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His return to  
Steven M. Spencer  
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ST. GEORGE AND THE LATTER DAY DRAGON

By Steven M. Spencer

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St. George, in the southwest corner of Utah, got its name not from the Fourth Century dragon slayer, the patron saint of England, but from a Latter Day Saint named George A. Smith. A counselor to Brigham Young and a sober, industrious Mormon, George M. Smith never speared anything more malevolent than a rattlesnake on the rim rock. But the town that bears his name has been reluctantly jousting with a latter day dragon whose poisonous breath has touched its 4,500 inhabitants and now taints the earth's atmosphere from pole to pole.

A neat plaid table-cloth of brick and frame homes with a sugar-white temple as the elegant center-piece, St. George is spread in a sheltering curve of red cliffs and black volcanic ridges. Forty-five miles east is Zion National Park, and just north of town the sage-speckled floor and pink walls of Snow's Canyon provide a favorite scene for Hollywood westerns. The Chamber of Commerce guarantees the climate is mild--at least 360 days of sunshine a year. ~~the Chamber of Commerce~~ and the Mormons who settled the land in the 1860's called it Utah's Dixie and proceeded to raise cotton and fig trees. Brigham Young for years made it his winter home.

St. George's only flaw (and not all its residents see it as a flaw) is that it lies just 125 miles east, as the radioactive cloud flies, from the main firing points of the Atomic Energy Commission's huge Nevada Test Site, near Las Vegas. Of all the cities and towns downwind of Yucca, Jackass

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and Frenchman's Flats, St. George had received the heaviest dusting of fallout-- 100 to 1,000 times the national average, depending on how it's counted. "When the wind was considered 'favorable' for a shot, that meant the cloud would come right over us," quipped (Name tokun) Barlow, who drives a cab for the Liberty Hotel & Taxi Company.

A cabbie's occupational cynicism aside, the records do show that in the decade between 1952 and 1962 St. George and other communities of Washington County--Hurricane, Enterprise, New Harmony--saw considerably more than their share of atomic action. Many townspeople vividly recall the blasts that lit up the early dawn and ~~sunlight~~, as Ronald McArthur of the school administration put it, "like a herd of cattle on a stampede down the valley."

The mayor, \_\_\_\_\_ proprietor of the Dixie Appliance Store on North Main Street, was deer-hunting on horseback when two of the autumn shots were fired. "I would sit on my horse and watch the explosions," he recalled. "First I'd see the flash and then feel the jar, and it would startle the horse. And then I'd hear the boom. On another occasion, a spring day, I was punching cattle on the Toole desert, near Mormon Mesa, much closer to the test site, and that time I could plainly see the cloud itself."

"When I got back toward town, I found the police were stopping cars, checking them with Geiger counters to see how 'hot' they were, and giving out slips for a free wash job to get rid of the radioactive dust."

\_\_\_\_\_, who with his father, \_\_\_\_\_ does much of the town's doctoring, tells how he was standing on that same day, May 19, 1953, outside the Twin Oaks Motel talking with some geologists who'd

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come up to prospect for uranium. "All of a sudden their Geiger counters began clicking so fast they had to turn them down," he said. "It finally dawned on us that this was a day when it wasn't healthy to be outdoors, and just about that time we heard radio warnings telling us to get inside."

John, a dairy farmer on the south edge of town, remembers the tests well. So does his son, Walter, now a physics teacher at the high school. They were half way through the milking when the first one went off, the father recalls. "It was just getting light, early in the morning, and the whole sky suddenly lit up. The blast like to shock the corrals down, and the cows were so frightened they hold back the milk."

"It was like a flash picture taken right in your face," said John. "I counted the time from the flash, and 11 minutes and 20 seconds later you could feel and hear it."

These are some of the atomic images that flicker through the memories of St. George citizens. What brings them freshly to mind today is the most intensive, though long over-due, investigation of fallout effects on humans ever conducted in the United States. Subjects of the study are the children of this area. Most of them were too young to remember the shots of the 1950's, but they were definitely exposed, mainly through fallout-contaminated milk, and presumably at the most vulnerable age.

Certainly no one can doubt the importance of the study. For whether we like it or not we are neck-deep in the atomic era, taking its risks along with its benefits, some of which are still debatable. What the experts hope to derive from the St. George children is a better definition of "safe limits" of radiation, if, indeed any level can accurately be called safe. At the moment

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~~with its benefits, some of which are still debatable.~~ ~~At the same time~~ the burden of man-made radioactivity in the world's atmosphere is relatively low. <sup>It</sup> reached a peak in 1964 as the fission products continued to drift down out of "temporary ~~residence~~ <sup>storage</sup>" in the stratosphere following the 1961-62 tests, which had spewed more radioactivity into the air than all the previous years of testing combined. Most of it--85 of the 101 megatons--came from the Russians, who broke the moratorium in 1961. Although we are now in the third year of another Russian-United States agreement, one prohibiting above-ground testing, the need for surveillance and better information about human effects will remain with us <sup>For a long time to come</sup> indefinitely.

