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The survivors— Lemeyo Abon and Rinok Riklon



Lemeyo Abon and Rinok Riklon, Majuro, Marshall Islands

Source: Nic Maclellan.

On 1 March 1954, Rinok Riklon was a young girl living on Rongelap, one of the northern atolls of the Marshall Islands. Then the bomb went off.

The US Government had exploded a thermonuclear weapon, codenamed Bravo, on Bikini Atoll, 120 kilometres to the west. With an explosive yield of nearly 15 megatons, this was the largest-ever nuclear detonation by the US military. It sent a cloud of radioactive fallout across the Marshall Islands, especially impacting the northern atolls of Rongelap, Utirik, Rongerik and Ailinginae.

In an interview nearly 60 years later, Mrs Riklon said:

People were playing with the fallout as it fell from the sky. We put it in our hair as if it was soap or shampoo. But later I lost all of my hair.¹

On the day of the Bravo test, Lemeyo Abon was 14 years old, living on Rongelap:

We saw the bright light and heard a boom and we were really scared. We had no idea of what was happening. Later on something like powder came from the sky. It was raining when we went home and our parents asked 'what happened to your hair?' The next day our hair fell out. We looked at each other and laughed, saying 'you look like a bald old man!' But in our hearts we were sad.²

With the tradition of washing their hair with coconut oil, girls like Rinok Riklon and Lemeyo Abon were at greater risk of exposure to hazardous levels of radiation. A memo from Joint Task Force 7 (JTF7), the military command responsible for the operation, acknowledged that 'the heavy coconut oil hairdressing used by the Marshallese tended to concentrate radioactivity in the hair'.³

On the eve of the Bravo test, the US military had received weather reports indicating that atmospheric conditions were getting less favourable. Winds at 20,000 feet were headed towards Rongelap and other atolls to the east.

1 Interview with Rinok Riklon, Majuro, Marshall Islands, September 2013, with thanks to interpreter Abacca Anjain-Maddison.

2 Interview with Mrs Lemeyo Abon, Majuro, Marshall Islands, September 2013.

3 'Operation Castle: Radiological Safety Final Report', Vol. 1, Joint Task Force 7 (Technical Branch J-3 Division, Washington DC, 1955). Cited in Holly Barker: *Bravo for the Marshallese—regaining control in a post-nuclear, post-colonial world* (Wadsworth, Belmont, 2004), p. 40.

In spite of these warnings, the test went ahead on the order of Major General Percy W. Clarkson, deputy commander of US Army Forces in the Pacific, who was responsible for the operation as JTF7 commander.⁴

As the winds carried high-level radioactive fallout across inhabited atolls, 28 US Army and Air Force weathermen on Rongerik Atoll were evacuated within hours by plane (even so, some had film badge readings that showed radiation exposure hundreds of times beyond established safety levels).⁵ A Navy tanker USS *Patapsco* was sailing east of Bikini when it was also caught in the main path of the Bravo fallout.

In contrast to the rapid response for military personnel on Rongerik, the US task force waited two days to evacuate islanders from Rongelap, Ailinginae and Utirik atolls, despite the hazardous levels of fallout.

As part of Operation Castle, the Bravo hydrogen bomb test was just one of 67 atmospheric nuclear tests between 1946 and 1958. Bikini Atoll hosted many such operations: Crossroads (1946), Castle (1954), Redwing (1956) and Hardtack I (1958). Test series on Enewetak included Sandstone (1948), Greenhouse (1951), Ivy (1952), and some extra tests from Castle (1954), Redwing (1956) and Hardtack I (1958).

In all, 80 per cent of all the nuclear tests conducted by the United States during the Cold War were held in the Marshall Islands. Merrill Eisenbud, Director of the US Atomic Energy Commission's (AEC) Health and Safety Laboratory has recalled that the US military would have preferred to test hydrogen bombs in the Nevada desert, but this might have endangered nearby communities:

4 US Government perspectives on the contested debate over weather patterns, fallout and lack of preparation for evacuation can be found in Barton C. Hacker: *Elements of Controversy* (University of California Press, Berkeley, 1994), pp. 134–158; and a 2013 study of Bravo by the US Defense Threat Reduction Agency (USDTRA): Thomas Kunkle and Byron Ristvet: *Castle Bravo: Fifty years of legend and lore*, USDTRA, Defense Threat Reduction Information Analysis Center (DTRIAC) SR-12-001, January 2013.

