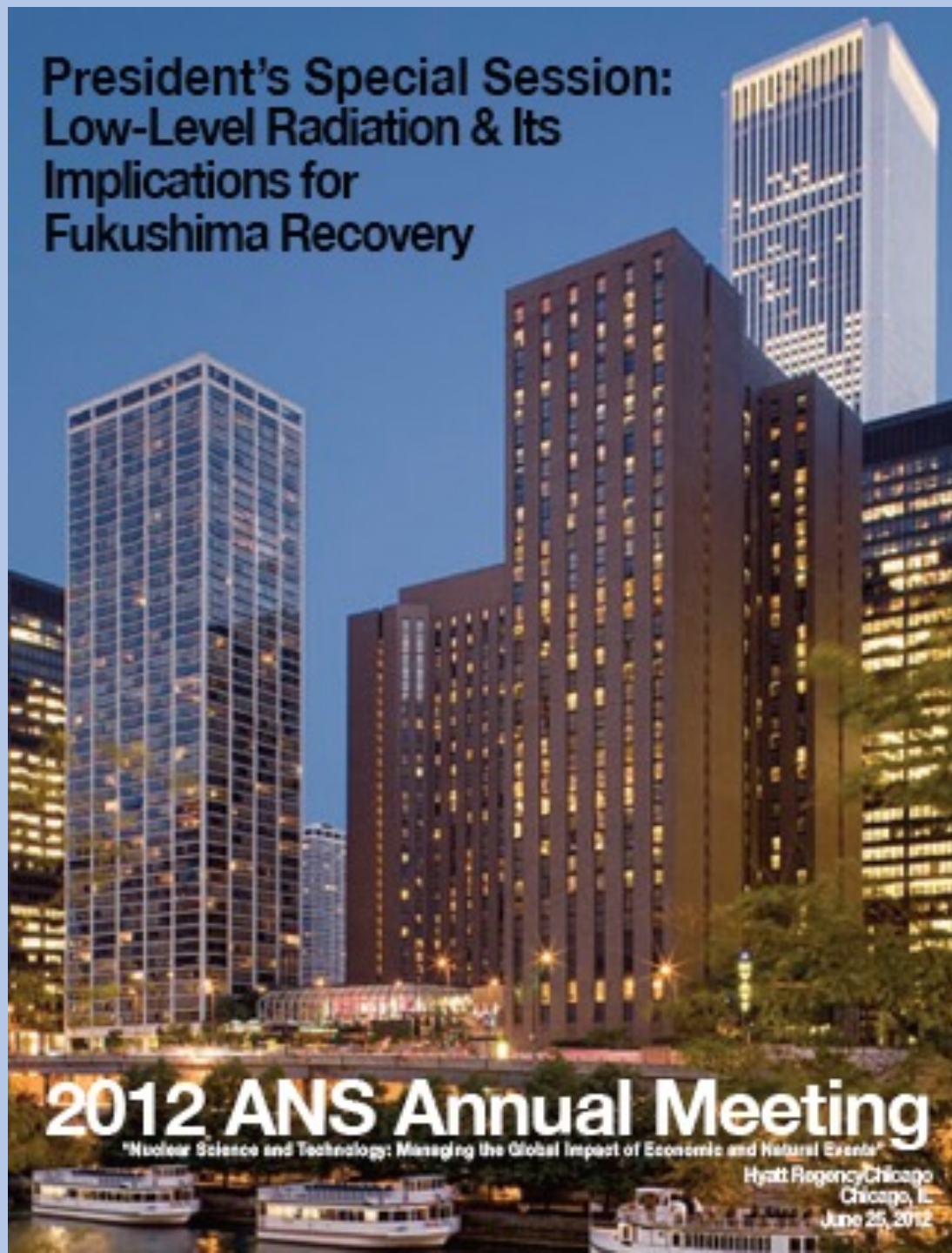
ng(o)<sub>3</sub>

# Cost of Regulation



- Viscusi, 1992
- 1990 US dollars
- Nuclear regulations not cost effective

President's Special Session:  
Low-Level Radiation & Its  
Implications for  
Fukushima Recovery



**2012 ANS Annual Meeting**

"Nuclear Science and Technology: Managing the Global Impact of Economic and Natural Events"

Hyatt Regency Chicago

Chicago, IL

June 25, 2012

What and where  
are any  
consequences?

If not now,  
when?

If not us,  
who?

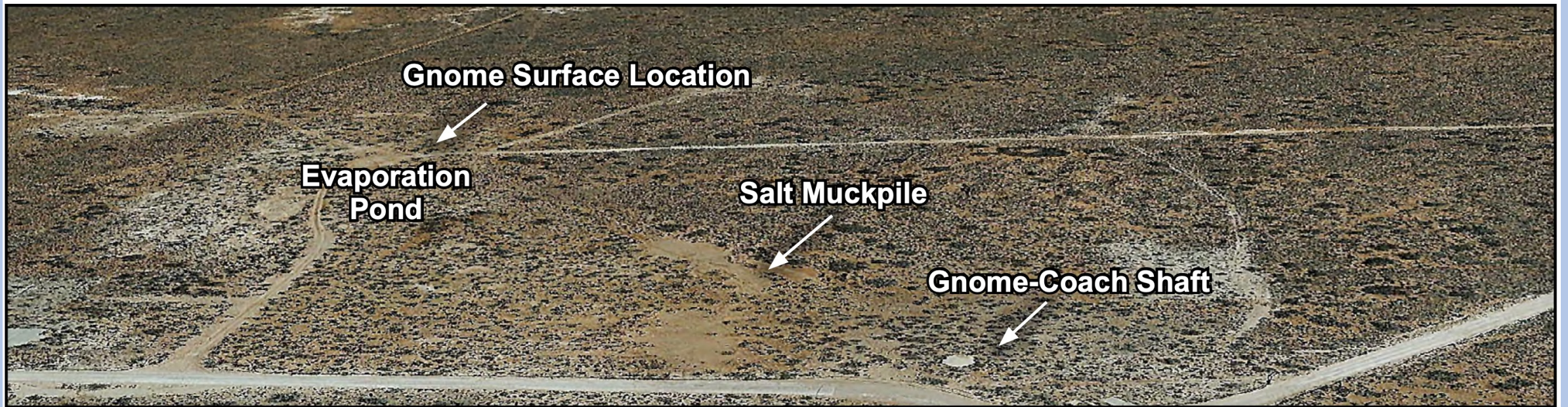
ng(o)<sub>3</sub>

**If you believe that the world is a better place because during the second half of the twentieth century the United States prevailed over its enemies, you will have trouble escaping the conclusion that**

**Edward Teller was a great man.**

Thanks for the opportunity  
to let your minds play  
“outside the box”

