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4/30/73

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DATE ANSWERED

BY

Eugene P. Cronkite

Dr. Liverman

RECEIVED BY

DATE

Re extensive report [illegible] Congress on the [illegible] following the fallout [illegible] the Pacific on March [illegible]

REMARKS

INFORMATION

MAIL CONTROL FORM

RETURN TO CENTRAL [illegible]

U.S. GOVERNMENT PRINTING OFFICE

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FOLDER: Marshallese - U.S. Servicemen

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BNL AUI

BROOKHAVEN NATIONAL LABORATORY
ASSOCIATED UNIVERSITIES, INC. [illegible]

MEDICAL DEPARTMENT

TELEPHONE (516) 345-[illegible]568

[illegible] April [illegible]

James [illegible]
Director
Division of [illegible]
U. S. Atomic Energy Commission
Washington, D. C. [illegible]

Dear Dr. [illegible]:

I have finished reading the [illegible] report of the Micronesian Congress on the [illegible] following the fallout accident in the Pacific on March 1, [illegible]. This report and the question [illegible] Rongelap people [illegible]. Separately, I am sending you the [illegible] of Dr. [illegible] who has been in residence in the [illegible] this year.

One of the [illegible] to have a single report including the present [illegible] people from the Marshall Islands, the American [illegible] the Japanese who were exposed. [illegible] and one which all of us [illegible] in the past. [illegible] reasons not at all clear [illegible] the Department of Defense [illegible] to have followup studies on the [illegible] who were exposed despite the fact that [illegible] termination of the [illegible] in 1956 when my personal participation [illegible].

When a report [illegible] the American [illegible] does not appear, I believe [illegible] Rongelap and the Micronesian Congress that the [illegible] Department of Defense are [illegible] knowledge.

I am bringing this to your [illegible] because I think it is potentially a very serious problem [illegible] will reflect unfavorably upon the Department of Defense and by inference upon the Atomic Energy Commission.

Sincerely yours,

[illegible]

[illegible] P. Cronkite, M. D.
[illegible]

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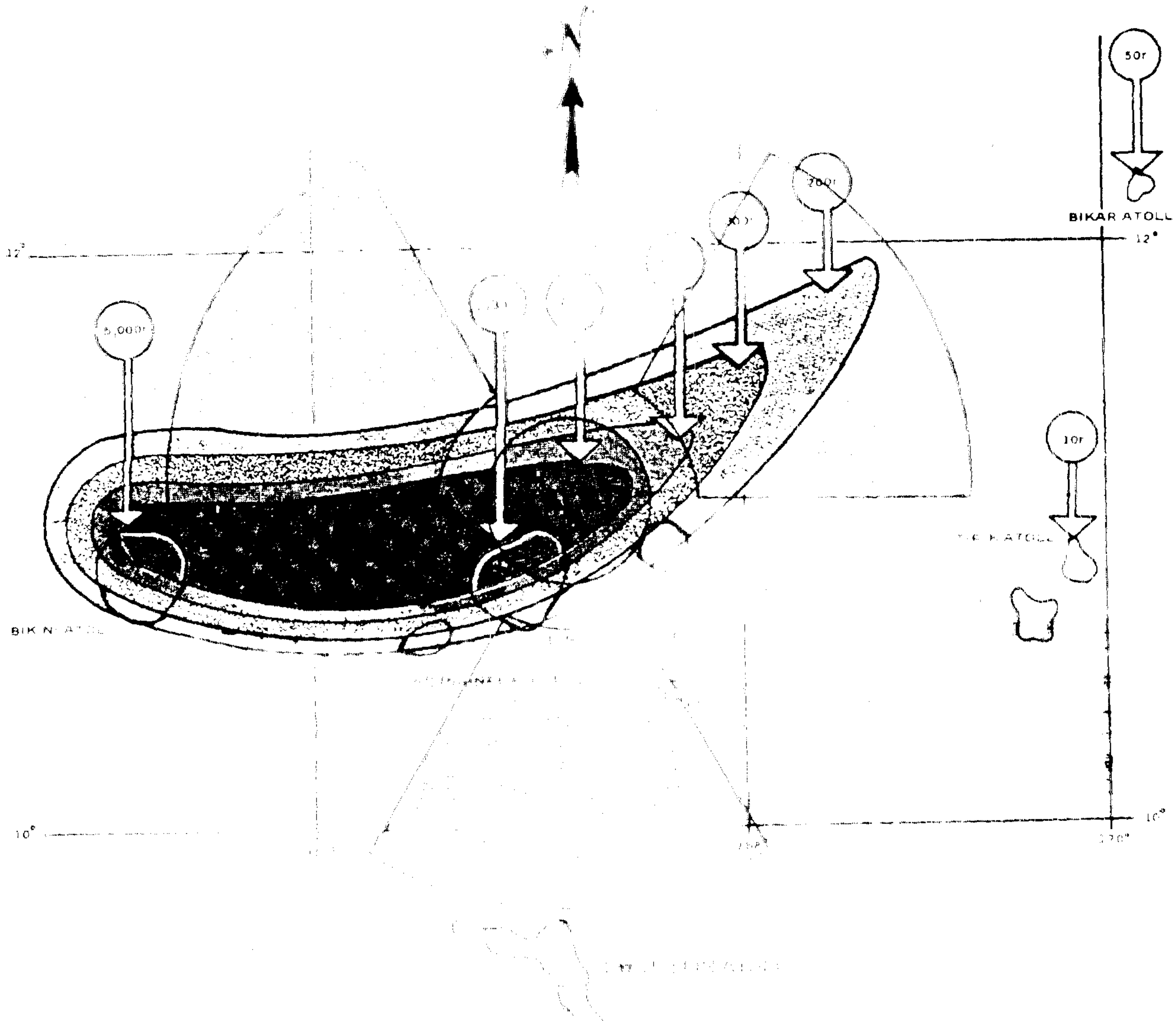
a report on Rongelap and Utirik to the Congress of Micronesia



Medical Aspects of the Incident of March 1, 1954
by the Special Joint Committee Concerning
Rongelap and Utirik Atolls

A Report on the People of Rongelap and Utirik

Reference 1.

Medical Aspects of the March 1, 1954 Incident

[illegible], [illegible], and [illegible]

Appendix D.

The Special Joint Committee Concerning Rongelap and Utirik Atolls

(Public Law [illegible])

[illegible]

Fifth Congress of Micronesia, [illegible] Regular Session

[illegible]

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[illegible]

XI. Appendices

THE SENATE

CONGRESS OF MICRONESIA

CAPITOL HILL • SAIPAN, MARIANA ISLANDS 96950

February [illegible]

The Honorable Tosiwo Nakayama
President of the Senate
Fifth Congress of Micronesia
First Regular Session, [illegible]

and

The Honorable Bethwel Henry
Speaker, House of Representatives
Fifth Congress of Micronesia
First Regular Session, [illegible]

Dear Mr. President and Mr. Speaker:

It is a distinct honor to transmit to you by means of this letter a report by your Special Joint Committee Concerning Rongelap and Utirik Atolls. Your Committee, as created by Public Law No. 4C-33, has worked faithfully and diligently to fulfill its obligations under the mandates of the law.

During its work, your Committee has been confronted with the technical nature of subject areas, which have in part produced perplexing problems connected with the well-being of the people involved. This report attempts to deal with and explain these, and to make recommendations which it feels are both practical and necessary.

While the Committee is certain that this is the most comprehensive and extensive investigation ever made concerning this matter, it wishes to state that the report is by no means as exhaustive as it could be. Had every medical aspect of the subject been explored, the length of the report would have been increased by half, or doubled. Furthermore, it was a determination of your Committee that

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the are[illegible] of compensation [illegible] inquiry and deserves to be [illegible] of [illegible] for these reasons, and others, [illegible] report [illegible] Committee's final determi[illegible] in the light of [illegible] evidence. It should be noted [illegible] Committee [illegible] its report in compliance with [illegible] No. 4[illegible] additional information wa[illegible] received after [illegible] was written. Consequently, [illegible] Committee [illegible] the right to include additional information [illegible] aspects in its subsequent [illegible] committee feels that th[illegible] the [illegible] of and the circumstances [illegible]

Respectfully submitted,

Senator [illegible]
Chairman

Representative Hans Williander
Member

Representative [illegible]
Member

I concur:
Representative Ataji Balos
Interpreter/informant

1014590

p. 75 [illegible] "[illegible] Rangoon [illegible]" [illegible]

p. 78 [illegible] should read [illegible] Study 177, p. [illegible]).

p. 82 [illegible]

p. 94 [illegible] February 1946, p. 5) should [illegible] 177, p. [illegible]).

p. 98 [illegible] should read "[illegible]" [illegible].

p. 102 In the quotation, "[illegible]" should read "[illegible]".

p. 104 In the quotation, the parenthesis [illegible] "percent [illegible]"

p. 107 [illegible] paragraph, second line, "[illegible] has not yet been [illegible] proven."

p. 112 Fifth paragraph, second line, "[illegible]" should read "[illegible]".

p. 120 [illegible] 1971. (doc. 29).

p. 121 [illegible] should be [illegible].

p. 127 [illegible] paragraph, first [illegible] should read "[illegible]".

p. 167 Third paragraph [illegible] people [illegible]

p. 175 [illegible]

p. 177 [illegible] should read "[illegible]" [illegible]

p. 178 [illegible] should [illegible] (...) [illegible]."

p. 178 [illegible] should be "[illegible]" [illegible]

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Special Comm[illegible]

Section [illegible] appropriated out of the Gene[illegible] Congress of [illegible] the sum of $10,00[illegible] the expense[illegible] appropriated shall [illegible] the ap- proval [illegible] accomplish the purposes [illegible] hereby au- thorized [illegible] members as it feels are ne[illegible] which are not [illegible] obligated [illegible] January 15, 197[illegible] Congress of Micronesia.

Section [illegible] effect upon the appr[illegible] High Commis[illegible] becoming law without [illegible]

[illegible], 197[illegible]

Edward E. Johnston
High Commissioner
Trust Territory of the Pacific Islands

101459

FOURTH CONGRESS OF MICRONESIA

SECOND SPECIAL SESSION, 1972

P.L. No. [illegible]
(S.B. No. [illegible], S.D.1, H.D.1)

AN ACT

To appropriate the sum of ten thousand dollars ($10,000) to cover the cost and contingent expenses of the Special Joint Committee on Rongelap and Utirik Atolls, and for other purposes.

BE IT ENACTED BY THE CONGRESS OF MICRONESIA:

Section 1. The sum of ten thousand dollars ($10,000), or so much thereof as may be necessary, is hereby appropriated from the General Fund of the Congress of Micronesia to defray the cost and contingent expenses of the Special Joint Committee Concerning Rongelap and Utirik Atolls as created under Public Law No. 4C-33. The sum herein appropriated shall be expended at the request, direction, and approval of the Chairman of the said Committee to accomplish the purposes of Public Law 4C-33. The Special Committee is hereby authorized to hire such consultants and other staff members as it feels are necessary. All funds appropriated under this Section which are not expended or obligated for expenditure before January 1, 1974, shall revert to the General Fund of the Congress of Micronesia.

Section 2. This act shall take effect upon approval by the High Commissioner, or upon its becoming law without such approval.

October 20, 1972

~~Edward E. Johnston~~
High Commissioner
Trust Territory of the Pacific Islands

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Section [illegible] Duties of Special Committee. The Special Committee shall [illegible] the [illegible] on the people of Rongelap [illegible] District, shall attempt [illegible] and aid for the people [illegible] from whatever sources [illegible], and shall attempt [illegible] compensation for the people [illegible] injuries which they suffer [illegible]

Section [illegible] Powers of Special Committee. The Special Committee shall have the power to [illegible] hearings and investigations, issue subpoenas [illegible] the attendance [illegible] witnesses and the production [illegible] documents and [illegible] and bring suits in any court [illegible] Islands in its own name [illegible] of the powers provided [illegible] the Trust Territory [illegible]

Section [illegible] Report of Special Committee. The Special Committee shall [illegible] report [illegible] President of the Senate and the Speaker of the House of Representatives on or before May [illegible] presented to the President and the Speaker, the Special Committee shall continue its work [illegible] members [illegible] their mission has been completed. [illegible] Special Committee [illegible] submit a final report to the Congress of Micronesia [illegible] Regular Session, Fifth Congress of Micronesia [illegible] date [illegible]

1014593

FOURTH CONGRESS OF MICRONESIA

SECOND REGULAR SESSION, 1972

Public Law No. 4C-33
(H.B. No. 198, H.D.1)

AN ACT

To create a Joint Special Committee Concerning Rongelap and Utirik Atolls, to appropriate money therefor, and for other purposes.

BE IT ENACTED BY THE CONGRESS OF MICRONESIA:

Section 1. Statement of purpose. During the period from 1946 to 1958 the United States of America exploded atomic weapons on Bikini and Eniwetok Atolls in the Marshall Islands District. As a result of such explosions the people of Rongelap and Utirik Atolls in the Marshall Islands District were exposed to harmful radiation and have been suffering serious ill effects as a result of such exposure. It is the policy of the Congress of Micronesia that these people should receive the best medical treatment available and that they should also receive compensation for the injuries which they have suffered. To insure that the people of Rongelap and Utirik Atolls receive such treatment and compensation, the Congress of Micronesia is creating a special joint committee to investigate this situation.

Section 2. Creation of Special Committee. There is hereby created a special joint committee of the Congress of Micronesia to be known as the Special Joint Committee Concerning Rongelap and Utirik Atolls, hereinafter referred to as the Special Committee. The Special Committee shall be composed of four members, to be appointed by the President of the Senate and the Speaker of the House of Representatives. Appointments shall be made on or before March 31, 1972. At its first meeting the Special Committee shall select a chairman.

"[illegible] about the
nature of things [illegible] valuable [illegible]
[illegible] appearances
[illegible] of causes."
— Aldous Huxley, Collected Essays

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[illegible]

As mentioned [illegible] covered all the aspects [illegible] considerably longer than [illegible] dealing with radiation [illegible] technicians and researchers [illegible] Among these people there are, [illegible] and liabilities of radiation as [illegible] scientific inquiry and discussion, [illegible] relatively new one. [illegible] affects human beings and will [illegible] forced man to experiment upon [illegible] this report is by no means [illegible] There never will be a "last [illegible] however, that it is perhaps the most [illegible] area, for not only does it [illegible] of the problem, but includes other related [illegible] in other countries, the personal [illegible], psychological and cultural aspects, [illegible] judgment, time, circumstance and, [illegible] that such a holistic approach--a [illegible] correct one to follow concerning [illegible] concept in medicine of treating [illegible] illness or disease as a single, [illegible] interrelationships of the total functioning [illegible]

As mentioned, the [illegible] By the same token, it is not perfect [illegible] assumptions contained in it. [illegible] who are more

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experiences in the subject areas of the report, or who have had available to them information [illegible]. If there be such errors, or flaws, [illegible] the Committee [illegible] for them, but rather asks the reader to [illegible] to the technical nature of the area and the difficulty in [illegible] it. The Committee believes that it [illegible] the best possible job with the resources available to it and considering the [illegible] of time and space of an event which occurred over eighteen years ago, but which is still affecting the daily lives of the people involved, and [illegible] of their descendants.

Some readers may object to the [illegible] of the section dealing with the detonation of [illegible] and subsequent [illegible] occurred. The Committee feels that the approach to this section [illegible], however, since in combining known facts, with recollections of the people [illegible] of the event itself brings into relief [illegible] relationships which could be missed by [illegible] charts or tables connected with the event. The Committee also believes that this approach also makes what could be a dull and uninteresting section [illegible] report on a highly specialized [illegible] for the reader. For instance, the personification of [illegible] whose radioactive cloud behaved as if influenced by [illegible] ghost [illegible] repugnant or perhaps improper by some scientists. [illegible] deny--not even the most prominent [illegible] of such an event has continued to "live" [illegible] physical and biological sense and in a psychological sense.

In writing this report, the Committee has [illegible] to popularize and simplify the subject of radiation and its effects.

The very subject of radiation is a [illegible] one, a fact which is indicated by the [illegible] radioactive

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contamination of certain lagoons as a result of nuclear testing. [illegible], [illegible] was to the effect that we are dealing with the small end of a very large subject.

In all instances it was not possible to cover everything as well as would be wished. Despite this, the Committee feels that there is enough basic information in plain language and plain terms to give the reader sufficient knowledge to make the report and its recommendations meaningful. The accuracy and appropriateness contained in the introductory section dealing with radiation in general is primarily due to the efforts of the Committee's consultants—[illegible] to Dr. William [illegible], [illegible], and [illegible]. Their assistance in writing this section has been invaluable.

Relative to this, it should be emphasized that the consultants to the Committee are in no way connected with the validity of the report, its assumptions, conclusions, opinions or recommendations. Under no circumstances should any part of this report, with the exception of the consultants' reports to the Committee, be taken to represent the views of the consultants, the organizations in which they work or with which they are connected, or their respective governments.

In commenting upon its own report on this section, the Committee would also like to bring to the attention of the reader what it considers to be some rather interesting circumstances, which may or may not have bearing on the report itself.

One of these, mentioned earlier on, involves the lack of information received from the Atomic Energy Commission and the Department of Defense. This information was requested nearly one year ago. No response has been forthcoming despite follow-up letters by the [illegible] office. The Committee [illegible] this points out what is a self-evident fact. The [illegible] of the [illegible] basically identical

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to the interests of the [illegible]. Yet the basic information needed by the Committee [illegible] very same source. Coupled with this [illegible] contradictory [illegible] of Micronesian and American interests embodied [illegible] which are manifested in the daily operations of the [illegible]. In short, the Committee, in carrying out the [illegible] of Micronesia, has had to deal with an [illegible]. In trying to investigate the matter, it has [illegible] agencies and departments. This situation was [illegible] which transpired in December, 1971, an[d] [illegible] 1972, [illegible] the medical treatment of the Rongelapese [illegible] politically (a fact which is discussed [illegible] somewhat highly charged emotional atmosphere [illegible] and investigations since its inception. [illegible] an enacting signature on the [illegible] the Committee were passively [illegible] mechanisms of law, rather than with official [illegible] authority. This apprehension about the Committee [illegible] has, [illegible] lessened as it has continued its work. [illegible] that its studies should be serious, [illegible] nature and professional manner. [illegible] excellent rapport and cooperation with the [illegible] government, although the same cannot be [illegible]. This has been evidenced at various [illegible] below.

First, the Committee [illegible] appearance of Dr. Darling [illegible] Public Health Service while on Saipan. [illegible] plays of old. Dr. Darling [illegible] Commission, and Dr. Steinfeld the resources [illegible] the Committee has no reasons to suspect the [illegible] it does believe that these visitations were [illegible].

Second, the [illegible] that government and the United States [illegible] somehow to be unenthusiastic, which contrasted [illegible] Hiroshima and Nagasaki. The [illegible] committees of this Congress and has found that [illegible] United States and Japanese governments [illegible] or resources development were far [illegible] that of this select committee dealing [illegible].

Third, this Committee [illegible] the September, 1972, survey of a somewhat [illegible] of 1972, even before Public Law No. 4[illegible] the Committee's interim report, one of its [illegible] of the Atomic Energy Commission and [illegible] to participate in the annual examination [illegible] credence to the correctness of the [illegible] the result of more than just [illegible].

Fourth, reference [illegible] from the AEC and DOD. The Committee [illegible] is aware that the AEC, at least, [illegible] information or assistance if requested from [illegible] the Committee wishes to refer to a letter [illegible] of the U.S. Congress, which [illegible] of the Congress held in Palau [illegible] and Utirikese.

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Senator Jackson, in turn, referred the letter to the Atomic Energy Commission. The AEC then sent to the Senator a [illegible] report from the General Manager. This report contained some information requested by the Committee, however, the Committee only came into possession of it indirectly and not in response to its request.

What the Committee wishes to prove by [illegible] these incidents is not that it has developed a pathologically [illegible] attitude wherein it believes that information is being constantly and intentionally withheld from it, but rather that there are perhaps forces, whose [illegible] of most of which the Committee is for the most part totally unaware, but which it believes exist nonetheless, due to the confidential nature of its work, which could possibly conflict with certain interests of the [illegible].

One final word should be mentioned concerning this report: how to read it. As readers will discover, it has been written in an inductive fashion; that is, evidence is presented, compiled and evaluated, which forms the basis for later conclusions. The report is for the most part [illegible] from the general to the specific, an example of which is the general information on radiation in general which [illegible] discussion of radiation effects later on. The Committee began its study with an open mind, but has formed opinions and conclusions as investigation has developed. The report is written to reflect this.

Lastly, one word of advice, for those who wish to merely read the recommendations because of the length of the report. The Committee would advise against this. This report is structured so that evidence and information build continuously to the concluding recommendations. Thus the recommendations are not easily understandable without reading the whole report. We, the members of the Committee, suggest that those who only want to read the recommendations, stop reading the report at this point.

[illegible] youth in a [illegible] the Tree of Life. No one denies that God is dead [illegible] and there is no longer [illegible] the world [illegible]. We deny the infallibility of the [illegible] being [illegible] the infallibility of the brotherhood of [illegible]."

—[illegible]

1014607

DEDICATION

First and foremost, this report is dedicated to the memory of a young Marshallese [illegible] who was one year old when the world's greatest nuclear explosion [illegible] from his home on March 1, 1954 and who was nineteen years old when he died during treatment [illegible] in a small hospital room at the National Institutes of Health [illegible], Maryland on November [illegible], 197[illegible]. It is also dedicated [illegible] and the people of Rongelap and [illegible], who were exposed [illegible] from the 1954 tests and to their descendants.

Also, [illegible] this report is [illegible], not only to those Japanese and American [illegible] exposed to the effects of nuclear weapons from the Hiroshima [illegible] and Nagasaki [illegible] to those scientists who willingly or [illegible] in order to gain new knowledge [illegible] of radio-activity. Finally, [illegible] and unnamed people now [illegible] the effects of weapons-testing [illegible] world in the name of national [illegible] application of radioactive materials [illegible] that this report will contribute [illegible], and important subject and w[illegible] increase knowledge of [illegible] control forces of nature at his [illegible] controlling and destroying ma[illegible]

1014603

"They were [illegible] could

give wings [illegible]

everywhere [illegible]."

[illegible]
[illegible] Korenetty[illegible]
[illegible] an Bohemian.

1014b0[illegible]

[illegible]

[illegible]

Man lives [illegible] radioactive [illegible] surrounded by radioactivity [illegible] which envelops the world. [illegible] naked eye. But we know it [illegible] can be measured [illegible]

If we could [illegible] naturally present in our [illegible] display of activity. We would see the[illegible] and soil of land, [illegible] buildings and metal structures.

In addition [illegible] passing through the [illegible] canned food[illegible] ray-producing machines [illegible] and research institutes--[illegible] radioactive materials and facilities [illegible]

We would [illegible] fresh-water lakes, [illegible] cosmic rays* from deep [illegible] passing through our bodies, [illegible] inside our bodies, we would [illegible] result of certain radioactive [illegible] naturally

---

*Some cosmic [illegible] recorded in mines over [illegible] (46)

1014605

by us and which form a part of the total amount of radiation which we are exposed to during our lives.

Radiation has undoubtedly been present in the world and the universe since its creation and has resulted in the natural radiation background which surrounds us today. Radiation, the sending out of particles, or invisible "pulses" of energy from atoms can be both natural, meaning it can be found occurring in certain materials spontaneously, or it can be created by man. The atom, then, is the basis of this radioactivity, and a brief discussion of the atom and its relation to radiation and to radioactivity will be undertaken to help give a foundation for the understanding of the sections in the report to follow.

If we look at ourselves and at other objects, we see that these things appear to be solid to the naked eye. But scientists also know that all matter is made up of smaller parts or components. Thus, while we can look at a beach as a whole, we also know that the physical thing we call a "beach" is also a series of millions of tiny bits of sand. Further investigation will show that the sand itself is made up of many different kinds of minerals, these minerals are made up of smaller parts called molecules and the molecules are made up of atoms, which are, for the practical purposes of this report, the smallest particles of matter which we shall discuss.

The atom, we might compare to a solar system like our own. In a solar system, the sun is the center and, revolving around it, a number of planets. An atom is similar in structure. Around the center, or nucleus, revolve a number of electrons. The nucleus, however, is not generally of one substance, but is made up, like a handful of marbles, tightly bound together by an electrical charge, which is what replaces the gravity of a solar system in keeping the electrons operating in their regular positions etc.

to the nucleus. This is, perhaps, an exceedingly simplified description of the atom, but one which will serve as sufficient for our purposes. There are a few hundred different atoms and their difference is indicated by the number of neutrons (neutrally charged) and protons (positively charged) "particles" in their nucleus. An element is defined as an atom with a given number of protons in its nucleus. Isotopes of an element have different numbers of neutrons in their individual nuclei.

Two other qualities of atoms and their relation to radioactivity should be mentioned. Atoms may emit different types of particles of different energies. A second fact is that the number and arrangement of electrons determines the chemical features of an element. While they are different, there can also be atoms with the same number of electrons and, consequently, the same number of positively charged (protons) particles in the nuclei. Since they are the same in this respect, they are both chemical brothers. They can form the same chemical bonds and molecules.

There are five types of radiated energies mentioned in this report but only three will be used frequently. The five are:

1. Neutrons
2. X-rays
3. Gamma rays
4. Alpha particles
5. Beta particles

Neutrons: These particles are emitted during the chain reaction which takes place during a nuclear explosion or a fission or hydrogen bomb. A neutron has about the same mass as a proton but is uncharged. It is highly penetrating to all materials except those of mass near that of its own.

Gamma rays or X rays. These are electromagnetic waves of relatively high energy and therefore having relatively high penetrability through matter. They may be emitted from a nucleus, a gamma ray, or produced by electron stopping outside of the nucleus, X rays.

Alpha particles. These are helium nuclei and are emitted from the nucleus of radioactive atoms. These particles have a low penetrability and, when they are emitted from an atom inside the body, they may produce substantial local damage.

Beta particles. These are the high speed electrons given off by a radioactive substance. Their penetrability is between that of alpha particles and X rays.

Half-life

The rate of emission of a given type of particle from a sample of radioactive material decreases with time. When the decrease is rapid the isotope is said to be short-lived and when it is slow the isotope is said to be long-lived. The time for the rate of emission to reduce to one-half of its initial value is called its half-life. Half-lives of from a small fraction of a second to many thousands of years have been observed for different radionuclides. The half life for plutonium 239 is about 24,000 years. Then, after 24,000 years it will have emitted half of that remaining, and so on. If we start with 1,000 atoms, after one half-life we have 500, after another half-life we are down to 250, another one gives 125, and so on until nothing is left and the entire sample has returned to its original stable form. Pu239 is one of the longer lived elements. Strontium 90 and cesium 137 have half-lives of about 30 years. Other isotopes have half-lives of a few months, days, minutes, or seconds.

Connected with this physical half life of the isotope is another kind of half life called the "biological half-life," which is the amount of time it takes for one-half of the radioisotope to be removed from the body, through elimination of waste matter. A further aspect of radiation that is of interest to the present context is that charged particles lose energy along their path to the medium they are penetrating. This energy may break up molecules or even produce radioactivity. For the energetic particles of interest here, thousands of molecules may be affected along the track of the particle. Because of the positive-negative electrical charges, these particles can tear electrons from atoms they strike. It takes anywhere from ten to one hundred electron volts of energy to tear an electron from an atom. Usually the radiation energy of particles is measured in the thousands (kilo electron volts = kev) or millions (million electron volts = mev). Consequently, particles in the kev or mev range may ionize thousands of other atoms before their energy is used up and they stop.

Measurement

The amount of radiation may be measured in a number of different ways or particular units. These are measures that indicate the interaction of the radiation with various types of material.

The "Roentgen" is a unit for exposure which indicates the ability of X or gamma radiation to produce ionization in air.

The "RAD" is a unit of absorbed dose and indicates the amount of energy absorbed in a material per unit mass of material.

The "REM" is the unit of dose equivalent. The dose equivalent is for radiation protection purposes and provides a common frame for expressing the biological effects of different kinds of radiation on the human body. The external radiation, the dose equivalent is obtained by multiplying the absorbed dose of a given type of radiation by the quality factor for that radiation and summing these products for all radiation incident at a given point in the body. The quality factor is defined in terms of the energy deposition per unit path length of the charged particles at the point of interest in the human body.

The Relative Biological Effectiveness (RBE) is the ratio of the absorbed dose of two radiations producing the same biological effect. One of these radiations, called the reference radiation, is frequently moderate energy X- or gamma rays. This term is most often used in reporting the results of biological experiments and the reference radiation is often moderate energy, X- or gamma rays. Thus, if the absorbed dose of the reference radiation is 20 times larger than the absorbed dose of the radiation of interest to produce the same effect, we would say that the RBE of the other radiation is 20.

Lethal Dose. The LD 50/30 (50 percent lethal dose) is the absorbed dose that will kill 50 percent of the population exposed. This term is usually used when the radiation is administered acutely. The second number is to indicate the time period over which the observations are made following the irradiation. Also, it is usually used when the absorbed dose is more or less constant throughout the organism and the organism is given no special post treatment of the organism. The LD 50 in 30 days for man is about 200 rads. This is a number which is stated in the National Academy of Science report on space travel.

Treatment for Acute Effects

There are no methods of treatment which will cure the immediate effects of severe doses of radiation. Only treatments for the different kinds of illness it produces. [illegible] dehydration and loss of body fluids [illegible] treated as normal burns to aid the healing [illegible] should be administered. [illegible] for the most part they are [illegible]

Protective Measures. [illegible] or moderate, the effect of radiation. [illegible] with animal experimentation. [illegible] with certain chemicals before [illegible] increase the animal's chance of [illegible] dose. There are no human experiments of this type.

Recovery Agents. [illegible] and to prevent or minimize damaging [illegible] described for acute treatment, [illegible] to control bleeding, and [illegible] injections, which help the [illegible] until the patient's marrow [illegible] from Dr. George [illegible] Commission in Japan, who [illegible] negative as to their effectiveness.

Removal Agents. [illegible] the administration [illegible] is injected [illegible] body greater than normal [illegible] kind of treatment is usually only effective [illegible] after the internal exposure [illegible]

[illegible]

The following [illegible] of radiation [illegible]

Los Alamos - [illegible] to radiation during two [illegible] nine days, another [illegible] days, and a third developed [illegible] people apparently [illegible]

Windscale - On [illegible] radioactive matter (I^{131}) [illegible] area was found [illegible] according to [illegible]

Oak Ridge - On [illegible] makes radioactive mate[illegible] to 365 RADS and three [illegible] but apparently [illegible]

Yugoslavia - An [illegible] exposed six men to very high [illegible] effects of the radiation and [illegible] figure is not available), [illegible] Four others, who [illegible] until their own [illegible] without injections. [illegible] injections can [illegible]

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[illegible] BACKGROUND AND [illegible]

The year of 1942 was not particularly important, historically perhaps, with one exception.

In 1942 the United States was still quite [illegible] out of a worldwide depression which had begun in 1929. It was not a particularly notable year for science, religion, or politics; isolationism characterized the international stance of the American people.

In the Hawaiian Islands in 1942, [illegible] year-old John [illegible] was probably contemplating his daily chores, the possibility of going fishing, and the increasing presence of [illegible] in his islands.

A singular event, however, did take place that year which would affect the future lives of [illegible], Americans, and [illegible] alike—in fact, all the people of the world. It was [illegible] of that year that German scientists at the Kaiser Wilhelm Institute in Berlin split an atom of Uranium 235 (U^{235}) (54, p. 9). While it had been theoretically considered possible, this was the first time that it had been actually accomplished. Splitting of this atom proved that a chain reaction was possible and creation and control of a chain reaction meant that man had, within his grasp, control of a basic force of nature and the universe. How this power was to be used would shape the world.

In May of 1942, the President of the United States of America, with a simple "OK, FDR" notation, made a decision that the United States would make an all-out, massive effort to develop the first atomic bomb before Germany could (54, p. 13). The successful construction of an atomic pile by Dr. Enrico Fermi and the "Chicago Group" on December 2, 1942, at 3:25 p.m. (54, p. 88) proved that the controlled chain reaction, necessary to produce plutonium for the atomic bomb, was possible. Today, processes were developed to produce both bombs and reactors, each of which would provide the critical material for the atomic bombs developed by the United States.

The process of the splitting of the atom, or "fission," is nearly impossible to imagine, understand, or describe. Atoms, which we cannot see, smell, touch, or hear because they are so small, have a fantastic amount of potential energy which, when released in the form of an explosion of a single bomb, is capable of flattening buildings and scorching earth over hundreds of square miles, of killing and maiming millions of people immediately, and more millions in the hours and days following.

In effect, however, the basic power of the fission bomb comes from two things: the fact that atoms can be split and a chain reaction. Even though atoms are very tiny, the amount of force holding the atom and its parts together is very great. For fission, when a neutron strikes a fissionable atom, the atom may split, and following the splitting, may produce additional neutrons. In turn, these neutrons may produce splitting of nearby fissionable atoms. A chain reaction is said to exist when the splitting of one atom produces, on the average, the splitting of more than one nearby atom. An example of a "chain reaction" is where a ball is tossed into a room in which the floor is covered with mouse traps set with ping pong balls. The ball strikes one mouse trap, which in turn sets off its neighbors, which in turn set off still more, until all have been sprung. When this chain reaction is slow and controlled, it can be used for electricity-generating atomic power plants. The reaction heats water and turns it into steam, which drives turbines connected to generators, which produce electricity.

When, however, this reaction is "uncontrolled," it results in an atomic explosion. The tremendous destructive energy released by fissionable material as opposed to regular sources of energy might be illustrated this way: the fission of one [illegible] to 9,000 tons (18,000,000 lbs.) of [illegible]

On May 7, [illegible] at the Alamago test site [illegible] possible effects of the test of a [illegible] July [illegible] 16, 1945, at 5:29 a.m., "Trinity," the first [illegible] and was supposedly equivalent to [illegible] as the May test, but only [illegible] Nagasaki bombs.

The "fusion [illegible]," works on a somewhat different [illegible] nuclear force of the atom as well as a chain [illegible] splitting atoms apart, they are fused [illegible] chain reaction. To do this requires [illegible] of 100 million degrees. Since this [illegible] reached by detonation of an atomic [illegible] the "trigger" for the [illegible] utilizes hydrogen atoms, [illegible] of fission: 1 pound of fusion [illegible] 10,000 [illegible] (23 p. 15) Scientists also [illegible] radioactive material in that it produced [illegible] problem with the addition of another [illegible] would [illegible]. Simply put, the [illegible] which in turn triggers a final [illegible] device to be tested at [illegible] 1954.

In millionths of [illegible] completed and in thousands of [illegible] heat and shock waves, that [illegible]. Regardless

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of whether a surface or air burst, the fireball will spread outward from 300 to 500 miles per hour at the beginning, and slowing as it approaches peak altitude. If the explosion occurs on the ground, the fireball will pick up with it great quantities of soil and pulverized materials, carrying the lighter ones to its highest altitudes. Much of this material will be heavy and only the lightest particles of it rise to thousands of feet. If, however, it is air burst, the heat and shock waves will be maximized, but little material drawn up into the cloud with the fireball; consequently, there will be little local fallout. Only [illegible] amounts of radioactivity are sent out during the initial flash [illegible] as it rises. However, if it is an air burst, little radioactivity will be deposited locally since little material has been vaporized, and since [illegible] of the some 200 radioactive products [illegible] have gone through one or two half-lives before the cloud has [illegible], [illegible] air burst the main radioactive [illegible], water vapor in the air, and the [illegible] themselves, which have become mixed with the fireball. A [illegible] 20 kiloton (20,000 tons of TNT) burst will rise to about 25 or 30,000 feet. A one megaton (1 million tons of TNT) will rise within 15 minutes to a height of roughly 100,000 feet. If it was a ground burst, it will have pulled up with it thousands of tons of matter and made it radioactive. The cap of the cloud will have moved up into the stratosphere where high winds will begin dispersing it worldwide; the rest of the cloud column will be torn apart by lower winds which will carry the radioactive debris with it. The heavier particles fall out first, the lighter ones fall back down later upon the earth below, in a direction set by the wind.

[illegible]

[illegible]

While [illegible] naturally radioactive [illegible] of artificial sources of radio[illegible] reactors, and nuclear bombs that [illegible] individually or on a mass [illegible]

As discus[illegible] nuclear devices or fallout from [illegible] although the effects are the [illegible] medical overexposures.

As mentioned [illegible] is its ability to "ionize," that [illegible] material and disrupt the [illegible] area of external expo[illegible] are very penetrating and can actually [illegible] ionized atoms. In effect, [illegible] through the human body may [illegible] comprising the molecules of the body's [illegible]

In regard [illegible] radiation, little is known. Most d[illegible] rads up to thousand[illegible]

From [illegible] within 30 days, although [illegible] This is also dependent upon ava[illegible] death to occur; [illegible] effect[illegible],

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having a sudden beginning and short course such as this short course would be noticed.

The range of acute effects within this dosage include nausea, vomiting, diarrhea, itching and peeling of the skin and mucous membranes, loss of hair, skin burns, and a lowering, or depression, of various kinds of blood cells due to the bone marrow (the material within the bones which makes blood) being affected.

At about 300 rads (depending upon dose rate, response, health, age, etc.) as mentioned before, more than 50 percent of the people exposed would be expected to die.

As the amount of exposure increases, fewer people would be expected to live and at about the 800 rad level practically 100 percent of the exposed persons would be expected to die.

Higher doses above 1,000 rads would result in what is called "gastro-intestinal death." This results in destroying the lining of the small intestine and causing nausea, vomiting and diarrhea. Death would occur within a few days or a week.

Central nervous system death would occur at doses over 3,000 rads. This size of dose causes extreme excitability, trouble with breathing, lack of balance and coordination and convulsions. Death may be immediate or after a few hours.