5 On Rongerik Atoll, 28 US Army and Air Force personnel had film badge readings of 32 to 52 rem (320–500 mSv). Three members of the US Navy Bikini Boat Pool had heavily exposed badges with readings from 85 to 96 rem (850–950 mSv). As a basis of comparison, a standard diagnostic chest x-ray delivers a radiation dose of about 0.02 rem. See 'Operation Castle', Fact Sheet, USDTRA, May 2015.

Nevada would be ideal, except that, when you got up above 50 kilotons or so, you made so much bang that you would begin to break windows, crack plaster. Couldn't go much higher than that, and here they wanted to go up to multimegatons. So they had to go out somewhere, and the Marshalls seemed like a reasonable place for them.⁶

In 1947, a year after the US military had begun its testing program, the Marshall Islands were designated as part of the Trust Territory of the Pacific Islands (TTPI). This trust territory was the only one designated as 'strategic' by the United Nations Security Council, so the United States as the Administering Authority was authorised to militarise the territory.⁷ At the same time, the Administering Authority was entrusted to protect the land, resources and health of Micronesia's inhabitants.

For many decades, the US Government hid details of the extent of contamination from its testing program, especially when they negotiated a Compact of Free Association with the Republic of the Marshall Islands (RMI)—an agreement that led to self-government and independence for the Micronesian nation in 1986. The RMI Government and people gave away the right to sue in US courts for compensation for damage to person and property from the tests. In return, a fund of US\$150 million was established under section 177 of the Compact to deal with the health and environmental legacies of the testing program.

In May 1994, the US Department of Energy released more than 70 boxes of newly declassified documents to the RMI Government. The documents revealed that the spread of fallout from Bravo and other tests was much wider than previously acknowledged by the US Government.⁸ For 50 years, the United States had hidden the fact that fallout from the Bravo test had spread over more than 11,000 square kilometres. Other atolls such as Ailuk, Likiep, Wotho, Mejit and Kwajalein had received significant levels of radioactive fallout. Over time, traces of radioactivity from the test were detected in Australia, India, Japan, the United States and Europe.

6 Oral History of Merrill Eisenbud, United States Department of Energy, Office of Human Radiation Experiments, DOE/EH-0456, May 1995.

7 Gary Smith: *Micronesia—decolonisation and US military interests in the Trust Territory of the Pacific Islands* (Peace Research Centre, The Australian National University, 1991).

8 See, for example, 'Radioactive Debris from Operation Castle—Islands of the mid-Pacific', US Atomic Energy Commission (AEC), 18 January 1955. Marshall Islands Nuclear Documentation Database (MINDD).

A range of authors have chronicled the sorry history of US nuclear testing in the Pacific and the lingering health and environmental impacts for the Marshallese people.⁹ Successive US governments have acknowledged damage to four northern atolls from nuclear testing. But at a March 2017 ceremony to commemorate the 63rd anniversary of the Bravo test, RMI President Hilda Heine stressed that this policy ignores the United States' responsibility for health and environmental impacts across the whole country:

Studies from the early years that were not known to the RMI government during the Compact negotiation process have now shown that 18 other inhabited atolls or single islands were contaminated by three of the six nuclear bombs tested in Operation Castle, as well as by the Bravo shot in 1954. The myth of only four 'exposed' atolls of Bikini, Enewetak, Rongelap and Utirik has shaped US nuclear policy on the Marshallese people since 1954, which limited medical and scientific follow up and compensation programs.¹⁰

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The effect of the 1954 Bravo test on British defence policy was profound. Bravo and other thermonuclear tests during Operation Castle were closely studied by British scientists and had both technical and political impact on the British hydrogen bomb program.