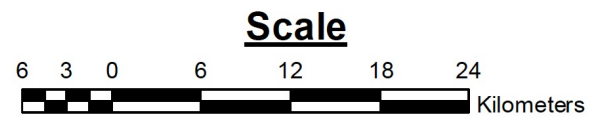
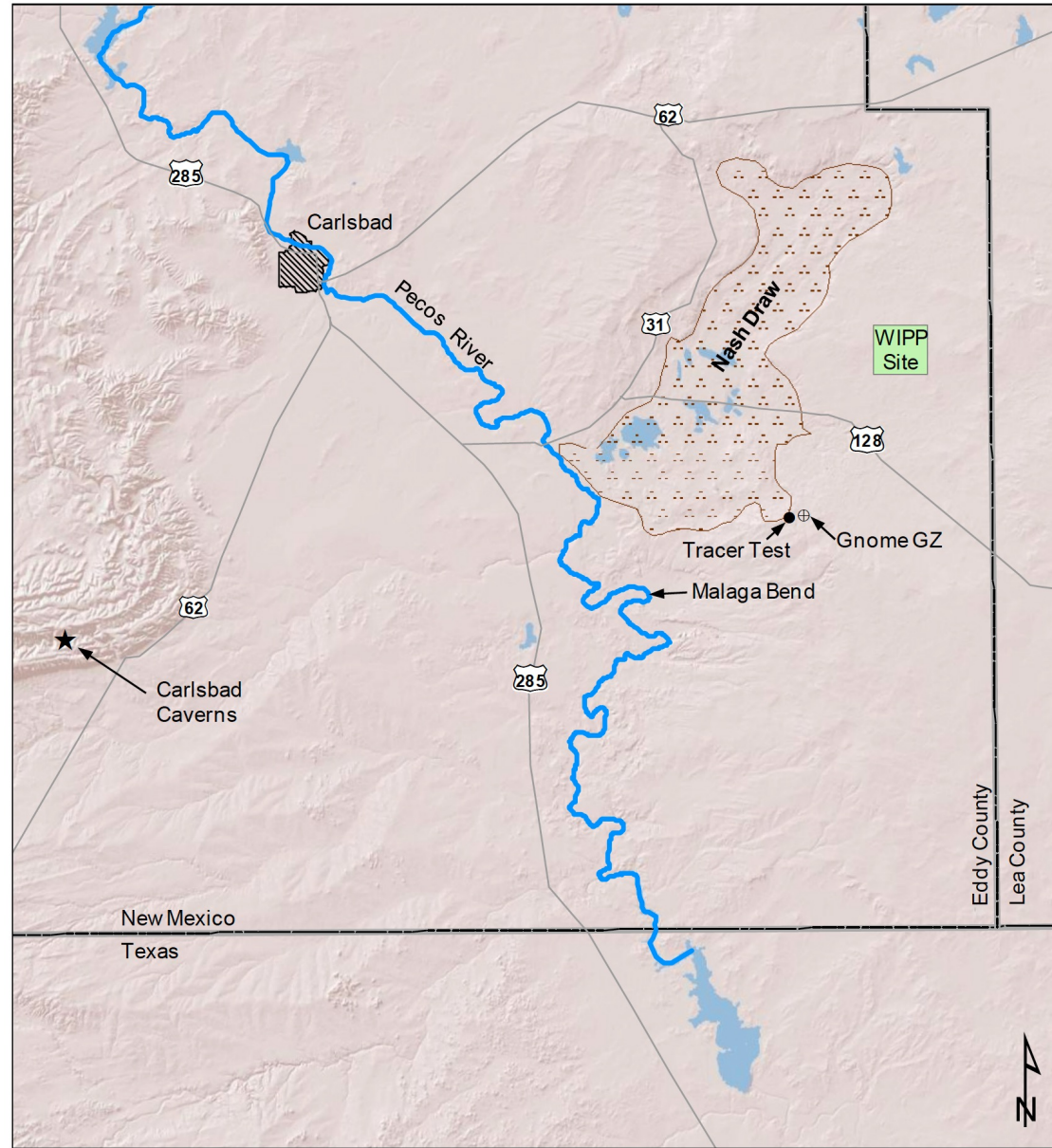
# Bonus slides