For one thing, neither the French nor the Chinese are bound by any and other countries, such as India and Israel, are pressing to join the agreement to keep their tests underground. <sup>nuclear club</sup> Moreover, atomic bombs are getting cheaper year by year and with the increase in nuclear power reactors the plutonium needed for their construction will become more and more plentiful. As Senator Robert Kennedy warned in a speech on June 23, 1965, some eighteen nations are in position to develop nuclear weapons within three years.

"There could be no security," Senator Kennedy said, "when a decision to use these weapons might be made by an unstable demagog or by the head of one of the innumerable two-month governments that plague so many countries, or by an irresponsible military commander, or even by an individual pilot."

our own

Thousands of nuclear weapons are constantly cruising through the skies in military planes; others are afloat in submarines, and still others are armed for action in missile silos. During the past fifteen years we have accidentally dropped fifteen or twenty of our atomic bombs in crashes,

air collisions or in other mishaps. None erupted in nuclear explosions but the four that fell at Palomares, Spain, last January required a vast and frantic search and cleanup operation to recover the bomb that fell in the sea and to remove or plow under the soil contaminated with radioactive bomb ingredients. Some 1,750 tons of topsoil and tomato vines were scraped from the "hottest" farm field and shipped in steel drums to an atomic "burial ground" in North Carolina.)

It is clear then, that ponding the utopia of complete and air-tight nuclear disarmament, we must learn to live with live bombs and other atomic risks, including underground testing, with its occasional "venting" of radioactive clouds. Recently the Federal Water Control Administration issued a report on another hazard, huge abandoned piles of highly radioactive tailings at seven closed uranium processing mills in Colorado, Utah, Arizona, and New Mexico. The Control Administration has recommended diking the piles or covering them with earth and vegetation, to prevent them from polluting the waters of the Colorado River and its tributaries with radioactivity that could last for centuries.

Even peace-time nuclear operations require close monitoring, though the growing number of power reactors have so far been models of tidiness and are, in fact, discharging less radioactivity into the air than conventional plants fueled by coal, which contains natural radioactivity.

But no matter how many safeguards we drape around our atomic servants, so long as men and machines are fallible, we can expect occasional puffs of lively and potentially lethal atoms to escape. Some may get into the air we breathe, the water and milk we drink, the food we eat.

Since much of the radioactive stuff will remain dangerous for tens and even hundreds or thousands of years, those charged with safeguarding the people's health must master detection and measuring techniques far

more sensitive than any demanded by the conventional public health assignments of the past.

"Public health officers used to wait until people were dying like flies from some disease before they moved in with control measures," observes Dr. Donald R. Chadwick, chief of the Division of Radiological Health of the U. S. Public Health Service. "Now we are having to devise more and more refined instruments just to find out what <sup>subtler</sup> hazards may be lurking in our environment. ~~We are looking into far more subtle threats to our health.~~"

It is Dr. Chadwick's "Rad Health" division which has been examining all of the 2,000 youngsters now in the ten-to-eighteen-year age group in St. George and other Washington County, Utah, communities. Cooperating in the program have been the Utah State Health Department, the University of Utah Medical Center in Salt Lake City, and local physicians, and school nurses. Pressure to conduct the tests came from several quarters--members of the Joint Congressional Committee on Atomic Energy, scientists at the University of Utah and the late State Senator <sup>Orval</sup> Hafen, of St. George, several of whose relatives had died of leukemia since the fallout began.

Actually, a possible leukemia "cluster" has been turned up in nearby Fredonia, in the "Arizona strip" north of the Grand Canyon. Edward Weiss, a Rad Health statistician who did much of the planning of the Utah study, reports there were four leukemia deaths in five years in this town of only 600, which is about twenty times the expected rate. "Some were older persons with chronic lymphatic leukemia, which has never been connected with radiation," said Mr. Weiss, "and we are still haggling over whether this was a real cluster." <sup>Although</sup> the search for signs of radiation injury will continue to include leukemia, as well as bone cancer and possible eye damage, ~~but~~ the current emphasis has been on the thyroid. This butterfly-shaped gland in the neck controls the body's metabolic rate.

It is the thermostat that dictates how hot and fast we burn our nourishment into energy.

The thyroid makes its hormone, thyroxin, from iodine, and any radioactive iodine in the environment is ~~simply~~ picked up along with normal iodine and quickly concentrated in the gland. During atomic tests the radioactive iodine (I-131) born of atomic fission gets into human thyroids mainly through milk from cows which have fed on pasture grass or hay contaminated by fallout. And because an infant's thyroid collects about 10 times as much iodine (and is apparently more sensitive to radiation, it ~~as does the adult,~~ as does the adult,

is the exposure of infants that has been of greatest concern to physicians and public health officials.