In a personal letter to US President Dwight D. Eisenhower immediately after Bravo, British Prime Minister Sir Winston Churchill recognised both the power of the hydrogen bomb and the hazards posed by fallout:

I am told that several million people would certainly be obliterated by four or five of the latest H-bombs. In a few more years, these could be delivered by rocket without even hazarding the life of a pilot ... Another ugly idea has been put in my head, namely, the dropping of an H-bomb in the sea to windward of the island or any other seaborne country in

9 Jonathan Weisgall: *Operation Crossroads—the atomic tests at Bikini Atoll* (Naval Institute Press, Annapolis, 1994); Barbara Rose Johnston and Holly Barker: *Consequential Damages of Nuclear War—the Rongelap report* (Left Coast Press, 2008); Jack Niedenthal: *For the good of mankind—a history of the people of Bikini and their islands* (Micronitor, Majuro, 2001); Giff Johnson: *Nuclear past, unclear future* (Micronitor, Majuro, 2009); Giff Johnson: *Don't Ever Whisper—Darlene Keju: Pacific Health Pioneer, Champion for Nuclear Survivors* (CreateSpace Independent Publishing, 2013). For interviews with Marshallese nuclear survivors, see the website established by anthropologist Glenn Alcalay at www.atomicatolls.org.

10 President Hilda C. Heine: Keynote remarks, 63rd Nuclear Victims Remembrance Day, Capitol Building, Majuro, 1 March 2017 (the author was present in Majuro for the ceremony and the Office of the President kindly provided a translation of the speech, which was presented in the Marshallese language).

suitable weather, by rocket or air plane, or perhaps released by submarine. The explosion would generate an enormous radioactive cloud, many square miles in extent, which would drift over the land attacked and extinguish human life over very large areas.¹¹

In a speech to the UK parliament on 30 March 1954, just a month after the Bravo test, Churchill defended the US testing program. Under pressure to hold a parliamentary debate, Churchill noted:

We are all naturally concerned at the prodigious experiments which are being carried out in the Pacific, but I do not think there will be any difference between us, that we would rather have them carried out there than in Siberia.¹²

Many peoples across Asia and the Pacific did not harbour the same sentiments. On 2 April 1954, Indian Prime Minister Jawaharlal Nehru called for a ‘standstill agreement’ on nuclear testing—launching a process that would culminate in a 1958 moratorium on atmospheric testing. While mass protests about Bravo were concentrated in Pacific Rim nations like Japan and Australia, Marshall islanders also expressed their opposition, despite the US Navy’s control of the UN strategic trusteeship.

Just weeks after the Bravo test, Marshall islanders, led by schoolteachers Dwight Heine and Atlan Anien and customary chiefs Kabua Kabua and Dorothy Kabua, lodged a petition with the UN Trusteeship Council. The petition requested that ‘all experiments with lethal weapons in this area be immediately ceased’, and highlighted the importance of land as a source of culture and identity—land that was being vaporised or contaminated by the nuclear tests:

the Marshallese people are not only fearful of the danger to their persons from these deadly weapons in case of another miscalculation, but they are also concerned for the increasing number of people removed from their land ... land means a great deal to the Marshallese. It means more than just a place where you can plant your food crops and build your houses or a place where you can bury your dead. It is the very life of the people. Take away their land and their spirits go also.¹³

11 ‘My Dear Friend’, letter from Prime Minister Winston Churchill to US President Dwight D Eisenhower, dated March 1954, cited in Martin Gilbert: *Winston S. Churchill, Volume VIII: Never Despair 1945–65*, p. 959.

12 *Ibid.*, p. 965.

13 Petition from the Marshallese People Concerning the Pacific Islands: *Complaint regarding explosions of lethal weapons within our home islands to United Nations Trusteeship Council, 20 April 1954*, circulated as UN Trusteeship Council document T/PET.10/28, 6 May 1954.

Most Marshallese were reluctant to directly challenge the US administration, with the petitioners noting:

Aside from this complaint, we have found American administration by far the most agreeable one in our memory.¹⁴

The US Government was suspicious that Americans resident in the TTPI had been involved in drafting the petition, but this was denied by Dwight Heine:

It taxed me to write it. We worked every day for nearly a month. We would meet with other Marshallese and put down their ideas. Then we would make a rough draft. I thought we had too many 'dangers' in it. So I looked through the dictionary and decided on 'lethal'. I also found the word 'circumvent' as a substitute for 'prevent'.¹⁵

Even as the Soviet Union conducted its own nuclear tests in Kazakhstan, Russian officials used the UN Trusteeship Council to criticise the United States for using the TTPI as a testing site:

One of the crimes of American imperialism against the peoples of Oceania is the testing of atomic and hydrogen weapons carried out in Micronesia, on the islands of Bikini and Eniwetok in the Marshalls archipelago. Starting in 1946, the American military gang has carried out a series of experimental explosions of atom and hydrogen bombs six times in this area ...