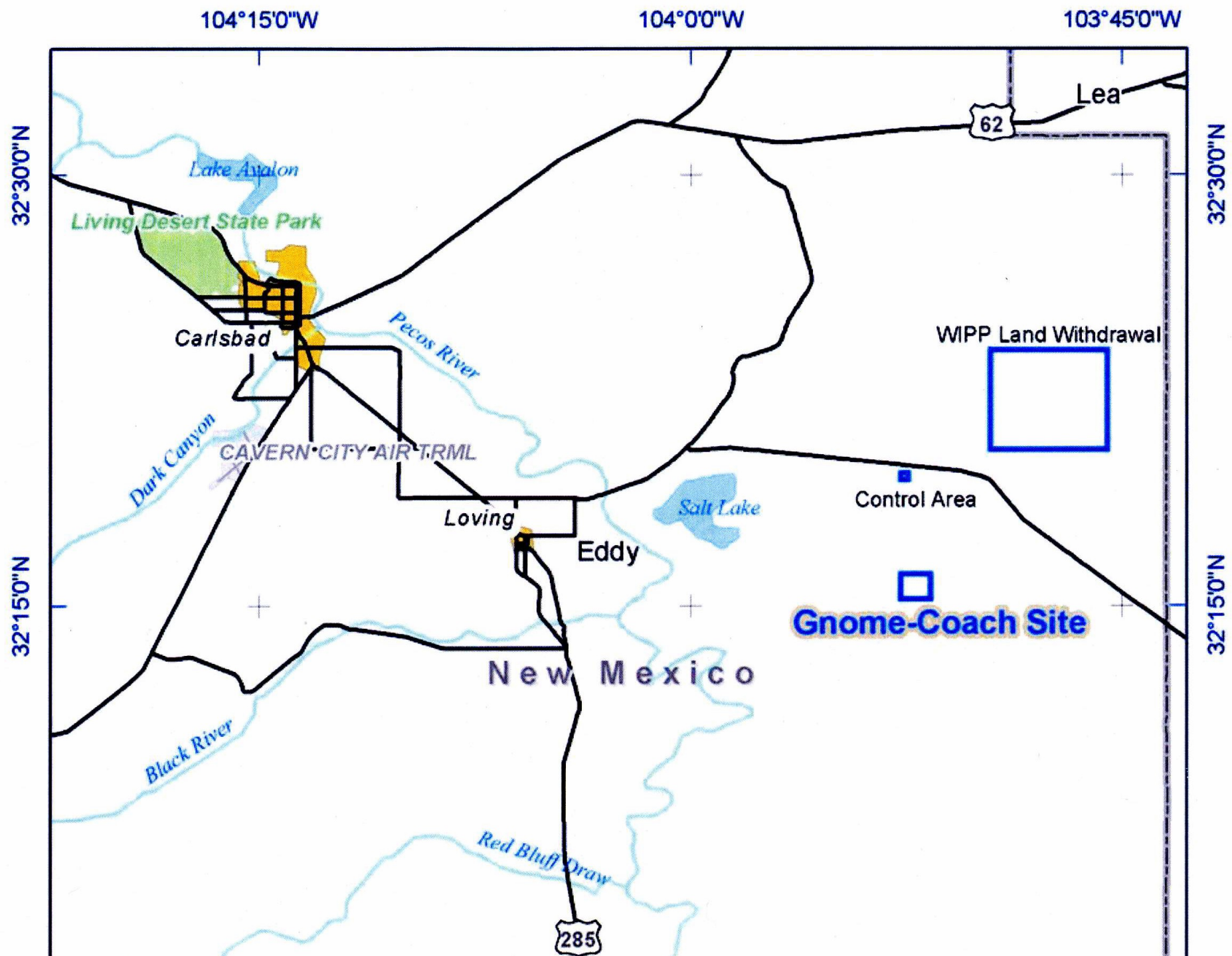


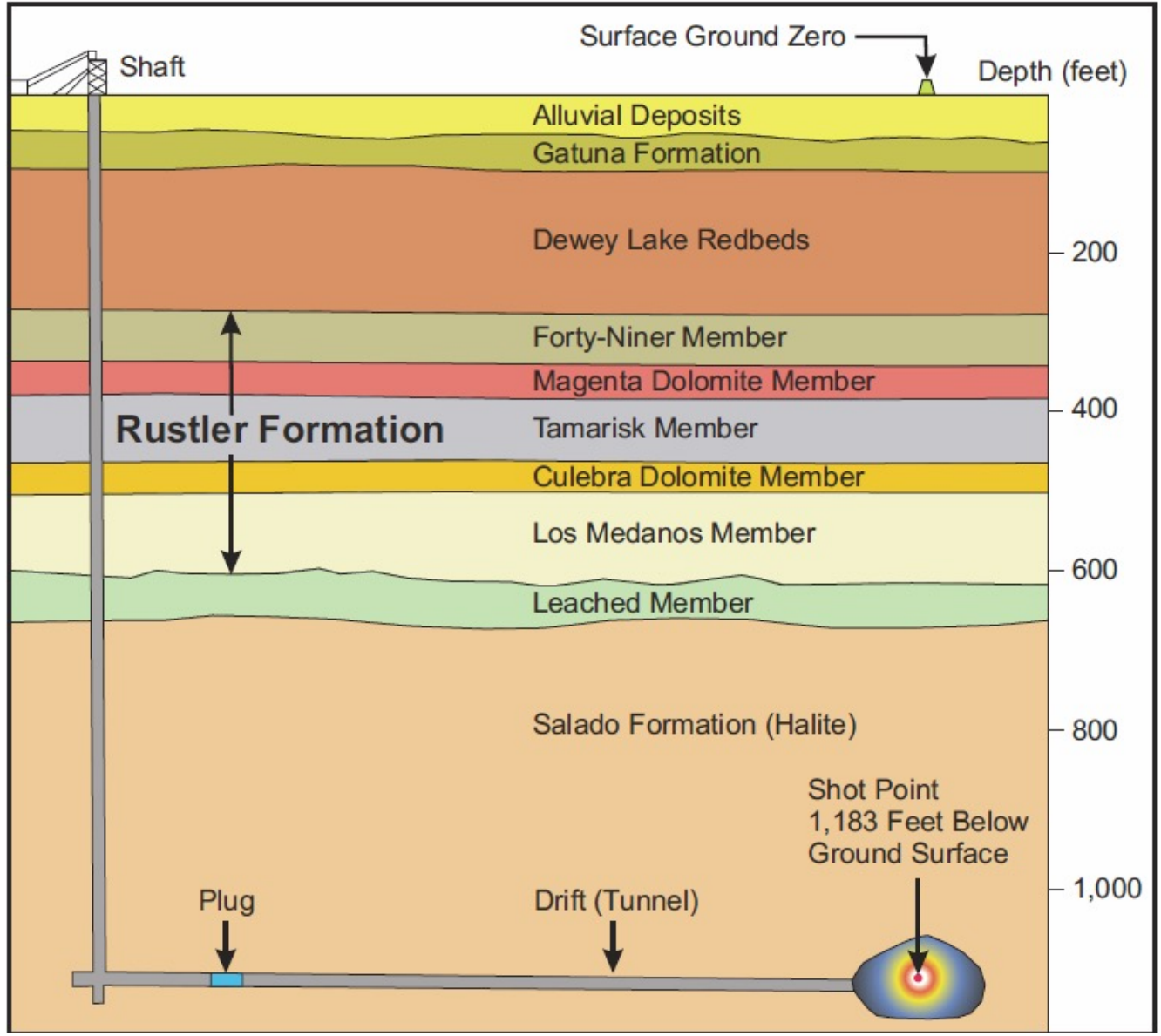
*Top: View of Gnome-Coach, New Mexico, Site (1961); Bottom: View (2014)*

crossed this road. One of the mobile monitoring teams in the area of the Highway 31 and Highway 128 junction noted automobiles with readings of 50 mr/hr - 250 mr/hr beta-gamma activity. This information was radioed to the Control Point and immediately road blocks were ordered by the Test Manager near the CP area to prevent other vehicles from passing through this contaminated area. The seven vehicles that had already passed through this area were monitored and directed to a service station in Carlsbad that had been previously designated as a vehicle decontamination station for washing. After the vehicles had been washed and remonitored, they were released when the activity levels were below 10 mr/hr. People in the vehicles were not subjected to the contamination that the surface of the vehicles were, because the thermal temperature required the windows to be closed. The highest reading recorded inside the vehicles was 15 mr/hr at the time they were first monitored. One individual apparently rubbed the surface of a vehicle with his hand and was directed to wash thoroughly which eliminated the activity.









# CARLSBAD CURRENT-ARGUS

United Press International Full Leased Wire

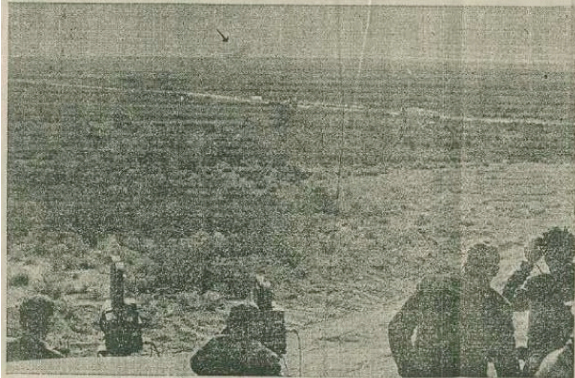
United Press International Home

☆☆☆

CARLSBAD, NEW MEXICO, MONDAY, DECEMBER 11, 1961

HOME EDITION

## -Shot Tests Start At



WHEN GNOME EXPLODED — Vapor billows skyward (top center) immediately after the Project Gnome underground nuclear blast Sunday, 25 miles southeast of Carlsbad. Newman are in the foreground. The shot, 4.5 miles from the camera, released radiation. (By Dale Sedgwick, Staff Photographer)

### A-Blast Results Studied

By DICK HARDWICK  
Current-Argus Editor

Post-shot tests were expected to start at Project Gnome Tuesday to determine if America's first experiment in finding peaceful uses for atomic energy was a success or failed to live up to expectations.

Re-entry rigs were expected to be placed over the hole Tuesday to drill for core samples.

But a spokesman for the Atomic Energy Commission said technicians will not re-enter the shaft until the pressure is bled off.

The shot itself was termed 70 per cent successful at a briefing Sunday night despite the fact that

reprint of  
December 11,  
1961 issue

# t At Gnome

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The shot itself was termed 70 per cent successful at a briefing Sunday night despite the fact that it vented radioactive steam and temporarily forced the closing of State Highway 31.



'WHITE VAPOR' — Dr. Edward Teller (with mike), the "sage of Berkeley," draws a chuckle from onlookers immediately after Project Gnome nuclear test blast here Sunday. Asked what sort of vapor it was escaping from the shaft, he replied dryly, "White vapor!" Beside him is Dr. Gerald Johnson of the AEC, who was with Teller in a helicopter over shot. In background is information chief Dick Elliott. (Staff Photo)

## Teller Proves Wry, As Well As Smart

By JERRY DORBIN  
Current-Argus Staff Writer

The man is short and stocky, with greying hair. Most prominent physical characteristic of his features, perhaps, is the heavy, bushy brow, reminiscent of John L. Lewis. He speaks with a rich southeastern European accent.

☆☆☆

### Earth Jumps, Impressing Observers

"It felt as if the whole earth were hollow, with only a crust about ten feet deep beneath us," said one observer when the Gnome shot was fired. Near him, other observers echoed his reaction to the sensation.

The earth "jumped about a foot" at the surface-ground-zero, reported Dr. Gerald Johnson of the AEC. He and Dr. Edward Teller were hovering just over 100 feet in a helicopter when the five-kiloton blast was fired. A seismograph at the site of the test during firing.

At about 10 a.m., just after the second postponement, and while spectators blew on their hands to warm them, he assured them, "It is a law of nature that when I come to a test, something goes wrong."

Asked about the possibility of the test being held up until today, he replied, "I have already made arrangements to stay over. That is the best indication I can give you that it won't be fired."

MORE PHOTOS ON PAGE 7

At last report, radioactive steam was still wafting from the shaft, but scientists said in a post-shot briefing Sunday night that this radioactivity was not considered high enough to be dangerous to humans, animals or crops.

"To the best of our knowledge, safety precautions have been adequate," said James E. Reeves, director of field operations for the Atomic Energy Commission.

"But we haven't collected all the data for firm and conclusive answers to all questions," he added.

Dr. Phil O. Randolph of the Lawrence Radiation Laboratory, deputy technical director for Project Gnome, said:

"Seventy per cent of the objectives of Gnome, in the sense of concrete data for future use and future planning, has been successful."

But he pointed out that Gnome was an experiment and that it may be years before it is known whether some of the long-

(Continued on Page Two)

800 words of testimony at the trial and more than 1,000 exhibits. The trial began April 11, about 11 months after Israeli agents tracked Eichmann to a hideout in Argentina and returned him to Israel to face charges unprecedented in legal history.

### Wreck Victim's Condition Same

The condition of Cecil West, 44, of 217 W. Texas St., remained unchanged today at Carlsbad Memorial Hospital.

West is in critical condition suffering from internal injuries. He was hurt in a two-car collision 21.5 miles east of Carlsbad Friday night on U.S. Highway 63-10.