Should, somehow, a person survive these critical dose symptoms, he would undoubtedly die in a hemorrhagic stage, where severe disorders of the bone marrow, which produce blood cells, lead to internal bleeding, anemia, and lack of resistance to infection. Such effects can also be seen at the sublethal to lethal range. (86, p. 590)

Many of the above types of disorders would be brought about by direct exposure to the original radiation of the nuclear blast. Those people who were not close [illegible] (heat) or blast wave (pressure) [illegible], gamma rays, and possibly alpha [illegible] with the increase of their distance [illegible] alpha particles are of biological [illegible] inhaled or ingested material. [illegible] external sources following nuclear [illegible]

These same [illegible], however, [illegible] by a person being in, or [illegible] radioactive fallout. In such an area, [illegible] and beta radiation from the fallout [illegible] the gamma radiation, because it is able [illegible], would be the most harmful. The beta [illegible] would mainly be dangerous externally [illegible] uncovered skin of the person. [illegible] penetrating (generally only the upper [illegible] sufficient quantity and if of enough [illegible] 'burns' in several degrees, from [illegible] are dangerous in the sense that if a [illegible] enough to lower blood cell counts and this [illegible] became seriously infected, the person [illegible]

[illegible]

As has been [illegible] directly to radiation either through [illegible] nuclear weapon (or source of radiation [illegible] fallout. A second way of being exposed to radiation is through internal exposure, or internal contamination. This can happen through two types: direct contamination or indirect contamination.

It should be recalled that a nuclear explosion results in the creation of approximately 200 radioactive elements, or isotopes. Many of these are short-lived, i.e. as polonium (Po^{218} or [illegible]) which has a half-life of 3.0 minutes, or astatine (At^{218} or [illegible]) with a half-life of 2.0 seconds (TRP, p. 55) and actually become ineffective or decay to a harmless stable form before they can reach the ground. However, longer-lived elements like strontium (Sr^{90}) and cesium (Cs^{137}) have half-lives of about [illegible] years; radioactive iodine (I^{131}) has a half-life of about eight days. It is these three elements which are among the most dangerous in the composition of fallout, or the material which returns to earth after being lifted into high altitudes by the explosion. This fallout material may result in exposure to human beings (and animals and fish) should they drink [illegible] drinking water, eat food, or if they are inhaled, or, as happened [illegible] where the fallout material landed on [illegible] the ground, [illegible] them to pick up a flake of material [illegible]. All of these result in the radioactive material, which gives off gamma and beta radiation, being deposited internally into the human body.

A second way man may be exposed to radioactive contamination is what might be called "indirect" exposure [illegible] through [illegible] mechanism: the processes of [illegible] environment.

The emphasis [illegible] during the past few years helps clarify how a person can [illegible] contaminated internally from a nuclear explosion which occurs thousands of miles away and years ago. The present emphasis on protection of our environment from pollution has made the [illegible] relationships between

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man, animals, [illegible] We now know that to continually dump sewage [illegible] lake may kill certain small organisms, [illegible] for larger animals, and [illegible] food or business. [illegible] There are "ecological chains" [illegible] destruction of the whole chain. [illegible] Within nature are many [illegible] ecological patterns. While the first [illegible] by pollution, or contamination, [illegible] In some areas, factories produce [illegible] waste is discharged into a fresh water lake, [illegible] tissues of the smaller organisms and [illegible] reaches man. If the concentration [illegible] large enough, the man may become ill [illegible] can happen with radioactive [illegible]

At this point, [illegible] and recall what happens when a [illegible] explosion--occurs. If on the surface, [illegible] of material into the atmosphere, [illegible] surrounded by vapor and particles [illegible] radio-activity and [illegible]

The lower [illegible] heavier particles of material [illegible] radioactive. This part will [illegible] (the Tropo-sphere or zone [illegible] heaviest particles

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will fall first, near the explosion. Lighter ones will be carried on winds, hundreds or perhaps thousands of miles, before settling to the ground naturally from the force of gravity, or more rapidly should they become caught in a weather front and be brought down by a rainfall. This is what is generally referred to as "local fallout," and is heavily radioactive in nature and lands within a few hours or days. It contains "mixed fission products"--that is, isotopes of many kinds, (i.e., strontium, cesium, iodine, zinc, cobalt, giving off both gamma rays and beams of different energies. Generally the local fallout can be seen in a cigar-shaped pattern, with the weakest activity at the outer edges and the heaviest toward the center.

Not all of the fallout, however, comes down in the first few hours or days. This is the material which has been injected into the stratosphere (a zone beginning at about 40,000 feet). The particles which have ascended to this height are those in the submicron class and very fine and light, like particles of smoke. These radioactive particles will be circulated about in the stratosphere which is largely free of clouds and in which the temperature is relatively constant until it has spread out all over the earth. This material will take months and years before it is returned to the earth's surface. The radioactivity, which may be spread throughout the world more or less uniformly, will return to the earth in the same manner, although it is possible that some areas of the world will receive heavier amounts of this fallout than others.

But this radioactivity, once it has returned to the earth, tends to be consumed and retained by man due to one of the unique properties of radioactive materials.

Most poisons are chemicals which [illegible] diluted by water or other harmless substances, become ineffective. If [illegible] radioactive isotopes had the same qualities, decontamination of fallout zones would be much easier--the material could simply be washed away and the major danger would be eliminated. Persons who accidentally ingested the material could drink quantities of water and literally wash the radioactivity out of their systems. Unfortunately this is simply not true with radioactive substances. As mentioned earlier, the [illegible] of the [illegible] any kind of isotopes are like "chemical [illegible]" of other [illegible] elements naturally found in our bodies. [illegible] radioactive [illegible] like calcium, and potassium have their "chemical [illegible]" counterparts [illegible] Sr^{90} and Cs^{137}. As pointed out by Dr. [illegible] in the [illegible] Congressional hearings on "The Nature of Fallout and Its Effects on Man" (56 p. 710)

> "Just as a [illegible] machine can be made to operate with a coin having a shape, weight, and properties similar to a genuine coin, so also can the body be "fooled" when presented with [illegible] counterfeit.
>
> "Natural strontium is the chemical [illegible] of calcium, an alkaline earth which is essential for the [illegible] of health and [illegible] like calcium [illegible] 99 percent of the strontium is found in the bone.

Thus it is that these counterfeit [illegible] which get into man's body locate themselves where their [illegible] the body. Calcium is an important compound in our bones and then [illegible] there. Potassium is found in our muscle tissue and [illegible]. Iodine is important in the operation of the thyroid gland and so we find [illegible] radioactive iodine there, too.

How these elements get there involves the food chain. If the fallout lands on the ocean, it is taken up by [illegible] like plankton. Plankton, in turn, serves as food for small fish and other sea life which, in turn, are food for other, larger fish. Eventually, at the end of the chain, man catches a fish which has been contaminated as a result of the original fallout, eats it, and becomes contaminated himself. If the fallout

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in or food, it goes through a similar process. Strontium 90, for example, is taken up by plants and grass. The grass is then eaten by cows, which manufacture milk containing strontium. Humans then drink the milk and consequently much of this contamination will reside in the bones of their bodies.

This state of affairs would be [illegible] if it were not for one factor, which Dr. [illegible] has pointed out:

> "The countryside is polluted, however, and there are slight differences in properties between strontium and calcium which permit our regulating systems to select calcium preferentially, or to discriminate against the less desirable strontium." (p. 7 [illegible])

The same is true for plants, cows, and so on. For example, if we started out with $100 worth of strontium deposited on the ground in a small area around a plant, the plant might absorb [illegible]. The milk from the cow that ate the plant would only contain $20 worth of the strontium. The man who drinks the milk would, perhaps, retain in his [illegible] only $5 worth of the original $100 worth of strontium. While the money figures are not real and only used as an example, they illustrate what is called the "discrimination factor"—a factor which means that part of the radioactive chemical is rejected all along the route of the food chain. Despite this rejection factor, however, [illegible] still present considerable threats to the health of the average person and future generations.

Sr^{90} gives off beta particles. Although these particles are high-speed in nature, they are also relatively small in size, or size and weight; cannot travel far through matter; and can be stopped quite readily by a layer of clothing or the upper layers of the skin. However, once they enter the body and reside in the bone close to the marrow, they can, in sufficient quantities, do great damage.

In *The Effects of Nuclear Weapons*, it is noted that:

"... [illegible] soft (low-energy) gamma-ray [illegible] considerable damage." (53, p. [illegible])

The [illegible] about which there was much controversy during the [illegible] about radioactive fallout and its effects [illegible] dosage and exposure [illegible] permissible concentration (MPC) of strontium-90 [illegible] in atomic industries. This is 1000 [illegible] (abbreviated as uuc--one [illegible] of radioactivity) per total weight of [illegible] the average person has 1000 grams of calcium [illegible] per gram. The equivalent maximum permissible concentration for the [illegible] working in atomic [illegible] 1/100th of [illegible] 100 "sunshine units." There are also other [illegible] does not [illegible] not only [illegible] but that its distribution [illegible] that it is possible for [illegible] body or an organ [illegible] to the MPC of [illegible] but that because it is unevenly [illegible] where the MPC[illegible] for each gram of calcium [illegible]

[illegible] gamma [illegible] which selectively

*The term MPC [illegible] Permissible Concentration (MPC).

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concentrate in certain areas (bones, muscle) or organs (thyroid) are greatly [illegible]. Besides the fact that the body does not take up all of the material available and that it also slowly eliminates some of the retained material little by little. The danger, of course, is due to the ionizing effect of the beta and gamma particles. While even today the way by which these particles influence bodily or cellular changes, it is known that continuous exposure to different quantities can produce bone tumors and leukemia in the case of strontium, liver tumors in the case of cesium and tumors and [illegible] in the case of iodine.

How these effects are indicated by [illegible] deserves to be outlined briefly, before considering long-term effects.

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[illegible]

[illegible]

[illegible] the [illegible] composed of tiny grains of sand and [illegible], [illegible] composed of tiny cells. These cells, which [illegible] different [illegible] different shapes, all have nuclei [illegible]. Within these [illegible] string-like materials called chromosomes, which [illegible] genes. The genes are also composed [illegible] chemicals, [illegible] of which is DNA, short for [illegible]. All of these things are composed of molecules and, [illegible] chromosomes, which are a series of [illegible] shapes, determine the working and division [illegible]. The genes, which are like different [illegible] function in making up the [illegible] chemicals form the genes. [illegible] chemical signals which regulate the [illegible] of the genes. The genes then determine the [illegible] chromosome the shape and function of the cells. The cells [illegible] the shape and form of our bodies.

Almost all the cells in our body are [illegible] producing new cells, some slower, [illegible] if we consider that when we [illegible] grow again. If we get a cut or burn [illegible] damaged will be replaced. [illegible] by the cells [illegible] duplicating themselves, and [illegible] process which [illegible] maturity, and [illegible] in our bodies are constantly "dividing" [illegible] to produce new cells. [illegible], which insures that each new [illegible] If it is not, it may die, or it may [illegible] not useful, or possibly harmful, [illegible] the body. Perhaps trillions of these [illegible] body during our lifetime -- and [illegible] usually done [illegible] defects. "Freaks" may occur during the [illegible] an imperfect chromosome. This [illegible] or may duplicate the new [illegible]

While these [illegible] "mistakes," they may also be produced by ionizing radiation. [illegible] beta rays, neutrons, and alpha [illegible] structure of the DNA chemicals [illegible] chemical changes that can be [illegible] can cause defects in the DNA [illegible] thus the cell.

In large doses, [illegible] readily seen. Damage by gamma particles [illegible] intestine cause nausea, vomiting, [illegible] and hair results in skin [illegible] (epilation).

The long term effects [illegible] of low doses, is another matter.

Long Term Effects

So far we have [illegible] radiation and what acute effects he can suffer, [illegible] and burning of the skin to [illegible] effects are

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bad enough in [illegible] no known radiation-specific medication which can [illegible]. What is perhaps even more insidious [illegible] long range consequences of irradiation, [illegible].

Here, it [illegible] point about long-range effects of irradiation [illegible] possible exception of genetic effects [illegible] radiation [illegible] "radiation" diseases which [illegible] bombs. Rather, it appears that [illegible] of radiation may encourage the development [illegible] to have an "ordinary" disease [illegible] were not exposed to radiation. This has been proven [illegible] there was a higher than normal incidence of [illegible] the peak incidence than those not exposed. Also, in the [illegible] nearly all the people exposed on [illegible] years of age have developed nodules [illegible] of the thyroid.

Just as there [illegible] "radiation disease" [illegible] special treatment for [illegible] of radiation. Treatment for radiation [illegible] leukemia not induced by radiation [illegible] cancer induced by radiation [illegible] by radiation. Exposure, as will [illegible] processes in the body's [illegible] are no traces of radiation in the body, [illegible] because of a one-time exposure, [illegible] years. Thus a person may develop [illegible] the cancer itself is not radioactive, [illegible] "normal"

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lung cancer; it might be slowed down by chemical drugs, removed by surgery, or "burned out" by X-rays.

Cancer

A neoplasm is any new or abnormal growth in the body. Examples of such growths are warts, moles, cysts, and certain tumors. There are generally two kinds of neoplasms. One kind is benign (not harmful). The other is malignant (harmful). Malignant growths are called cancers. What makes these growths harmful is the fact that cell production in them is uncontrolled. It is as though the cell growth has gone wild. Cancer cells reproduce themselves faster than their normal neighbors. They do not serve the body's needs, but use up the chemicals needed by other cells. The growth [illegible] of cancer [illegible]. If the cancer is in a local area, it may be removed by surgery or by X-ray treatment and a cure results. However, if only a few cancerous cells are left, the cancer will begin to reproduce itself again. Cancer may develop as a tumor or tumors in a single organ, such as the lung or liver, or as a malignant tumor [illegible] in the lymph glands, or in the blood, or it may spread throughout the body (metastasis).

As a result of the atomic bombs dropped on Hiroshima and Nagasaki, perhaps the most well-known long-range effect on survivors of human beings is the increase in leukemia. Leukemia is a cancer of the blood. It is a condition in which there is an abnormal increase in a certain kind of blood cell, the leukocyte. The disease can be either acute (having a short course, or life) or chronic (having a long course, or life). While leukemia cannot be cured, it can be controlled, or retarded.

The use of [illegible] from causing immediate death [illegible] for some time. The end result of [illegible], however [illegible], is ultimately fatal.

Another [illegible] Japanese A-bomb survivors [illegible] thyroid cancer, and thyroid [illegible] which has also been found in the [illegible] though the exposures were different. Results of the Atomic Bomb Casualty Commission (ABCC) and scientific studies on animals and human beings treated with radiation for therapeutic [illegible] in an increase of the [illegible].

In the early days of radiation studies, it was thought that at least as much as 1000 [illegible]. According to one source [illegible] last two months before birth [illegible] appearing a few years later." ([illegible], 1960) [illegible] suggested by the 1958 report of the UN Scientific Committee on the "Effects of Atomic Radiation" [illegible] "These studies have provided the important suggestion that [illegible] radiation doses, [illegible]." ([illegible], p. 7)

[illegible]

Mainly through [illegible], it is generally agreed among scientists that exposure to radiation, depending upon [illegible] and amount of dose, may result in shortening the life of an exposed person by a few days to months, or years. [illegible] appears to be dose dependent with high doses, although effects from low doses will [illegible]. [illegible] irradiation may, indeed, lengthen life somewhat, although at the same time the life span of the [illegible] is not increased. Since life span studies involve long periods of time (20-25 years), results to date have proved inconclusive; however, it is generally accepted by scientists that high doses of radiation will significantly lead to shortening of the life span through the production of malignant tumors. The life span may be shortened from non-malignant causes in other animals.

Stillbirths, Miscarriages, and Fertility

It has previously been thought that irradiation of the fetus, as it is growing inside the mother, may cause birth of a dead child (stillbirth), or early delivery of the fetus (miscarriage). Loss of fertility (temporary sterility) of the mother or father is also thought to be caused by radiation. Evidence in other studies is [illegible] in support of these effects. Yamazaki's study of Japanese children exposed to the atomic bombs did, however, indicate loss of fertility of the male through decreased, or greatly reduced, production of sperm cells ([illegible]), which would indicate that radiation does indeed affect human fertility. While findings on miscarriages and stillbirths are inconclusive, there are other effects on the developing child (fetus) in utero inside the mother which were discussed previously or will be discussed later.

Growth and Development

Children irradiated before birth have been studied in both Japan and the Marshall Islands. In both instances it has been found that such children show reduced height and weight and mental retardation, ranging from slight to severe. More detailed discussion of these findings will be included in the relevant chapters to follow.

Tissue Cell Alteration

As mentioned earlier in the section dealing with acute or somatic effects, moderate to heavy doses of radiation will result in the decrease of the production of certain kinds of blood cells. One of the late effects noted is the production of aberrations, or abnormal forms of certain cells through a change in the chromosomes which make up the reproductive part of the cell.

All cells in the body are able to [illegible] themselves, that is, they are able to go through a process of division, in which one cell will split into two cells, with each new cell having the same number and kind of chromosomes, thus enabling them to reproduce themselves again. This basic biologic feature allows our bodies to repair themselves, or to maintain certain necessary chemical balances. Thus, a cut or scratch can heal and the skin be replaced with new tissue; the body can manufacture new blood should we be suddenly deprived of part of it through a blood bank; or certain organs or tissues of the body, which are damaged, can complete a repairing process which will enable them to function normally again.

Again, we must recall the unique effect of the rays emitted by radioactive materials or sources as they pass through tissue along their paths through tissues or substances. By passing through the blood or the areas which manufacture the blood (bone marrow), these particles may disturb the nucleus (center) or the chromosomes, causing them to become abnormal or aberrant forms. This may result in cells which are unable to divide and reproduce themselves, or in cells which reproduce themselves in an aberrant form. These aberrations of the cells may lead to [illegible]

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either because the types of cells affected are long-living and may not reproduce themselves for a long period, or because the damaged cell keeps reproducing itself unchanged in abnormal forms.

Man possibly has abnormal cells by [illegible] [illegible], which may have been [illegible] him through the genetic material given to him by his parents, or through the exposure to certain non-radioactive chemicals, or from other sources. Radiation has been found to cause changes in forms other [illegible] [illegible] have more abnormalities than non-exposed [illegible]. The effect or influence of these abnormal cells has been and is being thoroughly studied, although just exactly what relation they may have to the development of cancer, including leukemia, has not been definitely proven. The UN report of 1958 states that:

> "... The mechanisms of [illegible] in general are not well understood. However, the evidence is that the neoplastic change occurs at the cellular [illegible] is frequently associated with chromosomal [illegible] changes in cell [illegible] (particularly also [illegible] consideration) are [illegible]." (Ibid., p. [illegible])

Simply put, this means that how cancer develops (mechanism) is not clear. This is known that neoplastic change (the formation of new cells in this case belonging to those of cancer) begins in the cell as a result of changes made in the cell, especially in the arrangements of chromosomes. In short, the scientists, with all their data, have a lot of "circumstantial evidence" that radiation causes cancer. They have found that in cancer alterations, they have found that persons irradiated develop more cancer than those not irradiated. They do not know exactly how this happens. They can only strongly suspect that the "accused" radiation is really the "guilty party."

Heredity and Genetic Effects

In the previous section, the effects of radiation on [illegible], or other body cells, were discussed. Much of this discussion involved how the cells go through division in order to reproduce (somatic, or cells of the body). The sex cells of the body also contain chromosomes, made up of smaller units called genes, which are made of special chemicals (and chemicals, we will recall, are composed of molecules and atoms). These also go through a kind of "cell life" or production process.

While there are some similarities between the somatic cell duplication process and the process which occurs for sex cells, there are two major and important differences. The first is that the chromosome and genetic material in a somatic cell are required for duplicating another cell. A sex cell (sperm or ovum), however, is the place for creating an entire human being, including all the functions of [illegible]. The second difference is in the duplicating process. A somatic cell can duplicate itself. The cell produced (daughter cell) and the original cell (parent) can again both duplicate themselves. Sex cells, however, are unique in the fact that there are "parent" cells in the testes and ovaries which preserve the ability to produce the sex cells, [illegible] through a subsequent process of division and are then transformed into the sex cells. If immature cells are irradiated, [illegible]. This, however, is affected by the fact that other [illegible] cells will be competing with them in the fertilization process and also that they have a relatively short life span. However, if the "parent" cells which produce the sex cells are irradiated and mutated, this will result in the continuous production of mutated immature and mature cells. (86, p. 49)

Mutations of somatic cells then only affect the "host" or body within which they occur; mutation of "germ" cells may result in mutation of the newly created being, in cancer or fetal death, or in the transmitting of these mutations to other generations resulting in illness, deformity or death.

When the male sex cell (sperm) is united with the female sex cell (ovum), the chromosomes and genetic "codes" begin going through a marvelous dividing process which assures that every cell in our bodies contains half of our mother's and half of our father's chromosomes. If, however, the genetic "codes" are damaged, for instance by ionizing radiation, then, instead of reproducing themselves perfectly, they will produce defective cells which result in mutations, or changes, from the originally intended form.

Mutation is the primary mechanism [illegible] is responsible for what is called individual variation, such as seen by differences in size and weight, color of hair and skin, shape of nose, mouths, ears, eyes, etc. If there were no such thing as mutation, all human beings would look alike. But because small changes in genetics, or "mistakes" (changes) were made during the reproduction process, [illegible] a great variety of variation within the human race. Our bodies, then, are the end product of millions of years of genetic change and [illegible] and in this sense it may be said that the genetic variation of the human population as a whole has benefited from mutation even though it represents the deaths of many people. What, however, we are [illegible] aware of is that many if not most mutations are generally harmful to those who carry them and generally result in the death or the elimination of the individual. Hemophilia (bleeder's [illegible]

normally would [illegible]

or missing. [illegible]

harden at the [illegible]

from a simple [illegible]

How mutation [illegible]

Genetics [illegible]

Congressional [illegible]

"Let me [illegible]

"The impli[illegible] majority of [illegible] great majority [illegible] beneficial.

"The reason [illegible] that have [illegible] process of nat[illegible] part of the [illegible] by this proce[illegible] the great ma[illegible] as to cause [illegible] cause the [illegible] tion. [illegible] ones [illegible]

"A mutant the[illegible] few generation[illegible] harm will per[illegible] larger number [illegible] affected [illegible] effect on the [illegible]

"The total harm [illegible] future generations [illegible] amount of [illegible] population." [illegible]

This [illegible]

somatic [illegible]

be dangerous [illegible]

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the worst will only result in the death of the patient. Genetic damage, however, cannot be repaired and may only [illegible] and transmit itself through many generations, resulting in the [illegible] to hundreds of [illegible] depending upon the [illegible] people affected. The amount of radiation needed to produce such effects will be the subject of the next chapter.

[illegible]

[illegible] into the test [illegible] On it were [illegible] citizen born [illegible] and longitude of [illegible] U.S. Coast Guard and ordered [illegible] was inten- tional [illegible] by the United States [illegible] in the waters [illegible] great worldwide concern [illegible] radio active fallout [illegible]

The world's [illegible] thermonuclear or H-(Hydrogen) [illegible] Island of Eniwetok Atoll [illegible] one year later [illegible] first H-bomb device on [illegible] with its first H-bomb [illegible] anxiety which developed [illegible] due to the fact [illegible] range reached [illegible] normally left their fallout [illegible] H-bomb detonations, however [illegible] that would disperse [illegible] period of months or years.

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Public concern generated by [illegible] and newspapers resulted in the holding of hearings by the [illegible] Subcommittee on Radiation of the Joint Committee on Atomic Energy of the Congress of the United States. The hearings, with the title "The Nature of Radioactive Fallout and Its Effects on Man," were published in three volumes totaling [illegible] pages. Unlike the hearings of some Congressional Committees concerning activities of agencies of the U.S. Government, these were generally [illegible], marked by only one or two sharp exchanges of opinion between Members of Congress and those testifying before the Subcommittee. [illegible] importantly, perhaps was the public [illegible] of atomic weapons and fallout. Of special interest to this report was the discussion of the effects of doses of radiation, particularly as to whether or not there is a "threshold", or minimum amount of exposure which [illegible] below which there is no effect, or if, in fact, the effects of such doses are "linear", meaning that any radiation exposure, no matter how small the dose, has a damaging effect.

Many scientists and experts, both from the Atomic Energy Commission and from independent universities and institutes gave testimony supporting both theories. [illegible] proposed that the fallout from then current testing was [illegible] justified [illegible] that there was a threshold [illegible] no evidence.

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to support [illegible] theory. [illegible] of the [illegible] theory, however,

pointed out that [illegible] threshold response [illegible] sufficient to

definitely prove [illegible].

Much of the [illegible]

from the establishment of [illegible] (GRC) as

mentioned in the [illegible]

established on [illegible] threshold effect

for radiation, that is, [illegible]

background radiation which [illegible] not cause

harmful effects [illegible].

Dr. [illegible], [illegible] School of Medicine [illegible] Reserve

University, testified [illegible]:

"At the very [illegible] natural level we are [illegible]

---

*An interesting [illegible] theory by one Alden P[illegible] attacks many commonly [illegible] statistics and mathem[illegible] linear experience in nature. A simplification [illegible] threshold relationships all [illegible] unchangeable laws [illegible] threshold nature. He states [illegible]

> "But if [illegible] conditions are also [illegible] the so-called [illegible] lethal. [illegible] too much of the [illegible] Then there are the [illegible] excess of which [illegible] 'linear' relation [illegible] matter and energy, a threshold [illegible]."

What this [illegible] to the effects of [illegible] course, in [illegible] with the whole [illegible] the effects will be occurring at low levels in the same [illegible] they are occurring at high levels, and whether there is such a thing as threshold. In other words, is there some level below which nothing will happen?

"Again, this is very difficult to establish. The evidence, as I see it, is very inconclusive in this direction, [illegible] ... I would hesitate to accept the concept that a threshold does not exist."

Dr. [illegible], former director of the Division of Biology and Medicine of the Atomic Energy Commission, [illegible] threshold effect:

"With acute or [illegible] radiation there is what is called a threshold effect in [illegible]. In other words, [illegible] cells can continue to function even though [illegible] as the body can be repaired even though damaged, we find that at low levels of radiation there are no [illegible] effects [illegible].

"I have favored the concept of a threshold [illegible] carcinogenic agents for a number of years [illegible]. First, that in our experiments with carcinogenic hydrocarbons, which are known to be [illegible] such substances as coal tar, we find that a threshold exists [illegible]. We find that, with many of the medicines [illegible] another effect on cells, there is a threshold effect [illegible], by analogy with simple things [illegible]. For example, I can push very lightly [illegible], and it will not move until I reach the threshold [illegible] greater than the friction which tends to hold it [illegible]."

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purposes there is no [illegible] to prove a generality with a generality. [illegible] in the unalterable fact that [illegible] in nature and neither behave like nor have the same effect as [illegible]. For example, it is possible that the [illegible] pesticides, or other poisons, like [illegible] genetic damage within the body's somatic [illegible], that such ingestion will cause hereditary [illegible] as does radiation.

Potter goes on [illegible]:

"Linear [illegible] fiction originating in the [illegible] in the days when the earth [illegible] was worked out in terms of [illegible] of reference, a state of [illegible] problems of solid state physics."

Potter's assertion [illegible] it may be that he is playing a semantic game [illegible] with the method of expressing effects [illegible] a straight line. Could he just as effectively apply the [illegible] of the word "proportionality"

In testimony [illegible] greater number of scientists who [illegible] accept the theory of [illegible] The following is a sampling of [illegible]

Dr. [illegible] University of [illegible] Laboratory.

"I think [illegible] doubt this at all. [illegible] with caution that a threshold [illegible] absolutely certain that a threshold [illegible] as my opinion is concerned, [illegible] at my disposal, [illegible]"

Dr. Ernest [illegible] University.

"I think the [illegible] to see policy momentarily at [illegible] there is a threshold then [illegible] there is not a threshold and we [illegible]"

Those who support the [illegible] consequence, the continuance of testing [illegible] the additional amount of exposure from [illegible] than smoking one

---

instead of "linear" [illegible] representing the interaction of three [illegible] dimensional form. Non-Euclidean geometry [illegible] of radiation. It may be that in the future [illegible] will prove [illegible] to the study of radiation and its [illegible] remembered that all current data relevant [illegible] presented in terms of conventional geometry [illegible] forced to base our conclusions [illegible] because "The meaning of symbols [illegible] Euclidean geometry, is at stake," [illegible] quarrel is with using two-dimensional [illegible] states, then he brings into question the [illegible] two-dimensional symbols, concepts in non-Euclidean geometry, [illegible] reasoning one should be suspicious [illegible] represented on the two-dimensional plane of the [illegible] by the same token, this page which [illegible] noted that while Potter attacks the [illegible] he also thus brings attention to [illegible] metaphysical [illegible] Lastly, it should be noted that Mr. Potter [illegible] appears [illegible] policy- and philosophy-wise to the [illegible] of continuing Russian tests. Despite [illegible] and fresh approaches to certain [illegible]

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package of cigarettes a day, so long as [illegible] that such a small number of persons might be affected or [illegible] as a direct result was so small as to be worth the risk. Those who did not [illegible], on the [illegible] in the linear dose [illegible] that the [illegible] the cigarette smoker was not applicable, [illegible] whereas general populations have no choice in the amount of [illegible] intake. Additionally they pointed out that [illegible] additional death, [illegible] amount of radiation [illegible] for such testing.

The whole debate over [illegible] threshold effect [illegible] related to testing was perhaps best summed up by the testimony of Dr. Walter Selove, Department of Physics, University of Pennsylvania, who quoted from a report by a committee on radiation [illegible] of the Federation of American Scientists:

> "The committee's study of the available [illegible] has led to two conclusions:
>
> "First: The added radiation [illegible] continued nuclear weapons testing at the present rate [illegible] than that from other radiation normally encountered . . .
>
> "Second: The total added radiation, [illegible], will cause many deaths.
>
> "The committee believes that both [illegible] are scientifically correct, and [illegible] contradiction [illegible].
>
> "Unfortunately, those who believe [illegible] continued testing . . . often emphasize the first conclusion and [illegible] the second. Similarly those who believe [illegible] often emphasize the second and ignore the first. [illegible] believes that both statements must be taken together [illegible] understanding."

Whether or not low doses of radiation [illegible] threshold or linear effect, has not yet been proven. [illegible] there is still not enough evidence [illegible] that one or the other of the theories is correct for [illegible]. However, [illegible] hereditary effects of

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irradiation of [illegible] complete agreement among [illegible] threshold, and that any amount of radiation [illegible] genetic damage, and thus [illegible]

Although [illegible] the effects of testing, it [illegible] for the reader to understand certain [illegible] follow in this report. The committee [illegible] in favor of the linear theory, [illegible] mentioned. It draws strength [illegible] Taylor, Chief of the Atomic and [illegible] National Bureau of Standards who testified [illegible]

> " . . . I frequently [illegible] question of radiation safety [illegible] a subject for which there [illegible] question of setting radiation [illegible] biology. It depends enormously [illegible] enormous amount good [sic] [illegible] of the people who are responsible [illegible] quantitative [illegible]

The Committee [illegible] scientific opinion and evidence [illegible] Dr. Karl Z. Morgan of the Oak Ridge [illegible] Standard Man --Standard Patient" [illegible]," a symposium sponsored by [illegible]

> "I believe the prudent [illegible] to the patient is that all ionizing radiation [illegible] patient is harmful, and therefore the [illegible] for a radioisotope diagnostic [illegible] evaluate the expected usefulness [illegible] possible radiation damage [illegible]

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Thus the Committee [illegible] the theory that all radiation exposure above background levels is harmful and that the effects are roughly proportional to the dose. As for the [illegible] Group, the Committee notes with considerable interest and dismay [illegible] that all penetrating radiation delivered to the [illegible], in general, is definitely harmful both in the short and long run.

The Special Committee [illegible] in complete accord with the intent and purpose of House Joint Resolution No. 305, H.D. 1, passed during the [illegible] Special Session of the [illegible] Congress which condemns the Republic of France for testing nuclear weapons in the South Pacific. It is clear to the Committee [illegible] the testing of nuclear weapons--whether in space, the atmosphere, in or on the sea, or underground has no beneficial [illegible]. The [illegible] of such testing is dangerous in the first place, and the testing [illegible] in all mankind in the long run [illegible] in the name of selfish national pride [illegible] innocent generations of children all over the world.

"In some crude [illegible]

no overstatement [illegible] have

known sin [illegible]"

[illegible] nuclear scientist
[illegible] 25, 1947

Give me water[illegible]
    Oh! Give me [illegible]
Let me have some[illegible]
    I want rat[illegible]
To die!
Help me, O, hel[illegible]
    Water!
        A b[illegible]t [illegible]
I beg you[illegible]
    Won't anyon[illegible] ...

The heaven spl[illegible]
    The streets [illegible]
The River,
    The river [illegible] ...

Night!
    Night coming [illegible]
To these eyes par[illegible]he[illegible]
    To these lip[illegible]
Ah! the moaning [illegible]
    Of a ma[illegible]
        Reel[illegible]ng,
Whose face i[illegible]
    Scorche[illegible], sm[illegible]
        This ru[illegible]"

[illegible] writer-poet
[illegible]

HIROSHIMA AND [illegible]

By August of 1945 the United States had won the "race" with Germany to develop the atomic bomb. Germany had not developed a bomb and had already capitulated to Allied forces. Japan, however, was still continuing to [illegible] belligerent. While U.S. forces were fighting [illegible] the Solomons and New Guinea [illegible] driving drive across the Pacific through the [illegible] through the Carolines, Marianas and Marshall Islands, [illegible] of launching a massive invasion of the Japanese [illegible] incendiary bombing missions on civilian populations of Japanese cities had already been carried out by U.S. planes. It was clear to both sides that the current of war was running strongly against the Japanese and the end was near. One writer has even suggested that Japan was only waiting for the appropriate time of capitulation. Whether or not this is true may never be known.

In August 1945, two American B-29's [illegible] took off into the skies for Japan carrying what was [illegible] the end result of three years of the most intensively planned and coordinated, massive industrial effort in the history of the world -- just to produce a few pounds of fissionable material.* This material, weighing less than 50 pounds, had cost about three billion dollars ($3,000,000,000), or $60,000,000 per pound.

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*this of course does not include the plutonium used in the Trinity test, nor does it consider the cost of facilities, being spread out over all probable [illegible] the production of subsequent material

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Thus, while the "Atomic Age", in terms of military use, technically began with the test of a plutonium (Pu 239) bomb at Alamogordo, New Mexico on July 16, 1945, it was officially and publicly begun in August 1945, with the first use of atomic devices against civilian populations, when roughly 50 pounds of fissionable material killed over 100,000 men, women and children and injured another 100,000 more at Hiroshima and Nagasaki in Japan [illegible].

At 2:45 a.m. local time on August 6, 1945 the B-29 bomber [illegible] Gay lumbered off the runway on the [illegible] island of Tinian, now a part of the Mariana Islands District of the Trust Territory of the Pacific Islands. In the [illegible], [illegible] belly of the plane was the "Little Boy," uranium bomb, so called because of its smaller size as compared to the [illegible] of the "Fat Man" plutonium bomb. The firing mechanism of this "Little Boy" bomb was deceptively simple. The heart of the device was a special gun barrel. At one end was a "bullet" [illegible] of refined uranium (U 235). At the other end was the "target," a large lump of U 235 estimated to be about 5 kilograms, or 11 pounds. As long as the "bullet" and the "target" remained apart, nothing could happen. But when the bullet was fired into the target, the amount of U 235 occupying the same space became critical* and the terribly destructive energy of the tiny atoms was unleashed.

At 08:15 on that day over Hiroshima, the Enola Gay's bomb

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*"Critical" means that the amount of material was large enough to [illegible] sufficiently cause a violent chain reaction. This is one of the unique qualities of radioactive materials. Such reactions cannot take place in natural unrefined uranium ore, but after refinement, are possible.

bay doors yawned open and the bomb and its parachute plummeted downward. The plane turned and ran away at full power. The parachute opened, and the bomb drifted slowly down over the bustling city and, at about one quarter of a mile from Hiroshima's Industrial Promotion Hall, it exploded.

It is in the description of such events that the limits of language are approached; even professional skill, words of narrative, ultimately pale in conveying the affective ferocity and horror of an atomic explosion over a populated city.

In a millionth of a second, a huge radioactive fireball existed where there was once blue sky. In the next instant some 19,665 buildings within one kilometer of the hypocenter were destroyed by the gigantic thunderclap. More than 60,000 people were immediately burned to death by the [illegible] wave or crushed to death by the pressure wave. Thousands of others were penetrated by [illegible] neutron and gamma rays. The expanding fireball then sped upward toward the heavens [illegible], pulling up behind it the ash and smoke of the incinerated people and buildings, which it finally [illegible] and pulled into the limits of the troposphere, [illegible] the base of the [illegible]. Thirty thousand feet below, the city of Hiroshima was the scene of a fiery holocaust; the buildings [illegible] of the center began to burn as air rushed in to replace the hot fireball's vacuum. Winds of 30 to 40 miles per hour fanned the flames of the already blistered and

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burning city. [illegible] that 26,227 buildings were completely destroyed, and 76,[illegible] partially destroyed, or nearly 92% of all the structures in the city of Hiroshima. A census [illegible] 200,000 men, women and children may have been killed from the one bomb. (64, p. 4)

NAGASAKI

On the morning of August 9, 194[illegible] the B-29 "Bock's Car" lifted off the Tinian airstrip [illegible] for Japan to drop the second atomic bomb, this one [illegible] plutonium. The primary target for this trip was Kokura, but poor visibility forced the plane to head for its secondary target, Nagasaki. At exactly 10:58 a.m. [illegible], the bomb fell [illegible] the parachute opened.

The A-bomb which floated down from the heavens on its parachute [illegible] was called "Fat Man", because of its egg-like shape. It contained approximately 30 pounds of plutonium. The firing mechanism was unlike that of the "Little Boy". It was based on a new concept called "implosion". Normally in an explosion the force of the blast is directed outward. In implosion, the force is directed into a pocket. In this bomb, however, there was a shaped charge which [illegible] a hollow sphere of plutonium [illegible] of a mango. As long as the plutonium [illegible] could not become critical. However, when [illegible] explosives were [illegible], the blast's force compressed the [illegible] mass, thus causing a chain reaction and [illegible] destructive [illegible].

"Fat Man" exploded about [illegible] Nagasaki, but was about two miles [illegible] when released [illegible]. Despite this fact, the explosion [illegible] and killed nearly 40,000 people. [illegible] from Hiroshima's experience, was the fact [illegible] the Nishiyama [illegible] near to Nagasaki that was spared direct radiation from the [illegible], was exposed to an estimated 30 rads of radiation from fallout [illegible] drifted into that area. The people still [illegible] studied since 1945 and are the subject [illegible] report [illegible] at the time of the writing of this report.

JAPAN [illegible] FINDINGS

As outlined [illegible] May [illegible], 1972, the Special Joint Committee [illegible] traveled to Tokyo, Japan on June [illegible].