The tests of nuclear weapons carried out by the USA undermined the very basis of existence of the population of the trusteeship territories ... The actions of the American 'trustees' aroused the anger of the inhabitants of the trusteeship territories. They submitted petitions to the Trusteeship Council of the United Nations protesting against the American nuclear tests and demanding that they be stopped. The representatives of the USSR in the Trusteeship Council repeatedly spoke in support of these just demands.¹⁶

14 Ibid.

15 Bill Waugh: 'Creation of the N-petition', *Associated Press*, 29 May 1954.

16 A.M. Shilkov: 'The National Liberation Movements in Oceania', pamphlet from All-Union Society for the Dissemination of Political and Scientific Knowledge (translated in *Translations from the Soviet press*, Colonial Office digest no. 365, p. 10). CO1036/859.

In response, the US Ambassador to the United Nations Henry Cabot Lodge Jr pledged that ‘the authorities were doing everything humanly possible to take care of everyone who was in the area’ and that ‘any Marshall islanders removed because of the tests would be re-established without incurring financial loss’.¹⁷

Despite the assurances, the April 1954 protest to the United Nations—released publicly in early May—sparked international attention and anger. The *Times* of London reported:

Bikini and Eniwetok were taken away for atomic bomb tests and their inhabitants moved to Kili Island and Ujelang Atoll. Because Rongelab and Uterik [sic] are now radioactive their inhabitants are being on Kwajalein for an indeterminate time. ‘Where next?’ is the big question in all our minds.¹⁸

The British Government was well aware of international public concern about radioactive fallout from the Bravo test, but government ministers went out of their way to downplay any need for action.

After publicity about the Marshallese petition to the United Nations, the UK Under-Secretary for Foreign Affairs Sir Douglas Dodds-Parker was questioned in the House of Commons about potential hazards for British dependencies in the Pacific.

Opposition Labour MPs cited media reports ‘which say that people on Utirik, which is 511 miles away from the explosion, are now complaining of changes in their bloodstreams, of their hair falling out and of nausea. Oughtn’t we not, having a responsibility on the Trusteeship Council, to be in possession of the full facts of the matter?’¹⁹

Dodds-Parker replied:

Her Majesty’s Government has no responsibility in the matter except as members of the Trusteeship Council. We have no information other than that contained in the petition which was circulated in the United Nations Trusteeship Council document of 6 May.²⁰

17 ‘Marshall Islanders urgent pleas—end A-bomb tests’, *The Times* (London), 15 May 1954.

18 Ibid. Spelling of Marshallese names as written in original report.

19 ‘Hydrogen bomb tests Pacific (representation)’, UK House of Commons, Hansard official record, 20 May 1954.

20 Ibid.

This parliamentary statement was a lie. Between March and May, under a program known as Aconite, aircraft of the Royal Air Force (RAF) based in Darwin, Australia were used to gather fallout samples from the Operation Castle nuclear tests in the Marshall Islands. After at least six Castle tests, including Bravo, UK Canberra bombers flew missions through the mushroom clouds to gather samples that could help determine the yield of the explosion.²¹

As we'll see in Chapter 19, pilots in Britain's Aconite program suffered augmented doses of radiation during the flights, opening the way for compensation from the US Government, but not the British authorities!

US aircraft flying from Guam, Hawai'i and Kwajalein Atoll monitored the spread of fallout from Bravo over 71 islands and atolls in the central Pacific. This operation included one dedicated US flight over the British Gilbert and Ellice Islands Colony (GEIC):

One special survey flight, [codename] KING, was flown on 6 March 1954 to monitor the Gilbert Islands for contamination from Bravo. British authorities approved this flight and the results were forwarded to the US Naval attaché, London, to inform the British government.²²