Clinton L. Backus, 35, was killed in the wreck.

Funeral services for Backus were to be held today at 3 p.m. in the Pine Baptist Church, near Leonard, Tex. Burial is to be in the Pine cemetery.

The body was sent to Leonard Sunday by train from Carpenter Funeral Home here.

### ONLY A RIPPLE

## Caverns Calm Unbroken By Gnome

By STEPHANY CROW  
Current-Argus Staff Writer

One of the world's most impressive natural wonders, Carlsbad Caverns, remained unscathed Sunday following the detonation of the Atomic Energy Commission's 5-kiloton underground device at Project Gnome.

The blast occurred in a basin approximately 34 miles from the caverns' limestone formations along a ridge of the Guadalupe Mountains.

1 was with park rangers who were stationed at Mirror Lake in the cave's Big Room. Another ranger stood watch in the Green Lake Room. These points were picked for observation because the only visible effects of the detonation were expected to be seen in the rippling of water in the pools.

Park personnel were so confident no damage would be brought to the cave's formations, that securing permission to go into the caverns during the detonation was easily obtained for this special assignment.



WATCH MIRROR LAKE — Paul J. Spangler (left), chief park naturalist and John M. Broadbent, chief park ranger, watch the water on Mirror Lake in the Big Room of Carlsbad Caverns, for visible indications of force from Sunday's detonation of Project Gnome. Ripples in the pool are caused by water dripping from the ceiling. (Staff Photo)

John M. Broadbent, chief park ranger, and Paul J. Spangler, chief park naturalist, watched the water of Mirror Lake intently for some visible sign of Gnome's force. But the only indication was what appeared to be a slight increase in the amount of water dripping from the ceiling, forming concentric circles in the pool.

The rangers concluded that these few extra drops might not necessarily have been caused by the blast, and Spangler reported, "Absolutely no effects observed."

Walker B. O'Neal, supervisory ranger, was stationed at Green Lake and said, following his return to the underground lunchroom, "Everything's exactly the same as it was before."

The only thing to break the "obvious" silence in the cave, during and after the detonation, was the episodic dripping of water from ceiling to floor, the seepage process which built up the flow of beautiful rock formations observed in the caverns.

A seismograph installed by the AEC in a subroom to the cave's underground lunchroom, may have

noted through its sensitive instruments, some effect of the Gnome blast within the caverns.

However, the vibrations were recorded on photographic film within the seismograph which was placed in a dark, locked room. The machine has been in the room for over a week, and has been transmitting ordinary vibrations within the cave for comparison with those during the blast. It will remain in the room to continue to record vibrations until its data film is removed, developed and checked by the AEC.

Nick A. Cafazati, administrative analyst in the public safety branch office of field operations was stationed in a car in the Tourist Center parking lot, with a radio tuned to the wave length of the Gnome site instruction transmitter.

Cafazati reported periodically to Bill Gray, assistant chief ranger, on developments and delays at the site. The blast, originally scheduled for 8 a.m., was postponed first to 10 a.m. and then to noon.

(Continued on Page Two)

# Colors of Rainbow Distinguish Cavity Of Gnome Project

By HARRY MOSKOS  
CMI 170-DEC 11 1962

CARLSBAD (AP)—The Project Gnome cavity is lined with a rainbow of colors one would think was the work of nature and not the result of a man-triggered nuclear explosion.

The 980,000-cubic-foot cavern created by the detonation of the world's first known nuclear "peace bomb" was examined by 36 U.S. newsmen and photographers Monday.

Chalk-white stalactites were visible around the ceiling and the walls of the chamber. Some of the stalactites were pencil-thin while others were in odd-shaped clusters.

Other salt formations are purple or dark blue, while rust-colored deposits indicate various potash formations. Clay deposits range in color from light gray to black.

There is a wide variation of colors in addition to the predominant blue, gray and rust hues.

"The radiation discolors the formation and gives it the wide range or spectrum of colors," said John S. Kelly of Washington, director of the Atomic Energy Commission's Division of Peaceful Nuclear Explosives.

## 3-Kiloton Blast

Project Gnome was a 3-kiloton nuclear charge detonated 1200 feet under ground in a salt formation 28 miles southeast of Carlsbad at noon on Dec. 10, 1961.

Gnome was the first experiment in the Plowshare program which is designed to find peaceful uses for nuclear explosives.

"The AEC already has started site preparation work for Project Coach, another test in the Plowshare program. Coach, which will use some of the facilities of the Gnome experiment, will be detonated in the same general area as Gnome was, beneath the rolling plains in a desolate section of southeastern New Mexico.

The cavity left by the Gnome detonation has a diameter of 123 feet to 125 feet. Its greatest height is about 89 feet, equal to a seven or eight-story office building.

Because of the small observation area, only four newsmen were able to view the cavity at one time.

The temperature in the cavity is around 105 degrees

# Newspaper clipping (unknown source) December 11, 1962

with a relative humidity of 60 per cent. The AEC, pumps cool air into the cavity to keep the temperature from soaring to unbearable levels.

There is some background radiation in the cavity, but the AEC considers it non-injurious to humans. Those making the observation tour wore radiation badges and newsmen were required to sign waivers against government liability in case of injury.

At the base of the cavity is a rubble pit which is composed of chunks of the colored deposits of salt, potash and clay.

The cavity size is much smaller than some of the chambers in the nearby Carlsbad Caverns National Park but is much more colorful in some aspects.

The 1116-foot hook-tunnel leading to the cavity is almost identical to the many potash mine tunnels in the area.

In summarizing Project Gnome, Dr. Gary Higgins, said scientists had very high hopes in the test which had three or four major objectives. Some Disappointments

"In some areas we learned what we expected — while in some phases we were pleasantly surprised, but in other areas we were disappointed," said Dr. Higgins, who is director of the Plowshare Division at the Lawrence Radiation Laboratory, Livermore, Calif.

One of the apparent disappointments was in the attempt to generate power.

"Heat was deposited in the salt as calculated, however two problems arose that were greater than anticipated," Higgins said.

One was the early partial collapse of the cavern walls which reduced the temperature of the melt below the predicted value and the other was that the quantity of cor-

rosive gases produced was larger than expected.

"Both factors," he said, "make power production very difficult and probably not competitive under conditions that can now be realized."

Kelly said, "It appears that we are further away than we thought we were from getting a plan to fill the cavity to produce a source for energy."

Plans for Next Test  
Plans for Project Coach are continuing. Coach is intended to exploit the Plowshare research started in Gnome.

Coach will be from 5-10 kilotons and will be about 100 feet deeper than Project Gnome.

The same vertical elevator shaft, which can descent 1200 feet in 40 seconds will be used in the Coach test. The Coach cavity will go off in a different direction from the Gnome chamber.

Prior to the Gnome detonation safety studies were made to assure that the underground nuclear explosion would not damage the nearby Carlsbad Caverns or the potash mines.

Kelly said the large Coach detonation is not expected to pose any danger to the caverns or the mines since the Gnome safety studies were in regard to a 10-kiloton explosion.

Kelly said there is no set timetable for Coach.

"We will do it as soon as we are prepared," Kelly said.

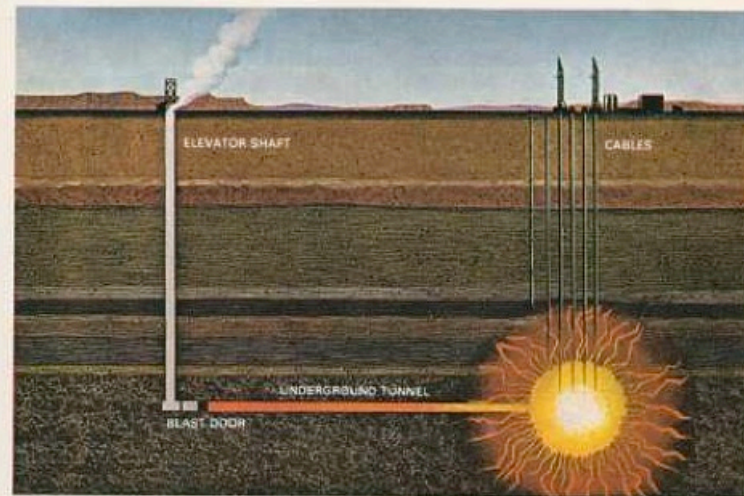
# An Atomic Gnome to Carve a Cave

# Life Science Library: Energy, 1963

"Atoms for Peace" is a popular layman's slogan in the postwar world, and the U.S. Government's "Plowshare Program" is aimed at making it a reality. In December 1961, Plowshare's "Project Gnome" sank an elevator shaft 1,200 feet into the New Mexico desert, dug a horizontal tunnel 1,116 feet long and planted a small (3.1 kiloton) atomic bomb. Closing a blast door at the elevator end, the Gnome scientists detonated the bomb. The result was the first man-made atomic cave (left). The cavity was 170 feet wide and 80 feet high.