The Committee included: [illegible] Borja, Chairman and members Representative [illegible] Timothy Olkeriil, informant/interpreter; Representative [illegible] Legislative Counsel Mamoru Nakamura (now Deputy [illegible]), the committee's staff member; [illegible] Director of Health Services (now Director) [illegible] Executive Branch. The Committee first made [illegible] with the [illegible] meeting with officials of the [illegible] of the Japanese

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Government. The [illegible] Mr. [illegible], Director of the International [illegible] the Planning [illegible] of the Ministry; Mr. Sa[illegible] Mr. [illegible] Takeuchi, Assistant [illegible] and Mr. Watanabe, wh[illegible] received 1965 English [illegible] which provides for medical care [illegible] survivors.

Specifi[illegible] provided under [illegible] interpretation by executive Min[illegible] to be classed as a victim [illegible] other term frequently used) [illegible] and, in some cases, compe[illegible] of these surviv[illegible]rs, [illegible] time of explosion or othe[illegible] consultation board. The first [illegible] within a 2,000 meter radius of [illegible] is composed of people wh[illegible] were [illegible] meters or more from the hyp[illegible]cent[illegible] two weeks after the explosio[illegible] examina-tions at me[illegible] Nagasaki. If disease is f[illegible]und, [illegible] another, detailed exa[illegible] maintain records [illegible] function of identifying [illegible] It is decided that a person [illegible] than prescribed medi[illegible] center) he is sent to the [illegible] can be "treated" (ie: surgery, [illegible] therapy, [illegible] of drugs, etc), or placed on a[illegible] of the two classes of survivors [illegible] and while the annual examina[illegible] of these people become sick, he can go to the [illegible] examined. If he is in the second [illegible] related to radiation, then [illegible] government and he receives a new [illegible] class. If his illness is not related, then [illegible] health insurance or that of [illegible] and treatment. A third area [illegible] provided for elderly survivors of the A-bomb. [illegible] there are homes for such people. [illegible] that they or their families cannot [illegible] is a hardship, or that the [illegible] family.

[illegible] A-bomb Hospitals and Old Age [illegible] done mostly by public dona[illegible] (similar to [illegible] the Red Cross or Community Chest in the United States) [illegible] operations are financed largely [illegible] government appropriations. [illegible] govern- ment financed and the ABCC [illegible] supported from money which [illegible] Atomic Energy Commission. [illegible] people who were in the [illegible] to receive one [illegible] examination is adequate, he said, [illegible] most people usually came in [illegible] examinations are "free" the Committee [illegible] they are part of the national medical [illegible] contribute. They were conducted [illegible] Health [illegible] the 47 Pre- fectures (states). [illegible] discussed — primarily related to [illegible] discussed in a subsequent report.

Before departing Tokyo for [illegible] Committee met with Dr. Tosiyuki [illegible] head [illegible] Radiation Health in the National [illegible] Sciences in Chiba-shi. Dr. Kumatori has [illegible] medical examinations [illegible] by fallout from the [illegible] affected Marshallese and Am[illegible] Committee Dr. Kumatori indicated [illegible] he would be willing to try [illegible] were to

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Tokyo to meet with [illegible] Committee then departed for Hiroshima on Friday, June 23, 1972.

HIROSHIMA TWENTY-SEVEN YEARS AFTER

Hiroshima [illegible] transformation from its burned [illegible] metropolitan city than is the fabled [illegible] Egyptian bird which was consumed [illegible] own ashes in youthful [illegible]

While the Committee [illegible] official facilities permitted [illegible] extensively, the impression [illegible] except for a preserved monument [illegible] destruction of the city, unless [illegible] hearts and minds of the people who witnessed the [illegible] survived.

The Committee [illegible] Honorable [illegible]suo Nagano, Governor of [illegible] Prefecture [illegible] the Honorable Setsuo Yamade, Mayor of the city of [illegible] official work in Hiroshima [illegible] by Mayor Yamada's Foreign Affairs Chief [illegible] guide and interpreter. The [illegible] Committee are described below [illegible]

ATOMIC BOMB [illegible] COMMISSION (ABCC)

The largest [illegible] of this Commission are in Hiroshima. [illegible] the primary purpose of studying the [illegible]. The ABCC is funded mainly [illegible] Energy Commission [illegible] Academy of Sciences-National [illegible] through the Japanese National [illegible] met June [illegible] with the Director, [illegible] and he indicated that [illegible] the Committee's visit, he would [illegible] advance. The Committee [illegible] Deputy Director, and his staff.

It was explained [illegible] established to study the acute [illegible] later the emphasis was changed [illegible]. During its early years the [illegible] as well [illegible] radiation victims; but today this [illegible] examination and the gathering and [illegible] patients who need medical treatment are referred [illegible] private clinics or physicians.

It was explained [illegible] divided into three areas.

(1) [illegible] determine

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whether or not the [illegible] of survivors' life will be shortened by exposure. There are 100,000 people in the group studied in both Hiroshima and Nagasaki.

(2) An adult health study [illegible] of a group of 20,000 people of the [illegible]. The purpose here is to study what effects of radiation [illegible] the exposed persons, such as certain [illegible] of cancer, [illegible] of the eye, or growth retardation. About 10,000 persons [illegible] annually and thus it requires two years to complete the [illegible] of the whole group.

(3) A pathology study [illegible] the examination of those survivors who die. This is done [illegible] to find out if there are effects of the radiation which cannot be [illegible] in the ordinary annual examinations.

The ABCC's main finding up to [illegible] increased leukemia and thyroid cancer. It was also stated that cancer in general seemed to be increased, [illegible] glands, lung, and breast. This was apparently [illegible] children who were 10 years old at the time of the bomb and who received [illegible] or more. The incidence of leukemia peaked in [illegible] and the incidence of thyroid cancer has not yet peaked. It was also explained that children born after the bomb have so far not shown any increase in cancer or early death.

Additional comments by the ABCC [illegible] indicated that they were still finding new things. The children who were less than 10 years

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old in [illegible] according to the [illegible] persons would normally start developing [illegible] more cases in the exposed [illegible] to leukemia [illegible] that in Nagasaki the threshold dose [illegible] while for Hiroshima there appeared [illegible] no threshold.

MEDICAL WELFARE [illegible]

At 9:0[illegible] morning, [illegible] traveled to the Hiroshima Medi[illegible] Dr. [illegible] Mizuno, Chief of the Counter[illegible] that the Center's three areas of [illegible] treatment. He explained that [illegible] about [illegible] in the Hiroshima area and that [illegible] Most of their work is concerned with [illegible] with the Hiroshima Univer[illegible] research portion, and with the A-bomb [illegible] health control, their main work, [illegible] a general examination [illegible] to canvass areas by school district [illegible] examinations of persons who, the general [illegible] more thorough clinical check[illegible].

RESEARCH INSTITUTE [illegible] HIROSHIMA UNIVERSITY

An adjunct of [illegible] University [illegible] is headed by Dr. Shinzo [illegible] work as

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different from [illegible] of the ABCC [illegible] They concentrate mainly on statist[illegible] [illegible] he said, they provide [illegible] to the ABCC [illegible] to a question, he stated that the In[illegible] findings [illegible] with those of the ABCC, with [illegible] differences. [illegible] the staff of the Institute also [illegible] at the meeting [illegible] Ezaki, a professor and surgeon [illegible] Dr. Ezaki accompanied [illegible] Japanese to the Marshall Islands in [illegible] of 1971, at the [illegible] of Representative Balos, in an unsuccessful attempt to exam[illegible] of Rongelap and Utirik. Dr. Okamoto was asked about [illegible] of Dr. Ezaki accompanying the Brookhaven National Laboratory, [illegible] (commonly known as the "AEC" team) to conduct the annual [illegible] scheduled in March, 1972. Dr. Okamoto [illegible] that the [illegible] of the Institute would have to make the [illegible] that advance notice would have to be given.

THE OLD AGE A-BOMB SURVIVORS HOME

This facility is an impressive, [illegible] story, concrete structure with a solarium and meeting room [illegible] fourth story. The Home cares for two classes of survivors: [illegible] persons who, while they may have families, are not [illegible] adequately cared for 2. those older persons whose families [illegible] wiped out by the bomb, or are no longer living today. The [illegible] accommodations for 150 persons, 50 [illegible] devoted to those persons no longer able to work and the other two floors for those who can walk. The Vice-Director of the home explained that this is not a hospital, but a home like their own home. They do, however, have one doctor and three nurses on the staff and if any treatment needs to be done, the [illegible] hospital [illegible]. Employees take care of the maintenance and the [illegible] activities, [illegible], as well as television and [illegible] to take [illegible]. The ambulatory residents are allowed to go shopping by themselves, but must return for their meals.

The Vice-Director also said that there are about 60 people on a waiting list in the city office and that they expect to have another 100 rooms for them in July of [illegible]. The majority of the people in the home were those who had no homes or those who had been living with a family in a home that was [illegible]. The [illegible] who [illegible] aged persons under 60 who are healthy but have no family. "Younger people can work for themselves," the Vice-Director said.

The Committee noted that one of the reasons the building was impressive was that it was newly built in [illegible]. Previous to that year there were several smaller homes throughout the city. This new facility cost [illegible] yen (about [illegible] at that time). The central government pays for [illegible] of the cost of the home, while the prefecture and city split the remaining [illegible]. Costs per patient on the first floor run about [illegible] a month, and about [illegible] a month for those on the other two floors.

THE A-BOMB MUSEUM, HIROSHIMA [illegible] PARK

This facility, run by Hiroshima [illegible] contains photographs, [illegible] and reproductions [illegible] relating to the air burst which [illegible] 8:15 a.m. Through that instant of destruction [illegible] as a visitor enters the museum [illegible] on the morning of August 6, [illegible] pictures show charred, scarred and [illegible] bodies [illegible] in obscene poses of death; there are bottles and other [illegible] melted like wax figures [illegible] man's outline burned into a [illegible]. A glass case holds the charred remains of a schoolboy's [illegible], and a painting depicts the dirty, grey [illegible] hanging over the city.

THE RED CROSS A-BOMB HOSPITAL

The Committee was introduced to Dr. [illegible] Shigeto, director. Dr. Shigeto [illegible] of the A-bomb [illegible] has worked in Hiroshima since the bomb and with the hospital since it was built in 1956. Funding for the hospital came from [illegible] lottery-type stamps. It has [illegible] receive free medical care. Operations [illegible] central, prefectural and municipal governments. [illegible] but persons as young as 27 or 28 can be [illegible].

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Some of the [illegible] cata-racts, and leukemia. [illegible] 80 patients [illegible] about 60 per-cent of the hospital's capacity.

Dr. [illegible] told the Committee that there is a difference between A-bomb and regular patients. They feel differently in that they are more uneasy and [illegible] about their future. [illegible], he explained, it seemed that of those who [illegible] their regular disease may have been caused by the A-bomb. [illegible] they have that feel-ing, according to the doctor. [illegible] to care for them. "It is a very [illegible] feeling", [illegible] "If patients re-cover", he related, "they [illegible] but [illegible] to come back again."

The doctor then [illegible] of the hospital where they saw many [illegible], some of whom [illegible] showed the scars from the burns they suffered nearly thirty years ago.

[illegible]

The Committee [illegible] on the evening of June 26, 1972, and that evening held a brief meeting with city officials to plan a schedule. The next morning the members [illegible] the Honorable Seiichi Urabe, Deputy Mayor of the City of Nagasaki. [illegible] a brief press conference was held. [illegible] similar to the ones visited in Hiroshima [illegible], only that infor-mation which differs [illegible] will be included.

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MEDICAL WELFARE [illegible]

The Committee [illegible] the annual general examination about [illegible] in the Nishiyama District (which [illegible]) [illegible] of the 630 survivors there [illegible] having been affected. The kinds of illness [illegible] thyroid cancer. The Committee was told [illegible] do not bother the people, except [illegible]

ATOMIC BOMB CASUALTY [illegible]

The Committee [illegible] Department of Medicine, in place of the [illegible] that their examination group is about [illegible] and that they examine about 4,000 people per year [illegible] Japanese. He talked briefly about findings [illegible] about [illegible] persons have been estimated [illegible] life-span and that these are in [illegible]

Dr. Kawamoto [illegible] continue pediatric studies, since it is hard to tell [illegible] by radiation or not. He said that the [illegible] for exposed persons. He said that he [illegible] sufficient in screening cases for leukemia [illegible] that the ABCC takes great pains to note [illegible] since that might be a factor in [illegible]

Dr. [illegible] Dr. Okajima of Nagasaki University [illegible] of the Nishiyama area which would [illegible] after them toured the facility.

A-BOMB HOSPITAL

This was built in [illegible] the central, pre-fectural and municipal [illegible], and about [illegible] patients. [illegible] percent of whom are A-bomb [illegible].

THE OLD-AGE A-BOMB SURVIVORS HOME

After the [illegible] people of Nagasaki feared the same [illegible] were evacuated to a place in the [illegible] on the 9th, they returned [illegible] people were saved, they felt that the [illegible] which to build a survivors home. [illegible] that the land in the area was fertile [illegible] Catholic Sister, who is the director of the Home, explained [illegible] distance from the city. [illegible]

The facility, [illegible] the Home made a deep impression on [illegible] the Chairman de-livered a speech [illegible] and staff, which was reciprocated [illegible] wearing black and gold [illegible] the Committee and two members [illegible] singing or chanting in their [illegible] was then taken on a tour of the [illegible] and found [illegible] of the best such facilities [illegible] The rooms and corridors were sunny and [illegible] comfortable. Parti-cularly, because of [illegible] and restful. The Sister explained that 80% of [illegible] from the central government [illegible] has accommodations for 150, with [illegible] planned. The tour included visiting the [illegible], handicraft work areas, auditorium, and [illegible] of the tour, the residents and staff [illegible] the bus for the return trip to [illegible].

A-BOMB MUSEUM

As in Hiroshima, [illegible] that Nagasaki once reeled under the [illegible] city, Nagasaki is modern [illegible] shipways within the city's limits [illegible] tanker sliding down the ways [illegible] rebirth of Nagasaki from [illegible] however, there are still reminders.

Located within [illegible] A-bomb Museum contains [illegible] destruction and death caused by the [illegible] were the remains and pictures of [illegible] and of the images of [illegible] burned and disfigured by the heat, radiation and shock of the bomb.

ATOMIC DISEASE INSTITUTE, NAGASAKI UNIVERSITY

The Committee met with Dr. [illegible], Director of the Institute. He explained that of an affected population of 9,000 in the Nishiyama District, about 500 people had been affected by fallout. These [illegible] in order to get from them a group of 80 to study. He said that there was [illegible] radiation remaining in the soil there now, although [illegible] of radiation could still be found in the study group. He [illegible] that this group showed a higher frequency of [illegible] than a comparison group. Although not exposed to direct radiation from the bomb, maximum exposure was estimated to be about [illegible]. He said that the people don't seem to mind the [illegible] relatively speaking, body burden [illegible] high, they were [illegible], in the order of 1/2000th of the [illegible]. He indicated that the Institute is preparing a study entitled "[illegible] Nishiyama Residents and Comparison Subjects, [illegible]," which would be published within the next several months.

TOKYO

The Special Joint Committee departed [illegible] for Tokyo on Wednesday, June 28, [illegible]. After arriving, it contacted Dr. [illegible]

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and, as he had [illegible] of the Lucky Dragon survivors, and [illegible] that evening. On the late afternoon [illegible] the Committee [illegible] with Dr. Kumatori and Dr. [illegible] Mr. [illegible] discussed [illegible] health, and Dr. Kumatori [illegible] the Committee [illegible] dealing with studies of the Lucky Dragon fishermen [illegible] in several scientific journals. [illegible] the Committee hosted a dinner for its two guests. [illegible] the Committee departed from Japan for the Trust Territory.

JAPAN: [illegible]

In Japan there [illegible] facilities to take care of those people exposed in the [illegible]. The programs which produced the [illegible] came about [illegible] after the bomb, through the passage of [illegible] delay was due, in part, to [illegible] that Japan was [illegible] country until about 195[illegible]. [illegible] the [illegible] these programs comes from the local and central governments of Japan [illegible] treatment and care for the victims [illegible] comprehensive. The Committee notes that [illegible] equipment [illegible] multi-channel blood analyzer) [illegible] exceeded in sophistication, that found [illegible] Territory District hospitals. At the [illegible] carried out.

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extensive long-range research studies are being continued by both the Japanese Government and the ABCC on survivors of the A-bomb, while the National Research Council carries on annual studies of the Lucky Dragon survivors. It is obvious that an annual medical examination is not needed for Japanese A-bomb survivors because of the multiplicity of facilities available and the relative ease with which the persons can get to them. A comprehensive compensation program is also being considered and will be discussed in a later report of the Committee.

March 1, 1954

A [illegible]

Some [illegible] north latitude, 166° [illegible] east longitude, in the [illegible] waters of the western Pacific [illegible] in the sea. The longline tuna [illegible] Dragon No. 5 was riding [illegible] crew began to [illegible] for the night, began [illegible] In like manner, tuna and [illegible] sucking small bait fish near [illegible] waited the Lucky Dragon, also [illegible]

The Lucky [illegible] from its home port of Yaizu City [illegible] at first headed his vessel toward [illegible] When these grounds [illegible] its 23 man crew south, [illegible] The captain, and the fishing [illegible] disappointed and anxious about [illegible] Bikini Atoll, the site of the first [illegible] the fact they risked being caught [illegible] waters. Perhaps also [illegible] the knowledge that Bikini had bee the [illegible] had been nearly eight years [illegible] their holds must have outweighed any [illegible] to Bikini. It was, after all, [illegible] accidentally cut line [illegible] force them to return home. [illegible] voyage and, [illegible] to the [illegible] of the [illegible], [illegible] going to get much worse, for, [illegible] 1954 [illegible].

At [illegible] latitude and [illegible] longitude, lies an atoll [illegible] by [illegible] Russian composer [illegible]-Korsakov [illegible] "[illegible]ppu To", but best known to [illegible] Rongelap, or, simply [illegible] atoll. Composed of 61 scattered [illegible] which total only 647 square miles, the [illegible] covers more than [illegible] square miles.

While the [illegible] between sleep and awareness, [illegible] men, women and children of Rongelap--like most [illegible] would have kindled [illegible] and to recook [illegible], while children would still be drowsing [illegible] fishing gear or canoes for a fishing [illegible] collecting and husking [illegible] vessel's next call. One particular [illegible] had reason to be contemplative. [illegible] thoughts must have crossed his [illegible] of his wife--especially that of [illegible] year old--the island work to be done, [illegible] disputes which often come the way of [illegible] when the 18 people on [illegible] would be returning to Rongelap from their fishing and [illegible].

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Perhaps he w[illegible] these days than he had been [illegible] years old rather young [illegible] of magistrate--but [illegible] thing by the Hawaiian [illegible] ship. The officer, [illegible] with his thumb, had told [illegible] asked him why if they [illegible] the people they were not removed [illegible] "We have no orders." But it w[illegible] consciously [illegible] later. As on every day, there w[illegible] it was hard to conceive of a [illegible] from a natural disaster like a ty[illegible] no such pending phenomenon. A sens[illegible] the Island of Utirik many mile[illegible] a common, unfort[illegible] it was, in fact, hard to imagine [illegible] morning in the Pacific [illegible] Rongelap, as a traditional part [illegible] The sun always rose on the [illegible] which includes Utirik Atoll, and [illegible] Rongelap lay. That morning, [illegible] in the west.

Some 3[illegible] miles [illegible] twenty-three white and five black [illegible] aluminum

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building as they prepared to take out [illegible] in connection with the testing of the [illegible] explosive device soon to be detonated by man. The [illegible] Kengerik [illegible] Safety were connected with Joint Task Force Seven. They were the only inhabitants of the island aside from [illegible], and [illegible]. Their quarters, while spartan, were well stocked with [illegible] food [illegible] water and they had a refrigerator to keep food and drinks cold. [illegible] early in the morning they [illegible] have begun to [illegible] of the heat, but from the [illegible] of the [illegible]. The feelings of boredom and anxiety, [illegible] permeated most of them to varying degrees. [illegible] interesting experience [illegible] probably [illegible]. The [illegible] Pacific islands were not always physically [illegible] kind to transplants from the [illegible]. There were no [illegible] no bars, no [illegible] and no movies [illegible] the [illegible]. [illegible] ships, the men fared better. Despite this, however, [illegible] practice for enlisted men, weary of the [illegible] their [illegible] and thus receive [illegible] from the relatively [illegible] that they might be transferred. (90)

But [illegible] little [illegible] of [illegible] on the [illegible], since the test would be [illegible]. The men checked their small radio [illegible] which they would [illegible] information, their badges and [illegible] devices [illegible] checking and rechecking of familiar [illegible] to

worry--if there [illegible] Anyway,
the test was [illegible].

At about [illegible] was
the island of [illegible] of
turquoise waters [illegible] islets.
On one of those [illegible] concrete
and costing millions [illegible] culmina-
tion of the efforts [illegible] Wilhelm
Institute in [illegible] the
Manhattan Project [illegible] postwar
efforts by such [illegible] together
with the testing [illegible] Eniwetok.
Cold, inorganic and [illegible] 200
pounds of uranium [illegible] than a
ton of uranium 238, [illegible] circuitry to
insure it would [illegible] radio
command. The device [illegible] awaited the
human signal [illegible] terrifying
giant--a giant [illegible] itself and
everything within [illegible] it sat on
the island, [illegible].

Roughly [illegible] west of
Rongelap, ships [illegible] against the
swells. Aboard [illegible]
the whole force: [illegible] the Army;

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7.5 the Navy, 7.4 the Air Force, and 7.? the contractors (primarily from the firms of Holmes and Narver) and Department of Defense people. The Joint Task Force concept was developed for the Able and Baker tests at Bikini Atoll in 1946 and was continued thereafter. It had been proven the most effective means for the way of conducting technical know-how, utilizing and [illegible] aircraft and [illegible] continuous checking of the [illegible] resulting from such tests. Upon the shoulders of the Task Force Commander, and the heads of all task groups of the force rested the responsibility for the safety of all personnel and the successful completion of the tests. [illegible] In the early morning hour of March 1, 1954, information was received concerning the winds of the [illegible], [illegible] surrounding 50,000 square mile area which extended from 10° 15' to 12° 45' north latitude and from 160° 30' to 166° 15' east longitude. Also received was [illegible] meteorological information concerning the weather conditions. After all data was received and evaluated, the decision was made to [illegible] with the first test of the "Castle" series. The code name for the [illegible] shot [illegible] in the series and code name was "Bravo."

At this moment, or even a few seconds before 06:45 a.m. (local) time on March 1, 1954, the tragic event which would follow "Bravo's" detonation could have been prevented, but [illegible], the decision was made to go ahead, despite an incomplete and [illegible] warning report concerning the winds above [illegible]. The "Ivy" shot on Enewetak in 1952 [illegible] available which showed winds heading to the east [illegible]

* See appendix for "Ivy" and "Bravo" wind direction charts.

level to 90,000 feet, with no data for winds at 95,000, 100,000, and 105,000 feet, and data for winds at 110,000, 115,000, and 120,000 feet (in reality, they were flowing to the west, or toward Bikini). For the "Bravo" shot, however, winds from sea level to the end of the troposphere at 55,000 feet were generally heading east, or northeast, in the general direction of Rongelap, Rongerik and Utirik. From 55,000 feet to 90,000 feet the winds were generally heading to the west. Above 90,000 feet, there was no data available.

Had the shot been delayed 24 hours, wind conditions might have changed, which would have altered the [illegible] of the radiation and the [illegible] cloud would have only expended its energy and visited its [illegible] upon the flora and fauna of the uninhabited spots of land in the Pacific. Unfortunately, such was not to be.

[illegible] that morning would produce such confusion and conflict, [illegible]. It would result in a controversy that is unresolved to this day, and an anxiety [illegible] uncertain future for nearly three hundred human beings and their descendants.

The decision had been made. "Bravo" lived and died.

In July of 1946 Operation Crossroads, the detonation of two "nominal" yield atomic bombs took place at Bikini. The first test, coded "ABLE", [illegible] bomb at 500 feet over a fleet of [illegible] naval vessels. The second test was the first underwater [illegible] conducted. It involved the detonation of [illegible] about 90 feet [illegible] halfway between the [illegible] below an LSM around which [illegible] the first test. The magnitude of the explosion [illegible] were stunning: a huge bubble [illegible] and then burst into a tumult of [illegible] of water, hollow in the center [illegible] Arkansas, a 26,000 ton battleship [illegible] to the bottom. The column, which [illegible] 10,000,000 tons (twenty billion pounds) of water, [illegible] which the rising fireball [illegible] area of the lagoon's floor, [illegible] 50 and 100 feet [illegible] as the water fell [illegible] the lagoon. The [illegible] of the blast itself was so [illegible] personnel, observing [illegible] began vomiting over the side.

If the effects of "Baker" were [illegible], then those of the "Mike" shot in the "Ivy" series of tests [illegible] were astounding. "Mike" was the name for the very first [illegible] device ever exploded by man. [illegible] liquid hydrogen [illegible] to almost absolute zero (-273.15° [illegible] a deliverable bomb, since the [illegible] 65 tons ([illegible], p. 35). The [illegible] material were located [illegible] Atoll. When "Mike" was detonated, not only [illegible], it was vaporized into [illegible] cloud, but the blast

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also gouged [illegible] 175 feet deep in the reef. "Probably [illegible] of material were dislodged and thrown [illegible]" [illegible] wave were sent out that [illegible] cloud rose to a height of [illegible] feet (25 miles) [illegible] minutes. "Mike" was indeed a [illegible] about 5 megatons or the equivalent of 250 [illegible].

"Bravo," [illegible] a.m. on March [illegible] a blinding rage of light, with [illegible] radioactivity, a cataclysm [illegible] shock and pressure wave which [illegible].

In [illegible] and the bomb and [illegible] the intense heat somewhere [illegible] degrees. In a one megaton (one million tons of TNT) [illegible] looking like half of a giant, [illegible] vaporized bomb particles, air, water and [illegible] than 7,000 feet in diameter after [illegible] "Bravo," [illegible] according to conservative estimates was [illegible] (it may have been larger). It was of a [illegible] undoubtedly the diameter of the [illegible] hemisphere of burning gases, thermal and [illegible] miles in diameter, an area in which [illegible] In the first few

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* In the early 1960's, Russia boasted [illegible] a 50 megaton device, and of having the capability of [illegible] 100 megaton monster bomb. Such a bomb [illegible] Hiroshima or Nagasaki-type-bombs.

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seconds of [illegible] it would [illegible] of about [illegible] miles per hour, [illegible] altitude of [illegible] miles. The bomb's energy would be spread in four [illegible] areas. The first area would be that of [illegible] radiation [illegible] for about [illegible] percent of the total energy yield. The [illegible] pulse of the blast was of heat and [illegible] the [illegible] The light from this process [illegible] and was brighter than the sun. The [illegible] second thermal pulse was generated [illegible] which vaporized the ocean's surface water, and [illegible] blistered and burned the near [illegible] This immense heat or thermal [illegible] miles away.

In addition [illegible] around the blast center would [illegible] by 5 percent of the bomb's energy in neutron and gamma rays.

At least half of the energy [illegible] was expended in a high-pressure [illegible] front caused by the fantastically [illegible] like a near-solid wall of [illegible] outward miles ahead of the [illegible] 2,000 [illegible] more than [illegible] faster than the speed of sound [illegible] pressures of several million pounds [illegible] inch, [illegible] traveled outward to more than [illegible] pressure at several miles distant. [illegible] the wave thundered over [illegible] dust would have literally "[illegible]" [illegible] wave came unearthly wind [illegible] hundred [illegible] near the center and 70 to 100 miles [illegible] which [illegible] the lagoon's waters into a [illegible] during a full scale typhoon, [illegible] and flinging waves breaking [illegible] Some time after the fireball had [illegible] winds [illegible] began flowing toward the [illegible] path of the rising superheated air. [illegible] winds" would increase to near gale velocity, [illegible] and the remaining trees on the [illegible] explosion. The lagoon once again was [illegible] wind. At the same time awesome waves [illegible] would have rolled out, which--ever [illegible] large enough to completely wash [illegible] islands [illegible]

During its [illegible] pulverized and lifted into the sky an immense [illegible] along with seawater vaporized by the [illegible] three times more powerful than [illegible] hundred million tons of matter into [illegible] the action of the "afterwinds" which [illegible] the column. During the period of the fireball's [illegible] percent of the bomb's energy was [illegible] which was deposited upon the [illegible] water vapor.

By 0[illegible] a.m., "Bravo's" [illegible] cloud stood 21.6 miles tall. Half of "Bravo" extended [illegible] troposphere, and the upper half [illegible] 50,000 feet [illegible] stratosphere. Within a few minutes the cloud began [illegible] apart; heavier particles of [illegible] into the sea; lighter particles, however, would [illegible] along with the dismembered cloud by the [illegible] first indications became apparent that something [illegible] irrevocably wrong.

[illegible]

By design, [illegible] the bomb's detonation were the inter-service, [illegible] agency personnel of Joint Task Force Seven. No known [illegible] of America's previous 43 [illegible] ships of the Task Force were arrayed [illegible] position some 30 miles from [illegible] "Bravo," [illegible] earlier, was the first hydrogen device [illegible] process in order to make maximum [illegible] reason for the addition of several [illegible] of U^{238} [illegible]. This would produce an exceptionally [illegible] which would be exceptionally dirty in terms of [illegible] meticulous safety precautions [illegible] be regarded as an underestimate of the [illegible] of this bomb, resulted in placing [illegible] ground zero. The officers, crews, [illegible] ships must have been both shocked [illegible] the heat of the thermal radiation and pressure of the [illegible] wave, heard the thunderous roar of the [illegible] blast winds, now reduced by time and [illegible].

In fact, [illegible] burst, there undoubtedly would have been [illegible] among the Task Force personnel, [illegible] second-degree burns up to 25 miles away from the explosion.

More insidious and frightening [illegible] effects experienced by the Task Force, [illegible] cloud's height and the direction [illegible] downwind. As though inhabited by [illegible] legends, the dead form of the cloud began heading [illegible] directly for the fleet, as though in its [illegible] to play a last impractical, [illegible] deadly joke [illegible]. Inherent to the fallout was the [illegible] fission and fusion, a boiling mass of [illegible] tens of thousands of deadly rads of gamma and beta [illegible].

Within [illegible] everyone's worst fears were [illegible] had already noted the unexpected movement of the [illegible] Geiger counters on some of the ships [illegible] over normal background radioactivity. [illegible] personnel were ordered below decks, [illegible] down and, while

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there [illegible] must have ordered all s[illegible] its slowest vessel [illegible] rse. While the ships [illegible] planes crisscrossed the area, [illegible] the extent and direction of the fall[illegible] frantic search, they must have misse[illegible] small Japanese tuna vessel rollin[illegible] fate about to befall it. Thus [illegible] and a gentle "snowfall" of rad[illegible]oact[illegible] the ocean and three inhabited [illegible] was made, one which would [illegible] during many years to come.

[illegible]

A [illegible] the deck of the Lucky Dragon [illegible] against the gentle roll and pit[illegible] familiar creaking sounds of the [illegible] the steady thump of the diesel engin[illegible] the east as he became aware [illegible] that the sun was also rising in the [illegible] the horizon in that direction. [illegible] quarters to awaken his shipmates [illegible] to witness the second rising [illegible] "deafening explosion" (62, p. 1[illegible]) [illegible] sky. According to their later [illegible] te, gritty ash began to fall [illegible] Puzzled by this strange snowfall, [illegible] the radioactive flakes in [illegible]. During the fallout [illegible] of the men suggested [illegible] of them, however, immediately [illegible].

These [illegible] enough to convince the captain that [illegible] with a full catch. They [illegible] fishing gear, were low on fuel [illegible] Dragon northward for home. [illegible] would suffer the acute [illegible] and mucous membranes, [illegible] exposure they would arrive [illegible] of their experience [illegible] and fear and panic in Japan.

Unknown [illegible] ship started its journey homeward [illegible] die, sent no messages to Japan [illegible] experience.

[illegible]

Upon [illegible] behavior, the RadSafe crew on Rongerik [illegible] observations. Information indicated [illegible] sent in readings from their [illegible] observations. At 13:33

local time [illegible] began recording a steady rise [illegible] swept past the extremity of [illegible] (see p. 6). All personnel [illegible] inside the tightly shut building. [illegible] have been tremendous, [illegible] falling on the aluminum building. [illegible] of the house, and the clothing and [illegible] also penetrated the steel sides of the [illegible] rads on a radiation badge inside. [illegible] registered nearly 100 rads.

Within [illegible] "Bravo" [illegible] the second decision had been made. [illegible] and headed for Kongerik. Sometime past [illegible] near contaminated waters, ghosted past Rongelap and Ailinginae [illegible] On the morning of March 2, 1954, contact was made with the [illegible] on Rongerik. By 11:15 a.m. eight men had been evacuated [illegible] hours after "Bravo" exploded. [illegible] personnel were aboard ship and headed away [illegible]

[illegible]

At 05:[illegible] of Rongelap and Sifo (Ailinginae Atoll) [illegible] reddish-yellow glow in the western [illegible] the dull roar of an explosion [illegible] Some 150 miles to the east [illegible] about 15 minutes later, the people of [illegible] heard the muffled thunder of the [illegible], and [illegible] people on the island rumored that [illegible].

[illegible] probably [illegible] the visit of a Navy Commander [illegible]. The Commander had tried to explain [illegible], and bombs--but despite the [illegible] of an interpreter, the people did not understand what he was talking about. [illegible] light had something to do with [illegible] point, [illegible] have briefly recalled the field [illegible] they had only seen an unusual light [illegible] heard the [illegible] explosion far away, there appeared [illegible] Hawaiian had been mistaken.

[illegible] after the [illegible], as the Lucky Dragon crew was puzzling over the [illegible] them and their vessel, the people on [illegible] the third unusual phenomenon; fluffy, white [illegible] blown into the air, was settling [illegible] heavens, the lagoon and the atoll. Two [illegible] climbing a papaya tree to pick some [illegible] they [illegible] ash fell into their eyes. An older man [illegible] also looked up. He had been having [illegible] with his eyes [illegible] intentionally let some of the [illegible] rubbed them with his eyelids shut, [illegible] would help his affliction.

Back on the [illegible] steadily and soon the ground, trees [illegible] a white, powdery layer of the [illegible] Rongelap [illegible] it had been the scene of a [illegible] in the middle of the Pacific, only 600 miles north of the equator.

[illegible] up the powder [illegible] and some tried to brush it off their [illegible] with the unexpected event, [illegible] people, like the Japanese fishermen, [illegible] to determine just what it was.

Sometime in the early morning [illegible] spotted a plane or planes buzzing by the island. [illegible] that the snow they had seen had been dropped by the plane [illegible] perhaps its purpose was to kill [illegible].

Eastward, on [illegible] after the explosion. [illegible]

That evening, [illegible] over Rongelap, the fallout ceased. The powder had reached a depth of about one and one half inches [illegible]. Sometime earlier [illegible] the white powder, and as it [illegible] radioactive ash from leaves to the ground, and from [illegible] catchment tanks.

The fallout of [illegible] coral reef had ended--but its long-acting effects had just begun to work.

H + 34 to H + 78

Thirty-four hours after the bomb (H+34) the 28 Americans were safely aboard ship. That same day, according to reports from the people, Radiation crew had visited [illegible] by amphibian plane, found [illegible] dangerously [illegible] had left to report their findings. Before they left, they left the people with one word of advice: [illegible] the day after the Americans [illegible] converged on Rongelap, [illegible] Ailinginae Atoll, [illegible] southwest, where some 18 Rongelapese had been temporarily [illegible] On Rongelap, as on the other island, the people were [illegible] they must leave the island immediately [illegible] were allowed to take only those personal [illegible] which they [illegible] carry and as they hurried to board the [illegible] Radiation personnel monitored the [illegible] and the people [illegible] with radiation detection devices.

At this point, individual readings [illegible] from 30 millirads per hour to 240 millirads per hour [illegible]

At H+50 hours, [illegible] of the people with the highest readings were air evacuated [illegible] and at [illegible] remaining Rongelapese were aboard ship [illegible] hours later at H+58 the 18 Rongelapese [illegible] were evacuated from their radioactive [illegible] ships reached Utirik Atoll [illegible] evacuation was begun at H+55 hours [illegible] hours, or three days and 6 hours after [illegible] exposed people were taken from their islands.

[illegible] 24 hours later, after [illegible] while the Lucky Dragon plunged its way north and to Japan, the 16 people from Ailinginae, the 64 people from Rongelap, the 28 Americans and the 157 people from Utirik had arrived at Kwajalein. [illegible], like the Japanese fishermen, [illegible] the symptoms of acute radiation [illegible] itching and [illegible] of the skin, eyes and mouth; nausea, [illegible] the people were instructed to [illegible] themselves by [illegible] with soap several times a day to clean the radioactive fallout [illegible] bodies. It was a particularly difficult task for the [illegible] traditionally used coconut oil on their hair, which caused the fallout particles to cling tenaciously to their long tresses.

About 2 weeks after the [illegible] affect manifested themselves: the hair on the [illegible] people wholly or partially fell out, and [illegible] "burns" [illegible] began appearing on the [illegible] feet of the more heavily exposed. During [illegible] afterward, the doctors [illegible] blood and urine [illegible]. The blood samples were watched [illegible] of the radiation on the marrow [illegible] of the number of certain kinds of cells in the blood dropped [illegible] below normal level, [illegible]. As they were watched and examined, the levels [illegible] dropped to 1000 m^3 (with [illegible] count of [illegible]) [illegible] counts dropped to [illegible] tests, and neutrophil counts dropped to 2000 or less. The symptoms of several persons who developed upper respiratory infections during this period were carefully monitored. When their temperatures rose [illegible], they were given antibiotics to prevent further complications and they responded favorably. In all, 22 persons were treated with antibiotics. Fortunately, no serious infectious illnesses appeared [illegible] individuals. Urine samples were taken to try to estimate the original amount of radioactive material taken into the bodies of people and to try to determine what amounts of radioactive material still remained. Fifty-two days after the bomb exploded, eight people were selected from the Rongelap group to be given a chelating agent, ethylenediamine tetraacetic acid (EDTA), which has the ability to hasten the excretion or elimination of some radionuclides through the body's normal functions. The attempt was ended after five days, however, when it was determined that the general effect of reducing the amount of the body's radioactive burden was too slight [illegible] to be clinically [illegible]. This was due to the fact that little was left [illegible] due to the fact it had been nearly two months since radioactive material had been ingested and it had been [illegible] settled in the tissues of the bodies.

