

Atomic Rays Deal Death Stealthily; Bikini Has Uncovered No Defenses

Operation Crossroads Exploded Some Myths Yet Confirmed Horror of Radioactivity — Darwin Theory of Atolls Reinforced

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By Wireless to THE NEW YORK TIMES.

PEARL HARBOR, Aug. 1 — Operation Crossroads, which saw the explosion of two atomic bombs in Bikini atoll, is now history, but the scientific, like the military, results will be the subject of study and analysis for months or even years to come.

All branches of science, from nuclear physics to geology, benefited from the tests, and even Darwin's theory of atoll formation received indirect confirmation.

Many fantasies about the atomic bomb and its results were disproved, and today far more is known about the phenomena of nuclear fission than was known before July 1.

Only a few scientific results can be summarized now, for many instrument readings have not been tabulated even yet. Oceanographers, seismologists, geologists and other scientists, headed by Commander Roger Ravelle, made a thorough study of Bikini atoll and its geological formation. The currents, surface and subsurface, were thoroughly charted and the movement of water in the lagoon ascertained.

By means of a series of hydrophone readings of depth-charge explosions, scientists found that the limestone strata underlying Bikini atoll are some 7,000 or 8,000 feet thick, and that this thick deposit of coral limestone, which would take at least 100,000 years and perhaps several million years to grow, overlies volcanic rock.

A Darwin Belief Upheld

These findings, although the conclusions, in Commander Ravelle's words, are "not straightforward," tend strongly to support the Darwinian theory of atoll formation—namely, that atolls originally were islands formed by volcanic eruption and that subsequently subsided into the sea, but at a rate sufficiently slow to permit coral, which does not grow at depths greater than 300 feet, to build upon the subsiding volcanic island.

Geologists also decided tentatively, although their seismographic readings are not yet available, that the subsurface bomb probably did not cause a landslide of debris from the coral outer shelf of Bikini atoll into deep water. However, the subsurface bomb probably did blast a hole 50 feet or more deep, and of unknown diameter, in the flaky limestone bottom of Bikini lagoon. This hole will be explored and measured. The bottom, because of its softness, apparently did not reflect much of the shock energy of the explosion.

Some fish were killed by the explosion and others by radioactivity, but their numbers have not yet been determined. The atoll's fish life has not been exterminated by any means, however, and there is little evidence so far that much change has occurred biologically in the life of the lagoon. There is no obvious evidence of any serious damage to the land animals or plants.

Wave Actions Recorded

The wave action induced by the subsurface blast was about as expected, Commander Ravelle said, except that the waves took somewhat longer to reach Bikini beach than had been expected. The waves induced by the explosion were 15 feet high when 8,000 feet from the explosion point and 4½ feet high 27,000 feet from the center, instrument readings showed.

Other instrument recordings of wave action have not yet been recovered, but the waves were estimated at seven feet high at Bikini beach, sixty feet high 2,000 feet from the center and ninety feet high 1,500 feet from the center. Many ships were undoubtedly tossed on beam's end by the waves, but except for those very close to the center, they recovered and wave damage was not nearly so serious to the target ships as the underwater shock of the explosion.

There were some, though incon-

clusive, indications of momentary and very localized electro-magnetic disturbances that might have affected radio transmission. The sun spots that blacked out radio transmission across most of the Pacific on the day after the subsurface burst had no connection, however, with the atomic bomb. These sun spots had been predicted far in advance.

The phenomenon of radioactivity in the air, in the water and on the ships was thoroughly studied and charted during the tests; it was obvious that man's knowledge of this invisible killer is limited. A conservative safety rule, which limited exposure to radioactivity of any man to standards set by the American Medical Association—one-tenth of a roentgen unit for each twenty-four hours, was adhered to. There were a few cases where men received more than this tolerance allowance, but they stayed away from radioactive areas for hours or days, and no harm was done.

The radioactivity released by the bomb consisted of lethal and tremendous bursts of gamma, neutron and other rays, disseminated over a wide area of water and air at the time of the explosion; residual radioactive fission products in the form of particles deposited in the air, on the water or on the ships; sodium in the salt water made radioactive by the explosion and induced radioactivity in the ships' structures.

By far the most important and persistent of these forms of radioactivity were the radioactive fission particles in the water and on the ships. Radioactive sodium, which has a life of about fourteen and a half hours, decayed or lost its potency rapidly; the radioactive particles in the air were dissipated rather fast. The particles in the sea water were dissipated and decayed more slowly, and those deposited on the ships by waves, mist or spray were particularly persistent and were dangerous to life in some cases five days after the subsurface explosion.

Decontamination Is Incomplete

Washing down the contaminated ships with uncontaminated sea water seemed to remove many radioactive particles, but it was not a complete cleanser.

No complete form of protection has been evolved against this invisible killer. Men engaged in ship decontamination work cannot be protected by any means now known, but they would wear the same kind of decontamination clothing, including the face mask and hood, used in gas decontamination work, to prevent the adherence of radioactive particles to hair, beard and skin.

The clothing worn during decontamination work is subsequently removed and the man bathes thoroughly and puts on fresh clothing. But, even so, exposure beyond the tolerance limit may result in serious illness or death days, weeks or even months later, for the radioactive rays penetrate clothing of any type now known and attack the blood cells and bone marrow.

No 100 per cent treatment for radioactivity illness is known, but blood transfusions, penicillin and rest have yielded—in treatable cases—therapeutic results.

One of the greatest scientific and medical efforts of the future must be the search for an "answer" to radioactivity and the invisible killer.