The temperature was still a torrid 140° F., but practically all the radioactivity had either already disappeared or been trapped beneath the rubble.

Gnome provided hopeful guides to the feasibility of using such blasts for mining ore, extracting oil and providing water reservoirs. It also proved there was one scheme which would not work. Water was poured into the cavity soon after the explosion in the hope that high-pressure steam would jet to the surface, where it could be used to generate electricity. But much steam escaped through cracks and vents, and what did come up was too full of corrosive minerals to be used.

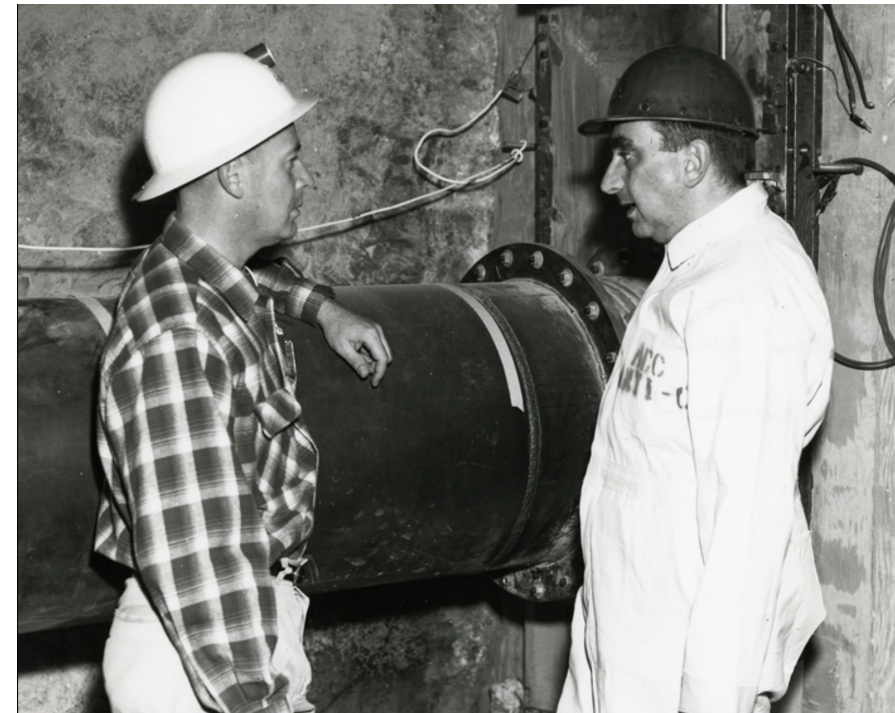


## A CAVE DIGGER'S BLUEPRINT

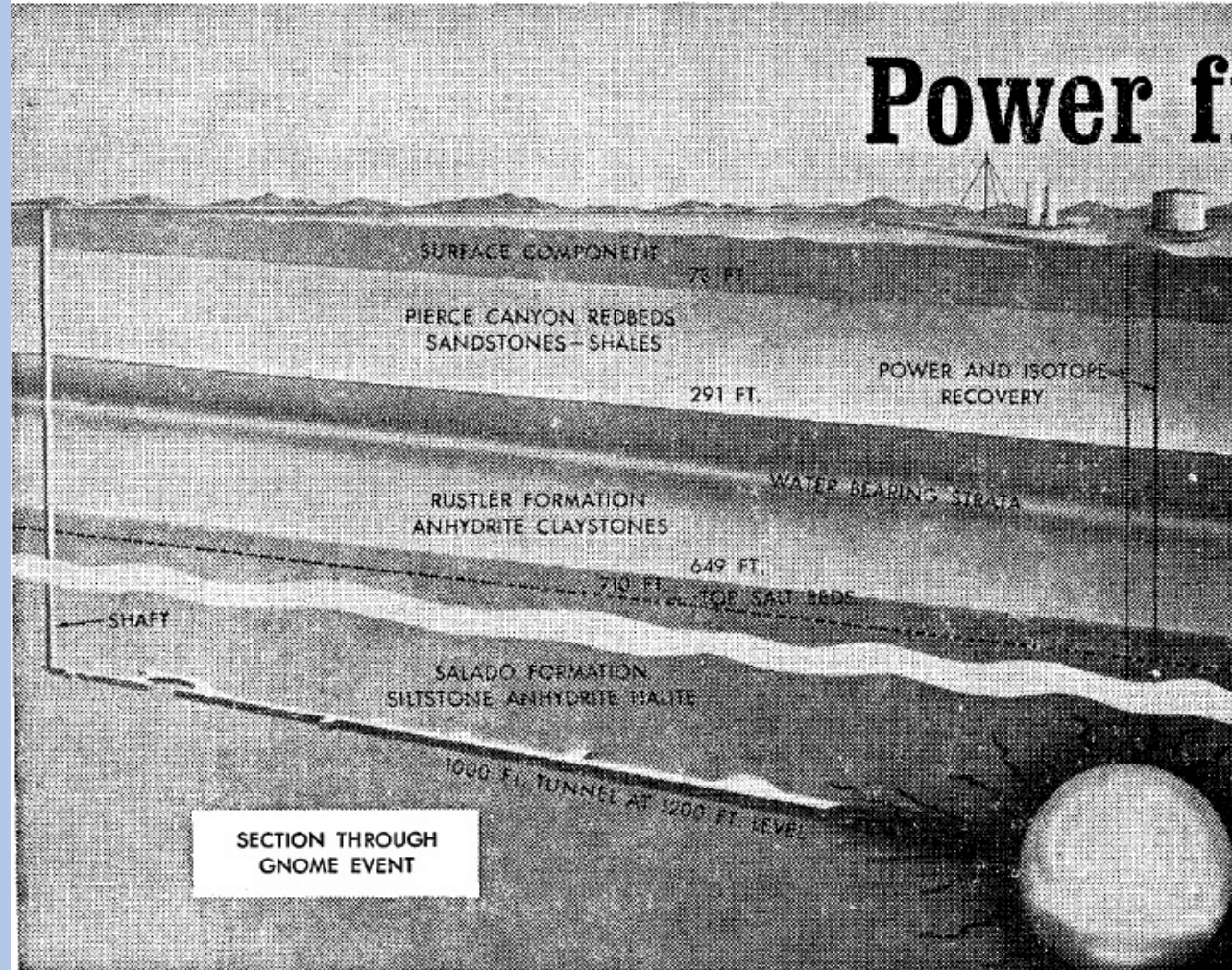
This cutaway diagram of the first underground atomic explosion shows the elevator shaft, the underground tunnel to the blast site, the fiery explosion and the cables which relayed information about the blast. Dozens of instruments were buried in the ground at various levels. Seismic stations around the world recorded the tremor, which was equal to a minor earthquake.

## A NUCLEAR SALT BUBBLE

As deep in the earth as the Empire State Building is high, the scientist at left stares in awe at Gnome's handiwork. Exploded in a bed of rock salt, the bomb blew a huge bubble that fused the salt, forming an almost perfectly spherical cavity. The bottom half is filled with rubble; the domed roof, with its slender stalactites, was turned blue, green and violet by intense heat.