By the end of two months [illegible] after exposure, it appears that any possible [illegible] the exposed American service-men, after careful [illegible] which showed no positive findings, were released to their duty stations. At the end of three months, the people of Rongelap, who essentially received the largest dose of radioactivity,

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were [illegible] to their [illegible] [illegible] [illegible] Rongelapese, however, were not [illegible] [illegible] [illegible] [illegible] had been severely contaminated [illegible] [illegible] [illegible] the Bikinians eigh[illegible] years [illegible] [illegible] to their island. In April of 1956 the AEC [illegible] company which had carried out much of [illegible] [illegible] the atomic proving grounds in the Pacific, [illegible] [illegible] were instructed to build home[illegible] [illegible] [illegible] Kwajalein Atoll. By June, 195[illegible] [illegible] houses were [illegible] [illegible] the Rongelapese were moved from their temporary [illegible] [illegible] to the island. There, they remained [illegible] [illegible] three years.

[illegible]

The Lucky Dragon

Discovery of what had happened to the crew of the Lucky Dragon after they arrived in Japan created a furor, [illegible] by the natural sensitivity of the Japanese concerning radiation exposure because of the experience of Hiroshima and Nagasaki. It also [illegible] to wide hysteria concerning radioactive contamination of [illegible] tuna fish caught near the test zone.

At that time Dr. [illegible] Kumatori, who would later visit Rongelap with [illegible] in 1974 and would [illegible] the [illegible] in 1977 as a consultant to the [illegible] Committee, was working at the First National Hospital of Tokyo. Seven of the [illegible] were sent to the Tokyo University Hospital. Since he had worked at the University Hospital for several years previously and knew the hospital's director, he requested that the other [illegible] be sent to his hospital. During [illegible] visit to Tokyo in 1977, Dr. Kumatori [illegible] what had happened to the men, who ranged in age from [illegible] to [illegible] years. They suffered effects similar to those experienced by the Rongelapese, and they were given [illegible] and treatment. After six months [illegible], [illegible], who was the radio operator and who had not [illegible] to their experience near Bikini Atoll. Dr. Kumatori stated that [illegible] whether this was caused by his irradiation, or from another cause. He noted that blood transfusions were given to [illegible] of the men [illegible] at that time hospitals did not use disposable syringes, the possibility of the patient contracting infectious hepatitis, which would have been very serious in his weakened condition, could not be ruled out. The notes that an autopsy performed on him indicated significant, but low amounts of radioactivity in the liver, kidneys, and bones, but in the order of micro-curies.

The Committee took special note of a paper given to it which Drs. Kumatori and Miyoshi presented before a meeting on Treatment of Radioactive Poisoning jointly sponsored by the AEC and the World Health Organization in Geneva, in 1962. This article shows how, through reproduction of [illegible] the material and estimation [illegible] of the crew aboard the ship until it arrived [in] Japan, [illegible] estimates of exposure were calculated, ranging from a low of 170 - 220 r [illegible] to a high of 460 to 650 r.

The patients were kept in the hospital for 14 months. Upon being released they were told not to return to the strenuous activity of fishing and [illegible] to take it easy for an additional year. In August of 1956 they were measured with a whole body radiation counter and their body burdens were found to be no higher than those in a control group. Recovery appears had been good in the persons during their stay in the hospital, [illegible] effects.

One early effect noted by Dr. Kumatori was a severe drop in the sperm counts of the men, even falling to zero and lasting for several months. [illegible] mentioned was a disturbance of the normal function of the liver which [illegible] serious or severe, but which was noticeable.

The survivors of this [illegible] are examined on an annual basis by Dr. Kumatori at the National Institute for Radiological Sciences in Chiba City, near Tokyo, where he is chief of the Clinical Research Division. He stated that of the 22 survivors, usually he [illegible] about 15 to 18 every year. Some of them [illegible]

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very busy and just can't bother to come out for examination. Many of them have changed their jobs and work as [illegible], [illegible] apartment buildings. One man, [illegible], [illegible].

No late effects have been noticed, [illegible], but he did state that [illegible] for 10 or 15 years. Most of the men have [illegible]. Aberrations in the chromosomes of the blood cells of the [illegible], however, still persist.

Rongelap and Utirik

Initial Medical Aid

The first assistance to the affected Marshallese and Americans was given by the medical department of the U. S. Navy at Kwajalein. In the meantime, the Commander of Joint Task Force [illegible] had requested the Defense Department and the AEC to provide [illegible] of the fallout victims. This group was organized in the United States jointly by two agencies: the AEC's *Division of Biology and Medicine*, and the Armed Forces Special Weapons Development Project of the Defense Department. Within eight days after the incident, a group had been organized and arrived on Kwajalein. Within this group were Dr. E. P. Cronkite and Dr. [illegible] A. Conard, both from the United States Naval Medical Research Institute.

[illegible]

One of the first reports published concerning the affected Marshallese and Americans came out in April, 1955 under the [illegible] of Brookhaven National Laboratory, a research center connected with [illegible] Universities

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[illegible] of Long Island, New York. [illegible] comprehensive report entitled "Some Effects of Ionizing Radiation on Human Beings," was published in July, 1956, by the United States Atomic Energy Commission. Thereafter, the major data published on the people of Rongelap and Utirik was the results of surveys conducted by Brookhaven National Laboratory (BNL). The reports were published after three years (March 1957), four years (1958), five and six years (one report covering 1959-60), seven years (1961), eight years (1962), nine and ten years (one report covering 1963-64), eleven and twelve years (one report covering 1965-66), and thirteen, fourteen and fifteen years (one report covering 1967, 1968, 1969). (The report covering the years 1970-1972 will be published sometime during 1973.) Contained in the reports are descriptions of the annual surveys and medical findings of the doctors who accompanied the team. A great number of articles have also been published in journals and periodicals by participating doctors as a result of these findings or examinations.

From the first year report, to the most recent BNL report, the size, sophistication and scope of the examinations and findings have increased greatly. In gross terms, this can be seen by an increase in the number of pages, from 12 in the twelve-month report to 155 in the latest report, which, of course includes the results of those examinations and numerous appendices. More specifically, the first report was concerned with general physical conditions with special emphasis on effects on the skin, blood and eyes of the irradiated Marshallese. The 1969 report, however, has a description of general medical findings from physical examinations, and then very detailed descriptions of examinations and findings on the following systems: ophthalmological (eye), thyroid, aging, blood (with chromosome studies and chromosome aberrations) as

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well as a summary of findings over the years since 19[illegible]. These include: [illegible] effects, malignancies, reproductive outcomes, growth and development, thyroid, eye, skin, blood, dental, aging, radionuclide body burden, environment, blood groupings and special studies. Also included are appendices which give statistical data for the above studies, as well as case histories of those persons operated on for thyroid tumor [illegible]. The reports, documented with footnotes, appear to be exhaustively thorough, highly professional and extremely detailed. In addition to all this, the language of the reports is clear and concise. In short, they are well written, [illegible] in an interesting fashion, well laid out, and carefully edited. Generally speaking, if there is a "flaw" in the reports then, it is not due to [illegible] on its contents, but rather due to the nature of the [illegible]. For the most part they are so technical [illegible] and replete with scientific data as to be virtually incomprehensible to the layman. However, the [illegible] of work carried out, and of past medical findings are generally [illegible] readable and valuable to the average reader. Specifically, however, there [illegible] certain threads of reasoning, assumption, and exposition running through the reports which [illegible] finds both frustrating and [illegible]. One of these is [illegible] to the basically conservative nature of scientific [illegible] and [illegible] medical and scientific reports concerning relatively new fields of inquiry. It appears to be [illegible] and not [illegible] that scientists are loath to make conclusions with any sort of finality about their findings and the significance of such, even when there is [illegible] statistical data to support [illegible] conclusions. Thus, for example, many times the reader will encounter such statements as "Although these findings appear to be statistically significant, no definite causal relationship can be proven due to a number of variable factors, or the possibility of an unknown influence."

A second area of concern by the Committee is related to certain unproven assumptions and statistics contrary to the tendency to make definite statements made in earlier reports, which apparently [illegible] and statements made in later reports. These general areas of concern will be elaborated upon more fully as appropriate, in the sections which [illegible] follow.

[illegible]

Dose Estimation of Whole-Body Radiation from External Sources

Since there were no Marshallese with radiation monitoring instruments or radiation badges on Rongelap, Ailingnae, or Utirik at the time of the fallout, the exact amount of radioactivity to which the people on these islands were exposed cannot be calculated, and will never be known. This is generally the result of three factors: One, no one on these islands had a watch or clock which could have recorded the time which elapsed from the time the fallout began to when it appeared to have ended. If anyone did have a watch, they did not do so. Two, there were great individual variations in exposures. For example children, because of their greater mobility and curiosity, may have been exposed to greater amounts of fallout than older persons. Conversely, this may be attenuated by the fact that children are used to play in the ocean during hot days and may have intentionally cleansed themselves of what larger amounts they picked up. Three, [illegible], however, may have received the largest doses because of following [illegible] pattern of daily activity which would have been outdoors much of the time. These people might have received the least accurate [illegible] of their [illegible] activity and their practice of normally staying indoors [illegible] shade [illegible]. Also, especially for the islands of Rongelap and Sifo (Ailinginae), the amounts of radioactivity present when Bravo personnel did not [illegible] to [illegible] their staying on the islands long enough to get many accurate data.

Nevertheless, [illegible] can be [illegible] of [illegible] done [illegible] in the areas are known, and because [illegible] although radioactive elements are variable, [illegible] term of instability is a stable characteristic — in other words, the behavior of radioactive materials is a known factor. [illegible], this is how the doses were arrived at for the [illegible] groups of people. The [illegible] upon which calculations were made [illegible] listed and discussed below.

Rongerik

Fortunately, [illegible] for the purposes of [illegible] calculation, the [illegible] team on Rongerik had [illegible] badges (film [illegible], which indicate exposure to radioactivity) on their persons, outside the buildings, and inside their refrigerator in the [illegible]. They also had a [illegible] device. From the differing exposures indicated by the badges after being exposed for 27.2 hours (time of arrival of fallout [illegible] (time of departure, [illegible]) exposure values could be calculated. One badge left outside registered 98 rads. Badges inside the refrigerator indicated [illegible], and badges worn by team members who were both inside and outside [illegible] 78 [illegible]. These [illegible] also helped to indicate the length of time of the [illegible]. The [illegible] device was set [illegible] for [illegible] when the fallout began, [illegible]. Unfortunately, [illegible] calculations of [illegible] had to be based on indications of the first half hour of readings. After that time, the instrument went off scale at 100 [illegible] per hour.

<u>Later Survey</u>

One known fact concerning radioactive fallout is the rate at which the radioactivity "decays", or decreases. This rate is directly proportional to time. As an illustration, it is known that the activity will decrease by a factor of ten after a sevenfold increase in time. Thus, after seven hours, the radioactivity will be one-tenth of its original; after two days (7 x 7 = 49 hours), it will be one-one-hundredth; after 14 days, [illegible] and so on. Consequently, when it was relatively safe, [illegible] went back to Rongelap and other islands and took measurements of the radioactivity there several days after the people had been evacuated. From the readings on their instruments, combined with the approximate known time when fallout ended, scientists estimated roughly how intense the radioactivity had been during the time the people were exposed. In other words, since normal decay after the bomb, the present level of radioactivity known, and the rough time of when the fallout stopped [illegible], what scientists did was to calculate backwards, so to speak, from the [illegible] recorded days later, to the time when the people were still on the island. One discovery by this later survey was that the readings taken during the time of the evacuation were apparently too low by one-half, or 50 percent. This was apparently due to the fact that the instrument used at that time had not been calibrated (checked for accuracy) before it had been used. ([illegible])

Another discovery they made concerned the nature of "mixed fission products." The fallout was composed of many kinds of radioactive isotopes giving off gamma and beta rays of different strengths. The relative strength of these particles is measured in [illegible] electron volts or kev. On [illegible] there were found three major "energy regions" of 300, 700, and 1500 kev. That is, within the fallout on the ground there were particles which were being emitted in these three general regions (levels) of strength.

Fallout Samples

A third source of information from which could be based whole body doses was actual fallout collected. By studying the radioactive calcium oxide (incinerated coral) scientists determined the [illegible] of different radioactive elements and their energies. However, it is interesting to note that the doses calculated for all the exposed persons, according to the 1956 report by the AEC "came from fallout samples taken soon after the detonation at points some distance from the contaminated atolls" (,16). Why the samples were not collected from the islands on which the people were exposed was not explained.

One of the important factors in determining the amount of radiation exposure is the length of time of the fallout itself. The only way this could be estimated was from the reading on [illegible] and personal eyewitness estimates of time.

Based on the early and later readings on [illegible], it appeared that the period of fallout was about 16 hours, or a long fallout. However, other information, including reports of persons who saw the fallout, indicated that it was shorter than 16 hours and that it occurred [illegible]. A long fallout also conflicted with readings taken later. Finally, it was concluded that whether or not the fallout was long or short, the result would be nearly the same, since in a short fallout the heavier material would descend during the same length of time as it would during a long fallout. In other words, the heavier part of the fallout would take about the [illegible] period of time to descend on the islands, even though the lighter [illegible] longer.

Ranges of fallout time and the doses that would result from them were calculated as follows:

Location	Dose in Rads* Fallout Time 16 hr.	8 hr.
Rongelap	150 r	209 r
Ailinginae	72 r	92 r
Rongerik	70 r	206 r
Utirik	32 r	45 r

Since it was believed that the fallout time was less than 16 hours, and because of data from other sources, the [illegible] used for the report, and the reported [illegible] were based on a fallout of [illegible] hours:**

Location	Best Estimate of Gamma Dose in Air
Rongelap	175 r
Ailinginae	69 r
Rongerik	78 r
Utirik	14 r

One additional [illegible] of fallout [illegible] the effect of a field, or area [illegible] as opposed to that of X-rays. Particles of a single energy from an X-ray machine come from a "point", or single source. However, particles in a fallout field are not emitted from a single source, but many. They are emitted from a [illegible] around the person as he stands or walks and they are at different energies. [illegible] the person is constantly being irradiated by X-ray [illegible] of different [illegible], placed around him [illegible]

*From "Some Effects of Ionizing Radiation on Human Beings", p. [illegible]

**Ibid., p. [illegible]

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cir 1-. The significance of this kind of [illegible] radiation compared to normal X-radiation [illegible] in that the fallout radiation had a greater effect than radiation from a simple source. This is to say that the gamma radiation from fallout on Rongelap penetrated the body and in many more places than a normal X-ray exposure would have. The [illegible] calculated that the gamma dose received by the Rongelapese [illegible] was 50 percent more effective than [illegible] X-ray dose. [illegible] In order to come up with what the dose in fallout was equivalent to in X-rays, the fallout dose had to be multiplied by 1.5. [illegible] person received 10 rads of fallout radiation [illegible] rads of X-radiation (1.5 times 10). On that basis the [illegible] gamma radiation are shown below in what would be the [illegible] X-rays:

Location	Gamma Ray Dose	Equivalent in X-rays*
Rongelap	175 r	260 r
Ailinginae	69 r	100 r
Rongerik	78 r	120 r
Utirik	14 r	20 r

In a section of the 1956 report dealing with effects of radiation on the blood, it was stated that [illegible] the low levels of [illegible] count observed was any indication, then "the effective dose received by the Rongelap people approached the lethal range." The report [illegible] noted that experiments on the effects of radiation on [illegible] showed that [illegible] 50 to 100 rads when the blood count [illegible] (1000 [illegible]) [illegible]. The report also noted that although [illegible] apply to man, and while human beings [illegible] to survive [illegible] 1000 mm^3 that

*From "Some Effects of Ionizing Radiation on Human Beings", p. 6

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It was likely that another 75 rads of [illegible] % reduction, would have caused [illegible] deaths. The report concluded that the minimum lethal dose for man was probably 225 rads in a [illegible]. The "[illegible]" figure was used consistently, with [illegible] for a period covering ten years. In 1964, undoubtedly as a result of the [illegible] of thyroid nodules, a recalculation was carried out. This [illegible] by [illegible] Ralph A. [illegible] of the Lawrence Radiation Laboratory of the University of California was interesting for two reasons.

First, [illegible] calculations of [illegible], the dose of the cloud passing over the island could not be calculated (1956 report). Ten years later, in 1964, because of evidence from [illegible] conducted after 1958, a recalculation was done, including the dose from the cloud. This review took into account the dose delivered as the radioactive particles passed over the islands. [illegible] exposure [illegible] the exact amount of arriving at the origin [illegible] was "not given and that it apparently did not include the dose from the cloud, but only from fallout" (36, p. 79). [illegible] included dose received (based on 37 [illegible]) from time of [illegible] to time of end of fallout, [illegible] rads; cloud passage, 47 rads; and from [illegible] during cloud passage, [illegible] rads, a total of 207 rads. [illegible] factors which might change or alter this amount [illegible] have [illegible] notes that the probable dose was 175 rads, plus or minus 25 rads.

The second reason that this recalculation is so important was because it dealt with and partially explained the reason for the late development of thyroid nodules. This second aspect of the recalculation involved the amount of

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radioactive material taken in by ingestion (eating) and inhalation (breathing),
and are discussed in the following section.

Some Estimates of Contamination
from Internal Sources

Like the amount of external exposure, the probable amount of radioactive material taken in and retained by the exposed persons was only an estimate at best. While the doctors and scientists studying the people could measure how much radioactivity was being excreted out of their bodies by analyzing samples of urine and feces, they could not check the actual amounts still remaining in the bone and other tissues. The only way this could be done would be to take out samples of tissue during an autopsy after death [illegible]. This was one of the [illegible] limitations accepted by doctors when dealing with human patients. Another limitation was due to the fact that there was at that time extremely little known about the internal [illegible] of radioactive elements in human beings. As mentioned in the previous chapter, despite the great death and destruction of Hiroshima and Nagasaki, only a relatively few people in the Nishiyama area of Nagasaki received internal contamination. The only other studies related to the plight of the Marshallese and Americans were those made of radium dial painters in the United States during the 1920's and 1930's who received high internal contamination as a result of the practice of wetting the tips of their brushes with their lips during work. Even this information was not wholly applicable since radium emits alpha particles, which are about [illegible] times as strong [illegible] as the beta of strontium and cesium. In fact, the doctors had very little to go on, [illegible] as though they were "shooting in the dark." There were, however, several bits of information which [illegible] to the people, for when the Rongelapese and other affected persons were evacuated, [illegible] pigs [illegible] chickens were left behind on the island. These animals were later collected [illegible] used [illegible] various tissues and pathological studies [illegible] of all [illegible]. With the findings from these studies, the doctors then attempted to extrapolate the information to human beings. While they realized that [illegible] findings from animals cannot truly represent the actual situation with humans, they at least provided a guideline. The conclusions in the 1956 report [illegible] the possible effects of radio-active iodine, [illegible] attention. [illegible] effects of iodine, it was thought that [illegible] received was [illegible] to be about 150 rep. for Rongelap group ([illegible]) and [illegible] rep. for the [illegible] both amounts, the report said, while high, were relatively low [illegible] to doses persons receive in radiation therapy. As to the other radioactive elements such as strontium, the report concluded:

> "[illegible] evaluation of the degree of internal contamination, including that of Sr^{90}, [illegible] conclusion that the internal hazard [illegible] Marshall Islands is minimal both from the [illegible] point of view." (p. 74) (emphasis added)

With the discovery in 1964 of thyroid [illegible] in exposed Rongelapese, a reexamination of the total thyroid dose [illegible] radioactive elements, including radioactive iodine [illegible] children ([illegible] 3-4 years old). James [illegible] higher than the original estimates [illegible] earlier calculation [illegible] the relative [illegible] of the thyroid in children as opposed to adults. The earlier report [illegible] assumed a constant thyroid weight for all persons (about 20 [illegible]). James, however, used a

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range of weight [illegible] for the children, which gave a "most probable" dose which ranged from [illegible] to [illegible] (including whole body radiation) and which is much higher than the [illegible] figure first used.

Exposure to Residual Radiation

A third general area about which the [illegible] is concerned will be noted here. This is the amount of radiation the Rongelapese, and to a lesser extent the Utirikese, were exposed to after being returned to their islands. There was radioactivity remaining from the "Bravo" shot of 1954 which was taken up into the ecological system of the [illegible] radiation of these areas from later nuclear weapons tests. As noted earlier, the Rongelapese were kept from their islands over three years [illegible] three months. The Rongelapese were returned on June 29, 1957, three years, three months and 26 days after the [illegible]. For their return, Holmes and Narver, at a cost of [illegible] to the AEC, had constructed a new village on Rongelap. However, [illegible] radioactivity [illegible] the radioactivity in the soil, plants, [illegible] the fish, and other fauna and flora of the lagoon.

In addition, the Rongelapese and Utirikese were exposed to radiation after their return as a result of additional tests in the area, especially from the "Redwing" series which included the explosion of thermonuclear bombs in the megaton range. As to the residual radiation remaining from "Bravo", the BNL three-year report indicated that [illegible] "the dose rate at the time of repatriation (July 1957) would be [illegible] 10 mr/week and at

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the end of [illegible] exceed 0.5 rem with [illegible] internal contamination, the [illegible] concentrate Sr^{90}) were [illegible] considered allowable by [illegible]

Despite [illegible] great pleasure [illegible] examinations which indicated that [illegible] Rongelapese did increase and remain [illegible] result of fresh fallout. The BNL five [illegible] cesium 137 had increased by [illegible] Rongelapese had been returned, and [illegible]. Even as late as 1960 the cesium [illegible] mμC and was "300 time the mean [illegible] study (0.048) (p. 42, seven year report). [illegible] the Rongelapese before testing [illegible] themselves to go home, plus the realization [illegible] their later life patterns [illegible] consultants estimated roughly that [illegible] three percent increase in additional [illegible] recent tests. He also [illegible] likely to be harmful. While the Committee [illegible] and it is just that, an assumption [illegible] previously mentioned but [illegible] Committee believes that basically [illegible] and that any additional exposure [illegible] should [illegible] for two reasons: 1) many of the exposed persons had already been exposed to near lethal doses of radiation, and 2) data on the effects of low doses like those received from [illegible]. Thus to assume small additional [illegible] the absence of statistics which [illegible] with this, there is also no known data on the effects of [illegible] of persons already exposed to [illegible] after exposure constantly lived in [illegible] environment. In this, the Rongelapese and [illegible] the Japanese and Americans, since returning to their [illegible] in a mildly radioactive environment.

[illegible]

The Special [illegible] of Dr. Robert A. Conard of BNL, has had [illegible] copies of [illegible] the reports and articles published by the [illegible] Atomic Energy Commission. As mentioned earlier, [illegible] well as being, for the most part, very technical [illegible] review each report individually [illegible] the Committee [illegible] study only certain of the medical aspects [illegible] effects on the blood cells, genetic [illegible], fertility, growth and development, [illegible] considerations.

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Effects on the Blood

Aside from [illegible] acute effects on the blood of the exposed people, causing the number of certain kinds of blood cells to drop [illegible] to dangerous[illegible] levels, there were found to be other effects which, while not themselves debilitating, were an indication of what are most likely permanent changes made by ionizing radiation. [illegible] may not be indicators of diseases which could develop in the future, like leukemia. Some of the changes noted in studies of blood from exposed persons included lower white blood cell counts than those of unexposed persons. According to the 1969 report, this "[illegible] residual radiation effect on the bone marrow." In other words, either from the initial whole body radiation, and/or later internal contamination, by such elements as Sr-90 being deposited in the bone, the ability of the marrow to produce these cells has been affected. Other abnormalities [illegible] found [illegible] of the blood included:

> "An alteration in the myeloid-erythroid ratio (increased red cell precursors), the presence of [illegible] with [illegible] chromatin material and double nuclei, [illegible] examination of peripheral blood smears [illegible] increase [illegible] of atypical lymphocytes in the exposed people [illegible] those forms in the children of exposed parents. [illegible] studies at 10 years post exposure [illegible] high [illegible] aneuploid cells and [illegible] alterations in the blood of the exposed group." (p. 47)

Of particular interest is the fact that the blood of the children of exposed parents, who were [illegible] not exposed, [illegible] showing unusual forms of lymphocytes. [illegible] possible [illegible]: 1) the irradiation of the parents [illegible] changes in the genetic material of the egg or germ cells which were then passed on to the children [illegible] produce mutated forms of the cells; or 2) by virtue of their living in a radioactively-contaminated environment — even though the levels are alleged to be within the tolerance

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of human beings [illegible] has been sufficient to cause these [illegible] no genetic studies of [illegible] the Marshallese affected therefore, [illegible] any possible future development [illegible] of their antecedents. Since this [illegible] and in a practical sense for the health [illegible] the Committee finds it difficult [illegible] Further elaboration on material [illegible] immediately following this one.

Genetic Studies

In the [illegible] report of 1957, [illegible] for the rest of the reports [illegible] genetic studies on the exposed [illegible] children of exposed Japanese [illegible] any significant abnormalities [illegible] had been found in the [illegible] the fallout occurred. The report then [illegible] both desirable and "fruitful" [illegible]

> "1) The people [illegible] easily available from year to year [illegible] 2) [illegible] rather homogeneous race anthropologically [illegible] Islands for about 2000 years with [illegible] intermarriage for such a period of time [illegible] Height, skin color, and features [illegible] marriages are prevalent [illegible] genes as evidence by the high [illegible] Radiation induced mutations would [illegible] (p. 20)

Even in consideration of all these aspects favorable to such a study, the concluding paragraph in that section of the report stated a single reason for not conducting such studies.

> "In spite of these factors, the small number of people involved in this study (compared to the large numbers in the Japanese studies) makes it unlikely that these studies would be fruitful."

In effect, they are saying that [illegible] of the three factors mentioned, represen[illegible] with the exception of the overriding factor that the group is too small in number for any developments to be statistically significant. [illegible] the Committee is appreciative of the constraints [illegible] which govern the statistical analysis [illegible] than just statistical significance, accuracy, or validity [illegible], the overriding consideration in these studies should be [illegible] the future welfare and peace of mind of those people exposed and their descendants. The Committee believes that the arguments for doing such studies far outweigh the arguments <u>against</u> such. They are:

1. An absence of observed abnormalities in first generation children (in Japan) does not preclude the possibility of such developments in either the second or third generation. This is [illegible] indicated by the fact that children of exposed [illegible] abnormalities.

2. Data on Japanese populations may not be relevant since almost all exposures were [illegible] due to neutron and gamma rays. The Marshallese were exposed to a considerable amount of radiation from internal contamination and from long-lived fission products, over a longer period of time.

3. The assum[illegible] that it would [illegible] that such studies would be fruitful, does not rule out the possibility of [illegible] being fruitful. Should such studies [illegible] that in itself is a finding, and would give some [illegible] of those exposed.

4. The [illegible] of thyroid [illegible] and the later development of one case of [illegible] leukemia [illegible] the assumption that other kinds of [illegible] effects may [illegible] studies of germ cells would add to the [illegible] knowledge of [illegible] to actual mechanisms connected with the [illegible] is valuable. That is to say, the more [illegible] whether a person contracts a disease [illegible] may also indicate how the disease developed, [illegible] predicted or genetically transmitted.

5. While the [illegible] may not be statistically significant, and while [illegible] pathologically be proven that this disease [illegible], it would seem to be almost impossible [illegible] leukemia was not caused by the [illegible] and evidence would tend to support [illegible] of only one more such case for the [illegible].

The Committee [illegible] certain monetary and sociological factors [illegible] touched. This will be mentioned in later [illegible], the Committee is of the disposition that [illegible] something in this case is a matter of [illegible] of the people, it

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would prefer to [illegible] rather than on that of statistical data.

5. During [illegible] on man in the United States Congress [illegible] of the effect of low doses of radiation [illegible] another refrain consistently repeated in the [illegible] extensive examination of the Utirikese, namely, [illegible] they supposedly received. Considering that [illegible] subject, both within and without the AEC, [illegible] radiation is ultimately harmful, [illegible] surveys of the Utirikese are not equivalent [illegible] eastern chain of the Marshalls. Again, [illegible] "statistical significance" is the reason. [illegible] agreement with this position, and would rather [illegible] comprehensive and more frequent examinations.

Miscarriages, [illegible] Fertility

There were [illegible] the possibility that long term effects would [illegible] internal contamination had been small. [illegible] the possibility that exposure of women to [illegible] The two reasons for the latter view were: (1) [illegible] (2) inability to examine the "products", [illegible] doctor was available or aware of the [illegible] indicated that, despite one miscarriage [illegible] statistics, "this incidence does not seem greater than that in the unexposed Marshallese people." (p. 16) This conclusion was revised, however, in the five and six year report after review of a wider accumulating information concerning [illegible] pregnancy terminations. The [illegible] showed that exposed Rongelap women had fewer live births, more terminations without live births, fewer recorded pregnancies, more women with one or more, or two or more terminations, and more pregnancies terminating in miscarriages than an unexposed control group. Especially significant was the fact that 61 percent of exposed Rongelap women who were pregnant had one or more miscarriages, while unexposed Rongelap women during the same period had only 28 percent of pregnancies end in miscarriages. The report noted that "The data on pregnancy terminations . . . indicate that an increased incidence of miscarriages in the exposed group."

Accounts of stillbirths and miscarriages are more vivid when the people themselves were questioned, they remember the fact that there was an increase. On Rongelap, in particular, the people remembered many strange deliveries after the bomb. One woman (presumably irradiated in the first three months) delivered a "grape-like" mass; another (exposed [illegible] months) delivered a baby whose [illegible] outside of the skull; another woman's baby was born with a deformed leg and later died; a fourth woman (irradiated at five months or [illegible]) delivered a baby whose eyes protruded from its head, making it look like an "octopus." A check of hospital records later indicated that the baby with the deformed leg, whose mother was said to have been irradiated at five months, was born on [illegible], 1960. Since so long a time had passed since the incident, it is possible that faulty memory has something to do with these stories. However, it is equally possible that since no data was available to examine these stillbirths and reported

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abnormalities [illegible] indeed, occur and were perhaps due [illegible]

As to fertility, [illegible] in the three year report which said that [illegible] loss of fertility may have [illegible] the people." This possibility, how[illegible] will never be known because of the oft-mentioned [illegible] and because the numbers of [illegible] conclusions. Rather, in consid[illegible] sterility induced in Japanese fisherme[illegible] believes that "entirely poss[illegible] certainty." Aside from the increased in[illegible] recorded in early years, there appear [illegible] One possibility which cannot be entirel[illegible] were even more stillbirths and [illegible] likely some of them were caused [illegible] parents.

Growth and Development

Of part[illegible] survey findings connected with growth [illegible] development was acknowledged as early as the [illegible] during the first six weeks after expo[illegible] (p. 22) The 1957 report at three [illegible] reports do with many areas, that it is "diff[illegible] radiation exposure on growth and develo[illegible] of children involved." (p. 18) Weight [illegible] years old were inconclusive, although "bone development appears to indicate a slight degree of retardation in the exposed group." (p. 8) The report discounted the possibility that such retardation was due to internal deposition of isotopes, or due to external beta activity. The second possibility was that since the children were smaller and thinner than adults, they received higher amounts of penetrating radiation than adults and that this, while not enough to affect the bone itself, may have affected some hormone-producing gland, such as the thyroid, which then affected growth. These tentative findings were further complicated as noted in the four year report which stated that a delay [illegible] in development of some children was being investigated since there was "uncertainty in the age of some of the children." (p. 29) The five and six year report discussed continuing difficulty in trying to determine the exact ages of some of the children. Despite this "it was noted, however, that in the 6-year chronological age group three boys out of [illegible] of five boys and [illegible] girls exposed to radiation were markedly retarded in skeletal maturation." (p. 29) This report concluded:

> "It might be speculated from these limited observations that these children were exposed to sufficient [illegible] radiation [illegible] that the resulting retardation [illegible] development led to [illegible] in [illegible] growth. On the other hand, it is not possible to [illegible] the possibility that [illegible] factors [illegible] for the retardation [illegible]." (p. 29)

This tendency to ascribe growth retardation to the effects of radiation was later [illegible] early newspaper reports [illegible] suggested that the process has been [illegible] by [illegible] exposure. This was confirmed in the [illegible] by [illegible] who had participated in the first survey and who is [illegible] of the [illegible] staff today.

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"These data appear to be [illegible] evidence suggestive of slight impairment of growth and development [illegible] by a comparison of height and weight in the control and exposed children. You cannot look at these children and pick out any abnormalities.

"It would [illegible] to comment on this [illegible] scientifically, because of the [illegible] for a few [illegible] to great attention of the growth. It can only be [illegible] by a [illegible] statistical [illegible] of the [illegible], by taking measurements of height and weight." (p. [illegible])

The seven year report repeated [illegible] information in the earlier two year reports, noting that studies had not yet been completed to determine the age of certain children. The eight year report dealt extensively with growth retardation noting several [illegible] were "significantly" retarded. This report also noted that "it was interesting that the boys born soon after the fallout [illegible] more retarded [illegible] than those born more recently." (p. [illegible]) The section concluded that the differences "were not statistically significant and the data available at this time would not support any findings concerning further growth [illegible] of skeletal maturation in these boys." (p. [illegible]) [illegible] The nine and ten year report was more conclusive in [illegible]:

"The slight retardation of growth in [illegible] children who were exposed when (less than) five years of age compared with unexposed males of the same age suggests that radiation may be a causal factor although possible [illegible] are not excluded."

Perhaps [illegible] the most [illegible] development of thyroid nodules in the Rongelap people during the [illegible] examination (196[illegible]), little attention was given immediately to growth development. The next report dealing with the eleventh and twelfth examination [illegible] (196[illegible] and 1966) however, [illegible] this area [illegible].

During the 196[illegible] survey, because of the development of thyroid nodules in many of the exposed people, it was decided to give thyroid hormone to possibly help induce regression of the nodules and to also stimulate growth in [illegible]

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retarded children.

"Accordingly, [illegible] of the [illegible] survey, [illegible] people in the [illegible] group [illegible] mg [illegible] 30."

The [illegible] nearly nine years after [illegible] of growth retardation that [illegible] was first [illegible] the results, especially for one of the two boys who not only showed growth retardation, but also developed thyroid function problems, are startling. [illegible] Nos. 2 and 3 showed "definite" spurts in growth, [illegible] "remarkable" [illegible] appearance of No. 2 after thyroid hormone therapy for 6 months." (p. [illegible])

The thirteen, fourteen, and fifteen year [illegible] noted that [illegible] early as 11 [illegible] report,) these two boys had developed [illegible] atrophy of the thyroid [illegible] and with [illegible] complete loss of thyroid function. [illegible] By this time their blood had low thyroxine and very high TSH levels. They showed body symptoms [illegible] sluggish Achilles tendon reflexes, puffy [illegible] dry skin." (p. 25) For some reason, however, this was not noted in the [illegible] report; in fact, that report states [illegible] "the [illegible] boys showed no evidence of hyperthyroidism or clinical [illegible] although [illegible] markedly delayed osseous maturation." (p. 24) [illegible] during the [illegible] survey, the boy [illegible] noted as not having hyperthyroidism and yet [illegible] report [illegible] to have been [illegible] a hypothyroid condition.

The implications of these findings [illegible] regarding growth and development will be discussed in the final section of the report.

Thyroid Abnormalities

Small growths (neoplasms) were found in the thyroids of three young girls at 9 and 10 years post exposure. They were subsequently operated upon and the thyroids totally or partially removed. Since that time to 1968, operations for thyroid nodules have been performed on 20 people, 17 from the Rongelap exposed, two from Ailingnae, one from Utirik, and one person from Rongelap not exposed to the original fallout. While it is generally acknowledged that most of these nodules are nonmalignant (not cancerous), the operations were performed for two reasons: (1) to check for possible malignancy, and (2) for removal based on the fact that the thyroids were no longer functioning and to anticipate the possibility of the nodules turning malignant at a later date. Several of these nodules were found to have "malignant lesions" according to a report from Dr. Conard. (See Appendix summarizing the 1977 survey).

As explained before, it was found that the thyroids of the persons who had been exposed to [illegible] had not shown [illegible]. However, especially in the case of exposed children the differing size of the thyroid was not taken into consideration and [illegible] resulted in a higher proportion of later nodule development. Despite this fact, and possibly in consideration of thyroid findings in exposed Japanese at Hiroshima and Nagasaki, the thyroids were watched carefully as part of the surveys. [illegible] tests were conducted to try and determine [illegible] surgery [illegible] possible abnormalities. These tests, however, failed to indicate any future possible problems because of the presence of an unusually high amount of [illegible] (iodine [illegible]) in the Marshallese compared to Americans. [illegible] that the eleven and twelve year report commented that

"Minimal hypofunction of the gland [illegible] missed in the past, since the previously normal T4 (thyroxine-iodine) levels may have been [illegible] the [illegible] being caused by the elevated [illegible] the [illegible] of the Marshallese." ([illegible])

While it cannot be stated with any certainty that no new thyroid nodules will be found (two new possible nodules were found during the 1974 survey) it is most likely that if they are found, they will be in persons who were less than ten years of age when exposed, although so far there have been three cases (including one [illegible]) in persons older than 20 years and one case in persons older than [illegible] years ([illegible]). This has been borne out in the case of the [illegible] who have not developed such nodules. This may be due to their generally older age (18-39) and possibly due to the fact that much of their [illegible], unlike that of the Marshallese, may have come from [illegible].

At present, [illegible] surgery is carried out at the United States [illegible] Dobyns at the Cleveland Metropolitan General Hospital, [illegible] of the Lahey Clinic. [illegible], however, [illegible] of one case, No. [illegible], who was operated on at the U.S. Naval Hospital on Guam during August of 1976. [illegible] Thyroid Surgical Cases, eleven and twelve year report [illegible] that "the parathyroid gland was identified [illegible] and this was implanted in the belly of the right [illegible]. No other parathyroids were seen and none were subsequently found in the specimen by the pathologist." [illegible] of the patient indicated that the parathyroid replantation failed to take and consequently the patient must receive medication for parathyroid function, in addition to that for thyroid function, for the rest of her life. The Committee has asked [illegible] about the circumstances surrounding this operation and the [illegible] of the uninfected gland, as part of a series of questions concerning the [illegible] Because of the large number of questions (about 100) sent [illegible] during December, 1972, the answers have not yet been received, but will be included, if relevant, in subsequent reports by the Committee.

In conclusion, it can be seen that the [illegible] of thyroid nodules which was connected with other conditions ([illegible]) was one of the important early [illegible] which [illegible] constant watching for the future health of these people.