In the first examination, held last fall in the gymnasium of the St. George High school, each child was seen independently by three doctors. He was asked to take a mouthful of water, tilt his head back and swallow. With ~~the help of~~ a strong light and sensitive fingers the doctor watched and felt the throat as the water went down. Among the 2,000 Utah children the physicians found 70 suspiciously lumpy <sup>or nodular</sup> thyroids. In a "control" group of 1,400 children <sup>Safford,</sup> in a southern Arizona town, selected because it was out of the fallout track, the medical team found only 25 ~~thyroids~~ ~~thyroidal~~.

A few weeks later, all of the youngsters picked out by the initial screening were given another examination by three thyroid specialists, Dr. Raymond Keating, Jr., of the Mayo Clinic; Dr. Brown M. Dobyns, of the Cleveland General Hospital and Dr. Joseph E. Rall, of the National Institute of Arthritis and Metabolic Diseases. They narrowed the "suspicious" group in Utah down to 25 and referred 13 of them to the University of Utah Medical Center in Salt Lake City for more detailed studies. Additional tests were given the Arizona group but none required medical center

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At the University of Utah Dr. Marvin Kallison, pediatric endocrinologist, Carl Chamberlain, a medical physicist in the x-ray department, and other specialists carried out tests to determine the size of the thyroids and the rate at which they were functioning. The children were injected many times with hormones and with Iodine-132, a form of radioactive iodine with a half-life of only  $2\frac{1}{2}$  hours. They lay under the sensitive nose of scanning machines that counted the test radioactivity. And in eight children, abnormal thyroid tissue was surgically removed as a health measure and for microscopic study.

Neither the children nor their parents have been overly concerned, although one high school boy was annoyed because removal of a cyst attached to his thyroid robbed him of the distinction of having two "Adam's apples." whose pretty daughter, , seventeen, was found through exploratory surgery to have a harmless thyroid condition definitely unrelated to radiation, said, "If we can add to the information about fallout that's all we care about. Of course, if they had found that had cancer we would have been real shook up."

Recently, upon completion of the tests, the results were announced by Dr. William H. Stewart, surgeon general of the Public Health Service. No thyroid cancer had been found. This was reassuring. However, there was an unexplained high incidence of thyroiditis, an inflammatory condition with nodules but with no discomfort. None of the children had complained of any symptoms at all, but several have been put on daily doses of thyroid or thyroxin to correct the trouble. Nine cases of thyroiditis were definitely diagnosed or suspected among the Utah children. Only three were found among the 1,400 youngsters from southern Arizona. This made a rate of .45 per cent among the children exposed to high fallout, as contrasted with .21 per cent among those in the "control" group.

"The significance of proven or suspected thyroiditis in the Utah and Arizona children is not clearly understood," Dr. Stewart said. "During recent years a general increase in thyroiditis has been noted in several widely separated areas in this country and abroad. To date, no relationship has been established between thyroiditis and exposure to radiation."

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This doesn't mean there is not a relationship. Indeed, several authorities believe it is too early to rule it out. At the moment the point is not proven one way or another, and for this reason the St. George children will remain under study for some time. Dr. Rallison doesn't think there is any way of saying now that radiation played a factor in the thyroid conditions he found.

But the examination of the St. George children, thorough as it was, may have involved too small a sample to provide a firm conclusion. Dr. Charles W. Mays, of the University of Utah's radiobiology division, points out that reliable data on the effects of low-level radiation require larger numbers. And he thinks the state of Utah as a whole can provide them. He has estimated that 250,000 children there were exposed before they were two and a half years old to significant amounts of fallout during the tests of the 1950's and early 1960's. In the latter part of that period he says Salt Lake City received more fallout than did St. George and most other areas. Dr. Mays has therefore renewed a recommendation he first made in 1963 that the survey be extended to all 250,000 of the exposed children, including a comparison of those who lived in radioactively "hot spots" with those in lighter fallout areas.

"Utah may provide a unique chance to determine the exact radiation level to which humans may be safely exposed," he remarked, "or to find out what small amounts of radioactivity will do to us. Hopefully, never again may 250,000 infants be irradiated with iodine-131 and become available for observation."

The Radiological Health Division is carefully considering such a plan, the extension of its studies at least to several other Utah communities.