## Power from below



An artist's conception of Project Gnome, a step toward providing power and isotopes from underground thermonuclear detonations. This area of endeavor is part of Project Plowshare, initiated at the Lawrence Radiation Laboratory of the University of California. Other Plowshare projects under study include the excavation of an experimental harbor in Alaska, production of oil from tar sands, control of groundwaters, mining applications, and other novel ideas using the energy of nuclear explosives.

The Lawrence Radiation Laboratory is working in the areas of Nuclear Propulsion, Controlled Thermonuclear Reactions, Nuclear Explosives for Industry and Defense, Space Physics, and other advanced problems in Nuclear Physics and Engineering.

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# An A-Blast Harnessed for Peaceful Test

Last week U.S. scientists were mulling over results of the first trial blast—Project Gnome—in an ambitious program to harness nuclear explosions for peaceful purposes. The AEC program, called Plowshare, is seeking ways to use A-bombs and H-bombs to build harbors, extract oil from shale, tap new water supplies, provide new power sources. The Project Gnome experiment encompassed everything from basic studies of neutron effects to tests aimed at the practical use of power from steam.

In this drawing the Gnome site near Carlsbad, N. Mex. is partially cut away to a depth of 1,200 feet to show the 110-foot blast cavity, the 1,100-foot-long horizontal tunnel (now partially collapsed) that connects the cavity with the elevator shaft, and six vertical holes drilled deep into the rock. These made possible four major experiments (indicated in larger type): 1) NEUTRON EXPERIMENTS. Rapidly rotating wheels with samples of various elements were placed at the far end of the tunnel to be bombarded by neutrons speeding from the blast. 2) EARTH MOTION. Dozens of instruments were placed in holes and on the surface to record the earth's complex heavings. Meanwhile seismic stations around the world recorded the tremor. 3) RADIOISOTOPE RECOVERY. A sampler collected radioisotopes (radioactive elements) from the blast. Later a rig drilled for more extensive samples. 4) POWER MEASURING. Water injected into the blast cavity will be turned into steam by the 1,440° F. heat trapped there. After its energy is measured, the steam will be condensed and stored.

But one major thing went wrong with Gnome. Radioactive steam escaped, no one knows how, up the elevator shaft and past three barriers—the sealed-off tunnel, the concrete block barrier and a blast door. There must have been a leak in the cavity, which may have to be plugged before the steam power experiment can proceed.

EARTH  
MOTION  
STUDIES

EARTH MOTION  
INSTRUMENTS

EARTH MOTION  
INSTRUMENTS

CABLES FOR  
DETONATING AND STUDYING  
NUCLEAR DEVICE

BLAST CAVITY



George A. Cowan (1950s photo)

The initial beam would be split into three separate beams: two would strike neutron detectors, while the third would be split again and then hit a pair of rotating wheels. The top, smaller wheel, contributed by George Cowan's team at Los Alamos, held samples of uranium-235, while the bottom wheel, from Lawrence Livermore, had samples of uranium-238, thorium-232, gold-197, and hafnium-180.<sup>[FNER]</sup>



Figure 13: *GNOME Rotating Wheel Experiment*<sup>[GHH]</sup>  
(US Government)

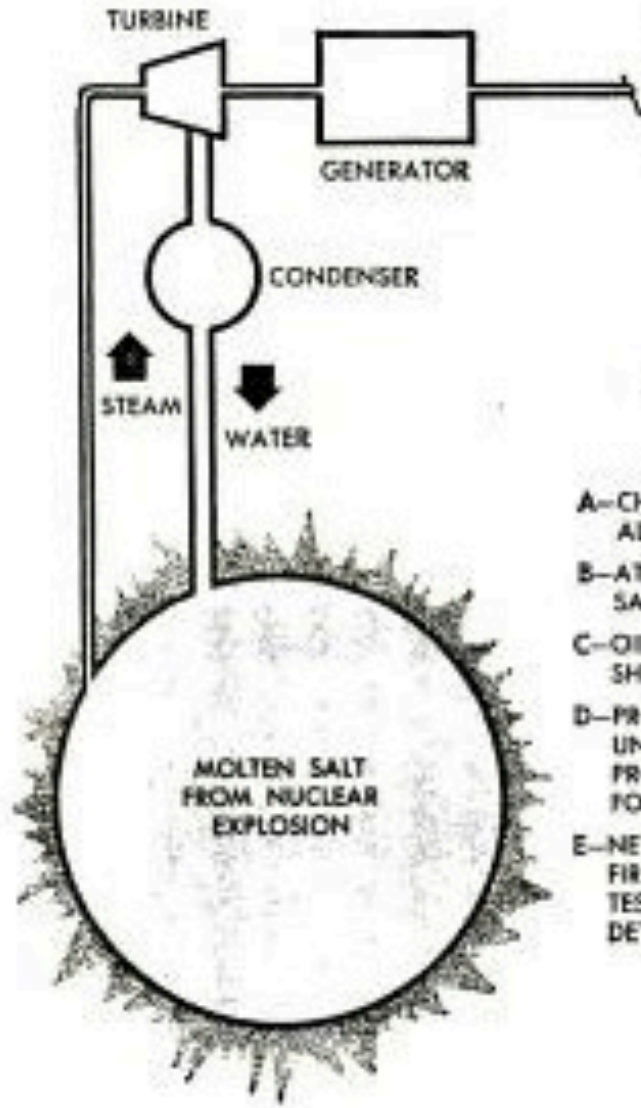




**Post-test  
re-entry  
May 1962**

Edward Teller, "We're Going to Work Miracles"  
Popular Mechanics, 113, 3, p.100, March 1960

[http://books.google.com/books?id=v9sDAAAAAMBAJ&pg=PA100&lpg=PA100&dq=Gnome,+Plows+har+AEC&source=bl&ots=CJW8rZ9k&sig=uacAhlLB8ik5htr8dYFwfg7Kpw&n=en&ei=A7chHTab9BoOcsQPU\\_\\_CxDg&sa=X&oi=book\\_result&ct=result&resnum=4&ved=0CC8Q6AEwAzgU#v=onepage&q=Gnome%2C%20Plowshare%2C%20AEC&f=false](http://books.google.com/books?id=v9sDAAAAAMBAJ&pg=PA100&lpg=PA100&dq=Gnome,+Plows+har+AEC&source=bl&ots=CJW8rZ9k&sig=uacAhlLB8ik5htr8dYFwfg7Kpw&n=en&ei=A7chHTab9BoOcsQPU__CxDg&sa=X&oi=book_result&ct=result&resnum=4&ved=0CC8Q6AEwAzgU#v=onepage&q=Gnome%2C%20Plowshare%2C%20AEC&f=false)



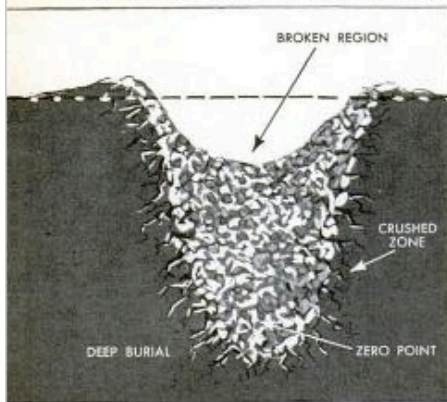
Five experiments of the Atomic Energy Commission's **Plowshare** program are located on the map. Project **Gnome** will test the possibility of "mining" heat from an underground nuclear blast to generate electricity. Simplified drawing shows how water would be pumped into the deposit of heat and then extracted as steam to run a turbine





In a matter of milliseconds, five nuclear bombs will blast open a new harbor in Alaska. The channel will be 1800 feet long and 750 feet wide; the inner harbor, about a half mile long and a quarter mile wide

Deep-buried bombs fling only surface material into air. Radioactive substances stay near the zero point