[illegible]

During the September, 1972, survey, one 19 year old Marshallese youth was found to have a low white blood cell count [illegible] examined on Rongelap. This person, the son of the former Rongelap Magistrate had been [illegible] for partial removal of his thyroid gland in August, 1968. [illegible] was admitted on August 4, 1968, to Brookhaven [illegible] and discharged [illegible] on August 30th. The hospital summary from Brookhaven, [illegible] Conard, indicated that he had "been very [illegible] in taking ([illegible])." At the end of the summary, it was noted by Dr. Conard that he [illegible] thyroid hormone therapy for life. A letter was sent to the [illegible] practitioner in charge of this patient stressing the importance of continuing thyroid hormone treatment." (p. 72) According to [illegible] from Dr. Conard, when last seen in [illegible],

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"was found to [illegible]." However, [illegible] survey he was taken into Majuro with the [illegible] of the [illegible] and there another blood test was given. This [illegible] showed the [illegible] than it had been on Rongelap. Arrangements [illegible] Army Hospital in Honolulu, where attempts [illegible] examination" failed and "we decided to [illegible] back to [illegible] Laboratory," according to Dr. Conard. There the [illegible] leukemia was determined after which arrangements [illegible] at the National Cancer Institute, Clinical [illegible] he was taken on October [illegible] 1972. [illegible] Building No. Ten, on November 15, 1972, 18 years [illegible] died of pneumonia during "attempts to [illegible] leukemia," according to a BNL release of the [illegible].

This is the first [illegible] to appear in any of the Marshallese [illegible] fallout. Whether it is a single incident, [illegible] radiation from fallout, cannot be stated [illegible], or the lack of such, will undoubtedly be [illegible] because of the higher incidence of [illegible] in Japanese [illegible] bombs, the situation bears watching with [illegible] attention.

[illegible]

Since the [illegible] of the Rongelapese and [illegible] people, certain difficulties connected with the [illegible] noted in the BNL reports.

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in the three year report [illegible]:

1. The Rongelap language, although [illegible] were aided by interpreters.

2. Lack of vital statistics [illegible], which would help in evaluating medical findings.

3. Relative to no. 2 is the [illegible] or absence of records of [illegible] of most of the [illegible].

4. Unhygienic living conditions which [illegible] the medical picture (the presence of numerous [illegible] diseases, poor oral hygiene).

5. Lack of a good comparison [illegible] group (this was later solved [illegible] of Rongelapese [illegible] who were not exposed [illegible] with the exposed group.)

In each of the subsequent reports the [illegible] problems are repeatedly listed as being continuing difficulties. Of special interest were additional comments regarding the attitudes and cooperation of the Rongelapese and Utirikese, which appeared in the five and six year report ([illegible] survey) and the seven year report ([illegible] survey). Because these reports are extremely important in characterizing attitude issues connected with the surveys in the past, they are reproduced here completely, with original headings:

From the [illegible] report, (p. 6)

ATTITUDE OF RONGELAP PEOPLE

"When the team arrived at Rongelap, [illegible] of the village indicated that there was some degree of uncertainty in the minds of some of the people as to the purpose and significance of repeated medical examinations. At the [illegible] to hold a meeting of the village people in the council house [illegible] and questions to help clarify the situation. [illegible] years during which the annual examinations have been going on there had been no problem in maintaining adequate rapport with the people. Indeed, the relations of the [illegible] with the [illegible] always cordial and friendly. It was noted that there was [illegible] resistance to blood sampling [illegible]. Also [illegible] that because of the high [illegible] they were [illegible] trials, which they considered [illegible] (Figure 4). [illegible] of the people to Rongelap [illegible] to the extent that the Trust Territory [illegible] copra production is the prime source of income, there was some concern over the slowness with which the people were getting back on their feet economically. It had been necessary to extend food assistance beyond the time originally planned. Fishing was not being engaged in as actively as it should be [illegible].

"At the [illegible] the [illegible] centered around the necessity for [illegible] in view of statements on the part of [illegible] the people were generally [illegible] to explain to them that, although [illegible] have recovered from the [illegible] was known about the possible [illegible] examinations were essential [illegible] effects, should they arise [illegible] again and the reasons for [illegible] explained through the interpreter [illegible] that several cases of fish poisoning [illegible] due to eating radioactive fish, [illegible] been going on in these islands for [illegible] radioactivity. After much discussion [illegible] satisfied with answers to the questions [illegible] examination proceeded. Thereafter [illegible] friendly relations prevailed throughout the [illegible].

"During the [illegible] visited Rongelap. A meeting with [illegible] was held [illegible] (Figure 5), and many aspects of the [illegible] situation [illegible]. The report of the [illegible] was [illegible] toward [illegible] being rendered the people.

"Upon completion of the 1959 survey, [illegible] was held for the people, and they were advised that they were found to be generally in good health with [illegible] effects [illegible] apparent, but that continued [illegible] in order to insure continued good health. [illegible] to improve their [illegible] hygiene and [illegible] the [illegible] on the island.

"Before the [illegible] the [illegible] held for the Rongelapese. The [illegible] were explained as [illegible] appreciation of [illegible]."

and from the 196[illegible] report (p. 7)

"On arrival, [illegible] with the Marshallese [illegible] the objectives of our visit [illegible] it was considered advisable to [illegible] meeting [illegible] proposed examinations could be explained to the people and any questions they might have could be answered.

"During the [illegible] House, the medical examination [illegible] for them were explained. The people [illegible] the effects of fallout on their [illegible] meetings during past surveys. [illegible] fish poisoning was related to the [illegible] black spot in their abdomens, [illegible] and to cause sickness [illegible] again explained to them that fish poisoning [illegible]. A new complaint was that [illegible] and blistering of the mouth [illegible] flour which they felt was affected [illegible] this type of effect has been noted [illegible] properly prepared. They asked [illegible] and were told that these were [illegible] would be carried out and that [illegible] reached a low enough level of [illegible] their diet which they are forbidden [illegible] the coconuts were small and that [illegible] coconut and pandanus trees which they [illegible]

"Despite [illegible] friendly and cooperated with [illegible] examination that followed."

No other [illegible] with the people are mentioned in subsequent reports [illegible] mention in the eleven and twelve year [illegible] "The [illegible] examinations naturally limit the [illegible] In the thirteen, fourteen and fifteen year [illegible] with the lack of vital statistics, [illegible] attempting to improve registration of such data."

The Committee [illegible] mention of problems connected with [illegible] It is noteworthy that the first [illegible] after exposure, and the second mention [illegible] The Committee discussed some of these [illegible] in the section dealing with the [illegible] 1977 survey.

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[illegible]

One of the [illegible] which [illegible] the radioactive fallout persists even today. [illegible] Atoll, called [illegible] or, the robber [illegible] radioactivity to this day. [illegible] which contains long lived [illegible] 137 tends to concentrate in [illegible] concentrate in the carapace, [illegible] the calcium rich shell, just [illegible] the shell of the crab is actually the [illegible] of the internal human skeleton. What [illegible] forbidden to the Rongelapese [illegible] which they have sloughed off, [illegible] they manage to retain a relatively [illegible] and that the Rongelapese have been told [illegible] though the Rongelapese [illegible], rightly considered by [illegible] from Rongelap and [illegible] per person per [illegible], he indicated, would still remain [illegible] they were [illegible].

[illegible]

The [illegible] 1972 survey which normally would [illegible] leading to the

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creation of the Special Joint Committee Concerning Rongelap and Utirik Atolls of the Congress of Micronesia under Public Law No. 4C-33 have already been outlined in the Committee's Interim Report of May 16, 1972. However, since only a limited number of copies (400) of that Report were published, and since other developments have taken place since that time, the Committee feels a brief review for background purposes should be included here.

The Interim Report indicated that [illegible] Congressman Ataji Balos in whose representative district [illegible] had invited a Japanese survey team headed by [illegible] to study the victims of the 1954 fallout. He had invited the team, he said, because the peoples of Rongelap and Utirik had been complaining that the [illegible] team was not treating them properly, as [illegible] in the [illegible] condition. His idea was to invite the Japanese team in order to provide [illegible] medical opinion. In November, 1971, Representative Balos attempted to secure permission for the entry of the Japanese from the Trust Territory Government; by December no answer had been received, and the [illegible] entered the Trust Territory with tourist permits, hoping to straighten out their status after arrival. No small amount of confusion then [illegible]. First, the Acting Attorney General ruled that they did not appear to be a bona fide medical survey team and thus [illegible] Saipan. Finally, the acting Attorney General reversed his opinion and found that the group was indeed a research team, but because they had entered under a tourist permit could not change their status and would have to return to Japan. This they did, without completing any [illegible].

On January [illegible], during the [illegible] Session of the Fourth Congress of Micronesia, [illegible] delivered a speech on the floor of the House of Representatives [illegible] charged that the United States had intentionally exposed the people of Rongelap and Utirik to radiation and that they were being used as "guinea pigs." [illegible] the fate of the Japanese [illegible] the World Health Organization to conduct a survey of the people. [illegible] he introduced a bill which later became [illegible] considerable controversy which resulted [illegible] between the [illegible] Executive Branch, in Palau, where it was [illegible] would be requested to accompany the [illegible] survey [illegible]. Unfortunately, when the survey was attempted in [illegible] Dr. Hayakawa, was present. Dr. Toshiyuki Kumatori [illegible] plan. Dr. Haruo Ezaki [illegible] had been invited, [illegible] to attend. At that point, with only one Japanese [illegible] doctor with little or no experience in the [illegible] Congressman Balos and Congressman [illegible], [illegible] people of Utirik, asked the people not [illegible] was cancelled.

On April 14, 1972, [illegible] automatically became law without the signature of the [illegible]. On April 17, 1972, the three members appointed by the Presiding Officers of the Congress: Senator Olympio T. Borja, [illegible] and Timothy O. Kerill, met on Saipan for [illegible] meeting was Representative [illegible] and Representative Balos was appointed [illegible]/Informant.

On April 19, 1972, through [illegible] Dr. William Peck, the Committee [illegible] of the United

States, Dr. Jesse L. Steinfeld, who had come to visit the Trust Territory to see what programs or assistance of the Health, Education and Welfare Department could be developed in Micronesia. The Committee was very impressed by his open and helpful attitude. This was evidenced by his offer to commit the resources of his office upon request by the Committee to carry out the following:

1. Assemble a medical survey team from the resources of the United States Public Health Service which could conduct a survey independent of the BNL survey, and continue conducting the annual examinations in the future if requested.

2. Provide a specialized medical consultant to the Special Joint Committee from PHS. (This consultant would accompany the Committee to Rongelap and Utirik and also accompany the Committee on the completed 1972 survey in September).

3. Provide a radiological survey team which could study radiation levels at Bikini and Enewetak Atolls before the people were returned to them.

On Saipan, the Committee was also pleased to meet, through Dr. Peck, Dr. Knud Knudsen, of Brookhaven National Laboratory. Dr. Knudsen had chosen to take his sabbatical from BNL and be stationed for one year on Kwajalein, Marshall Islands, so that he could do a follow-up examination of the people of Rongelap and Utirik and check the accuracy of vital statistics. Also, most of his time would be spent on Ebeye helping out at the Trust Territory health facilities there.

By May 26, 1972, the Committee had issued its Interim Report as called for by the public law. Among the principal recommendations made in that report were:

1. The [illegible] health of the people of Rongelap and Utirik were of "utmost importance."

2. An agreement with the High Commissioner that a doctor from the World Health Organization and Dr. [illegible] from Japan [illegible] accompany the Brookhaven team at "the earliest date possible," and [illegible] the addition of an American doctor from the U.S. Public Health Service.

3. The Committee would [illegible] from Japan and the U.S.

4. The Committee would [illegible] A-bomb survivors, [illegible] to the [illegible] of Rongelap and Utirik [illegible] the Marshall Islands [illegible].

By the end of July the Committee [illegible] consultation with the High Commissioner's Office [illegible] the presence of [illegible] consultants [illegible] on behalf of the Committee as soon as possible.

These consultants [illegible] Dr. [illegible], Dr. William [illegible] of the [illegible], who [illegible] with the Committee in the Marshalls in July, and Dr. [illegible] of the British Medical Research Council, Department of Clinical Research of the University College Hospital Medical School, London, England. [illegible] the World Health Organization [illegible] previously [illegible] established with Dr. Conard of Brookhaven, who [illegible] by his institution and the AEC [illegible] proposed a starting date of September [illegible], 197[illegible]. [illegible] on the part of the Committee [illegible] of the consultants [illegible] able to handle the [illegible]

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[illegible] Brookhaven [illegible], all of whom were to [illegible] as scheduled.

At 13:00 hours on September [illegible], 1972 ([illegible] time) the Brookhaven team, the Committee members and staff, and [illegible] consultants departed [illegible] the M/V [illegible], Captain [illegible] McDonald, Master. The ship arrived at Rongelap at 07:00 hours (local time) on September 10, [illegible].

Dr. Conard was [illegible] Navy [illegible] (now [illegible]) at the time he [illegible] in the first survey in 1954. Since 1957 he has headed the annual medical surveys. On this particular trip his [illegible] included: Dr. [illegible] of Brookhaven; Dr. [illegible], a thyroid specialist; Dr. [illegible] W. Sutow, a pediatrician from M.D. Anderson Hospital, University of Texas; and Dr. Austin Lowrey, U.S.A. (ret.). Providing [illegible] assistance to the [illegible] team were [illegible], William A. Scott, [illegible] of Brookhaven. From the Trust Territory were Dr. [illegible], [illegible] Anjain, District Officer [illegible], Registered [illegible] Technicians [illegible] and [illegible], and [illegible].

By previous [illegible] the Committee's medical [illegible] ate, slept and [illegible] with the other members of the survey [illegible] in their quarters and [illegible]. They consist of [illegible] which [illegible] mess hall and [illegible], a building which houses a jeep, tractor and [illegible], along with a 40 kw generator; and [illegible] large [illegible] in which [illegible] are taken and processed.

The Committee, in order not to interfere with the actual [illegible] of the team, [illegible] the M/V [illegible] to the [illegible]

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order to briefly discuss the activities of the team and to meet with the people of Rongelap.

After that, arrangements were made to have a meeting with the people of the island at 6:30 p.m. At that meeting the purpose of the Committee's accompaniment of the team, and the role of the consultants was explained. The Committee asked the people, for their own health and welfare, to cooperate with the examinations. The consultants then introduced themselves. Dr. Conard talked about the work they would be doing and introduced the doctors on his team. He made three announcements: (1) sick call would be at 8:00 a.m. every morning; (2) a feast would be held the following night and at the same time (3) a movie would be shown. He also announced that due to radiological analysis on crabs taken last year, the people of Rongelap would be able to eat the crabs from Rongelap and Arbar Islands at the rate of one crab per person per day. Then he opened the meeting to questions.

One questioner stated that they wanted someone to look after them all the time and they hoped that full responsibility would be given to the AEC to do this. Dr. Conard replied that Dr. [illegible] was stationed on Kwajalein for [illegible] years. He said he hoped this position could be a full time job all the time, but that it was difficult to find doctors willing to come out and do such work.

Another questioner asked why, if the team was really interested in their health, there is only one examination a year. Dr. Conard replied that "We are trying our best under the circumstances."

A last questioner asked why there was only one crab per person per day allowed. Were they still poisoned yet? Dr. Conard replied that, "Yes, they were, but only slightly, and that they would only know later this year from Eniwetok tests if they could be declared safe."

On Tuesday, September 17, it was decided that the team would not depart the following day, but on Thursday. [illegible] a feast, hosted by the BNL team, was given for the people. [illegible] Conard and his crew [illegible] the Committee's consultants [illegible] time for the people and passed out the food prepared by the team. It consisted of hot dogs, beans, [illegible] orange juice, small [illegible] donuts, and coconuts.

On Wednesday, September 18, the Committee met informally with the island's magistrate. During the discussion the following points were brought out: While the people [illegible] the BNL team [illegible] informed [illegible] they are never asked for permission to let the team come on the island. According to them, the team never meets with the magistrate and the council, but rather [illegible] meetings. [illegible], they are asked to provide [illegible] local food, but [illegible]. Finally, they are usually told [illegible] there will be a feast; there was, however, [illegible] arrangement to meet with the magistrate and council the following morning at 9:00 a.m. at the Protestant Church. The points raised during the meeting were:

1. The people would like the doctor who is on Rongelap to be stationed on Rongelap.

2. The people asked whether or not the crabs are safe to eat since there is still radiation. Many people still do not eat [illegible] today because they were apparently told not to do so upon their return to the island in 1957. They would like someone to [illegible] and [illegible] the [illegible], plants, trees, fish, etc., to tell them if these [illegible] are really safe to eat.

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[illegible] people expressed their general feeling about the survey. They said that the general attitude is the same as in the past. They (the [illegible]) [illegible] they want. One person said that he is afraid of Dr. Conard. The general feeling is that the [illegible] although they own the island [illegible] they come for the survey.

At 1430 [illegible] Conard, the [illegible] departed Rongelap for Utirik. Unknown to the [illegible], among [illegible] was [illegible]. Unknown to [illegible] as the ship left the lagoon and Rongelap [illegible] from sight, it would [illegible] the last time [illegible] his home.

The [illegible] vessel anchored at Utirik [illegible] at 10:30 on September 15, 1972, after Captain [illegible] had guided [illegible] through the treacherous passage in the atoll's reef. A meeting with the [illegible] and people of Utirik was arranged and held at 1430 hours.

A brief [illegible] was given by the [illegible] and his consultants were introduced. [illegible] of them did the same and introduced the members of his team. He announced that there would be [illegible], that there would be a movie, and that [illegible] would be [illegible] they [illegible]. The Committee then asked if there [illegible] any questions [illegible] people.

One question was [illegible] Dr. Conard if the people of Utirik had radioactivity in their bodies. Dr. Conard replied that all people have radioactivity in their bodies; that the people of Utirik received a [illegible] amount of radioactivity from fallout, and that the amount that they have is below the amount that is hazardous to man.

A second question was: How did the people of Utirik compare with the people of Rongelap? Dr. Conard explained that the Rongelap people received about [illegible] and the [illegible], 14. These people in the U.S., he said, [illegible] each an [illegible] in a normal [illegible] population.

On the next day, Saturday, September 10, 1977, the Committee met [illegible], with one of the [illegible] leaders. The discussion centered [illegible] the question of compensation. It was noted that this was only the second [illegible] way to have a party with the [illegible]. The people, it was noted, [illegible] if they want the party. The question was asked if they asked the [illegible] and the answer was, "Well, there is food, so we go." Was there enough food, it was asked? The reply was, "No, not enough."

On Monday, September 12, the Committee met with Dr. Conard in the afternoon. He explained that there were [illegible] people from Rongelap [illegible] who would be traveling on the ship [illegible] for "people with medical findings" and who would be treated in Majuro. He stated that there were no new findings since the last complete survey in 1976 (cf. [illegible]). He also added that general condition of the islands was poor, that the health care was [illegible] medicine (there was not even aspirin on Utirik, he noted), and that Dr. [illegible] was trying to implement a procedure of having a standardized [illegible] drugs which could be checked on every field trip.

The Committee then discussed [illegible] with Dr. Conard.

It was asked if Dr. Conard thought that Dr. [illegible] would be able to [illegible] two weeks on Rongelap and Utirik. Dr. Conard noted that [illegible] would be traveling to the islands on the field trip and would look at the people for radiation and other problems. He was asked if BNL or Brookhaven could continue that program. Dr. Conard said it could [illegible], since it would be difficult to recruit [illegible] women to do that. The doctor was asked if it would be good to have [illegible] of the Trust Territory trained in certain techniques of examination and send out [illegible] women to give the same kind of attention as Dr. [illegible]. Dr. Conard replied in the affirmative.

Dr. Conard was then informed that the local people had reservations about eating the coconut crabs. He reported that the guide was based on the assumption that no one would eat more than the equivalent of one per day per person and that tests had shown that it would be safe to eat them. He was further advised that the people are still afraid to eat the coconut crabs. He expressed amazement over this and indicated that he had never heard that this had been on the restricted list.

He was asked if the people were continuing taking their thyroid medicine and his response was that by and large they were, but most of the [illegible] were not very conscientious.

To the question of why the team has studied the people of [illegible] in 195[illegible], Dr. Conard replied that it was for the purpose of gathering baseline information about the thyroid in the Marshalls.

The doctor was then asked if he believed the people of Rongelap and Utirik were normal today. He responded that there is very little difference between the people of the two islands today except for early acute effects and a slight increase in [illegible]. Other than the development of thyroid nodules, there differences are the same. "Of course," he added, "we don't know what will happen in the future, and that is why we keep returning each year."

Finally, he was asked if he heard the same types of questions from the people during each survey. He noted that he did, and that they must have [illegible]

[illegible] in some way because of communication problems, perhaps because of the language barrier.

That evening a party was given [illegible] for the [illegible] in Rongelap. [illegible] that, a movie about [illegible] and the people of Rongelap was shown. It was produced at the expense of a drug company which manufactures the [illegible] medicine taken by the Marshallese.

The next day, the Committee met with the [illegible] and the [illegible] [illegible] of the information [illegible] about [illegible] Conard.

At [illegible], Tuesday, September [illegible], the [illegible] departed [illegible] arriving [illegible] the next day at [illegible] hours.

While the examinations were going on in the [illegible] hospital, the [illegible] [illegible] of the Office of the District Administrator. Dr. [illegible], Dr. [illegible], and Dr. [illegible] departed for [illegible] on [illegible], [illegible] and Dr. [illegible] departed [illegible] for [illegible] home.

On Sunday, September 24, the Committee met with the people of Rongelap [illegible] during which time the results of the [illegible] explained to the people. By September 27, 1972, [illegible] members of the Committee had departed [illegible] to [illegible] Conard and [illegible] to return to the United States.

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"On March 1, 1954, an experimental thermonuclear device was exploded by the U.S. Atomic Energy Commission at its Eniwetok Proving Ground in the Marshall Islands. Following the detonation, unexpected changes in the wind structure deposited radioactive material on inhabited atolls and on ships of Joint Task Force #7..."

-- Statement of Charles L. Dunham, M.D., Director,

Division of Biology and Medicine, AEC, 1956

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[illegible]

[illegible]

Were the [illegible] in laboratory exp[illegible] intentionally cause 239 Marshallese [illegible] fallout in order to study the [illegible] which occurred as a result of the [illegible] from the often-stated "unexpected [illegible] that the answer [illegible] single statement. Although consideration of [illegible] part of the Committee's mandate [illegible] that since the issue was raised [illegible] it is inextricably intertwined with the [illegible] deserves to be broached and d[illegible] had available to it a great quantity of [illegible] pertains to the question, and [illegible] situation the Committee wishes [illegible] report.

[illegible]

Bikini [illegible] for nuclear weapons. It suited all [illegible] 1,000 miles of an airfield which [illegible] heavy weather and no extreme [illegible] for test ships and support vessels, [illegible] fishing zones, coastal waters and [illegible] were also met in choosing Bikini: [illegible] evacuated without causing hardship [illegible] and perhaps most importantly [illegible] under the Navy.

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and later under [illegible]).

Originally [illegible] was used to test the effects of atomic weapons on naval vessels [illegible] later, as more information was [illegible] were conducted in Nevada, the Pacific Proving Grounds [illegible] an even more important role, that of [illegible] weapons [illegible]. As noted by Dr. Gordon M. Dunning [illegible] of the AEC during Congressional hearings in 1957, [illegible] have been used to reduce the radioact[illegible] of the test site [illegible], of course, only small nuclear devices are tested [illegible] range were ever tested [illegible] thermonuclear weapons were either tested [illegible] the Pacific [illegible] Proving Grounds.

Public Relations and [illegible]

Testing in [illegible] was accompanied by [illegible] public relations work by the AEC and its [illegible] hearings in the U.S. Congress, Dr. Dunning described [illegible] of the public [illegible] carried out:

> "The off-site [illegible] program [illegible] (Spring 1957) illustrates [illegible] to take numerous radiolo[illegible] liaison with the citizen [illegible] Energy Commission and the United States [illegible] organized a program wherein the areas [illegible] into 17 zones. A technically qualified man [illegible]. His duties consist not only [illegible] prior to and during the test se[illegible] in his zone, to know the peo[illegible] the 17 zone commanders, as they [illegible] teams on call to go to any locality [illegible] outside the 17 zones."

The public relations [illegible] involved public discussions and showing [illegible] detailed [illegible], see Appendix No. 6). Information [illegible] in the 1957 [illegible] that "Practically every

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person throughout [illegible] found to

at least one [illegible]

clubs, schools and [illegible]

in a town which [illegible] attended by

sixty persons, [illegible] of the [illegible]

since they were [illegible]"

Several [illegible] the Pacific

Proving Grounds [illegible] available to the

Committee indicates [illegible] for the

Marshallese. There [illegible] attending PTA

meetings and church [illegible] to the

people. There were, [illegible] in case

of fallout contamination [illegible]

relatively short length.

"RADIOACTI[illegible]

"RADSAFE EMERGEN[illegible]

"1. The commander, [illegible] for each off-site location outside [illegible] near the PPG, the representative is re[illegible] for the [illegible] safety of the local population and the members [illegible] task force.

"2. The represent[illegible] provided guidance as follows:

(a) The Mar[illegible] and the Marshallese health [illegible] should be assured that every [illegible] exposure of the natives to radi[illegible]

(b) The rep[illegible] magistrate to insure that a meth[illegible] whereby [illegible] atoll may be summoned to a [illegible] water transportation if a fallout emerge[illegible] will be determined by the commander, [illegible] will assume that a fallout emergenc[illegible] survey instruments, when held at a [illegible] a rate of 1 r./hr

(c) Suc[illegible] will be limited to that which each [illegible] pounds. Whether evacuation is achie[illegible] evacuated. [illegible] tabulation of [illegible] possible to

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insure the [illegible] of claims [illegible] government.

(d) The local magistrate [illegible] informed that in event of an unforeseen [illegible] doctors will [illegible] from the United States by special airlift [illegible] who will be evacuated to Kwajalein At[illegible] in existence to permit the task for[illegible] with any [illegible].

(e) [illegible] danger [illegible] can be suspected by the presence of a saltlike precipitate [illegible]. Should such an event take place, it should [illegible] confirmed [illegible].

"3. The representative [illegible] arrange [illegible] the local magistrate and native health aid to inform [illegible] measures that they may take to protect them[illegible] danger [illegible] is suspected or confirmed. These measures are:

(a) [illegible] themselves from the falling or [illegible] radioactive [illegible].

(b) [illegible] dust and shake off clothing.

(c) [illegible] attention should be given to washing [illegible] the arms, the [illegible] and hair.

(d) [illegible] covered [illegible] of fallout particles.

(e) [illegible] the readings [illegible], it is recommended that the natives be [illegible] (ocean) and immerse themselves as often as [illegible] or keep [illegible] under water. This recommendation is based on [illegible] water [illegible] in attenuating radiation."

Since these [illegible] whether they existed prior to [illegible], then for some reason there were no monit[illegible] not know what to do; if after, it indicat[illegible] relations program nor a safety program for [illegible].

Danger [illegible]

Another area [illegible] the size of the test zone and its relation [illegible] of the [illegible] group and Utirik. When Bikini was added [illegible] enlarged to 50,000 square miles and ran from [illegible] eastward to 166° 16' E. [illegible] and 166° [illegible] E to 166° to 167° [illegible] Atoll, whose westernmost limit extends [illegible] the northernmost boundary

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extended above Rongelap [illegible] easternmost boundary line stopped sh[illegible] (about one mile) and of Rongelap Atoll by 21" [illegible] apparently done so that the people of the at[illegible] prior to the test, which would indicate an assum[illegible] that [illegible] might go 90 miles north of Rongelap, it could n[illegible] extend to [illegible] position. However, the Committee notes [illegible] then why was it that the Radsafe team was statione[illegible] of inhabited Rongelap.

Whatever the assumptions were at that time, [illegible] interesting to note that the danger zone was enlarged eight times* [illegible] the next shot on March 27, 1954, which was witnessed by [illegible] hairman [illegible] Admiral Strauss.

Yield an[illegible] Type of Burst

Other notable factors touched upo[illegible] deal with both the size and the locatio[illegible] energy yield was estimated [illegible] have made it 750 times more powerful than the A[illegible] in his Book 'Proving Ground [illegible] greater yield than calculated." Other factors [illegible] danger from this detonation are outlined [illegible] hearings.

---

*Although the coordinates were not given in Proving Ground, a rough extrapolation based on the proportions of the latitude and long[illegible] boundaries of the former zone would give a new danger zone which include[illegible] Ujelang, Utirik, and Likiep. Assuming this is true, and the zone [illegible] same size until the end of testing, it means that the returned Rongelapes[illegible] as well as the people on the other inhabited [illegible] the danger zone during subsequent tests.

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Dr. Graves: "In the case of [illegible] try to avoid a situation where the device [illegible] because we don't want to have this very heavy [illegible] to avoid this situation if we can. We try [illegible] as high as we can, or we use [illegible] balloons for holding the device up. All of this [illegible] of dirt into the cloud itself."

While Dr. Graves [illegible] site, the implications of his remarks [illegible] passage from "The Effects of Nuclear [illegible]":

"Although the [illegible] extensive local fallout [illegible] that the phenomenon was not necessarily [illegible] thermonuclear explosions. It is very pr[illegible] been detonated at an appreciable di[illegible] that the large fireball did not touch [illegible] early fallout would have been of insign[illegible]" [illegible]

[illegible]

Sayings about [illegible] the inability of human beings to tell [illegible]. For the average person, what kind of weather [illegible] comfort or discomfort. For those people [illegible], the whims of weather and wind conditions [illegible]--they could produce disease and death [illegible] atomic weapons test. For this reason, weather [illegible] directions and velocities was of prime importance [illegible] the Congressional hearings by Dr. [illegible] who was test director for the Ne[illegible].

Dr. Graves: [illegible] plan whereby the total amount of fal[illegible] come to face with the problem of car[illegible] the fallout that does occur will not hurt [illegible] have assembled in Nevada as competent a me[illegible] anywhere. This meteorological group tel[illegible] such that we

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> can control where [illegible] will [illegible]
>
> "Consequently, [illegible] siderable hand to this group of meteorologi[illegible] have [illegible] ma, make us mad because they make us postpone [illegible] keep [illegible] schedule. They tell us the weather with great [illegible] that the weather will not give us a fallo[illegible] that [illegible]."

Unfortunately for [illegible] the meteorologists of the Pacific Proving [illegible] things so that they could "control where the [illegible] particularly ironic in the face of met[illegible] and Bravo shots, as previously mentioned. [illegible] direction above Enewetok was known, with [illegible] to 105,000 feet. Included in the [illegible] feet which almost totally were heading tow[illegible] at [illegible],000 feet and winds above 105,000 feet were [illegible] however, the winds in the space above Bikini were [illegible] easterly direction. For 35 percent of the sp[illegible] westward, away from Rongelap. The top remain[illegible] 120,000 feet, the expected height limit of [illegible] may be granted that such weather reports [illegible] it seems somehow incredible that the deci[illegible] the assumption that either the unknown winds [illegible] direction (as they were at Enewetok) or that [illegible] direction, they would change by the time the device w[illegible] credibility of this decision is that if [illegible] of Bikini, then firing of the device when [illegible] heading in that direction can only be [illegible] serious error in judgment which only the [illegible] disaster.

These events combine[illegible] "The Effects of Nuclear Weapons," a Defense [illegible]

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"11.149 Valua[illegible] development and healing of beta burn[illegible] Marshall Islanders who were expos[illegible] Although the fallout was observed [illegible] powder, [illegible] particles of lime (calcium oxide [illegible] from [illegible] coral (calcium carbonate) [illegible] not realize its significance. (emphasis add[illegible])

[illegible]

A further [illegible] the fact that according to reports the extent [illegible] known, only the 28 Americans on Ronge[illegible] the fallout. Two days after the explosion, the [illegible] after the detonation, the people of [illegible] argued that attempting to pick up people from [illegible] immediately after the detonation might have exposed [illegible] radioactivity, it can also be argued that [illegible] and could have been avoided. Decontami[illegible] serious exposure.

[illegible]

Notwithstandi[illegible] to understand why it was that the people [illegible] evacuated at the same time, one day after, whe[illegible] especially valid question since the Americans [illegible] because of certain factors. In the [illegible]

"Most of the [illegible] the danger of the fallout, took shelter [illegible] changed clothes and consequently [illegible] (p. 35)

Dr. Dunning, [illegible] described the situation for the [illegible]

"The Marshall[illegible] most of them were out-of-doors [illegible] during the two-day exposure [illegible], therefore, there were optimal [illegible] damage.[5]

[illegible]

These later [illegible] contrast to the press release [illegible] after the event, and before the Lucky [illegible] it, apparently the Commission [illegible]

"During the course [illegible] the Marshall Islands, 28 United States personnel [illegible] transported from neighboring atolls to Kwajalein [illegible] according [illegible] as a precautionary measure. These individuals were [illegible] exposed to [illegible] radioactivity. There were no burns. [illegible] completion of the atomic tests, the natives [illegible] (Ibid., p. 168)

The Japanese, however, [illegible] discovering that the Lucky Dragon's crew [illegible] lethal doses of radioactivity. [illegible] vast areas of the Pacific had been [illegible] that possibility caused tremendous [illegible] Japan's fishing industry. Again, the [illegible] ed in a statement released on March 24, [illegible]

". . . the warm currents [illegible] Islands area . . . move slowly (less than [illegible]). [illegible] radioactivity collected in test area would become harmless [illegible] and completely undetectable within [illegible])

The Japanese, despite [illegible] scientific survey team which would cruise aboard [illegible] around the test zone. American scientists [illegible] inexplicably, when they arrived in Tokyo, [illegible] days earlier than scheduled, leaving [illegible] Japanese scientists differed somewhat from the [illegible] Roger Revelle, Director of the Scripps [illegible] Committee:

"This area [illegible] investigated by Japanese oceanographers [illegible] Castle test. They got figures [illegible] 70,000, 20,000 disintegrations [illegible] distance of [illegible] for seawater [illegible])

[illegible]

In discussing [illegible] Committee would like to state [illegible] examinations and the reports of the [illegible] Committee that the examinations, [illegible] Marshallese in terms of both general health [illegible] disease, also provide a con[illegible] effects of a fallout field on human [illegible] for the persons affected. By saying [illegible] the known advantages [illegible] case histories for patients. What [illegible] they are written and presented are of primary [illegible] should such an event as happened [illegible] The reports themselves are of [illegible] they are of no value to the Marsh[illegible]

[illegible]

Like the reports [illegible] Marshallese and the radioactivity [illegible] the reports have tended to minimize [illegible] dosages seem "too small" to have [illegible] statistical signif[illegible] over a long period of time, and expos[illegible] than near lethal. It is to the credit o[illegible] disproved most of these minimizing state[illegible] to indicate a conservative, mind[illegible] this as a mere game of seman[illegible] to say that it is not particularly [illegible] and their connotations, but [illegible] of mind which they imply. The Committee [illegible] two possible reasons for this tendency, [illegible]

[illegible]

As mentioned before, [illegible] events or facts in order to be reassuring, [illegible] of the news media seizing upon the [illegible] event. Most "newsworthy" events are [illegible] people are not interested in what [illegible] Bravo event occurred at a time when the [illegible] ment of nuclear weapons and their psych[illegible] World War II "cold war." The event [illegible] caused in Japan most certainly had [illegible] Whether it is justified or not, [illegible] "reassuring." It is also easy to see [illegible] the Marshallese also tended to "minimize" the [illegible] that the first major report dealing with [illegible] Atomic Energy Commission. This report set the tone [illegible]

While most of [illegible] organization which appears [illegible] Commission, it is a fact that the annual [illegible] financed through a contractual ar[illegible] it would be refreshing to find such [illegible] dealing with radioactivity set by the Com[illegible] on which the AEC is well represented, [illegible] accepted guidelines (MPC for example) [illegible] in the reports any doubt as to [illegible], or the appropriateness of returning t[illegible] in that area ended. It is presumed [illegible] terms of the contract are of a like kind [illegible] the contract. This is not to say that th[illegible] as to force that institution [illegible] the AEC's views or positions--however [illegible] that the contract might be shift[illegible] not a terribly good one, it might [illegible] Datsuns does so because he lik[illegible], however, he drove around in a Volkswa[illegible] the product he sold and the Datsun [illegible].

Specific Aspects

As mentioned before, [illegible] of purpose for the examinations. [illegible] out of the nature and significan[illegible] the Marshallese. Most human beings [illegible] which govern their behavior. One way [illegible] "approach-avoidance"

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concept in elemen[illegible] with [illegible] situation and we simultaneo[illegible] situation, but at the same time we have str[illegible] the situation. For a [illegible] these impulses is stronger than the [illegible] the other course of action. By mean[illegible] two motives, or influences appare[illegible] These influences might be characte[illegible] medicine, the doctors were inte[illegible] as possible for any illness or dys[illegible] natural scientific curios[illegible] effects to documen[illegible] processes--before administering treatmen[illegible] duty and scientific curiosity were perhaps [illegible] the immediate treatment given concerning [illegible] and also with regard to the grow[illegible] several years.

Concerning the [illegible]

"2.31 Clinic[illegible]

"Between the 33rd a[illegible] percent of the individuals i[illegible] level of 1000 per cubi[illegible] millimet[illegible] below. [illegible] observed during this period was 70[illegible] interval the advisability of giving prophyla[illegible] individuals was carefully cons[illegible] however, [illegible] therapy <u>was not instituted</u> for the [illegible] reasons:

(1) All individu[illegible] observation, so that infection would be [illegible]

(2) Premature [illegible] <u>obscured indications for treatme</u>[illegible] development of drug resistant [illegible] infection.

(3) There <u>was [illegible] knowle</u>[illegible] granulocytes required by man [illegible] granulocytopenia." (emphasis added)

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The Committee [illegible] concerning this passage, but at the [illegible] response had not been received.

It is hoped that [illegible] report of the Committee.

To the layman, [illegible] appearing to be unnecessary and therefore somewhat [illegible] contradictory. If there was no accurate knowledge [illegible] required by man to prevent infection, [illegible] treatment would have led to recovery, despite [illegible] continuous medical observation? The [illegible] might have resulted in the patients [illegible] statement that can be made about any prophylactic [illegible] "obscured indications for treatment" [illegible] particular effect or for other effects? [illegible] treatment for that effect? It would seem [illegible] treatment at that point might have prevented [illegible] other words, if an antibiotic were administered [illegible] to help raise the cell count level at that point [illegible] might be prevented from occurring. This [illegible] the comforting fact that the people were well-[illegible] However, it would appear on the surface, that here [illegible] was somewhat stronger than that of medical [illegible] of the patient.