The US Armed Forces Special Weapons Project also agreed that the Air Force Office of Atomic Energy (AFOAT-1)—which was tracking fallout to determine the yield of US and Soviet thermonuclear weapons—would provide British scientists with long-range detection filters exposed during Operation Castle. This data would provide valuable information about the yield of weapons and the spread of radioactive isotopes from the Marshall Islands tests.²³

21 More than 60 years after the tests, three UK Ministry of Defence (MoD) files entitled 'ACONITE series of American tests: British sampling and analysis' (UK National Archives ES 1/849, ES 1/850 and ES 1/851) are still restricted from public access under section 3.4 of the Public Records Act 1958 'on security or other specified grounds'. In the US archives, there is evidence of UK involvement, such as a February 1954 letter from the US AEC, which 'approved the Joint Chiefs of Staff view that it is now considered practical to grant permission to the United Kingdom for accommodations for two Canberra aircraft during Operation Castle'. Letter from AEC Chairman Lewis L. Strauss to Robert LeBaron, Chairperson, Military Liaison Committee, 15 February 1954. MINDD.

22 'Summary of fallout from shot Bravo' message from Alvin C. Graves, scientific director, JTF7, US AEC SF00 NV0077 7756, 1954, cited in Thomas Kunkle and Byron Ristvet: *Castle Bravo: Fifty years of legend and lore*, op. cit., p. 91.

23 Letter from Captain G.S. Brunson, Armed Forces Special Weapons Project, Department of Defence to Dr Paul McDaniel, US AEC, 26 February 1954 (MINDD). For information on AFOAT-1 and US efforts to track radioactive fallout from the Soviet tests, see Doyle L. Northrup and Donald H. Rock: 'The detection of Joe 1', *Studies in Intelligence*, Central Intelligence Agency (CIA), Vol. 10, Fall 1966 (declassified by the CIA in September 1995).

This data was helpful in the development of the British hydrogen bomb, allowing chief scientist William Penney to draw inferences about the way the United States had constructed its thermonuclear weapon.²⁴

Beyond the Aconite program, the UK Government was monitoring whether the Bravo test had caused any contamination in British colonial dependencies in the Pacific. Throughout March and April, there was a flurry of correspondence between UK officials in Honiara, Tarawa, London and Washington, discussing potential hazards from Bravo for the Pacific colonies. The H-bomb test had especially caused anxiety in the British GEIC, as Western Pacific Commissioner Sir Robert Stanley reported to London in late March:

The United States hydrogen bomb test on 1 March was heard as far south as Arorae and in Tarawa there was sound like gunfire followed by prolonged rumblings.²⁵

The Colonial Office queried whether Michael Bernacchi, the GEIC Resident Commissioner in Tarawa, should be advised about potential radiation hazards. According to the Colonial Office:

[In 1946] our technical advisers were satisfied that there is no likelihood of damage in the Gilbert and Ellice Islands Colony from experiments at Bikini ... Since that time, explosions with far greater and more far reaching effects have been carried out and we now hear from the High Commissioner that the recent explosion on 1 March was heard as far south as Arorae (the most southern of the Gilbert Islands) while at Tarawa, the noise was much more severe.

The Resident Commissioner asks for advice on the exact time of future explosions so that steps can be taken for the security of mental patients etc and also whether there is likely to be any effect on fish, a staple food in the colony.²⁶

After the Bravo test, the United States declared a danger zone of 450 nautical miles around Enewetak in the lead up to further tests. The Colonial Office approached the Foreign Office on 29 March about

24 Michael S. Goodman: *Spying on the Nuclear Bear: Anglo-American Intelligence and the Soviet Bomb*, Stanford Nuclear Age series (Stanford University Press, 2007), p. 111.

25 Telegram no. 126, marked secret, from Sir Robert Stanley, Western Pacific Commission, to Secretary of State for the Colonies, London, 30 March 1954. CO1036/236.