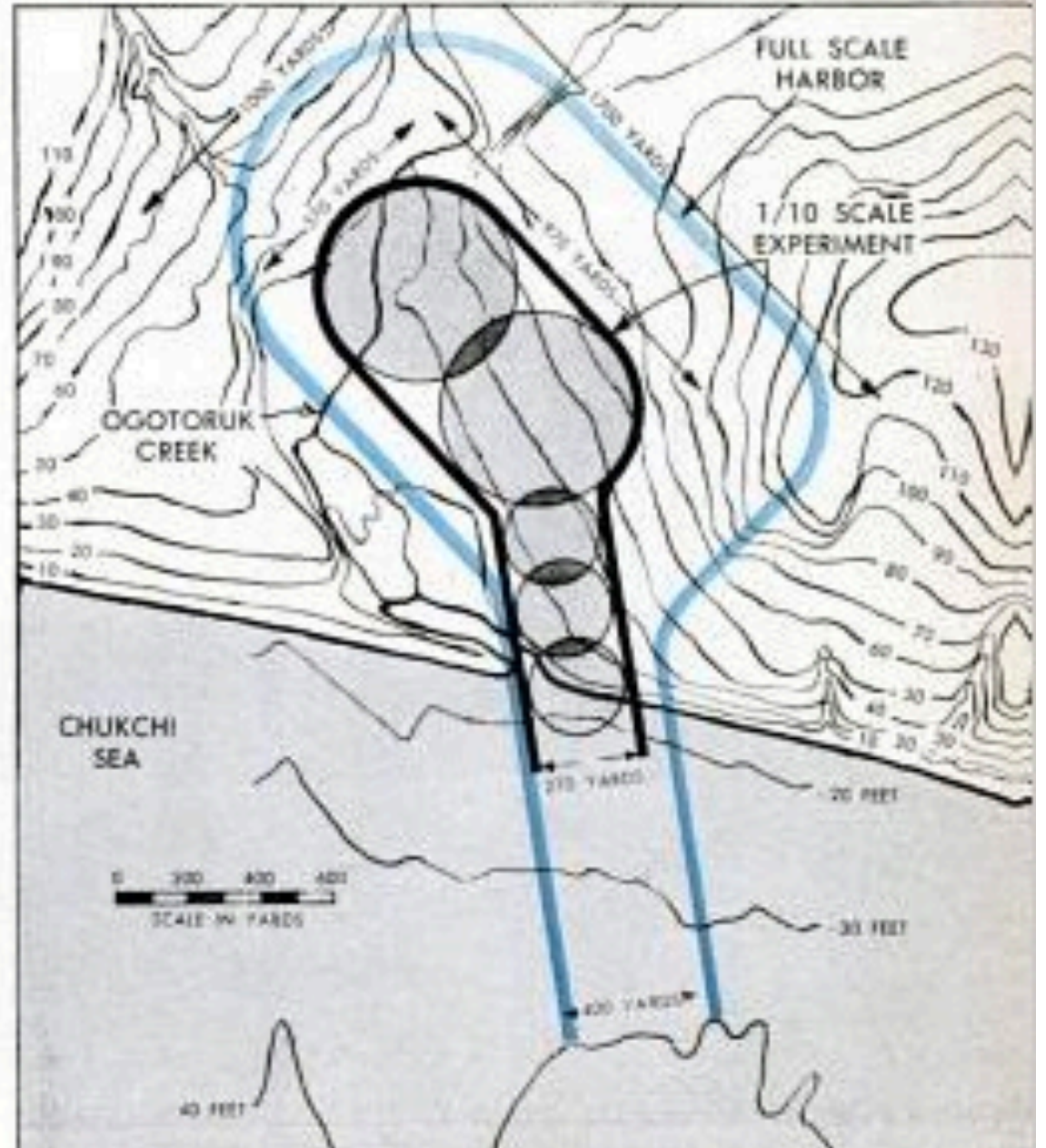


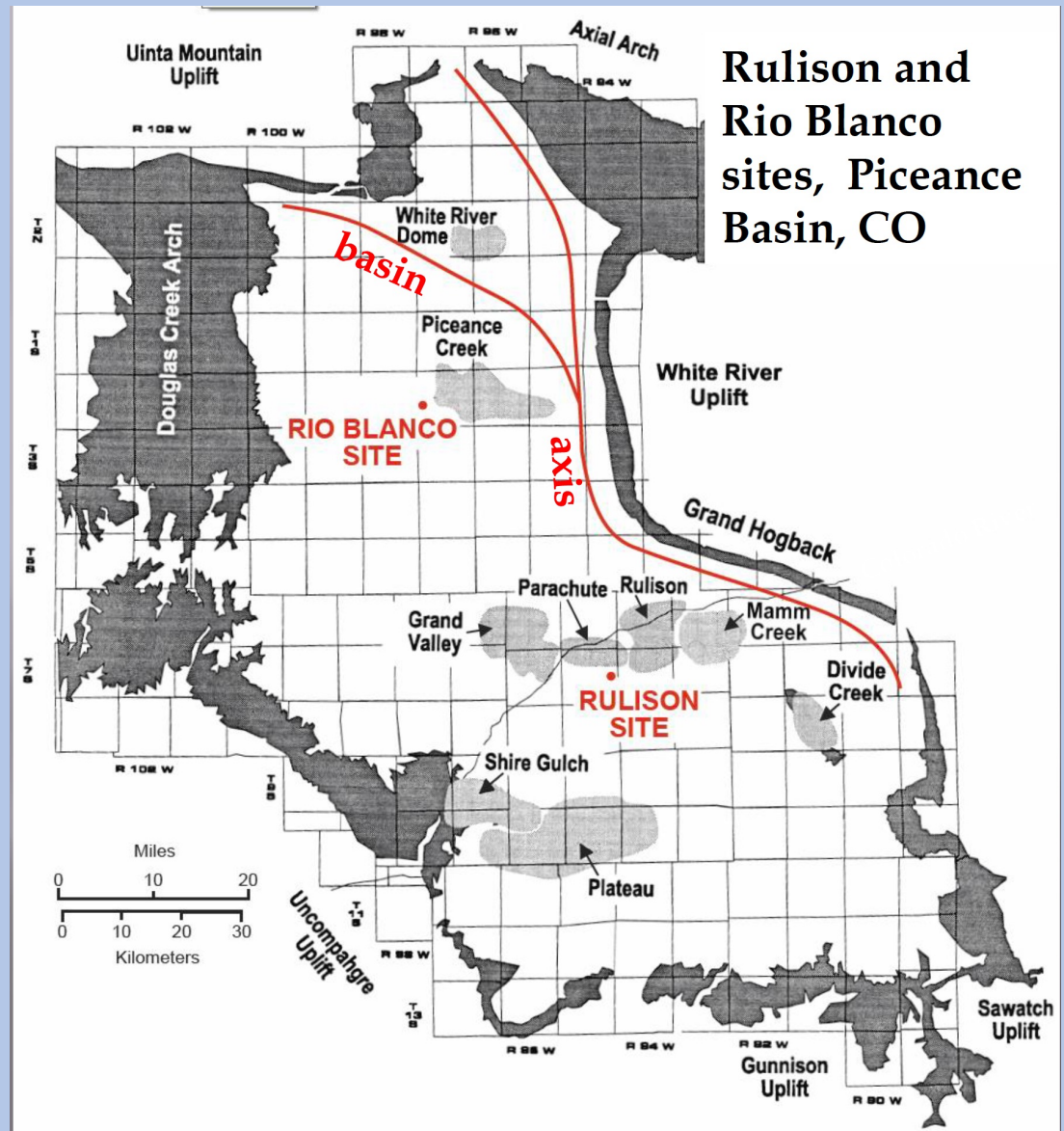
experiment of great hope for the future. The harbor will be excavated in an instant—in a matter of milliseconds—by the explosion of five nuclear bombs having approximately as much power as 500,000 tons of TNT.

In that tiny interval of time this energy will move 20 million tons of earth and rock. It will blast out a channel 1800 feet long and 750 feet wide and at the same time create an inner harbor a quarter of a mile wide and half a mile long. The minimum water depth will be around 30 feet.

The site is 100 miles north of the Arctic Circle, below Point Hope and Cape Thompson, at the mouth of Ogotoruk Creek.

Project Chariot, as the harbor is called, may become very worthwhile in the years to come, but it is intended mainly as a demonstration that will usher in the age of peaceful uses of atomic explosions. We expect to show that this new kind of power can perform large earth-moving jobs with proper safety and at less cost than conventional methods.