The Committee feels [illegible] relatively early administration of Thyroid [illegible] would have corrected the retardation of growth [illegible] Rongelap children, especially cases three [illegible] what appeared to be growth retardation, yet the [illegible] retardation for more than [illegible] that the reports consistently [illegible] latter two cases were [illegible] birth dates, the [illegible] that the administration [illegible] even if it had [illegible] had to wait until the appearance [illegible] the value of administering [illegible].

Another matter [illegible] in the three-year report which [illegible]:

> "Eight [illegible] in a study of immunological [illegible] primary stimulus of tetanus toxoid [illegible]. Sera were obtained just prior to the [illegible] injection [illegible] six days later. Subsequently, [illegible] the sera were obtained for the two [illegible] described." (p. 6)

In other words, [illegible] with a supposedly safe amount of [illegible] just before a second injection. [illegible] the first and second injections was an [illegible] to combat infections [illegible] especially concerned about is whether the [illegible] whether or not they did, if there was any [illegible] there was no further danger, the [illegible] study was to the people involved. [illegible] for greater medical care of the people, [illegible] were poor, which would leave them open [illegible] would normally be a simple infection. However, [illegible] of people involved is too small for [illegible], it is curious why the test either wa[illegible] statistical singificance) or [illegible] significance). To all intents and pu[illegible] what it was described to be. [illegible]

[illegible]

Concerning the [illegible] (20 cases, four with m[illegible] with three particular areas o[illegible]

One, it finds [illegible] involving this gland did not [illegible] children. Many times, especially [illegible] such as Sr^{90}, mention is made [illegible] from that estimated for adult[illegible]. How was it that the many experts wh[illegible] accounted for this factor unt[illegible] development of nodules in 1963 and 1964. True, [illegible] scientists, despite the rigors [illegible] subject to errors; however the [illegible] such a simple fact was overlooked [illegible] doctors were faced with a development [illegible] assumptions.

By the same token, [illegible] that inconsistent findin[illegible] data. Mention was made of [illegible] or the findings were attri[illegible] hindsight point of view, it would [illegible] of iodine and considering the [illegible] investigated with more detail the reasons [illegible] appeared to be inconsistent with [illegible] that unusually high levels may have [illegible] that thyroid function was not [illegible] again baseline information was lacking [illegible] of the studies both to the scientific [illegible] it appears that a certain amount of [illegible] in the future prevailed, where prudence [illegible].

Finally, in the [illegible] with the thyroid, the Committee is extremely [illegible] parathyroid gland was accidentally [illegible] of this fact. Secondly, the Committee [illegible] had any connection with future thyroid operations [illegible] United States as opposed to the Naval [illegible] Committee's query will be answered by Dr. Conard.

[illegible]

The Committee [illegible] whether or not the incidence of [illegible] infants, there was no intensive effort to [illegible] to determine whether these deliveries [illegible]. Again, the question of statistical [illegible] however, the Committee is of the opinion that [illegible] this situation should have had closer attention [illegible] there are certain kinds of effects of radiation [illegible] miscarriages; examination of such [illegible] radiation, but it would then have been [illegible] been used to indicate that there [illegible].

As to fertility, [illegible] that a Japanese doctor working with [illegible] statistical significance should come up with [illegible] detailed [illegible] sperm tozoa production after irradiation [illegible] the AEC-Brookhaven teams apparently felt [illegible] with the irradiated Marshallese and Americans. [illegible] consideration of the private and personal [illegible] connected with such studies, it is [illegible] discussed except generally in terms of [illegible] in terms of statistics

[illegible]

The circumstance [illegible] the detonation of "Bravo" on a clear March morning in 1954 [illegible] illustrative of how circumstance, time, error and [illegible] historical event: in this case a trag[illegible]

The location of the testing [illegible] major factor, in that its placement provided [illegible] the detonation of large yield weapons, and the [illegible] go wrong. It was in a sense equivalent to the Nevada site, which [illegible] same flexibility and safety for smaller yield weapons. Unfortunately, [illegible] Nevada, there was no Public Relations or information program, [illegible] dealing with the people. In Nevada, tests were [illegible] amount of local fallout. In the Marshalls, however, the [illegible] bomb explosion, to that time, was detonated [illegible] boasted, they could practically con[illegible] someone made the decision to go with [illegible] wind shift was not "unexpected," [illegible] upper level of wind. Furthermore, the test danger [illegible] eastern boundary to

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save convenience [illegible] judgment was also responsible for [illegible]," and poor judgment resulted in the [illegible] days, and the Utirikese for three [illegible] only one day. Whether these actions and [illegible] judgment, miscalculation, and faulty assumption, [illegible] in a conscious and [illegible] to the reader of this report.

As to the medical [illegible] human error and faulty assumption [illegible] examinations and conservative and [illegible] both [illegible] seriousness of the original exposure [illegible] findings which are related to irradiation. [illegible] violation of the general principle [illegible] generally understood, supposed to serve [illegible] the care of a physician, there [illegible] which did not necessarily prove [illegible] the [illegible] shown in the three-year report: [illegible]

> "The group of [illegible] Marshallese [illegible] most valuable source of data on human [illegible] from all the possible modes of exposure [illegible] though [illegible] radioactive contamination of Rongelap Island [illegible] perfectly [illegible] human habitation, the levels of activity are higher than [illegible] other inhabited locations in the world. [illegible] will afford most valuable ecological [illegible]

and in the four-year [illegible]

> "The habitation of [illegible] affords the opportunity for a most valuable [illegible] Since only small amounts of radio[illegible] necessary [illegible] studies, the various radionuclides present [illegible] from the soil through the food and into the [illegible] organ distributions, biological half-[illegible]"

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It is also the [illegible] of the Committee [illegible] of the uniqueness of the experiences of [illegible] tendency, perhaps more unconscious [illegible] tendency to let scientific curiosity at times [illegible] the Committee would also like to [illegible] always included the Rongelapese. [illegible] and members of the teams themselves [illegible] for comparison purposes. Even Dr. [illegible] to be used as a "guinea pig" as disclosed [illegible] twelve-year report (p. 159):

> "Since facilities [illegible] metabolic [illegible] were not available on Rongelap Island [illegible] of us (R.A.C.) [illegible] several native food items (pandanus fruit [illegible] meat [illegible] to Brookhaven and consumed them under controlled conditions. [illegible] and fecal specimens were collected and whole-body counting [illegible] were made over a period of 180 days. The [illegible] seven-day period was twenty times [illegible] sixty times higher than normal."

In conclusion, [illegible] by the very nature of their experiences [illegible] of the unique set of circumstances surrounding [illegible] groups, the people of Rongelap and [illegible] that no other group of people in the world have [illegible] differing kinds of radioactivity, and [illegible] group of people [illegible] have been exposed to the same amounts [illegible] no other group in the world has been [illegible] of such effects. Again, whether these people [illegible] extended study of the effects of fallout [illegible] only of secondary importance, or whether [illegible] a group of people who are [illegible] humanitarian aims is a decision the Committee [illegible] In closing, the

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Committee wishe[illegible] and Utirikese are by their experience, [illegible] and thus deserve no less than extraordinary care, [illegible].

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[illegible] CONSIDERATIONS

[illegible]

Today, [illegible] years after [illegible] there are few outward signs of [illegible] the people [illegible] especially those who were on Rongelap [illegible] Rongelap, only [illegible] was examined [illegible]. This is in stark contrast [illegible] by the people of Hiroshima [illegible] hospitals, elderly [illegible] lesions, or gross [illegible] today, in the Marshalls, it [illegible] radioactive fallout were not [illegible] thyroid operations which have [illegible]. Some of these removed thyroid [illegible] lesions and while those [illegible] for other nodules or cancer, [illegible] developments may occur. [illegible] that while late, administration [illegible] persons to return to [illegible], to the extent they can be [illegible] it is possible that radiation [illegible] mentioned lack of [illegible] of adequate examination of the [illegible] expressed the consternation [illegible] of immediate treatment and [illegible] that, as evidenced by the repo[illegible] the examinations are thoroug[illegible] an[illegible] human manner.

Especially [illegible] must have been to the Brookha[illegible] fatal case of acute myelo[illegible] that the person responsible for [illegible] development the attention [illegible] involved. The Committee [illegible] Tuesday, November 21, 1972, ed[illegible] writer Walter Sullivan, w[illegible] death [illegible] said in part:

> "To prepare [illegible] Japanese physicians and [illegible] from [illegible] include[illegible] in the party and [illegible] apparently [illegible] Had the visit [illegible] earlier, [illegible] possible that the leuker[illegible] advanced [illegible]

The phrase [illegible] that the annual survey had been [illegible] previously men- tioned. While [illegible] might have been accomplishe[illegible] at [illegible] understanding of the Comm ttee [illegible] ultimately fatal, and that acute [illegible] forms. In addition, the [illegible] record that if the period of [illegible] and remission of leukemia or [illegible] consideration should be given to havi[illegible] than just a once-a-year basis.

One aspect of the [illegible] of this report which has not [illegible] public concerns the psychological [illegible] from nuclear weapons. Dr. [illegible] to the Trust Terri- tory [illegible] for bringing this area of [illegible]. Although his original intention [illegible] connection with com[illegible] valid and interesting [illegible] to Japan and the Marshall Islands [illegible].

In some [illegible] the Japanese exposed to the [illegible] and the Ronge- lapese and [illegible] figures dif- fer, it is [illegible] 300,000 people died in Japan [illegible] were literally vaporized [illegible] others died from heat [illegible] flying debris, [illegible] fires that spread through [illegible] from lack of adequate medical care, [illegible] the people in the Marshalls were [illegible] to a snowlike or mistlike [illegible]. Despite these differences, [illegible] these cases: the radioactivity [illegible] upon those exposed. Today, [illegible] effects of

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the bomb [illegible] in the Marshall Islands, [illegible] apparently caused by H-bomb fall[illegible] years [illegible].

In [illegible] to meet with [illegible] A-bomb survivor and director of [illegible] mentioned the unea[illegible] like himself felt about [illegible] shared by "all survivor[illegible]".

Later, [illegible] the people of Rongelap and Utir[illegible] whether or not the people [illegible] exposure. The answer at meetings [illegible] we have a cold, or some [illegible]."

The [illegible] given by the Lucky Dragon surviv[illegible] [illegible]ing in Tokyo with Dr. Kumatori, [illegible] his experience. He was firs[illegible] examinations he submitted t[illegible] Was his mind at ease? [illegible], as translated, were, "Psychol[illegible] satisfied." He was then ask[illegible] illness. Did he think of the [illegible] "Immediately."

[illegible] long term effects of [illegible] and Utirikese is that of [illegible] future. It is the un-

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known, the [illegible] that is just as real to them a[illegible] [illegible]patriation. In the three [illegible] the "psychic effects' of [illegible] the differences between [illegible] "relative calm and rapid ad[illegible] [illegible]d in adapting to their new [illegible] [illegible]luded that. "There was little [illegible] radiation exposure. It would [illegible] Marshallese that there has be[illegible] [illegible]ffect of this momentous event."

The Comm[illegible] [illegible] of the Marshallese cannot and does [illegible], who, in addition to witnessing [illegible] also lost friends, relatives an[illegible] to the "uncertain feeling," [illegible] the Committee feels that the [illegible] amount of anxiety, [illegible] cause of the uneasiness abo[illegible] will be discussed [illegible]

[illegible] Com[illegible] Culture

[illegible] the annual examinations co[illegible] report indicated that the [illegible] little concern about their ex[illegible] two [illegible] would seem to be in

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agreement, [illegible] difficult and perplexing [illegible] facilities existing for the [illegible] care of [illegible], which the people can easily reach [illegible] Japan, the Atomic Bomb Casualty Commission [illegible] reports in both Japanese and the [illegible] staff of these facilities [illegible] the people receive an extens[illegible] examination [illegible] Americans assisted by a Micronesian [illegible] their examinations until the [illegible].

Originally, [illegible] what was being done for [illegible] explain that the bomb had affected [illegible] the skin ulcerations and [illegible], nausea, and diarrhea. However, [illegible] the people became perplexed. Every [illegible] tell them that they are healthy, [illegible] if everything is still at [illegible] next year the process is repeated. W[illegible] are healthy, does the team [illegible] year? [illegible] a small indication of the vast [illegible] understanding [illegible] involved as to just what did happen [illegible] consequences of their exposure ar[illegible].

While the Committee [illegible] radiation, as applied to physi[illegible] sophisticated subject which wo[illegible] translate into terms w[illegible] Rongelapese, it seems that [illegible] order [illegible] resolve not only [illegible] of the people, but [illegible] examinations and of the [illegible].

[illegible] did not understand anything [illegible] the exposure, the possible [illegible] on their environment. [illegible] why the team did not [illegible] reported reply was that even [illegible], would have difficulty understanding what [illegible]. This may be true, if it were ex[illegible] about the exposure and if [illegible] visit. However, the Committee [illegible] possible and should be carried [illegible], pictures, analogie[illegible] to convey to the people [illegible]. It is, after all, a widespread [illegible] to explain to the patient [illegible] patient's mind. Unfortunately, [illegible] Rongelapese. It has effectively [illegible] a teenager whose parents [illegible] to have the son or daughter [illegible], hearsay, and innuendo. [illegible] produce a healthy state of mind. [illegible] Rongelapese, this has been especially [illegible] the Utrikese, and those Rongelap [illegible] control, or comparison groups.

This fact [illegible] the public meeting at Utirik [illegible] with the people of Rongelap [illegible] nearly two decades, these people would [illegible] exposure and how it differed [illegible] not the case. This uncertainty, despite the [illegible] of the team that the people are [illegible] are operated on for thyroid nodules [illegible] the people of the islands. [illegible] can be roughly grouped into three categories:

1. Rongelapese [illegible] the visible effects of their exposure, [illegible] seem [illegible] understanding in certain areas [illegible] group of people who generally express [illegible] medical attention ranging from having [illegible] stationed [illegible] to having more frequent medical examinations. [illegible] people still need to have explained [illegible] their level of understanding the [illegible] past and possible effects. [illegible] the seven year report which [illegible] that some of the people at times [illegible] of the fact they

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had been [illegible] evidenced by

statement [illegible] to the effect

that some [illegible] were [illegible] regularly for the

rest of their [illegible] this medicine.

The Committee [illegible] and very dis-

turbed at [illegible] lack of [illegible] by the people concerning

prescribed [illegible] future health and

welfare. [illegible] which should have been

corrected long [illegible] which [illegible] allowed to exist in

the future.

[illegible] there appear

to exist [illegible] examinations should

be discontinued [illegible] they are healthy

and were not [illegible] were the Ronge-

lapese, [illegible] of the Ronge-

lapese since [illegible] for the team

to continue [illegible] by several in-

fluences. [illegible] were compensated by

the United [illegible]

subject to [illegible] is the know-

ledge that [illegible], were removed

from the [illegible] Rongelapese

who [illegible]

they might [illegible]

compounded [illegible] taken to the

U.S. for [illegible] found to

[illegible]

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contain malignancy, [illegible] would suggest that this single [illegible] only "normal" case of thyroid [illegible] to believe this while [illegible] Again, misunderstanding [illegible] explanations persists in the [illegible] the general uncertainty about [illegible]

3. The unex[illegible] of the necessities in the exam[illegible] team is to have a group [illegible] and sex but not exposed to [illegible] These people represent what is kn[illegible] "control" or "comparison" group. In laborat[illegible] pigs or flies there are usually [illegible] chemical or other influencing [illegible] group is not. By studying both [illegible] effects the influencing agent [illegible] In a similar fashion, those [illegible] examined and give blood and urine samples, [illegible] use in comparison with the [illegible] which was the most vocal in express[illegible] They indicated that they resented [illegible] if such examinations were to be c[illegible] compensated for them. While the Committee [illegible] its major concern is that the people [illegible] control group is helpful to [illegible] to a lack of

information--a [illegible]

[illegible]

As it will be [illegible] that perhaps the team had failed [illegible] special situation and the certain [illegible] they must accept. The Committee [illegible] reasons.

First, [illegible] event involved a great number [illegible] the later examinations in [illegible] (and later Commander) in the Medica[illegible] the Japanese military was undoubtedly [illegible] and Utirikese and the examinatio[illegible] of course in the beginning and as a matt[illegible] the emphasis gradually shifted from [illegible] in the teams. Thus, while D[illegible] considerate man, the examinations [illegible] in a military manner ("they [illegible] carried out with an almost mil[illegible]

Second, the [illegible] coupled with their annual occurar[illegible] with the people. Also, it shoul[illegible] may not be ready for [illegible] the exam has taken place.

Lastly, [illegible] cultural differences [illegible] communication.

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While this [illegible] of this report, it is pertinent [illegible] uninformed or unaware non-Micronesians [illegible] with [illegible] described in this report. [illegible] generally practiced Micronesian [illegible] of [illegible] in general, not to give offense [illegible] directly [illegible] situation. This results [illegible] Micronesian [illegible] give a positive answer to a question [illegible] the questioner; or will avoid [illegible] concerning a problem either to avoid [illegible] that the problem will resolve itself [illegible] non-Micronesians, especially Americans, [illegible] Micronesians already indicate the [illegible] like "Isn't it a nice day?", or [illegible] invariably met with an affirmative, "Yes," [illegible] feelings of the person being [illegible] not to give offense by contradicting [illegible] of [illegible] customary to express [illegible] directly concerning a person or a [illegible] the activity ceased. Thus, [illegible] with Micronesians may leave with [illegible] with the people, that he was [illegible] and accepted. He may be [illegible] are actually in opposition to [illegible] or the manner in which he [illegible] it may appear that the people are [illegible] behind his back"

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or have "sta [illegible] the [illegible] nonsense.
It results f[illegible] another
person's cultural [illegible] like direct
answers. [illegible] appreciate
behavior [illegible] However,
these differ[illegible] problems in
communicatio[illegible]
the case [illegible] Rongelap and
Utirik, and [illegible] a [illegible] problems in com-
munication a[illegible] to be
an important [illegible] the next
section unde[illegible].

RECOMMENDATIONS

General Statement

At the [illegible] emphatically one point concerning [illegible] the recommendations [illegible] United States of America, either through [illegible] of Defense [illegible] instrumentalities, the Atomic Energy [illegible] of the Interior and [illegible] instrumentality, [illegible] directly responsible [illegible] injury and suffering, disease and possible [illegible] by [illegible] exposed to the fallout from the March 1, [illegible], whether or not any fiduciary [illegible] the United States of America is also directly responsible [illegible] bearing any and all burdens connected with [illegible] that time and until lack of the [illegible].

Several [illegible] the [illegible] Committee, [illegible], through written communications [illegible] verbal [illegible] inquired of the opinions of certain [illegible] with the annual surveys that the Marshallese [illegible] for the examinations since similar [illegible] in the neighborhood [illegible] ancillary argument posed by one [illegible], was that the Congress of Micronesia [illegible] the [illegible] surveys estimated to cost from [illegible] to state that it [illegible]. Did the Rongelapese [illegible] to conduct nuclear tests

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in their [illegible]. Did the Rongelapese [illegible] ask for the bomb to be detonated [illegible]? Did they [illegible] skin burns, thyroid nodules and cancer [illegible] as a gift from the United States? Did the [illegible] ask to suffer [illegible] for more than ten years before receiving [illegible]? Did [illegible] to be deprived of their ancestral [illegible] to have [illegible]? Did these people ask to inherit [illegible] for themselves and their children? [illegible] Committee wishes to make known its feeling [illegible] the United States of America is primarily responsible for [illegible] shared equally on a moral level with [illegible] Islands Government, if it is, in fact, possible to separate the United States of America from the Trust Territory [illegible], the Committee is of the opinion that [illegible] money [illegible] by the Congress should be spent for the [illegible] and welfare of [illegible] and not one penny should be [illegible] for the purposes of funding [illegible] and instrumentalities of the United States Government.

The Committee [illegible] to the nature and intent of its [illegible]. Through its [illegible] investigations the Committee has [illegible] such as that experienced by the Rongelapese [illegible] it is a sad but true fact that [illegible] the condition of the people [illegible]. Some effects may not develop for [illegible] forty years [illegible]. Dr. [illegible] commented at [illegible] 30 year ball game."

Other [illegible] generation. Thus the Committee [illegible] extent of which is to provide for care [illegible].

Secondly, [illegible] reports issued from the Congress [illegible] were not carried out or they were [illegible] on the part of the executive branch [illegible] in mind, the Committee has made [illegible] and practical; that should meet [illegible] concerned, and which can be imple[illegible] to the benefit of the people [illegible] that its life be extended [illegible] the action taken or [illegible] are carried out to the most [illegible] allow the Committee [illegible] more thoroughly before presenting [illegible].

Finally, [illegible] Committee and this report would [illegible] persons, both Americans and Micronesians [illegible]. The Committee finds the AEC [illegible] to remain in virtual ignorance [illegible] notes that many Marshallese [illegible] these examinations for nearly [illegible] of the complaints [illegible] took the initiative [illegible] also expresses its concern that [illegible] has apparently never taken positive action regarding this matter which is, admittedly, a situation unique to the Marshall Islands District. This statement, however, should not be construed to imply that district problems should only be handled at the district level. The Committee is only too happy to carry out the requirement of its mandate where local remedy has failed to rectify a local problem. The Committee also wishes to note its displeasure with actions of certain non-Micronesians at the Headquarters Administration level. Specifically, the Committee notes that the expulsion of the Japanese survey team by the Trust Territory Administration in December of 1972 may have deliberately resulted in the delay of the annual survey scheduled three months later. While [illegible] the possible [illegible] may have been a consideration, the Committee [illegible] the people of Rongelap and Utirik, but [illegible] and a devastating experience to Mr. [illegible], one of the [illegible] impeccable credentials in the field of [illegible] effects on the thyroid. The Committee is also disappointed to note [illegible] allegations made by the Trust Territory Administration in connection with the aborted March, 1973, survey. The one Japanese doctor who did arrive in time to join the team in March was an "unknown," no one in Japan, including such people as Dr. [illegible], had ever heard of him. This doctor himself told members of the Committee that he had little background in thyroid and radiation [illegible] that he was not particularly interested in the [illegible] problem. Rather, he was interested in [illegible] something about the [illegible]. The executive branch [illegible] charged that Dr. [illegible] was persuaded by [illegible] "leftist" [illegible] on the March survey. The Committee has questioned [illegible] and he has [illegible] that during his meeting with [illegible], he tried to [illegible] to go on the tri[illegible] and did not discourage him. These points made, the Committee would also like to commend the executive branch, including High Commissioner [illegible], Deputy High Commissioner Peter T. Coleman, Dr. William Peck and Dr. Masao Kumangai for their excellent cooperation, help and assistance to the Committee [illegible].

The Committee would like to make one final point before proceeding to the recommendations, which has affected [illegible] the issue connected with the people of Rongelap and Utirik. [illegible] often heard complaint or charge by persons in the Administration or persons connected with the annual surveys that it is unfortunate that political issues are being injected into what is a purely medical and public health matter. The Committee does not agree with this attitude. The Committee would like to remind those who hold this attitude of the origins and connotations of the word "politics." The original Greek term was [illegible], and it referred to [illegible] the [illegible] relationships of the citizens of [illegible] and the enforcement of laws and regulations for their [illegible]. A political action is any action which takes place in the public [illegible] of the polis. Thus, virtually any action is a political action which affects or influences other persons. In a more general sense then, in both [illegible] definition and because of other considerations, the [illegible] political actions [illegible] to the special [illegible] to the elected representatives of the people [illegible]. Their actions have been committed in the interest of [illegible] with the intent to [illegible], their health and welfare [illegible] actions of the Administration. In the past, however, [illegible] more concerned with the image of the [illegible] than they are with the welfare of the people involved. The Committee notes that, as with the [illegible], the Administration [illegible], in the past has reacted more slowly [illegible] certain [illegible], [illegible] about [illegible] problems [illegible] with those who raised the [illegible] and trying to find out [illegible] how the [illegible] could be [illegible]. [illegible], the Committee is pleased to note the [illegible] cooperation of the executive branch with this committee of the [illegible] which has [illegible], in part, resulting from a greater understanding by the executive branch of the perplexing problems and difficulties [illegible] the people of [illegible]. The Committee is happy to note this [illegible] that [illegible] increasing cooperation between the executive and legislative branches of the Trust Territory [illegible] the subject matter of this report, [illegible] other considerations affecting the interests and well-being of the people of Micronesia.

RECOMMENDATIONS

United Nations

The Committee recommends that the United Nations Scientific Committee on Radiation [illegible] the annual report of the [illegible] of surveys on the Marshallese, Americans, and Japanese exposed to the March 1, 1954, fallout from the "Bravo" test and that scientific meetings on the subject be held, as suggested by Dr. [illegible].

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Atomic Energy Commission

1. The Committee believes that because of psychological implications, new thyroid nodule findings, and the [illegible] of leukemia, it strongly recommends that the [illegible] Dr. Knudsen-- on a one or two year contract basis, to visit the Rongelapese and Utirikese during the [illegible] the yearly [illegible]. The Committee has been advised that finding [illegible] to do this is very difficult. The Committee believes that [illegible] consideration, the [illegible] Surgeon General of the United States [illegible] the U.S. Public Health Service has about 40,000 [illegible], 12,000 of [illegible] professional [illegible]. Also, the Committee [illegible] believe that [illegible] should stand in the way of this proposal [illegible] several times the [illegible] for the [illegible] of the Pacific Islands. Arrangements for [illegible] can be made through the Department of the Interior and the [illegible] Government.

As an alternate proposal, should the [illegible] be impossible to fulfill--which [illegible]--the Committee then would favor the recommendation [illegible] to visit the island regularly, the [illegible] of which would [illegible] by the [illegible].

2. [illegible] recommended by the Committee that the Atomic Energy Commission provide funds in addition to [illegible] for [illegible] hospital facilities [illegible] for the purpose of [illegible] additional [illegible] providing [illegible] to the examination of the Rongelapese and Utirikese.

The Committee further recommends that the Atomic Energy Commission increase its funding [illegible] Brookhaven National

Laborator[illegible] so that [illegible] of the recommendations made by this [illegible] studies as he may feel [illegible] to the people [illegible].

[illegible]

In order [illegible] that the BNL [illegible] the health of the people but is also [illegible] in these matters which [illegible]:

1. Prior [illegible] of the Marshall Islands [illegible] of the people of the islands [illegible].

2. Permission [illegible] should be asked in order [illegible] results from the last visit [illegible].

3. During [illegible] the people if they would like to have [illegible] want to have the party, they should [illegible] (like fish and breadfruit). [illegible] such food as hot dog [illegible] for the people to prepare [illegible].

4. The Committee [illegible] give serious and careful consideration [illegible], Kumatori, [illegible] what action it proposes to take [illegible].

5. The Committee [illegible] March, 19[illegible], survey, as an interim [illegible] each person examined

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a written [illegible] findings [illegible] 1972 and 1973. [illegible] publication [illegible] exposed, children of exposed [illegible] persons, which [illegible] will be ready by the March, 1974, [illegible] will be included in the [illegible].

[illegible]

1. The Committee recommends that the [illegible] construct, [illegible] with the people, a dispensary and [illegible] which will enable the [illegible] equipment and personnel and [illegible] to perform [illegible]. The cost of such shall be borne by the [illegible].

2. [illegible] with this [illegible], the Committee noted the deteriorating [illegible] at the [illegible] site. The Committee [illegible] after consultation with the [illegible] collapses and injures one of the inhabitants of the island.

3. In [illegible], it is recommended that the [illegible] Department of [illegible] formulate an education program which will [illegible] to the Rongelapese and Utirikese the [illegible] of their [illegible]. It should be thorough [illegible] to satisfy the curiosity of the people involved, [illegible] questions are not asked [illegible] every year. [illegible] include the fact which the Committee [illegible], various Japanese experts, [illegible] that such

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examinations [illegible] for [illegible] years [illegible]

4. [illegible] during the First Regular Session of the Fifth [illegible] will provide free transportation, [illegible] survivors, their descendants, [illegible] control group if they [illegible] Trust Territory, under this law, will [illegible] survivors and descendants, [illegible] at places available [illegible]

5. It is [illegible] that health aides or Rongelap [illegible] record keeping and certain [illegible] thyroid, for example). The [illegible] monthly report by radio to Majuro and [illegible] on every field trip vessel.

6. It is [illegible] Community Development encourage [illegible] fisheries, and handicraft [illegible]

Congress of Micronesia

1. It [illegible] the law introduced by [illegible] free transportation, housing, and per diem [illegible] control persons.

2. The [illegible] Special Joint Committee [illegible] Health Services, cause to be [illegible] Marshallese and English [illegible] as described in

[illegible]

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the public [illegible] In this case, the Committee [illegible] to the Department of Health Services the [illegible].

3. It [illegible] that the Congress [illegible] Joint Committee, [illegible] report and its recommendations in the Marshallese language and that [illegible] to the people of Rongelap and Utirik.

4. The Committee [illegible] the effects of radiation [illegible], that members of the Special [illegible] to assure that its recommend[illegible] the same time, it encourage[s] further [illegible] District Legislature [illegible] from the Joint Committee.

5. The Committee [illegible] in scope and that its life [illegible].

The People of Rongelap and Utirik

1. To the people of Rongelap and Utirik, the Special Joint Committee recommends that they form [illegible] composed of members of the regular island [illegible] council, [illegible] persons. This is a common practice [illegible] groups like these, the people [illegible] or agitate for correction of [illegible].

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ACKNOWLEDGMENTS

First [illegible] the Committee would [illegible] thanks and appreciation [illegible] and the people of Rongelap and [illegible] for their cooperation [illegible] assistance to the Committee. [illegible] and studied [illegible] recommendations will help [illegible] they [illegible] face the future, [illegible] government of Micronesia [illegible] of their special circumst[illegible]

The Committee [illegible] persons or agencies for their assistance [illegible] They are listed below in alphabetical [illegible] jurisdiction.

ENGLAND

The Committee [illegible] E. Eric Pochin, M.D., CBE, [illegible] Medical Research Council's Department [illegible] University College Hospital Medical [illegible] the Committee is grateful to the [illegible] Dr. Pochin to the Committee.

JAPAN

Tokyo

We are [illegible] Dr. David Brown, Second Secretary, [illegible] Embassy in Tokyo; and [illegible]

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Director of the International Affairs Division of the Ministry of Health and Welfare, Dr. [illegible] Kato, Head of the Planning Section of the Bureau of Public Health, Mr. [illegible], Legal Counsel, Mr. Watanabe, [illegible], and Mr. [illegible], Assistant Chief of the [illegible] Section of the Bureau within the Division of the Ministry.

The Committee would also like to make its special thanks to Dr. [illegible], who heads the Clinical Research Division of the Japanese National Institute for [illegible] for his acting as a consultant to the Committee, and is also grateful to Dr. [illegible], Director of the Institute for [illegible], [illegible] to participate in the Committee's work. The Committee is especially appreciative of having the opportunity to meet and talk with Dr. [illegible] of the Tokyo [illegible].

The Committee wishes to also make its appreciation to Mr. Warren Fisher, Mr. [illegible], Mr. [illegible], and Mrs. Yoshiko [illegible] of Pan American World Airways for their [illegible] helpful assistance to the Committee during its stay in Japan.

Hiroshima

The Committee would like to extend its sincere appreciation to the Honorable [illegible], Governor of Hiroshima Prefecture, and the Honorable [illegible], Mayor of Hiroshima City and to the Foreign Affairs Office, [illegible].

A note of appreciation is also [illegible] the staff of the Atomic Bomb Casualty Commission in Hiroshima including Dr. George B. Darling, Former Director, and the present Director [illegible] Dr. [illegible], Associate Director, and Dr. [illegible] [illegible], Tokyo, and [illegible].

Also in Hiroshima the Committee wishes to thank Dr. [illegible] Shimoto, Director of the Hiroshima [illegible] Hospital; Dr. [illegible] Mizuno, [illegible] Section Chief at the Hiroshima Survivors' Welfare Center; Dr. [illegible], Vice-Director of the Hiroshima A-bomb [illegible]; Dr. [illegible], Director of the Hiroshima Peace Memorial [illegible]; and Dr. [illegible], Director of the [illegible] Hospital.

Our [illegible] to Dr. [illegible], now Professor in the [illegible] Surgery Department of the Hiroshima University School of Medicine, for [illegible] as a consultant to the Committee. We are especially grateful [illegible] supervisor, Dr. [illegible], Director of the Research Institute for Nuclear Medicine and Biology of Hiroshima University, [illegible] to take time from [illegible] to [illegible] the Committee.

Nagasaki

The Committee would like to extend [illegible] to the Honorable Yoshitake [illegible], Mayor of Nagasaki [illegible] Deputy Mayor [illegible] for [illegible] kindness to the Committee, and for the assistance in arranging the Committee's [illegible]. We are also grateful to Dr. [illegible], [illegible] of the Department of Medicine, Atomic Bomb Casualty Commission; Dr. [illegible], Assistant Director of the Nagasaki Survivors' Welfare Center; to the Director of the Nagasaki [illegible] Hospital; the [illegible] A-bomb Survivors' Home;

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the [illegible], and to Dr. [illegible], Director of the Atomic [illegible] of the [illegible] University School of Medicine.

[illegible]

The Committee [illegible] the efforts of the Department of [illegible] Assistant Secretary for Territorial [illegible], and the [illegible] of the Interior [illegible] in coordinating the participation of the [illegible] with the Brookhaven [illegible].

Deserving [illegible], M.D., former Surgeon General of the United States Public Health Service for his offers of assistance to the Committee. [illegible] thanks are also due to Dr. William [illegible], [illegible] of Radiological Health [illegible] as consultant by Dr. Stein[illegible] and the U.S. Public Health Service [illegible] certain materials of the Committee translated [illegible] English, and for the [illegible] to the Committee through the [illegible] of Dr. [illegible].

The Committee [illegible] disappointment with two agencies of the [illegible] the Department of Defense [illegible] their apparent lack of cooperation [illegible]. While it should be stated [illegible] to some extent

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concerni[illegible]

of Utirik, [illegible] have [illegible]unaccountably

failed [illegible] and materials

in a letter [illegible] through the Office

of the High [illegible]

bureaucratic [illegible] of the agencies named

is not known. [illegible] for the

record [illegible] of [illegible]

and expre[illegible] the

future.

The Committee [illegible] to Dr. Cronkite

and Dr. R[illegible] Laboratory of Long

Island, New York [illegible]. We are

especially [illegible] to the Com-

mittee's [illegible] hospitality during

the September [illegible] are the medical

and support [illegible] Doctors Lowery,

Larsen, [illegible] William Scott,

Douglas Clare[illegible]

[illegible]

The Committ[illegible] Vice

President [illegible] University of Guam,

for his advice [illegible] in obtaining

material from [illegible] been invaluable

to the writing [illegible]

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[illegible]

Saipan

As noted [illegible] to High Commissione[illegible] Peter [illegible] Coleman, an[illegible] Special not[illegible] Health Services Dr. Ma[illegible] Committee [illegible] Japan as [illegible] assistance and advice [illegible] Mizutani, [illegible] the September [illegible] to the Committee was Mr. [illegible] of the Department of Res[illegible] thankful to Resource[illegible] Deputy Director [illegible] Mr. Bergin Weilbacher.

Marshall Islands [illegible]

The Committ[illegible] for their help and as[illegible] Marshall Islands District[illegible] District Administrat[illegible] with [illegible] tive Liaiso[illegible] Mr. Jack T[illegible] Administrat[illegible] Atoll Anier, the [illegible] Congress of

Micronesia; M[illegible], [illegible]; Mr. Jaleing;

Captain Willie M[illegible], Doctor of [illegible] during the

September survey [illegible], [illegible] Director of

Health Services; [illegible], [illegible] Laboratory Tech-

nician; Mr. Nelson [illegible], Laboratory Technician; Mr. [illegible];

Mr. Kimura Riklon, [illegible], and [illegible], Health Aide

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[illegible]

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Appendix D

Memorandum of Understanding [illegible] of Consultants

CONGRESS OF MICRONESIA
[illegible]

SPECIAL JOINT COMMITTEE
CONCERNING RONGELAP &
UTIRIK ATOLLS
(Public Law 4C-33)

Senator Olympio T. Borja, Chairman
Representative Timothy Olkeriil
Representative Hans Williander

September 2[illegible], 1972

Memorandum of Understanding

To : Medical Consultant to Special Joint Committee Concerning Rongelap and Utirik Atolls, Congress of Micronesia

From : Vice Chairman, Special Joint Committee

Subject : Submission of Report

As per the Special Joint Committee's Interim Report of May 16, 1972, the Committee would like to request that you submit a report to it discussing the following areas of [illegible]:

1. Method of examination of [illegible] at Rongelap and Utirik used by members of Brookhaven National Laboratory medical team including:

a. your (sic) indication as to whether you feel examination on a [illegible] basis is justified in an island situation; and

b. whether you feel the present examination methods are adequate to protect the health of those examined, including whether you feel certain tests should be added, or if certain tests being now conducted are not necessary; and

c. your discussion on the doctor-patient relationship between the team and the people being examined and also any observable problems in communication apparent to you; and

d. any other comment you [illegible] in this area.

2. Relative to the area of [illegible], the Committee requests that you:

a. comment based upon your [illegible] of this particular

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Memo

survey, whether you feel that type of treatment (surgery, medicine, etc.) is adequate [illegible], or is inadequate [illegible]; and

b. from your knowledge, [illegible] review of pertinent literature, [illegible] adequacy of past medical treatment.

Additionally, the Committee would [illegible] comments on:

1. The advisability of return [illegible] Rongelapese and Utirikese to their islands [illegible] testing [illegible] ceased and their consequent exposure [illegible] of residual background radiation; and

2. Any other comments or suggestions relating to professional medical aspects of the team's work, either [illegible] general or specific nature, or any information comparing [illegible] examination and treatment of [illegible] familiar with; and

3. Your professional opinion [illegible] Brookhaven-AEC reports as to the validity of the original amounts [illegible] exposure, and residual amounts [illegible] whole-body [illegible].

The Committee asks that you prepare [illegible] separately, upon return to your present place of work [illegible] be written without soliciting the opinions of the other consultants to the Committee or doctors connected with the AEC or Brookhaven other than for informational purposes and that [illegible] report be submitted [illegible] Committee no later than 50 days after [illegible] departure [illegible] Islands District.