26 File note dated 30 March 1954, in 'Hydrogen bomb experiments, Western Pacific', PAC 310/4/01, CO1036/236.

potential hazards for the northernmost Line Islands such as Makin, especially as the Bravo cloud did not remain solely within a 450-mile radius around Bikini:

There were press reports that the last explosion made a ship, or ships, radioactive when they were 1,000 miles from the site. We would, of course, have populated islands and local shipping within that distance. Somewhat further afield is Ocean Island which, like Australia's Nauru, is a phosphate centre and there is an amount of plant and machinery there. No doubt you will tell us if anything should be said to the Gilbert and Ellice authorities.²⁷

Foreign officers contacted the UK Embassy in Washington, asking whether Bernacchi:

could be advised of the times of future explosions which, he understands, will be several times greater in strength, so that he can take measures for the security of mental patients, fragile stores etc. He also enquires whether there is likely to be any effect on fish on which the Colony largely depends for food.²⁸

The Foreign Office told the Colonial Office to calm down, downplaying any potential hazards:

The danger area is 450 miles around Eniwetok [sic]. This has been calculated with all due allowance for chance errors, and you may rest assured that neither Makin Island nor any of the other islands in the Gilbert and Ellice group will be in danger. I suggest that in the circumstances nothing should be said to the Gilbert and Ellice authorities for fear of causing unnecessary alarm.²⁹

In the weeks after Bravo, the United States continued with further tests throughout March as part of Operation Castle. These included the 8-megaton Yankee test on Bikini Atoll (22 March) and the 275-kiloton

27 Letter from C.J.J.T. Barton, Colonial Office to J.E. Jackson, Foreign Office, 29 March 1954. DEF 103/61/02. CO1036/236.

28 Telegram no. 1340 from Foreign Office, London, to UK Embassy, Washington, 2 April 1954. CO1036/236.

29 Letter, marked Top Secret, from J.E. Johnson, Foreign Office to C.J.J.T. Barton, Colonial Office, 2 April 1954. CO1036/236. Two years later, this policy had been overturned, with Colonial Office officials in the Gilbert and Ellice Islands Colony (GEIC) announcing forthcoming US hydrogen bomb tests. See, for example, a brief item in the GEIC *Headquarters Information Note* in May 1956 stating 'information has been unofficially received that Operation Redwing is the dropping of a thermonuclear weapon by parachute from an aircraft of the US Air Force in the Marshalls area and will take place around 8 May'. *Headquarter Information Note* no. 19, 4 May 1956, p. 2. Gilbert and Ellice Islands Colony. F76/6/32 (1957). PAMBU document AU PMB Doc 493.

Echo test on Enewetak Atoll (29 March). From his headquarters, Resident Commissioner Bernacchi reported to London that the further explosions had been heard on the GEIC islands of Butaritari and Tarawa, though less clearly than the massive Bravo blast.³⁰

To calm ongoing concern in Britain's Pacific colonies, Prime Minister Macmillan asked officials whether up-to-date information could be obtained from the US Government about the dates of forthcoming tests on Bikini. Following approaches to the US State Department, the UK Embassy in Washington reported:

Uncertain meteorological conditions in the Pacific make it impossible for the United States authorities to give us more exact warning of shots than they already do. The Resident Commissioner may be told, however, that the tests will continue at intervals throughout the month and the precautions need not be any more elaborate than warranted by the first two explosions.³¹

With a parliamentary debate likely in early June, the Colonial Office again sought information about effects on people in the GEIC. From Tarawa, Resident Commissioner Bernacchi replied:

Confirm no (repeat no) harm to British subjects in North Gilberts has been caused by nuclear-fission bomb experiments, although they have caused slight alarm.³²

The last six words were deleted when the reply was reported to Parliament.

As reports of the Marshall Islands petition to the UN Trusteeship Council spread through the media in the United Kingdom, stories of Bravo's radioactive fallout sparked concern from British companies with operations in the central Pacific.

The British Phosphate Commission (BPC) comprised Australian, British and New Zealand representatives who had managed phosphate mining on Christmas Island, Nauru and Banaba (Ocean Island) since 1920.

30 Telegram no. 135 from Assistant High Commissioner, Western Pacific to Secretary of State for the Colonies, 2 April 1954. CO1036/236.

31 Telegram no. 577 from UK Embassy, Washington, to Foreign Office, London, 8 April 1954. CO1036/236.

32 Priority telegram no. 195, from Sir Robert Stanley, Western Pacific Commission, to Secretary of State for the Colonies, London, 25 May 1954. CO1036/236.