Several experts, considering the possibility that radiation might have been a factor in the St. George thyroid findings, feel it is significant that thyroid nodules (the not the St. George type of thyroiditis) have recently turned up in 16 of the 69 young and adults now living who were on Rongelap atoll when that and four other inhabited Marshall Islands were showered with heavy fallout ashes on March 1, 1954. The Marshallese had been caught when the wind shifted during

the monster H-bomb test, "Shot Bravo," at Bikini, 115 miles away. ~~Actually~~  
 The zone of potentially lethal fallout extended more than 300 miles downwind  
 from the firing point and covered an area of 7,000 square miles. Many islanders  
 would have been <sup>where they were exposed</sup> killed if they had not been evacuated. The Rongelap people  
 were moved out two days after the blast. <sup>Scared</sup> Many had already suffered injury  
 and recently the U.S. government indemnified them with a total payment of  
 \$980,000, about \$11,000 for each ~~of the 86 Rongelapese~~ <sup>of the 86 Rongelapese</sup> exposed.

"Eighty-per-cent of the Rongelap children who were under the age of ten  
 at the time of fallout exposure now have some type of thyroid pathology,"  
 reports Dr. Robert A. Conard, Brookhaven National Laboratory physician who  
 has visited the islanders ~~every~~ every year to keep tabs on their

health. "And this pathology is almost certainly due to radiation," he adds.

"The I-131 reached their thyroids not in milk--they don't have cows on Rongelap--  
but in their drinking water, which ~~was~~ <sup>was</sup> caught from the roofs. There  
was a heavy rainfall the night of the shot ~~and~~ <sup>increased the level in the drinking water</sup> washed the fallout down."

The hard thyroid nodules were at first thought to be malignant, but when ~~they~~  
were removed and examined microscopically they proved to be benign. However,  
one definite case of thyroid cancer was diagnosed last year, in a <sup>42-</sup>47-year-old  
Rongelap woman named \_\_\_\_\_. Dr. Conard sees a statistical clincher in

the fact that among 200 Rongelap people who were away from their home island ~~at~~  
when the bomb dusted it with radioactivity not a single one has developed  
thyroid nodules. ~~in which nodules have been found in the exposed group. Two nodules were not~~  
~~found in the other 199 people.~~

~~Now it must be emphasized that~~ "Shot Bravo" caught its firing experts  
way off base by producing twice as powerful a blast--15 megatons--as they had  
predicted. <sup>must be noted that it</sup> And it was several hundred times bigger than anything set off at  
Las Vegas. Its effects included not only delayed thyroid impairment but such  
immediate afflictions as nausea, skin burns and ulcers, loss of hair, and pro-  
longed anemia. There has also been a slight growth retardation in some  
of the boys.

No one foresees any such dire consequences from the relatively low level  
fallout from the Nevada weapons tests, or from peaceful atomic activities.  
Nevertheless, the St. George experience has put both atomic scientists and physi-  
cians on sharper guard than ever before. Dr. Lee E. Farr, who is both a pediatrician  
and an expert on atomic effects, a professor of nuclear and experimental medicine  
at the University of Texas, in Houston, said recently: "I think we have to assume  
there is a relationship between the St. George findings and radiation. I don't  
think we can at this point rule out anything. If the thyroid condition is a  
temporary disturbance, all well and good. But this kind of statistic in an  
epidemiological survey simply cannot be shrugged off."

Dr. Farr was for many years the medical director of the Brookhaven

ational Laboratory, a leading center of atomic research on Long Island and is chairman of the National Academy of Sciences advisory committee to the Atomic Bomb Casualty Commission, which maintains a continuing study of the survivors of Hiroshima and Nagasaki. He is also chairman of a committee on environmental health of the American Academy of Pediatrics. In that capacity he organized a special conference on the Pediatric Significance of Peacetime Radioactive Fallout at San Diego, California, last March. Sponsored by the Academy and financed by the Radiological Health Division, the conference provided lively arguments between representatives and government over the assessment of fallout risks and the establishment of safeguard measures.

Dr. Farr was also critical of the medical profession for being so slow to face up to fallout and take a firmer stand on it. "We have the first generation to grow up in fallout, and we should do as we do in other medical problems, assume the worst diagnosis until we prove it's untenable. Our objective here is to prevent disease. Therefore, we are looking for the first, very early warning symptoms. This is the time to take action, not after we've got a full-blown disease."

When St. George's brushes with the radioactive dragon began, in 1951, fallout surveillance and protective guides were rather sketchy. Prior to 1951 all testing, except for the historic opening shot of the atomic age at Alamogordo, in July, 1945, had been conducted in the mid-Pacific, at Bikini or Eniwetok. The only neighbors of the Pacific Proving Grounds were the ~~Polynesians~~ <sup>Islanders</sup> on a few coral atolls, some of whom, in 1954, were too close for comfort.

The Nevada Test Site is much less remote. Its 1,250 square miles of low mountains, mesas and flat desert are within easy ear-shot of St. George when the wind is right, and the people of southwest Utah heard a great many of the shots fired there. One of the first and loudest was the test called "Big Shot," on April 22, 1952. The most powerful detonated up to that time, it was bigger than the 20-kiloton