It is agreed that all reports, information and correspondence between the Special Joint Committee and its consultants will be treated confidentially as [illegible] normal medico-legal doctor-client relationship; provided, however, that the Special Joint Committee may, upon its discretion, make public any and all information received from said consultants without naming them unless [illegible] agree and that such publication will release the consultants [illegible] restriction on using said information for [illegible] personal use [illegible]. It is furthermore, provided that those consultants who are [illegible] by their supervisors or superiors to do so will make available [illegible] of their reports with the understanding that the information [illegible] therein is confidential in nature. The reports, when completed, [illegible] be sent to Chairman Olympio T. Borja, [illegible] Congress of Micronesia, Saipan, Mariana Islands, 96950. Any expenses connected with the [illegible] the consultants will be reimbursed or defrayed [illegible] funds of the [illegible] Committee Concerning Rongelap and Utirik [illegible] Government.

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Memo

Concurrence by consultants to Special Joint Committee

/s/
Hans Wiltander, Vice Chairman
Special Joint Committee Concerning
Rongelap and Utirik Atolls
Congress of Micronesia

/s/
William E. Cole

/s/
Haruo Ezaki

/s/
Toshiyuki Kumatori

/s/
E. Pochin

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DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
PUBLIC HEALTH SERVICE
[illegible]
ROCKVILLE, MARYLAND [illegible]

OCT [illegible]

Senator Olympio T. Borja
Chairman, Special Joint Committee
Concerning Rongelap and Utirik Atolls
Congress of Micronesia
Saipan, Mariana Islands [illegible]

Dear Senator Borja:

It is my pleasure to submit my report (Attachment No. 1) as a Consultant to your Committee in accordance with the Memorandum of Understanding of [illegible] 21, 1972, (Attachment No. 2).

I have combined portions of my responses to the multiple questions in an attempt to more concisely state my observations on the methods of examination of the exposed persons of Rongelap and Utirik as well as on the delivery of health care to the entire population of those atolls. The latter observation is made in response to the verbal request of Mr. [illegible], Vice Chairman of the Special Joint Committee.

I trust my report will be of assistance to your Committee in its continuing deliberations concerning Rongelap and Utirik Atolls.

As requested by you, I have [illegible] a resume of my professional background.

With best personal regards, I [illegible]

Sincerely yours,

William [illegible] Cole, M.D.
Associate Director
Bureau of Radiological Health

3 Enclosures

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[illegible]

Attachment No. [illegible]

REPORT OF W[illegible] COLE, M.[illegible] CONSULTANT TO THE SPECIAL [illegible] COMMITTEE [illegible] RONGELAP AND UTIRIK ATOLLS, CONGRESS OF MICRONESIA, [illegible] THE U.S. PUBLIC HEALTH SERVICE, BUREAU OF RADIOLO[illegible], FOOD AND DRUG ADMINISTRATION, [illegible] EDUCATION, AND WELFARE

In accordance with the Memorandum [illegible] Understanding, dated September [illegible], [illegible] I submit [illegible] report. The observations and opinions expressed are th[illegible] of my visits to Ebeye Island, Rongelap Atoll, Utirik [illegible] and Majuro Island, Marshall Islands, Trust Territory [illegible] the Pacific Islands, from September [illegible], 1972, to Se[illegible], 1972, with the Brookhaven National Laboratory [illegible] Team. During this interval the following Marshallese [illegible] examined:

Exposed [illegible] Rongelap [illegible]	[illegible]2
[illegible] Utirik [illegible]	76
Unexposed [illegible]	[illegible]
Children of exposed Rongelap[illegible]	[illegible]
Children of [illegible]exposed [illegible]	[illegible]0

In addition, approximately [illegible] [illegible]men, and children were examined and treated for [illegible] not related to radiation exp[illegible]. For e[illegible] than 60 pairs of charity-donated eyeglasses w[illegible] to the people of Rongelap and Utirik.

The visit [illegible] the Medical Team [illegible] with a serious outbreak of upper respiratory [illegible] and an acute gastro-enteritis infection on both [illegible] and Utirik. In addition, a [illegible]ized epidemic [illegible] influenza occurred among those people and the personnel [illegible] Medical Team, resulting in a quarantine of the inv[illegible]. This proved to be an additional handicap [illegible] the examinations by the Medical [illegible] Majuro Memorial Hospital, [illegible].

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1. METHOD OF EXAMINATION OF THE PEOPLE OF RONGELAP AND UTIRIK ATOLLS BY THE BROOKHAVEN NATIONAL LABORATORY MEDICAL TEAM

The annual [illegible] of the [illegible] people of Rongelap and Utirik [illegible] considered [illegible] adequate for the detection of radiation-[illegible] disease [illegible] result of fallout exposure in March 1954. This [illegible] examination has detected [illegible] abnormalities in 21 Marshallese in the past and resulted in the [illegible]very of two additional cases at the most recent examination. The first case of acute myelogenous leukemia was discovered at this examination and the patient taken to the hospital of the Medical Research Center at Brookhaven National Laboratory, Upton, New York, and subsequently transferred to the National Institutes of Health, Department of Health, [illegible] and Welfare, for observation and treatment.

Examinations performed by the Brookhaven National Laboratory Medical Team are considered to [illegible] adequate for its purpose. The [illegible] and physical examinations are performed under difficult circumstances on the islands with the lack of any facilities on Utirik compounding the problem. The permanent facilities available [illegible] on Rongelap are much more adequate for the examinations. The blood and urine tests performed by the American and Marshallese technicians are adequate and accurate. Additional examinations not related to radiation-induced disease could be added as clinically indicated. [illegible] regard to the treatment of radiation-induced disease and, in particular, the thyroid abnormalities occurring in exposed persons who were under the age of 10 at exposure, all available records [illegible] the treatment to have been excellent. The surg[illegible] are rendered to these individuals in Guam, Hawaii, and the United States is comparable [illegible] the best afforded [illegible] country.

An annual medical examination [illegible] diagnosis and treatment of diseases endemic to the Marshall Islands not related to radiation is inadequate to [illegible] the health of the people. Much more medical training of [illegible] Trust Territory Health Aides with [illegible] of [illegible], surgical supplies, and medication [illegible] necessary [illegible] much improvement is to be expected. [illegible] officers of the District Headquarters [illegible].

There [illegible] with the people on the pur[illegible] the detection of radiat[illegible] available on both [illegible] the opportunity for a good [illegible] and, until this situation [illegible] and mistrust by the peo[illegible] evident when I visited the [illegible] the Special Joint Committee [illegible] barrier increases [illegible] and examining physician [illegible] conducted.

2. OBSERVATION [illegible] OF PAST AND PRESENT [illegible]

In regard to [illegible] of disease endemic to the [illegible] and not related to radiation, [illegible] of good health care are totally [illegible] in transporting heavy diagn[illegible] at Rongelap and Utirik [illegible] example, modern x-ray machines. [illegible] deration should be given to the [illegible] ship with such equipment [illegible] method would also allow addit[illegible] be performed as well as treatment [illegible]. Such a facility would afford [illegible] clean living accomodation [illegible] method of delivery of good health [illegible] proven highly successful [illegible]

The medical [illegible] totally unsatisfactory. A medical re[illegible] for all persons, both exposed and [illegible] pertinent to the exposed popula[illegible] a record and available f[illegible] of the Trust Territory. [illegible] immunizations should be maintained [illegible] which could be prevente[illegible]. The tragic poliomyelitis [illegible] example of the necessity [illegible]

Considerati[illegible] of a document in [illegible] of the annual examination [illegible] Medical

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Team for [illegible] to the [illegible] prior to the visit of the physician[illegible] I am not [illegible] such written informa- tion is [illegible] document may alleviate misunderstanding [illegible].

The dispensar[illegible] on Rongelap [illegible] should be upgraded with standar[illegible] [illegible] and medications. The hospital [illegible] deliver good health care to the [illegible]. The construc- tion of th[illegible] hospital [illegible] expedited as rapidly as possible. [illegible] of the Health Aides on Rongela[illegible] [illegible]. In my opinion, without it [illegible] the schedul[illegible] by the Medical Officers from the [illegible] Headquarters [illegible] prevent possible serious [illegible] islands.

3. OPINION [illegible] THE REPORTED [illegible] LATE RADIATION EFFECTS ON THE PEOPLE OF RONGEL[illegible] [illegible]TRIK ATOLLS

The Bravo [illegible] Operation Castle test series was [illegible] on Bikini Atoll on March 1, [illegible]. This produced [illegible] of [illegible] megatons TNT equivalent and contaminated [illegible] approximately 330 miles by 60 miles with radioactive [illegible]. This large area included Rongelap and Utirik [illegible]. The reported exposures to the people [illegible] those islands [illegible] by the U.S. Atomic Energy Commission [illegible] follows:

Rongelap	175 rads whole body gamma	
Ailingnae	69 rads " " "	
Rongerik	78 rads " " "	(USAF Personnel)
Utirik	14 rads " " "	

The people of Rongelap [illegible] exposure to such a degree to [illegible] burns and [illegible] epilation of the scalp, the result [illegible] significant [illegible]. The external beta dose was the result of [illegible] contamination by fallout material. The presence of [illegible] and partial shielding by trees [illegible] contamination

In addi[illegible] and beta burns of the [illegible] radionuclides was absorbed by [illegible]. The dose calculations were begun [illegible] after the detonation by determin[illegible] pooled urine samples. Such sample[illegible] States for radiochemica[illegible] continued and, at six months [illegible] amounts of radioactivit[illegible]. Radioactive iodine was the mos[illegible] isotopes and, by extrapo[illegible] thyroid gland of the exposed [illegible] rads to the exposed child's thy[illegible] addition, both groups receive[illegible].

Articles on [illegible] the U.S. Atomic Energy Commission, [illegible] Laborat[illegible]ry, the Department of Defense, [illegible] Special Subcommittee on Radiation [illegible] Energy, Congress of the United [illegible] with particular attention [illegible]. Granted that much of the [illegible] detonation calculations and extrapola[illegible] that the published figures are reasona[illegible] to reevaluate the data but [illegible].

By the Spri[illegible] Rongelap Atoll had been made by the [illegible] of the University of Washington [illegible] Defense Laboratory. A decision [illegible] return to their island on Jun[illegible] 1957, [illegible] that permanent residence [illegible] their health. The last nuclear dev[illegible] Tests was detonated on Eniwetok [illegible] data indicates that only a smal[illegible] background levels occurred [illegible].

In early [illegible] made by the Laboratory of Radiatio[illegible] Washington and the Brookhaven [illegible] Team. Subsequently, three additi[illegible] conducted by the Laboratory [illegible] 1960. The maximum gamma dose [illegible] September [illegible] was recorded as 0.04 mrads per h[illegible] per year, well within the [illegible] of 500 mrads

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per year [illegible] recommended to the people that [illegible] because of their selective [illegible] of [illegible] cesium-137.

It is a [illegible] the radio[illegible] iodine I-131, I-132, I-133, and [illegible] contribute [illegible] dose to the thyroid gland, resulting in the [illegible] nodules in the thyroid gland i[illegible] exposed p[illegible]gelap, with the preponderance [illegible] than 10 years of age at the time [illegible] abnormality was discovered [illegible] subsequent surgical exploration [illegible] and the United States [illegible] to have cancer of the thyr[illegible] were found to have develop[illegible] atrophy [illegible] resulting in hypothyroidism. [illegible] the development of thyroid nodu[illegible] the exposed [illegible] administered thyroxine on a continu[illegible] the surgical and medical treatment [illegible] was comparable to the best [illegible]

The long ter[illegible] ation are in the main the result [illegible] strontium-90 and cesium-137 [illegible] in the fission products and [illegible] relatively [illegible] ive. Body burdens for cesium-1[illegible] radiochemical assay of the exposed Rongelap [illegible] 1969 [illegible] increase since similar evaluations [illegible] was no significant difference [illegible] exposed and unexposed persons living [illegible] gelap, [illegible] equilibrium had been reached. [illegible] to predict the ultimate resu[illegible] burden of potentially carcinogenic [illegible] considered that the biological haz[illegible] great as strontium-90, a beta em[illegible] that is [illegible] deposited in bone. There are anima[illegible] experiments [illegible] strontium-90 in sufficient [illegible] may [illegible] and possibly leukemia [illegible] in the muscle mass of the [illegible] present time.

At this exami[illegible] was detected in a Rongelap[illegible] of exposure and the firs[illegible] exposed on Ailingnae when she was [illegible] Unfortunately, the first case [illegible] among the exposed

Rongelapese was discovered at this examination. This case of leukemia occurred well beyond the peak incidence expected as the result of radiation exposure but radiation cannot be dismissed as the causative agent. In my opinion, the discovery of this disease in an exposed person on Rongelap is an extremely disturbing event at this late date following the acute radiation exposure. One of the most difficult problems at the moment is determining the effect of continued low dose irradiation of a given population. It is prudent to assume that there is no level below which some damage may be produced. Although I am not able to conclude with certainty that this case of leukemia resulted from radiation, it would appear that this is the case. Certainly it demands the continued annual examination of all exposed Marshallese for the foreseeable future.

W[illegible] Cole, M.D.

[illegible] October 18, 1972

PRIVACY ACT [illegible] REMOVED

[illegible]

[illegible]

BIRTHDATE

[illegible]

MEDICAL EDUCAT[illegible]

University [illegible] Medicine, 1937

INTERNSHIP AND [illegible]

Virginia Mas[illegible] Seattle, [illegible] -1938
Resident [illegible] Seattle, Washington, 1938-1939
Fellowship [illegible] Minnesota, 1947-[illegible]

CIVILIAN PRACTI[illegible]

General [illegible], Washington, [illegible]
Chief of Rad[illegible] D.C., 1954-1968
Assistan[illegible] University, Baltimore, [illegible]
Staff Radiol[illegible], Maryland, 1969-1973

MILITARY SERVI[illegible]

U.S. Navy Med[illegible]
Rank: Comman[illegible]
Last duty sta[illegible] Naval Hospital, Bethesda, [illegible]
Retired from [illegible] received in combat in [illegible]

SCHOLARSHIPS AN[illegible]

E. I. DuPont [illegible] of Virginia
Richard [illegible] University of Virginia [illegible]
Alpha Omega Al[illegible]

1014813

ALUMNI ASSO[illegible]

Mayo [illegible]
Unive[illegible]
Presi[illegible], 1966
Board of [illegible]
Execu[illegible] of Governors, 1968
Advis[illegible] of Governors, 1969-1972

SEMINAR[illegible] AN[illegible]

Radiol[illegible] U.S. National Naval
Med[illegible]
Americ[illegible], Washington, D.C. Chapter,
1964 [illegible]

PROFESSI[illegible]NAL A[illegible]

American Me[illegible]
American Co[illegible]
Execut[illegible]
Counc[illegible], [illegible]-1968
Committee [illegible] Protection, 1970-1972
Counc[illegible]-1972
Member, [illegible] 1970-1972
Member, Am[illegible] Workshop,
Washing[illegible] 1965
Chairman, [illegible] College of [illegible] Workshop,
Johns H[illegible], 1970
Fellow, A[illegible]
Diploma[illegible]e of [illegible]
Distric[illegible] of [illegible] Medical [illegible]
Chairman, [illegible]
Vice-Chair[illegible]
Chairman, [illegible]
Chairman, [illegible]
New York Aca[illegible]
Eastern Radi[illegible]
Louis Mackall [illegible] D.C., President, 1967-1968
Advisory Com[illegible] of X-ray Technicians,
1967-1968
Honorary Mem[illegible] of Radiological
Techni[illegible]ian[illegible]
Radiolog[illegible]
Commit[illegible]
American [illegible]

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PRESENT POSITIONS

Associate Director
Bureau of [illegible] Health, [illegible]

Executive Secretary, [illegible]
Bureau of [illegible] Health, [illegible]

ARTICLES, BOOKS, [illegible]

"Macrocytic Anemia in Association with [illegible]"; William [illegible] Cole, M.D.; Clinics of the [illegible] Hospital; [illegible]1937.

"Tabes Dorsalis [illegible] of the [illegible] Tract"; William S. Cole, M.D.; Clinics of the [illegible] Hospital; 16:3:1937.

"The Plasma [illegible]"; Alfred Chanutin, J. C. [illegible], and William S. Cole; [illegible] Chem., p. 123-247, 1938.

"Massive Hemorrhage from Peptic Ulcer"; [illegible], M.D., and William S. Cole, M.D.; [illegible] 1948.

"Peptic Ulcer: A [illegible] of 1,0[illegible] Cases"; [illegible], M.D., M. F. Dwyer, M.D., [illegible], and William S. Cole, M.D.; Radiology; [illegible].

"A Manual of [illegible]"; William S. Cole, M.D.; Mayo Clinic Press, Rochester, Minnesota, [illegible].

"Carcinoma of the [illegible] Receiving Therapeutic Doses of I-131"; [illegible], M.D., William S. Cole, M.D., Alex Horwitz, M.D., [illegible], M.D.; Archives of Otolaryngology 59:33[illegible]; Mar [illegible].

"Opportunities and [illegible] in the [illegible] of Radiology"; American College of Radiology Meeting, Washington, D.C., Nov. 13, 1965.

"Aggressive Approach to [illegible] Carcinoma"; Theodore H. [illegible], Capt. MC [illegible], Capt. MC USN, William S. Cole, M.D.; The Journal of [illegible], Vol. [illegible], August 1966.

"The Judicious Use of [illegible]"; William S. Cole, M.D.; (Presentation at [illegible], November [illegible]), [illegible] Journal of Public Health, Vol. 59, No. 7, July 1969.

1014815 [illegible]

HIROSHIMA UNIVERSITY [illegible] OF MEDICINE

[illegible] Japan

[illegible] 18, 197[illegible]

Senator [illegible]
Chairman
Special Joint Committee
Concerning [illegible]
Congress of M[illegible]
Saipan, Maria[illegible] 96950

Dear Senator [illegible]

Thank you [illegible] extended to me during my recent visit to M[illegible] all your assistance.

Enclosed [illegible] of my [illegible] to Rongelap and Utrik. As for [illegible] on the [illegible] of thyroid nodules, I will submit [illegible] Conard on the details of [illegible].

If you and [illegible] please do not hesitate [illegible].

Thank you again.

[illegible]

[illegible], M.D.
[illegible]
[illegible] of Surgery

Enclosure:
Report on Visit to Rongelap and Utrik [illegible]

HE:amk

1014816

[illegible]

At the [illegible] Concerning Rongelap and Utirik [illegible] participated as an observer of the Brookhaven [illegible] Survey Team and made observations at Ebeye Island ([illegible]), [illegible] September) and Utirik Island ([illegible]). [illegible] I wish to report my findings in sequence [illegible] the Committee.

As I [illegible] held on board the Militobi [illegible] of 10 [illegible] like to limit my opinions mainly to [illegible] and not attempt to answer items outside [illegible] have the results on the specimens [illegible] that it be understood I shall [illegible] literature and my current [illegible].

[illegible] is being held on an annual basis is appr[illegible] however, [illegible] islands with limited hygiene facilities, [illegible] 3 to 4 physical examinations per year [illegible] same time, it is necessary to strengthen [illegible] the local residents, independent [illegible].

b. [illegible] have been modified slightly in accordance [illegible] present policy is considered satisfactory, [illegible] is that almost no autopsies are performed [illegible] methods to detect the effects of [illegible] technical difficulties involved in pe[illegible] strict and difficulties in securing the [illegible] hope that the medical survey team and [illegible] cooperate in overcoming these difficul[illegible] perform autopsy on the whole body, I strong[illegible] thyroid glands at least, where disturba[illegible].

c. [illegible] physical examinations and their attitude [illegible] that members of the medical survey team were [illegible] results of examination in full detail [illegible]. However, when the opinions of [illegible] received the impression that some [illegible] comprehension of the results. This [illegible] efforts on the part of the medical sur[illegible] of language and lack of knowledge [illegible] a mechanism whereby the results of [illegible] the health preservation of th[illegible].

d. [illegible] following countermeasure can be considered. [illegible] containing the contents

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of laboratory [illegible] is prepared for each individual and [illegible] retained by the Government of M[illegible] at any time as required by [illegible] ications. I recommend also that more [illegible] health [illegible] on the islands and have doctors [illegible] examination and consultation, an[illegible] rate in maintaining the health [illegible]

[illegible]

Surgical Treatment

The [illegible] that have been conducted are appropriate. It [illegible] goiter that operation is performed on[illegible] tumor [illegible] causing disturbances. Therefore, [illegible] many of the exposed, total thyroidectomy [illegible] required. It is enough to closely follow [illegible] only when cancer is strongly suspec[illegible] the treatment given in th[illegible] pa[illegible]

(1) [illegible] examination is made per year, it [illegible] make [illegible] follow-up observations. Therefore, it is [illegible] with even the slightest suspic[illegible]

(2) [illegible] from surgical material, I received the im[illegible] severe cell abnormality. Considerations mu[illegible] such areas developing into cancer [illegible] presenting radiation induced canc[illegible] such operations.

Medical Treatment

(1) [illegible] operation of the thyroid is considered [illegible] view of the fact that the patients [illegible] hypothyroidism.

(2) [illegible] prevention of thyroid diseases is also [illegible] though some patients were found no[illegible] to [illegible] the doctor. This is considered due [illegible] the necessity for a means to more effec[illegible] stated in 1-d was keenly fe[illegible]

b. The [illegible] on the basis of my knowledge, exp[illegible]

3. Additional [illegible]

Item [illegible]

Item [illegible] of my opinion [illegible] stated above.

Item [illegible] beyond the [illegible] my specialty.

NOTE. The Medical Survey Team [illegible] National Laboratory - AEC is conducting the [illegible] with [illegible] in a way considered appropriate from the [illegible] only contributing much to the treatment [illegible] the exposed people, but also is providing [illegible] the health [illegible] the local people in general. I am [illegible] impressed [illegible] effort being devoted to this difficult work [illegible] inconveniently located areas. It shall make [illegible] will serve as some reference in achieving [illegible]

[illegible] Ezaki, M.D.
Professor
Department of Surgery
[illegible] University
[illegible] of Medicine

CURRICULUM VITAE

Name: [illegible]

Date of Birth [illegible]

Present Address: [illegible] Hiroshima-shi

Permanent Address: Gifu-ken

Education:

October 1945 [illegible] University School of Medicine

Positions Held

October 1945 [illegible] Nagoya [illegible] University School of Medicine
([illegible] Surgery Department)

December 1945 [illegible] Hiroshima [illegible] School of Medicine
([illegible] Surgery Department)

October 1951 Assistant Professor, [illegible] University School of Medicine
([illegible] Surgery Department)

April 1962 Professor, Hiroshima [illegible] Research Institute for
[illegible] Medicine [illegible] (Surgery)

October 1972 Professor, Hiroshima [illegible] School of Medicine
([illegible] Surgery Department)

NATIONAL INSTITUTE OF RADIOLOGICAL SCIENCES

[illegible], Japan

[illegible] Olympio [illegible]
Congress of Micronesia
Saipan, Mariana Islands [illegible] October 27, 1972

Dear Senator [illegible]:

I have the honor to submit the report concerning the medical examination of exposed Marshallese. Also enclosed please find one sheet [illegible] as a reference for the additional comments, [illegible] 2.

I appreciate your [illegible] information. Dr. Conard also informed me of the [illegible] survey. I regret the occurrence of a leukemia.

With the understanding that the information contained is confidential in nature, [illegible] this report was given to [illegible] Masono, [illegible] Institute, by his request.

I hope this report [illegible] use for the future medical examinations.

Respectfully submitted,

Yours sincerely,

Toshiyuki Kumatori

Toshiyuki Kumatori, M. D.
Head, Division of Radiation
Health

[illegible]

1014821

NATIONAL INSTITUTE OF [illegible] SCIENCES

[illegible]

Report [illegible] Special Joint [illegible] Concerning
[illegible] Micronesia

This report [illegible] request from the Special Joint [illegible] report are arranged in the same [illegible] Memorandum of Understanding [illegible] 1972.

Comments on

1-a. I think [illegible] Marshallese on once a year [illegible] situation. However [illegible] of the Rongelapese and Utirikese [illegible] is necessary to take [illegible] purpose, those who bear the [illegible] Rongelapese and Utirikese [illegible] and Dr. Conard [illegible]. These actions will be very [illegible].

1-b. The [illegible] which seem to attach [illegible] protect the health of exposed [illegible] the radiation health control [illegible] control and that detection [illegible] necessary.

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it is [illegible] ideal [illegible] other examinations to the present [illegible] to all residents, liver function [illegible] more detailed [illegible] examinations, cytogenetical study, [illegible] equipments and man power will be [illegible]. Moreover, closer co-operation of [illegible] because more frequent blood [illegible] not be avoided.

I-[illegible] AEC [illegible] meetings to discuss [illegible] problems [illegible] and Utirikese before the beginning of the [illegible] these meetings were helpful [illegible]. Nevertheless, I still feel that [illegible] the biggest obstacle which may sometimes [illegible].

[illegible] personnels [illegible] health control of the Rongela[illegible] and Utirikese [illegible] trained. With the help of these [illegible] between the AEC team and the people [illegible] more improved.

I-[illegible] paragraph I-h, more detailed examination [illegible]. I propose that Trust Territory [illegible] has enough rooms to complete the examination [illegible] with an automatic

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NATIONAL INSTITUTE OF [illegible] SCIENCES

[illegible], Chiba, Japan

[illegible] and other small examinat[illegible] a dark room. With the [illegible] examinations will be availabl[illegible]

2-a [illegible] the present [illegible] team is adequate. Most [illegible] Marshallese were thyroid [illegible] treatment of these abnormalities [illegible] quite adequate [illegible] to the Brookhaven National [illegible] Report

2-b. The [illegible] following three ways, external [illegible] skin, and internal irradiat[illegible] due to γ-ray and β-ray [illegible]

According [illegible] when the uptake of radioactive iodine [illegible] suspected, [illegible] NaI should be given to [illegible] as [illegible] after irradiation as possible. The Ronge[illegible] days after the initial exposure. Even [illegible] NaI containing 200 mg of stable [illegible] iodine might not have [illegible]

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NATIONAL INSTITUTE OF [illegible] SCIENCES
[illegible], Japan

Furthermore, [illegible] operations were done 18 years ago, I don't think [illegible] without giving them inorganic [illegible]

Additional [illegible]

1. The [illegible] considered to have [illegible] following test explosion after their [illegible] However, the amount of fallout was [illegible] At that time, namely in 1954 and 1957, if [illegible] in their home islands and wished [illegible] necessarily wrong to have made [illegible]

2. On the [illegible] cytogenetical studies have been [illegible] 1964 by the [illegible] Division. The chromosome analyses [illegible] lymphocytes. Some of the results [illegible] paper. We found intimate correlation [illegible] aberrations and estimated [illegible] of neutrophils which indicates the [illegible]

According to the [illegible] (BNL 50029, p. 137) correlation [illegible] severity of early radiation

NATIONAL INSTITUTE OF [illegible] SCIENCES

[illegible]

syndrome was [illegible]. [illegible] Sasaki, Dept. of Human Cytogenetics, [illegible] Medical [illegible] University, has found a difference [illegible] group of the exposed Marshallese (Radiation [illegible] Communication 3: 3-21, 1968, [illegible] Conard (Science 157: 445-447, [illegible] estimate for atomic bomb [illegible] exposure (Nature 220: 1189-1193, 1968)

Taking [illegible] I would like to suggest [illegible] on the selected cases in near future [illegible] important to detect the late effect.

3. Since I am [illegible] radiation dosimetry, I asked [illegible] opinion, the ways of estim[illegible] reasonable.

In addition to [illegible] a proposal that Trust [illegible] United Nations to have an international [illegible] of radiation exposed people [illegible] meeting is useful to disp[illegible]

NATIONAL INSTITUTE OF [illegible] LOGICAL SCIENCES

[illegible], 4-chome, [illegible], Japan

Lastly I would like to take this opportunity to express my grand [illegible] for the [illegible] results which have been obtained under the co-operation of [illegible] Territory Government at [illegible] overcoming many difficulties.

Toshiyuki Kumatori

Toshiyuki Kumatori, M. D.

NATIONAL INSTITUTE OF RADIOLOGICAL SCIENCES

[illegible], Anagawa, Chiba [illegible] Japan

[illegible] of Professional Background

I was graduated from School of [illegible], Tokyo University in 194[illegible] and [illegible] degree of [illegible] Medicine. After the graduation [illegible] the 3rd Dept. [illegible] Internal Medicine Tokyo University [illegible] research [illegible] October 1945 I went to Hiroshima [illegible] survey [illegible] of A-bomb victims and spent a [illegible] months [illegible] hematology. From 1948 to 195[illegible] I was [illegible] lecturer [illegible] Dental College.

In 1952 [illegible] First [illegible] Hospital of Tokyo. When Bikini radiation [illegible] in charge of the treatment of Japanese [illegible] exposed [illegible] radiation in March 1954. In 195[illegible] I [illegible] Government and studied radiation [illegible] in Oxford University, England [illegible] visited other [illegible] and U. S. A. for the study [illegible] in 195[illegible].

In 1959 [illegible] to [illegible] Laboratory of Clinical Investigation [illegible] National Institute of Radiological Sciences. In October, 196[illegible] invited [illegible] meeting on "Diagnosis and Treatment of [illegible] Radioactive [illegible] the International Atomic Energy Agency. [illegible] went to the Marshall Islands [illegible] exposed Marshallese with U. S. [illegible] In 196[illegible] appointed to Head of Division of [illegible] Health [illegible] National Institute of Radiological Sciences. [illegible] 1966, I [illegible] several European countries [illegible] "Medical Supervision [illegible] August, 1970, I attended to the 13th [illegible] which was held in Munich [illegible] follow-up studies on above [illegible] published many papers on [illegible] radiation effect on human being.

[illegible] Kumatori, M. D.

[illegible]

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stored [illegible] studies. [illegible] processed [illegible] pretation [illegible] and displayed [illegible] (Fig. 8). [illegible] is an [illegible] imated at [illegible] writer equipped [illegible] allowed to [illegible] employed in program [illegible] he finds [illegible] diagnosis. [illegible] the physicians [illegible] tion which [illegible] methods [illegible]

Chromosome Abnormalities [illegible] Exposed to Fallout Radiation [illegible] 1954

[illegible]

Twenty [illegible] fallout radiation [illegible] 1954. The fishermen [illegible] the radioactive ma[illegible] ternally from [illegible] organs and by [illegible] face. Although the [illegible] very difficult, the [illegible] each person was [illegible] days, nearly [illegible] day. The external [illegible] important role [illegible]

Follow-up studies [illegible] performed [illegible] ber of persons [illegible] which correspond[illegible] fishermen.

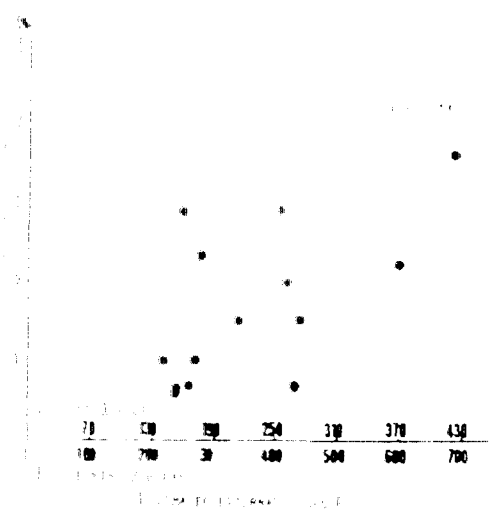
The cytogenetic [illegible] since 1964. [illegible] the culture method [illegible] did 72 hrs culture [illegible] tions, 2 days culture [illegible] of chromosome ana[illegible] 1. The frequency [illegible] which was [illegible]

[illegible] frequency of stable and unstable chromo[illegible] remarkable high. Compared [illegible] of a normal person, the frequency of [illegible] 10-20 times higher, and fairly con[illegible] examination.

[illegible] results it was suggested that [illegible] correlation might exist between chromo[illegible] rate and the externally irradiated [illegible] person. This correlation was examined [illegible] 1969 survey. The aberration rate [illegible] stable cells 300 cells on an [illegible] each case for the calcula[illegible]. As shown in Fig. 9 the close cor[illegible] stable cell percentage and external [illegible] (P<0.01). In addition a similar [illegible] existed between these aberration [illegible] minimum values of neutrophils, which [illegible] at the critical stage (4-7 weeks after [illegible]) and almost corresponded to the severity [illegible] radiation syndrome of each fishermen. Fig. [illegible] this relationship (P<0.01).

[illegible] significance of chromosome ab[illegible] should be elucidated by further follow[illegible] noted that the examination of [illegible] abnormalities is valuable for the risk [illegible] radiation exposed persons.

(Unpublished)



[illegible] Correlation between chromosome aberrations (Cs [illegible]) and estimated external doses.

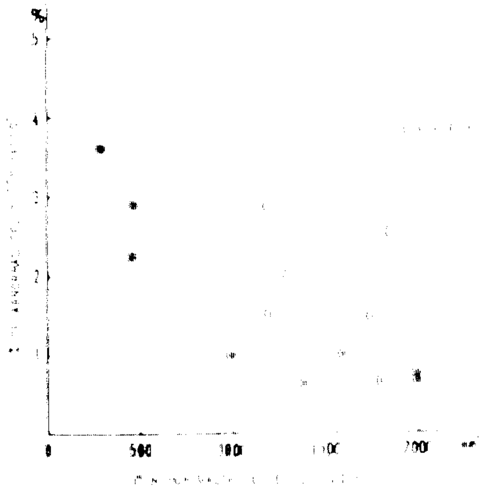


Fig. 10 Correla[illegible] (% cells) an[illegible]

Common Clone Cells with [illegible] Chromosome Aberrations in Periph[illegible] and [illegible] Marrow of Irradiated [illegible]

[illegible]

[illegible] leukemia is [illegible] erythro[illegible] row, but not [illegible] stimulated to [illegible] The evidence has [illegible] cytes might be [illegible] the former three [illegible] mon stem cell [illegible] the presence [illegible] stem cells has been [illegible]

As a means [illegible] problem [illegible] derivation of [illegible] marrow cells [illegible] dividuals who showed [illegible] with structural chrom[illegible] marrow were studied [illegible] or not clone cell[illegible] cytes and bone marr[illegible]

The results of the [illegible] the bone marrow and [illegible] of the three cases a[illegible]

[illegible] common clone cells in the two tissues [illegible] and TN3.

[illegible] of the fishermen exposed to [illegible] 1954, a clone with a [illegible] occurred in the bone [illegible] frequency of about 10%. In the [illegible] of the 600 cells (0.58%) showed [illegible]

[illegible] injected with Thorotrast in [illegible] cells (4%) in the bone marrow [illegible] cells (2%) in the blood cultures [illegible] karyotype of 46, XY, Gq-?, [illegible]

[illegible] cervix cancer with hypoplastic [illegible] therapy, nearly 100% of the [illegible] bone marrow were members of a single [illegible] karyotype of 46, XX, t(Bp+ Cq-) [illegible] but none of the 273 cells [illegible] cultures showed this karyo-[illegible]

[illegible] of cells with the same radia-[illegible] among the dividing cells in [illegible] lymphocytes and in bone marrow in [illegible] seems to be conclusive evidence [illegible] of a lympho-hematopoietic stem [illegible] both lymphoid and bone mar-[illegible]

[illegible] data from irradiated humans clearly [illegible] PHA-responsive peripheral lympho-[illegible] of the same stem cell for [illegible] but they do not explain the [illegible] absence in peripheral lymphocytes of [illegible] chromosome in chronic granu-[illegible] of the clone cells of case RT-1 [illegible] the majority of the cells in [illegible] serious problem to be solved [illegible]

(Unpublished)

1014830

[illegible]

[illegible] Department of Clinical Research
[illegible] College Hospital Medical
[illegible]
[illegible] Street, London WC1E 6JJ

MRC
Medical Research Council

Telephone 01 - 387 9300 ext 188

reference [illegible]

[illegible] 1977

TO: [illegible]
[illegible] Committee [illegible]
[illegible]
[illegible]

Sir,

I have [illegible] the medical examinations made during [illegible] 1977 by [illegible] National Laboratory team and the [illegible], [illegible] specified in the Memorandum [illegible] Hans Wiliander and the consultants to your Committee.

I [illegible] 3rd, and either observed [illegible] that of the thyroid gland, [illegible] and [illegible], and of about 60 of the [illegible] also examined microscopic sections of [illegible] these people, and have studied [illegible] estimates of radiation dose.

I will [illegible] the Memorandum of Agreement but [illegible] Committee if I refer first to the aims [illegible].

It seems [illegible] have had, three aims which are [illegible]

(a) As [illegible] early stage any radiation-induced [illegible] treatment can be given, e.g. by removal [illegible] malignant development, and of malignant [illegible] the thyroid or the neck, or [illegible] prevent such changes occurring [illegible]

(b) In [illegible] the frequency of any observed thyroid [illegible] the radiation exposure of thyroid gland [illegible] to be made anyhow as under (a), [illegible] examination or study except of the normal [illegible] people who have not been exposed, and [illegible] have been received by those exposed. It [illegible] importance in the proper planning [illegible] know the changes that may

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[illegible]

/ continued . . .

occur after [illegible] with which they occur. This include[illegible] recognized importance, for example [illegible] Radiological Protection, and in the [illegible] on the Effects of Atomic Radiati[illegible] clinical examinations that [illegible]

(c) [illegible] treatment, for any condition dete[illegible] s, although unrelated t[illegible] strongly qualified and equipped [illegible] examinations in any case [illegible] ndition, the team would wis[illegible] as well. In fact I think that [illegible] the visit clearly occupied [illegible] general "sick-call" for any i[illegible] held on each day (in Rongelap [illegible] discussed in detail by the [illegible] findings (clinical exam[illegible] rather full clinical examination of [illegible] supplemented by eye examinations a[illegible] chest X-ray and urine examinations i[illegible] value in general medical surv[illegible] which were unrelated [illegible]

Comin[illegible] agreement.

1(a). [illegible] interval is necessary, [illegible] visit in two people, an[illegible] of thyroid function (the latter [illegible] analysis of the blood sample[illegible] rather prompt action: for the nodules, [illegible] are benign and that they [illegible] operation if either should [illegible] depression of thyroid function, [illegible] ("Synthroid") dosage.