BPC's general manager James Bissett wrote to the Australian Department of Territories in May 1954, seeking information about the US nuclear testing program:

In view of recent press reports concerning hydrogen bomb experiments at Eniwetok, which is approximately the same distance from Nauru as Bikini Atoll, and the fact that some anxiety has been expressed by members of our Nauru and Ocean Island staff, the commissioners would appreciate any information obtainable in the United States authorities and Australian nuclear research experts as to possible effects, if any, at Nauru and Ocean Island.³³

Tipped off from Canberra, a Foreign Office official sent a personal message to the BPC's UK representative, in an effort to short-circuit any public protest. Enclosing copies of a statement by UK Secretary of State for the Colonies Oliver Lyttelton to the House of Commons, the Foreign Officer argued that there was no danger to the Gilbert Islands and 'as some of these islands are considerably closer to Eniwetok than is Ocean Island, I thought that Mr. Lyttelton's answer in the House of Commons would be of interest to you'.³⁴

* * *

For the Marshallese, the aftermath of Bravo led to tragic consequences. The US military and medical staff from Brookhaven National Laboratory, led by Dr Robert Conard, saw an opportunity to research the effect of radiation on people living on contaminated land. Under Project 4.1, medical studies were undertaken on at least 539 men, women and children—often without informed consent—including experimental surgery and injections of chromium-51, radioactive iodine, iron, zinc and carbon-14.³⁵

33 Letter, marked confidential, from Jas. A. Bissett, general manager BPC, for British Phosphate Commissioners, to the Secretary, Australian Department of Territories, 15 May 1954. CO1036/237.

34 Letter from J.B. Sidebottom, Foreign Office, London to G. Calder, British Phosphate Commissioners, 23 June 1954. CO1036/237.

35 In the first 15 years after Bravo, 54 medical studies were published by Project 4.1 researchers. Documents from Project 4.1, which continued until the 1970s, can be found in the MINDD. A short history of the project by some of its key staff can be found in E.P. Cronkite, R.A. Conard and V.P. Bond: 'Historical events associated with fallout from Bravo shot—Operation Castle and 25 years of medical findings', *Journal of Health Physics*, Vol. 73, No. 1, 1997, pp. 176–186.

Merril Eisenbud of the US AEC's Advisory Committee on Biology and Medicine noted in 1956:

It will be very interesting to go back and get good environmental data, how many per square mile, what isotopes are involved and a sample of food changes in many humans through their urines, so as to get a measure of the human uptake when people live in a contaminated environment. Now, data of this type has never been available. While it is true that these people do not live, I would say, the way Westerners do, civilised people, it is nevertheless also true that these people are more like us than mice.³⁶

Dr Thomas Shipman, health division leader at the Los Alamos nuclear weapons laboratory, wrote to Dr Robert Conard of Project 4.1 stating:

Many thanks for the copy of the most recent survey of the Rongelap natives ... The development defects in the small children are also of considerable interest, and I presume an attempt will be made to correlate these findings with what has been reported in Japan.³⁷

With little irony, Shipman recalled the dangers of sunburn while visiting the Micronesian islands:

Maybe one of these days I can get back out when your survey team goes and sees the natives again. I will, however, be very careful about getting a sunburn comparable to the one I got on my previous visit to Rongelap.³⁸

Reluctant to be used as mice or guinea pigs, Marshall islanders again petitioned the Trusteeship Council in 1958.³⁹ US Ambassador Lodge formally requested UN Secretary General Dag Hammarskjöld to delay introducing the Marshallese petition until after the US military had completed Operation Hardtack, a new series of 35 atomic and hydrogen bomb tests on Bikini and Enewetak atolls.⁴⁰ Hammarskjöld agreed and the second petition was not formally considered by the United Nations.

36 AEC: *Minutes of the Advisory Committee on Biology and Medicine, 13–14 January 1956* (AEC, New York, 1956), cited in Holly Barker: *Bravo for the Marshallese*, op. cit., p. 45. See Eisenbud's January 1995 oral history for his role in human experiments—Merril Eisenbud: 'Human radiation studies, remembering the early years', United States Department of Energy, Office of Human Radiation Experiments, DOE/EH-0456, May 1995.

37 Letter from Thomas L. Shipman M.D., Los Alamos, New Mexico to Dr Robert Conard, Brookhaven National Laboratory, New York, 13 March 1961. MINDD.