[https://www.searchanddiscovery.com/documents/2015/41735suneson/ndx\\_suneson.pdf](https://www.searchanddiscovery.com/documents/2015/41735suneson/ndx_suneson.pdf)

## **US Nuclear Frac'ing Tests: Gov't - Industry Partnership**

### **Gasbuggy (1967)**

**US Atomic Energy Commission (AEC)**

**US Bureau of Mines**

**El Paso Natural Gas Company**

**Lawrence Radiation Laboratory**

### **Rulison (1969)**

**AEC, USBM**

**Austral Oil Company**

**CER Geonuclear**

**Los Alamos Scientific Laboratory**

### **Rio Blanco (1973)**

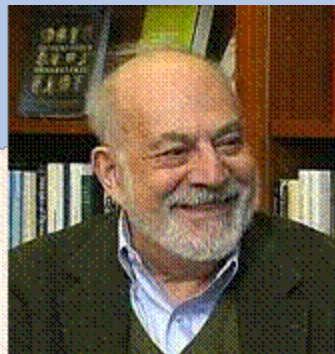
**AEC**

**Equity Oil Company**

**CER Geonuclear**

**Lawrence - Livermore Laboratory**

Background photo - Gasbuggy wellsite



# ON BULLSHIT



Harry G. Frankfurt

PRINCETON UNIVERSITY PRESS

PRINCETON AND OXFORD

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July 31, 1979  
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## "I was the only victim of Three-Mile Island."



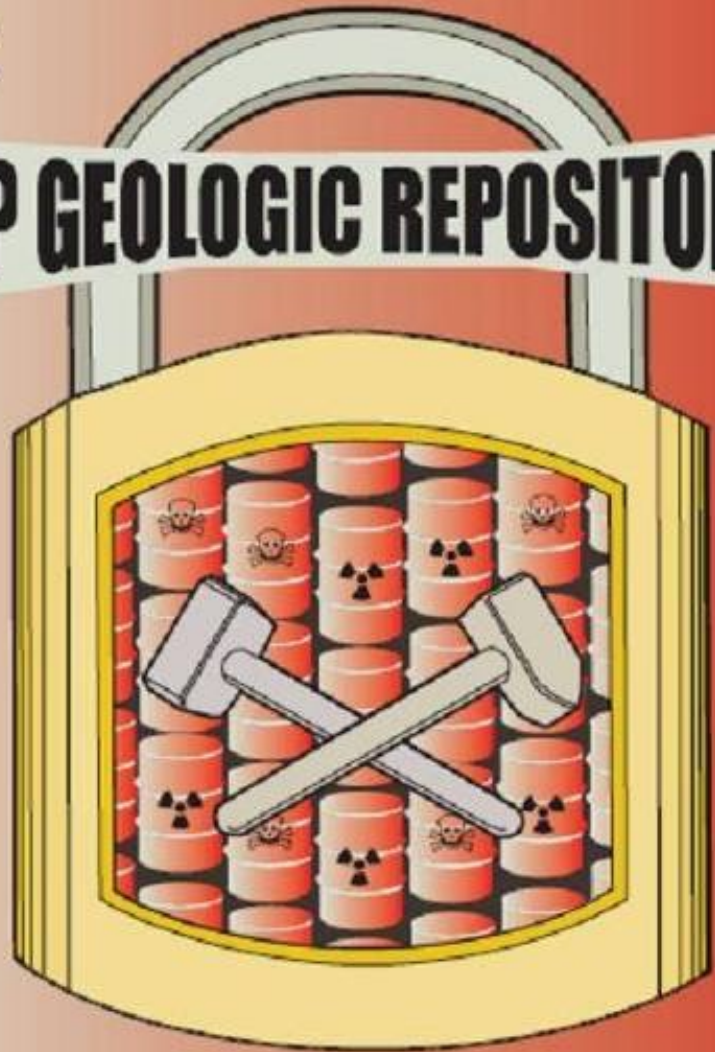
The image shows a newspaper clipping with a large headline at the top. Below the headline is a photograph of a man in a suit, identified as Edward Teller. The rest of the page is filled with columns of text, which is mostly illegible due to the low resolution of the scan. There are several small boxes and sections of text interspersed throughout the main body of the article.

**“On May 7, a few weeks after the accident at Three-Mile Island, I was in Washington. I was there to refute some of that propaganda that Ralph Nader, Jane Fonda and their kind are spewing to the news media in their attempt to frighten people away from nuclear power. I am 71 years old, and I was working 20 hours a day. The strain was too much. The next day, I suffered a heart attack. You might say that I was the only one whose health was affected by that reactor near Harrisburg. No, that would be wrong. It was not the reactor. It was Jane Fonda. Reactors are not dangerous.”**

~ EDWARD TELLER



# DEEP GEOLOGIC REPOSITORIES



edited by Norbert T. Rempé

It describes past and currently active facilities and also discusses generic considerations of the isolation capability of average crustal rock, **apparently in an effort to convince audiences of the safety of these facilities.**

(<http://www.thefreelibrary.com/Deep+geologic+repositories.-a0184353864>)



...I do not advocate a law forcing married couples to sleep in twin beds, but from the point of view of radiation safety, I must warn against the practice of sleeping every night with *two* girls...

Teller in Playboy interview, August 1979 (the issue with Richard Rhodes' "Waste of the Pecos" article)

**ANS Teller award for**

**pioneering research and leadership in the use of laser  
and ion-particle beams to produce unique high-  
temperature and high-density matter for scientific  
research and for controlled thermonuclear fusion**

**Edward Teller Award  
for the Defense of Freedom  
by Doctors for Disaster Preparedness**

In spite of their good efforts, my friends did not succeed in turning me into a politically polished person. As President Kennedy handed me the (Fermi Prize) medal (on December 3, 1962), he asked me about the proposed **Plowshare** plan of a **sea-level canal across the Panama isthmus**. My response to the president was truthful but inexcusable: **“It will take less time to complete than for you to make up your mind to build it.”**



**In radiation protection one ounce of gray matter outweighs one ton of lead**

(F. Wachsmann, 1969)

### Three observations about Edward Teller

A participant in the Manhattan Project, Teller argued that before dropping an atomic bomb on Japan the United States should instead detonate a bomb above Japan, demonstrating the new weapon but harming no one. Teller's proposal never made it as far as Truman's desk, but it proves that Teller was never even close to the bloodthirsty, mad scientist that Cornwell and so many others have attempted to portray.

2. Over the bitter objections of much of the scientific establishment, Teller insisted that a hydrogen bomb would prove feasible, playing a personal and decisive role in persuading Truman to move ahead with the project. In doing so, Teller ensured that the United States remained ahead in the arms race. The Soviets behaved brutally enough even so, of course. But what would the world have looked like if the USSR had believed that it was stronger, not weaker, than the United States?

3. Beginning during Reagan's term as governor of California, Teller briefed Reagan on the increasing technical feasibility of some form of defense against ballistic missiles, briefings that led directly to the Strategic Defense Initiative. What good did SDI do? A brief excerpt from *How Ronald Reagan Changed My Life*:

In 1992, the year after the Soviet Union was dissolved, I attended a dinner at which former secretary of state Henry Kissinger described a trip he had just made to Russia. Speaking to high officials in the government and military, Kissinger had asked each to name the critical factor in the demise of the USSR. "Almost without exception," Kissinger said, "they named SDI."

"The Soviets may have overestimated our technical capacity," Kissinger now says. "On the other hand, we didn't have to build a complete version of SDI to make their calculations difficult. If the Soviets no longer knew how many missiles would get through, then they might have had to launch hundreds more to have had a chance of success." Hundreds more? But the Soviets could never have *afforded* hundreds more. "You can see," says Kissinger, "why SDI had them so rattled."

**If you believe that the world is a better place because during the second half of the twentieth century the United States prevailed over its enemies, you will have trouble escaping the conclusion that Edward Teller was a great man.**

Source: <https://www.nationalreview.com/corner/edward-teller-peter-robinson/>