38 Ibid.

39 Interview with Ambassador Tony de Brum, Majuro, Marshall Islands, March 2017.

40 Ambassador Lodge: *Memorandum to the Secretary General of the United Nations regarding the delay of submission over Marshallese petition to the Security Council*, 1958, cited in Holly Barker, *Bravo for the Marshallese*, op. cit., p. 24. For details of the tests, see 'Operation Hardtack', Fact Sheet, USDTRA, May 2015.

The adverse effects of Bravo continue to this day. Marshallese from the northern atolls are still displaced from their home islands. Food plants like breadfruit and coconut take up radioactive caesium-137 from the soil and this hazard has persisted on Bikini, Rongelap and other contaminated islands to this day.⁴¹ Although the US Congress has allocated funding to finance a partial clean-up, only a small part of Rongelap, Rongerik and Ailinginae atolls have been remediated. Exiled residents are calling for more comprehensive efforts before they return home.

The presence of radioactive isotopes that can accumulate in the food chain pose particular hazards for women and children, as detailed by UN Special Rapporteur Calin Georgescu:

Because of cultural differences and language barriers, Marshallese dietary customs were either unknown or ignored during the testing period. For example, the difference in dietary and other eating habits of men, women and children may have led to higher exposure of some members of the population, especially women. Women eat different parts of the fish to those eaten by men, especially bones and organ meat, in which certain radioactive isotopes tend to accumulate.

The differences in the retention of radionuclides by coconut and land crabs were not recognised by the medical profession in the United States. Apparently, women were more exposed to radiation levels in coconut and other foods owing to their role in processing foods and weaving fibre to make sitting and sleeping mats, and handling materials used in housing construction, water collection, hygiene and food preparation, as well as in handicrafts.⁴²

After Bravo, Lemeyo Abon was one of the children relocated from Rongelap—an evacuation that began a decades-long odyssey, which has left many people still living in exile. After returning to live on the contaminated atoll for 30 years, she was again evacuated to Mejjatto Island

41 For current contamination levels on Bikini, Enewetak and Rongelap, see recent research from a Columbia University team led by Professor Emlyn Hughes. Autumn S. Bordner et al.: 'Measurement of background gamma radiation in the northern Marshall Islands', *Proceedings of the National Academy of Sciences of the United States of America*, Vol. 113, No. 25, 2016, pp. 6833–6838. DOI: 10.1073/pnas.1605535113.

42 Report of Calin Georgescu, UN Special Rapporteur on the implications for human rights of the environmentally sound management and disposal of hazardous substances and wastes, on his mission to the Marshall Islands (27–30 March 2012) and the United States of America (24–27 April 2012), UN Human Rights Council, Twenty-first session, 3 September 2012, A/HRC/21/48/Add.1.

in 1985 aboard the Greenpeace vessel *Rainbow Warrior*.⁴³ She later moved to the Marshall Islands capital Majuro—still far away from her home island. Speaking to Mrs Abon in Majuro in 2013, her loss was clear:

We are still living in this place in exile from our homeland, like a coconut floating in the sea. The United States has to live up to their responsibility and make sure our children and grandchildren will be cared for.⁴⁴

As we'll see in later chapters, women who were living on Christmas Island during the British hydrogen bomb tests express similar concerns for their spouses, children and grandchildren.

The nuclear test site on Bikini Atoll is now considered a world heritage site, symbolising a significant stage in human history. As the United Nations Educational, Scientific and Cultural Organization (UNESCO) notes:

Through its history, the atoll symbolises the dawn of the nuclear age, despite its paradoxical image of peace and of earthly paradise.⁴⁵

43 Just weeks later, this Greenpeace vessel was sunk in Auckland Harbour by French intelligence agents who had been sent halfway around the world to sabotage protests over French nuclear testing at Moruroa and Fangataufa atolls. For the Marshallese relocation, see David Robie: *Eyes of Fire—the Last Voyage of the Rainbow Warrior* (Little Island Books, Auckland, 2015) and testimony from participants at eyes-of-fire.littleisland.co.nz/.

44 Interview with Lemeyo Abon, Majuro, September 2013.

45 UNESCO: *World Heritage List: Bikini Atoll Nuclear Test Site*: whc.unesco.org/en/list/1339.

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