I understan[illegible] been found to have a sign[illegible] and this will require immediate i[illegible]

The thyroid [illegible] radiation are relatively [illegible] apparently successful complete re[illegible] reassuring. Whether [illegible] examinations is uncertain. [illegible] even at this stage after [illegible], since annual thyroid examinati[illegible] nodule is detected early enough [illegible] spread too far

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to be [illegible]

[illegible] appeared to me to be extensive, [illegible] the clinical examination of the [illegible] one of the team and one observer, [illegible] other observers also in any case [illegible] highly sensitive modern methods [illegible] as any actual, depression of thyroid [illegible] concentration of the thyroid stimulating [illegible] hormone itself). They are in gene[illegible] that I use in my own work [illegible] Apart from additional tests that [illegible] thyroid function (by in[illegible] few cases), these are the orthodox [illegible] advanced thyroid clinic [illegible] specially arranged outside the Trust [illegible]

I there[illegible] tests which should be added, or any prese[illegible] tests for radiation effects which [illegible] matter of opinion whether any [illegible] medical care and surveillance [illegible] radiation effects, for example by electrocard[illegible] should be deleted. If an expert team [illegible] these islands in any case, and if [illegible] that had not otherwise been detected [illegible] to delete them, even though from [illegible] deletion would probably not impair [illegible] regard to purely radiation induced effects [illegible] examination is available to these [illegible] sources, therefore, it would seem to me wrong [illegible] health protection, even though the size [illegible] were confined to radiation effects [illegible] and general surveillance were excluded [illegible] even be held that the exposed [illegible] better health than other islanders [illegible] detected and treated and despite [illegible] that have required treatment

1(c) [illegible] between most members of the team and the [illegible] brusqueness could easily be created, [illegible] examinations that I saw were [illegible] obvious that Dr. Conard was being greeted [illegible] gentleness and charm in dealing with [illegible] very evident. In general the difficulties [illegible] for example, I find in London in examin[illegible] common language: namely that one [illegible] indicate in detail

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/ continued . . .

what examin[illegible] explain the purpos[illegible]

I[illegible] first obtained from [illegible] symptoms they had, a[illegible] examinations. In additi[illegible] suspected from the examination [illegible] questions to amplify the history [illegible] understood the position [illegible] that this arrangement was [illegible] 1972 [illegible] expect that difficulties in communic[illegible] particularly in view of [illegible] positive personality.

On [illegible] irradiated people had questioned [illegible] should be exposed to blood sampl[illegible] hear this since, if so, [illegible] been clearly asked for, or understood [illegible] that such help would be valuable, [illegible] their irradiated fellow people. [illegible] that [illegible] thyroid nodules were common [illegible] progress to malignant forms, [illegible] the exposed people might be [illegible] nodules were rarely seen in the unexposed [illegible] of communication [illegible] asked for and interpreted [illegible]

1(c) [illegible] nodules removed at operation [illegible] with the diagnoses - of benign [illegible] pathologists who have examined [illegible] men who are internat[illegible] pathology

2(a) [illegible] have been on normal and [illegible]

In [illegible]

(i) [illegible] of thyroid activity by a synthetic [illegible] case 'Synthroid' - is a routine, [illegible] bound iodine and, when the test [illegible] stimulating hormone) enable [illegible] the whole weekly dose of Synth[illegible] given the slow utilisation [illegible] that the appropriate average [illegible] given daily. It is of course [illegible] that correct supplies of tablet[illegible]

/ continued . . .

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(ii) A [illegible] of Synthroid is necessary [illegible] are needed in patients who have [illegible] thyro[illegible] was done in the four affected pati[illegible] in [illegible]. The [illegible] then used was in my view [illegible] point with Dr. Conard. [illegible] months were used (1 of which [illegible] patients for the tests). [illegible] was not, substant[illegible] symptoms, and at least [illegible] persistence of tumour tissue [illegible].

(iii) [illegible] to decrease the likelihood [illegible] generally accepted practice [illegible] basis for this practice is [illegible] of the thyroid cells by the [illegible] hormone) and it is not [illegible] it is. It cannot be completely [illegible] year in a young woman [illegible].

(iv) [illegible] normal medical practice if they arise [illegible] people and often also in older [illegible] thyroxine administration. When [illegible] if only occurring rarely in [illegible] of life, there is a much [illegible] possible malignancy.

2(b). [illegible] on these lines appear appropriate [illegible] inion in the team that the nodules [illegible] (by the time of my leaving Majuro [illegible] whatever removal of thyroid tissue [illegible] their histological nature (benign [illegible]).

A particular [illegible] the completeness of removal of any [illegible] the four people from whom thyroid cancers [illegible] removed [illegible] in detail at the time of operation, [illegible] to exclude any remaining tumour [illegible] evidence [illegible] any. They have in addition had [illegible] showing no concentration of radioiodine [illegible] necessarily indicate tumour tissue to be [illegible] uptake [illegible] been found except in positions [illegible] have discussed in detail with Dr. [illegible] tests that we currently use [illegible] present greater difficulties than those [illegible] high concentrations of a character[illegible] in the blood

/ continued . . .

of many [illegible] would
themselves [illegible] or specialized
linear [illegible]

[illegible] requests
comment:

1. [illegible] the likelihood that
further [illegible] and [illegible]ese, might
have added [illegible], if only because
this assessment [illegible] planning arrangements
laid down [illegible] current meteorolo-
gical reports, [illegible] fission/fusion yield, etc.
In retrospect [illegible] radiation and
body burden [illegible] in fact the amount
of whole body [illegible] less than 3
of that initial [illegible] from a raised
background or [illegible] increase in thyroid
radiation is [illegible] have not attempted to
make any exact [illegible] the above estimate
shows that [illegible]
received.

2. [illegible] of the exposed
people and of [illegible] illustrated the
value that [illegible] for people living
in relatively [illegible] part of the world. Our
present practice [illegible] visits to the
Marshallese and [illegible] importance in detection
and treatment [illegible] however by the
frequency of [illegible] epidemics, the manage-
ment of [illegible] of Health Aides.
This point [illegible] consultant. I wondered
however whether [illegible] radio link, and
appropriate arrangements [illegible] between dispensaries
and hospitals [illegible] could be economically
practicable and [illegible] only allow discus-
sion of [illegible] valuable form of
continuing [illegible]
isolated [illegible]
maintaining [illegible] might be given
hospitals, and [illegible]
reviewed [illegible]

3. I [illegible] estimate of
external radiation [illegible] are derived.
These dose [illegible] based on
early and [illegible] as to the
decrease [illegible] estimates

of the [illegible] period of exposure.

The [illegible] of internal [illegible] in the [illegible] phases depend upon three [illegible]:

(i) [illegible] of the thyroid [illegible] which the radioactive iodine was [illegible], and [illegible] gland size varies with age. [illegible] countries do not vary greatly [illegible] children, in the absence of [illegible] values.

(ii) [illegible] the body, and whether by inhalation [illegible] this affects the time and duration [illegible] be present at any time since [illegible] physical grounds, and the ass[illegible] reasonable.

(iii) [illegible] of these [illegible] incorporated in the thyroid and [illegible] radiation [illegible] glands of any given size here the [illegible] the amounts excreted in [illegible] days after exposure, and on assumption [illegible] initial uptake that will be excreted during [illegible] assumption was that 0.[illegible] to 0.2% of [illegible] that day. I have recalculated [illegible] later estimates of which I am aware [illegible] iodine from the normal thyroid and [illegible] a figure of 0.09%, in good agreement with the [illegible] original assumptions. I have also [illegible] based directly on measurement [illegible] people. This gives a higher [illegible] estimate of radiation exposure as [illegible]. It should also be added that, [illegible] any of these (normal) values, it would [illegible] iodine from the gland, and [illegible] excreted in the urine. [illegible] estimate of thyroid dose. The average [illegible] than estimated, and it seems unl[illegible] been [illegible] emphasized however that these are [illegible] from internal radiation [illegible] likely to have differed cons[illegible] their age, owing to individual [illegible] contaminated water drunk, [illegible] of iodine from the thyroid [illegible].

I apologize [illegible] this report and recognize that [illegible] technical or medical detail. I felt [illegible] which your Committee [illegible] it was

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/ continued . . . .

preferable [illegible] the basis [illegible], even [illegible] the detail is technical, [illegible] to give [illegible] conclusions without supporting reasons. [illegible] my comments [illegible] adequately with the information and opinion [illegible] you require, [illegible] will not hesitate to raise [illegible] questions [illegible] Committee may wish.

[illegible] sincerely,

[illegible] CBE MD FRCP.

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Dr. [illegible]

Director [illegible] Council's Department of [illegible] pital Medical School, [illegible] College Hospital, [illegible]

Fellow [illegible] 1946, and member of its Council [illegible] Association of Physicians of Gt. Br[illegible] Society of Medicine, and of the [illegible] Ethics Committee of the [illegible]

Engaged [illegible] Department in 1946 in clinical w[illegible] medical teaching, and in research [illegible] and treatment of thyroid dis[illegible] activity, and the study of the diagnos[illegible] cancer; and author of various pap[illegible]

Member [illegible] Thyroid Club of London, and [illegible] Association.

Member [illegible] Radiological Protection, formerly [illegible] (1957-65) of this Commission [illegible]

Member [illegible] Research Council's Committee [illegible] and member of its Committee [illegible]

Member [illegible] and Honorary Member of the Faculty [illegible] Protection Association and the [illegible]

UK Representative [illegible] Committee on the effects of Atomic Radiation [illegible] its Biological Section

[illegible]

[illegible] Examination
[illegible]

BNL AUI

BROOKHAVEN [illegible]

ASSOCIATED [illegible]

MEDICAL DEPARTMENT

TELEPHONE (516) 345- 3577

[illegible], 1972

Senator [illegible]
Chairman, Spe[illegible] Committee
Concerning [illegible]
Congress of Micronesia
Saipan, Maria[illegible]

Dear Senator [illegible]

Thank you [illegible], 1972. I was glad we were able [illegible] examinations of the Rongel[illegible] people. [illegible] you were not able to be with [illegible] Willander and other member[illegible] committee [illegible] our appreciation for their effor[illegible] helping make [illegible]ssful survey. I am also most gr[illegible] physicians of the [illegible] actively in the medical exam[illegible] the success of the surve[illegible].

I am en[illegible] letter summarizing [illegible] the examinations. I am most re[illegible] only assure you tha[illegible]

With rega[illegible] and Utirik, I would like [illegible] statement to the peoples of [illegible] islands [illegible] results of our examinations [illegible] September. [illegible] statement translated into Marsha[illegible] prior to your departure. [illegible] leave.

If I can [illegible] further [illegible] know.

[illegible]ly,

Robert A. Conard, M. D.

RAC:ls

BNL AUI

BRO[illegible]HAVEN NATIONAL LABORATORY

[illegible] N.Y. [illegible]

MEDICAL DEPARTMENT

TELEPHONE (516) 345-3577

[illegible], 1972

Mr. [illegible]
Staff [illegible]
Special [illegible] Committee [illegible]
Rongelap [illegible]
Congress of [illegible]
Saipan, [illegible] 96950

Dear [illegible]:

[illegible] 4, 1972. You requested a rough [illegible] following summary must be considered [illegible] medical records and equipment [illegible] I understand that the [illegible] up the Militobi [illegible] to be airshipped [illegible].

[illegible] we were able to [illegible] Utirik people at [illegible] were performed at [illegible]:

[illegible]	[illegible]	Utirik	Majuro
Rongelap [illegible]	[illegible]	[illegible]	9
Children [illegible]	[illegible]	[illegible]	14
Utirik	[illegible]	[illegible]	30
Rongelap [illegible]	[illegible]	[illegible]	8
Children of [illegible]	[illegible]	[illegible]	6
[illegible]	[illegible]	[illegible]	67

[illegible] people were examined and [illegible] call each morning at Rongelap [illegible] Rongelap [illegible] severe gastrointestinal [illegible] upper respiratory infection and, [illegible]. At least a dozen children [illegible] were treated at sick call [illegible] children (26 in one [illegible] for various ailments. At

Majuro also treatment [illegible] recommended [illegible] the people examined to the local medical [illegible]. In the [illegible] trying to promote a better communication [illegible] the examin[illegible] and the Marshallese examined, an attemp[illegible] the [illegible] each examination to explain to the pers[illegible] general results of the examinatio[illegible]

At each island [illegible] conference [illegible] the physicians, including the medic[illegible] Dr. [illegible] the health aide, to evaluate all cases exam[illegible] and to recomm[illegible] and disposition. In some cases, the [illegible] was advis[illegible] further treatment. In other cases, Dr. [illegible] was asked [illegible] cases on his return visit to the [illegible]. In other [illegible] to the Majuro hospital were recomme[illegible] further [illegible] treatment. At Rongelap there were tw[illegible] hospital case[illegible] five cases. We took them with [illegible] the Militobi [illegible] None of these people appeared to have con[illegible] related [illegible] exposure. When we left Majuro at the [illegible] the survey, the two [illegible] women were being further examine[illegible] of the [illegible] cases were found to have conditions tha[illegible] treated [illegible] island and they were to be returne[illegible] further consultation.

There were importa[illegible] findings in [illegible] people who lived at Majuro. Two young expose[illegible] girls ha[illegible] thyroid nodules since last examined in [illegible]. They wer[illegible] female, age 19) who had been exposed [illegible] one year of age [illegible]. The other girl was [illegible] female [illegible] who had been [illegible] Rongelap at age 12. Surgical removal [illegible] the [illegible] nodules is [illegible] necessary. Dr. Brown Dobyns at the Cleveland Metropolitan [illegible] Hospital, who operated on many of the other Marshallese thyr[illegible] agreed to operate on these as soon as [illegible] possible [illegible] transportation of the patients to Clevel[illegible] already been started for this.

The third case [illegible] male, age 19, who was exposed at one year [illegible] Rongelap [illegible] to have a low white blood c[illegible] count later in the survey wa[illegible] even lower. This boy [illegible] had thyroid surgery for removal of beni[illegible] of that [illegible] and when last examined in March [illegible] he was found [illegible]. In view of the alarmingly low blood [illegible] and after [illegible] with his father, we took [illegible] with us [illegible] Army Hospital [illegible] Honolulu. They were unable, however, [illegible] successful [illegible] examination and we decided to take [illegible] Brookhaven [illegible] Laboratory. I am sorry to report [illegible] leukemia was

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PRIVACY ACT MATERIAL REMOVED

Mr. Brian Farley [illegible] 1972

established. [illegible] the extent [illegible] that would be needed for th[illegible] we arrange[illegible] him admitted to the National Cancer [illegible], Clinical [illegible] Bethesda, Maryland. This is the lead[illegible] hospital in the [illegible] States for treatment of such cases. [illegible] down by hospital plane to Maryland. [illegible] were sent [illegible] that the mother and father o[illegible] to Washington [illegible] as soon as possible at AEC expense. [illegible] Shoniber [illegible] aide at Majuro was requeste[illegible] as [illegible]. The father [illegible] A[illegible]jain and Sebeo, arrived Friday, October [illegible] have not yet been notified [illegible] travel.

Examination of the Utirik people [illegible] reveal any unusual or unexpected condition that might be [illegible] radiation exposure. The incidence [illegible] abnormal [illegible] and not different from that [illegible]

At both Rongelap and Utirik [illegible] were made to the Trust Territory health services [illegible] concerning requisition of certain addit[illegible] and equipment [illegible] checking of drugs and so on. A better arrangement for [illegible] keeping on the islands was discussed includ[illegible] data from our [illegible] examinations, thyroid treatment and transfer [illegible] information [illegible] individuals move to another island. Thes[illegible] are still [illegible]

After our [illegible] have arrived [illegible] of blood data have been made we will [illegible] position [illegible] comprehensively on findings of the past [illegible] I can [illegible] help at this time please let me know.

With best regards,

Sincerely,

Robert A. Conard, M. D.

RAC:ls

P. S.: I am [illegible] lesions to include the [illegible]

1014844

THYROID LE[illegible] IN [illegible] MARSHA[illegible] TO FALLOUT
(A[illegible])

Marshall Island group (radiation dose-gamma)	Age at exposure	Estimated thyroid dose (rads)[1]	Thyroid lesions percent[2]	Thyroid surgery	Malignant lesions percent[2]
Rongelap (175 rads gamma exposure)	[illegible]	[illegible]	[illegible] (?/19)	[illegible]	5.3 (1/19)
	[illegible]	[illegible]	[illegible] (?/8)	0	-
	[illegible]	[illegible]	[illegible] (?/26)	2	7.7 (2/26)
	[illegible]		[illegible] (?/53)	17	5.7 (3/53)
Rongelap (on Ailingnae Island-69 rads gamma exposure)	[illegible]	[illegible]	[illegible] (?/6)	0	-
	[illegible]	[illegible][3]	[illegible] (?/8)	1	-
	[illegible]		[illegible] (?/14)	[illegible]	-
Utirik[5] (14 rads gamma exposure)	[illegible]	[illegible]	[illegible] (?/55)	0	-
	[illegible]	[illegible][4]	[illegible] (?/69)	[illegible]	1.4 (1/69)
	[illegible]		[illegible] (?/124)	[illegible]	0.8 (1/124)
Rongelap unexposed	[illegible]		[illegible] (?/61)	0	-
	[illegible]		[illegible] (?/133)	[illegible]	-
	[illegible]		[illegible] (?/194)	[illegible]	-
Likiep unexposed	[illegible]		[illegible] (0/31)	0	-
	[illegible]		[illegible] (5/106)	0	-
	[illegible]		[illegible] (?/137)	0	-

1 Dose from 131, 132, 133, [illegible] plus gamma [illegible]

2 Based on number living. [illegible] number in group.

3 One child 10-17 years [illegible] estimated thyroid doses between 132 and 200 rads.

4 Fifteen children 10-17 years [illegible] group received estimated thyroid doses between [illegible] rads.

5 The more energetic shor[illegible] contributed less to the total thyroid dose in the [illegible]. One might surmise therefore that the biological [illegible] would be less in that group.

6 In addition to thyroid lesions, one case of [illegible] myelogenous leukemia was discovered in a 19-year-old Rongelap [illegible] gamma radiation at 1 year of age.

1014845

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
WASHINGTON, D.C. [illegible]

August 2, 197[illegible]

SURGEON GENERAL
OF THE
PUBLIC HEALTH SERVICE

Senator Olympio T. Borja
Chairman, Special Joint Committee
  Concerning Rongelap and Utirik Atolls
Congress of Micronesia
Saipan, Mariana Islands 96950

Dear Senator Borja:

Enclosed is the report of Dr. William S. Cole, summarizing his recent visit to the Trust Territory.

I hope this report and Dr. Cole's attendance at your recent Subcommittee's investigation will be useful to you. We, of course, continue to be available to assist the High Commissioner and the Congress of Micronesia in whatever way is appropriate.

Sincerely yours,

Jesse L. Steinfeld, M.D.
Surgeon General

Enclosure

1014847

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
[illegible]
[illegible]
[illegible]

July [illegible], 19[illegible]

Senator Olympio T. Borja
Chairman, Special Joint Committee
Concerning Rongelap and Utirik Atolls
Congress of Micronesia
Saipan, Mariana Islands 96950

Dear Senator Borja:

The attached document represents my report to you as an invited radiological consultant from the United States Public Health Service during the visit of your Committee to Majuro, Utirik, Rongelap, and Kwajalein (Ebeye) Atolls on [illegible], 1972.

In order to condense the subject matter I have made my observations and recommendations on the findings on Rongelap and Utirik although we interviewed some of these people on Majuro and Ebeye.

My report will be released to you through the office of Surgeon General Jesse L. Steinfeld, U.S. Public Health Service, as you requested at the Executive Session of your Committee on July 20, 1972.

I trust my report will be of assistance in the preparation of your official report to the Special Session of the Congress of Micronesia on August [illegible], 1972.

Sincerely yours,

William A. Cole, M.D.
Associate Director
Bureau of Radiological Health

Enclosure

1014848

REPORT OF FIELD TRIP TO THE MARSHALL ISLANDS, TRUST TERRITORY OF THE PACIFIC ISLANDS, AS A RADIOLOGICAL CONSULTANT TO THE SPECIAL COMMITTEE CONCERNING RONGELAP AND UTIRIK [illegible], CONGRESS OF MICRONESIA, ON [illegible]

Introduction

This is a report of my observations and recommendations based on a field trip in the Marshall Islands, Trust Territory of the Pacific Islands, with the Special Committee composed of the following individuals:

- Senator Olympio T. Borja, Chairman
- Representative Timothy Olkeriil, Member
- Representative Hans Williander, Member
- Representative Ataji Balos, Interpreter
- Dr. Masao Kumangai, Deputy Director of Health, Trust Territory
- Mr. Brian M. Farley, Researcher, Trust Territory
- Dr. William [illegible], Radiological Consultant
- Mr. Henry Moses, Majuro Atoll, Interpreter

The purpose of the visit to Rongelap and Utirik Atolls was to interview those people living on those islands at the time of the detonation of the thermonuclear device at Bikini Atoll on March 1, 1954. This resulted in exposure to fallout radiation of those people due to an unpredicted shift in winds at the time of the explosion. Sixty-four persons on Rongelap received an estimated 175 rads of whole-body radiation and severe contamination of the skin; an additional 18 Rongelap people on a fishing trip received an estimated 69 rads of whole-body radiation; and 157 people on Utirik received an estimated 14 rads of whole-body radiation. Twenty-three Japanese fishermen aboard the vessel, the Lucky Dragon, also received significant whole-body radiation. These data are reported by the Brookhaven National Laboratory Medical Survey Team.

In the 18 years following the radiation exposure, an undetermined number of the exposed persons have died and others have moved to different atolls. The Committee for this reason interviewed people on Majuro and Ebeye. The four sessions were attended by approximately 300 people including exposed persons, families of deceased exposed persons, and numerous persons in the control groups. Although the interviews were carried out through Marshallese interpreters, there was little difficulty in following the proceedings.

The Chairman of the Committee, Senator Olympio T. Borja, presided at each of the four sessions. At the start of each session, he stated the purpose of the visit of the Committee was as follows:

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1. To determine the extent of personal [illegible] the people of Rongelap and [illegible] radiation exposure.

2. To determine [illegible] land and trees.

3. To obtain ad[illegible] treatment.

4. To obtain reasonable and just [illegible] for personal injury and damage [illegible] Utirik Atolls.

<u>Observations</u>

A. Medical Problems:

The examinations conducted by the medical team from the Brookhaven National Laboratory are [illegible] resented by the involved people, both exposed and control groups. I am deeply concerned that the Marshallese have apparently lost confidence in the medical examinations and the aborted effort in March [illegible] had little [illegible]. I am of the opinion that a major [illegible] trouble has been a lack of understanding by the people of the purpose of the examinations. At all four sessions, it was repeatedly asserted by the people that they were not informed of the findings and that treatment and medications were not available. The people attribute any and all sickness to the effects of the radiation and believe that the medical team should treat them. The control groups appear to most resent the examination because of the lack of understanding as to its purpose. For example, the people from Utirik asserted they were told they were not injured and therefore not entitled to compensation, yet were forced to submit to the examinations. [illegible] result, many refused to be examined. They resent the taking of large samples of blood and feel that they should [illegible] compensation [illegible] procedure.

I repeatedly heard that the involved people [illegible] submit to additional examinations in September or October only if independent physicians from Japan, WHO, and the [illegible] Health [illegible] accompany the team.

The Health Aides on Rongelap and Utirik have difficulty in administering the prescribed thyroid medication due to the lack of written records on the patients. The Aide on Rongelap stated he thought the records were in the trailers but were not available [illegible]. There are apparently no records in Marshallese for the use of the Health Aides or Medical Practitioners that periodically visit the Atolls.

At all four sessions, the women repeatedly stated that there have been more miscarriages and abnormal babies on both Utirik and Rongelap since the explosion. Those from [illegible] stated this occurred during the first year after [illegible] to their Island. Specific dates and instances could not be determined. Apparently there were four abnormal babies born to [illegible] exposed women of Rongelap who were not pregnant at the time of exposure. After much discussion among themselves, the [illegible] for the women stated that there [illegible] the number of miscarriages on Rongelap.

According to statements made at the sessions, approximately 19 exposed persons living on Rongelap at the time of the explosion, who were under the age of 10, have developed thyroid nodules requiring surgery. Although biopsy reports indicate [illegible]-3 of these to be malignant, the involved patients believe [illegible] all have cancer. They are not able to distinguish between benign and malignant lesions. It is apparent that some of these patients are not taking thyroxine as instructed. I emphasized at all four sessions that the prescribed medication was necessary for their health and welfare.

In summary, the apparent lack of communication and understanding between the people and the medical team has been a major problem. There have been difficulties with interpretation between English and Marshallese [illegible] factor.

B. Compensation:

Although I did not [illegible] participate in the sessions devoted to compensation, the following complaints [illegible] registered:

1. The exposed people of Utirik [illegible] believe that they have sustained physical injury from the radiation and are entitled to just compensation. Those now living on Majuro and Ebeye stated they wanted to return to their home but were afraid of the radioactivity [illegible].

2. The exposed people of Rongelap [illegible] believe that the compensation paid to them in 1964 was inadequate because of the thyroid abnormalities that have developed since that time. The Rongelapese now living on Majuro and Ebeye will not return to their home because of the [illegible] radioactivity and the fear of [illegible].

1014851

3. The people of both Atolls [illegible] the land and trees were damaged by the radiation and [illegible] should receive just compensation for this damage. [illegible] would agree to have such compensation placed in trust for [illegible] the good of both groups.

4. The control groups believe they should receive compensation for submitting to the medical examination.

C. Recommendations:

As a physician concerned with the health and welfare of the exposed people, I urge that the next medical examination proceed without further delay. In order to have the examination proceed without difficulty, the following recommendations should be seriously considered by the Special Joint Committee.

1. Independent physicians from Japan, WHO, and the U.S. Public Health Service should accompany and make individual reports to the Special Committee.

2. The physicians from Japan [illegible]

Dr. Haruo Ezaki, University of Hiroshima
Dr. Toshiyuki Kumatori, National Institute of Radiological Sciences

The importance of the presence of these two physicians cannot be overemphasized. In my opinion, if they are not present the involved people will refuse to be examined. Due to possible complications in clearance of these physicians, the proposed date of September 7, [illegible] may have to be delayed.

3. The Director of Health, Trust Territory of the Pacific Islands, should be requested to send Medical Officers with the examining team to treat local diseases. Such treatment would be advantageous from a public relations standpoint and should lead to more cooperation by all concerned.

4. Every effort must be made to improve communication between the physician and the people under study. A better understanding of the purpose of the examinations would remove an apparent major source of resentment now evident. [illegible] written translation of the major findings into Marshallese should be made for the use of the Health Aides and the Medical [illegible].

1014852

5. The Trust Territory should provide additional medical examinations and treatment to the people of Utirik and Rongelap. This would supplement that provided by the annual surveys by the Brookhaven National Laboratory Medical Team.

APPENDIX NO. 4

Statement of Dr. R.A. Conard Concerning [illegible] of Persons as a Result of

March 1, 1954 [illegible]

(From Radioactive Fallout and Its Effects on Man, U.S. Congress, 1957)

1014854

"The estimated [illegible] gamma dose [illegible] evacuated from the island of Utirik following [illegible] the Pacific Proving Ground was about 15 roentgens [illegible] but no beta burns appeared. It is fair to assume [illegible] place due to their mode of living, [illegible] currents. Gamma dose rate readings [illegible] natives at about H+78 hours both on the beach and [illegible] the personnel readings averaged [illegible] per hour [illegible] probably included some contribution from the [illegible] wading through the surf and boarding the [illegible] per hour gamma.

"The 18 natives [illegible] received an estimated whole-body gamma dose [illegible] days. Of these, 14 later experienced [illegible] and none showed epilation.

"In the case of the [illegible] whole-body dose was about 170 roentgens [illegible] later experienced beta burns to some degree [illegible] the natives showed epilation from slight [illegible]

"The 16 natives from [illegible] to Kwajalein had personnel gamma dose-[illegible] hour although 1 was as high as 140 [illegible] per hour (at H+ about 55 hours). The remaining [illegible] were reported to have personnel readings that "averaged" 60 [illegible] before decontamination. The picture is further [illegible] natives had bathed and some had not before the arrival [illegible]

"Most of the 28 [illegible] stationed on Eniwetok Island, Rongerik Atoll [illegible] based on film badge readings. Three [illegible] for part of the time in another section [illegible] received somewhat higher doses. Seventeen [illegible] showed only slight, superficial lesions [illegible] It should be pointed out that the [illegible] during some of the fallout time and [illegible] evacuation. This reduced the direct [illegible] body gamma dose. A film badge hanging [illegible] end of the island read 98 roentgens. [illegible] readings at another part of the island indicated [illegible] had remained in the open for the [illegible] hours) to evacuation (at about H+34 hours [illegible] personnel gamma dose rate reading was as [illegible] hours.

"The above data [illegible] rough bracketing of gamma-beta [illegible] natives from

Utirik received [illegible] dose of 25 roentgens and showed no evidence of [illegible] natives on Sifo Island, Ailinginae Atoll, received about [illegible] whole-body gamma dose of 75 roentgens, with [illegible] moderate burns, 2, no burns, 3 with moderate epilation, [illegible] epilation. In addition, Rongelap natives [illegible] gamma dose, and about 90 percent showed [illegible] percent some degree of epilation.

"It is to be [illegible] probably were out of doors and received [illegible] seminaked, perspiring bodies, including bare feet, and [illegible] most, would tend to collect and hold [illegible] time of delivery of essentially all of the doses [illegible] may be speculated that the fallout on the more distant [illegible] about 300 statute miles) would consist of smaller particles [illegible] possibility of overlapping of radiation [illegible]

Appendix [illegible]

[illegible]

(From Radioactive [illegible] and Its Effects on Man, U.S. Congress, 1957)

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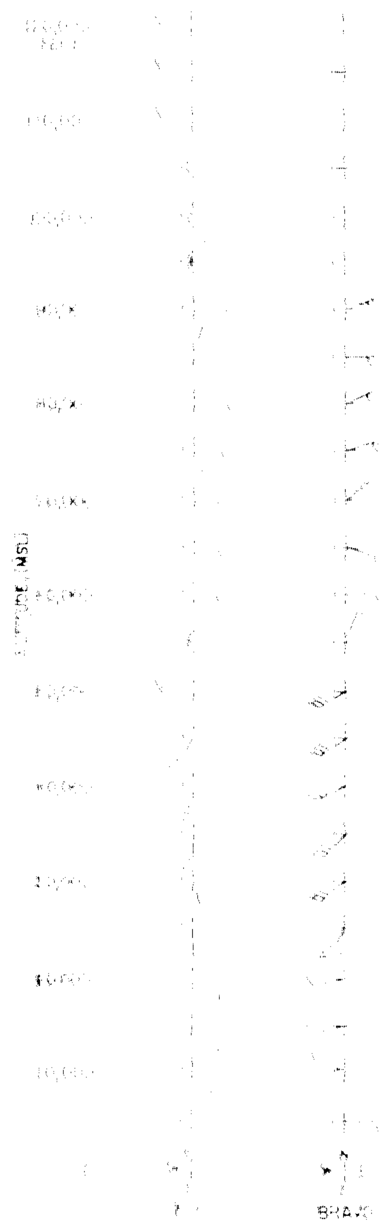

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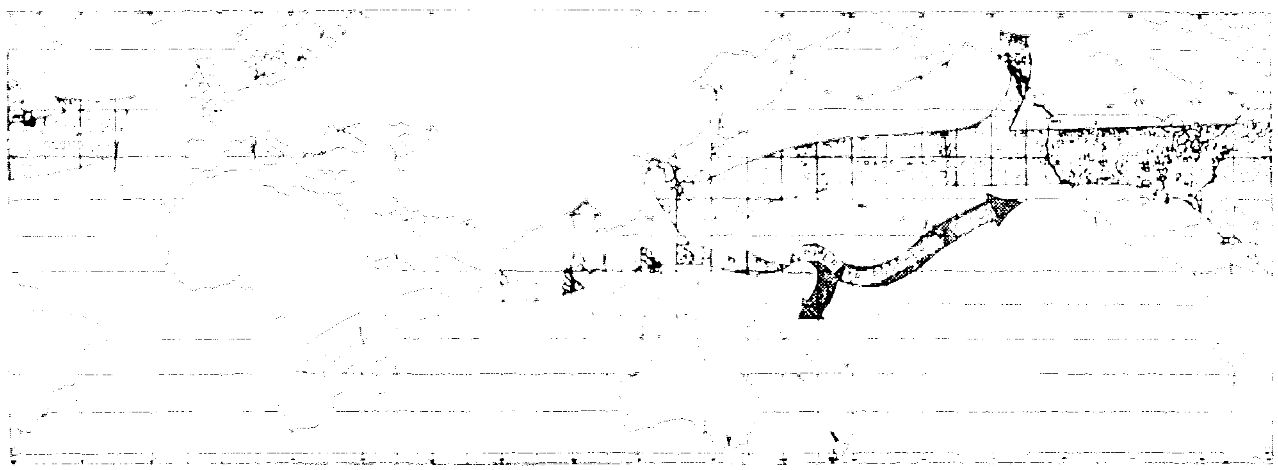

Figure [illegible].—Early history of the Mike cloud. The figures indicate the number of days between detonation and the first ground observations of fission products.

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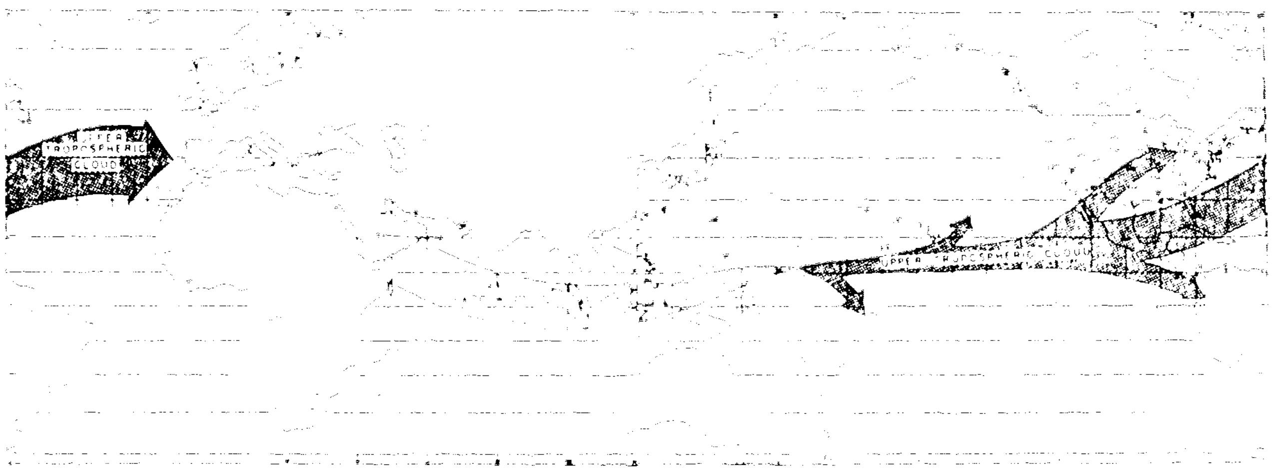

APPENDIX NO. 6

Atomic Energy Commission Off-Site Radiation Safety Program
for Nevada Proving Grounds

(From Radioactive Fallout and Its Effects on Man, U.S. Congress 1957)

1014861

[illegible] PUBLIC RELATIONS

"It was recognized that adequate [illegible] necessary to the successful operation of the Nevada [illegible] The off-site program was designed to facilitate good p[illegible] This was accomplished by cont[illegible] the system of zone commanders w[illegible] relations within a specified area [illegible] reported immediately and, of [illegible] carried out by the Joint Office of Test [illegible]

"The public relations program during [illegible] laid the general ground work for a c[illegible] carried out in the interim period.

"In general, relations with the [illegible] were good. People were particularly appreciative of [illegible] that monitors were permanently stationed in their communities [illegible] expressed to monitors indicated that [illegible] population [illegible] secure with this arrangement with regard [illegible] they appreciate having a local contact [illegible] for information [illegible] with complaints. Off-site personnel were [illegible] carry out [illegible] educational program since full advantage of their [illegible] the community was taken and they were asked [illegible] civic clubs and other organizations, [illegible] programs and newspapers and to aid [illegible] program.

"Prior arrangements [illegible] series, all of the large population centers [illegible] off-site personnel to inform people of the [illegible] manner in which off-site problems would be handled.

"Immediately before the start of [illegible] of these communities were revisited by a group consisting [illegible] Test Manager, Scientific Advisor, Test Director, [illegible] Information Director, Off-Site Operations Chief, [illegible] PHS officer. A series of talks were [illegible] Caliente, [illegible] and Tonopah, Nev., and St. George and Salt Lake City, [illegible] these talks the value of continental [illegible] was stressed and the precautionary measures [illegible] taken with [illegible] public safety were outlined. People were informed of the [illegible] monitors in their community and [illegible] become a part of the community during [illegible] in regard to public safety, [illegible]

"From 7 to 1[illegible] days before the [illegible] the monitors with their equipment [illegible] into the community, familiarized themselves with the area, [illegible] took over the job of public relations.

"Liaison [illegible] Arrangements [illegible] made to keep those health officials who [illegible] informed of the activities at the test [illegible] were Nevada, Utah, California, an[illegible] and the [illegible] officers of these States were advise[illegible] that might affect area[illegible] advised in these instances were:

Nevada: Dr. [illegible]
Utah: D[illegible]
California: [illegible] State health officer.
Arizona: [illegible]

"In addi[illegible] were made with affected USPHS of[illegible]

"Activities [illegible] personnel conducted a public-relations program [illegible] informal a[illegible] earth basis. They formed a wide acquaintance [illegible] participated in local events and [illegible] part of the community seriously; as [illegible] example, the [illegible] dale who became a Sunday school teache[illegible] ceiling in one of the hotel[illegible] intima[illegible] with the people in the area was good [illegible] while it may not have altered comp[illegible] tests, it at least made the [illegible]

[illegible]

"Every [illegible] to reach [illegible] through talks and film showings was [illegible] throughout the off-site area saw at [illegible] least one discussion by monitors. [illegible] schools and PTA, and other groups. In this connect[illegible] should be stated that the new film Atomic [illegible] Nevada [illegible] reception. From the remarks made [illegible] personnel, [illegible] general feeling was that, for the [illegible] shown exactly what happened during [illegible]

"A comp[illegible] is not available, but the partial [illegible] table [illegible] will indicate the [illegible]

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Table [illegible] [illegible] Movies

Zone	Location	Date	Film	Attendance
[illegible]	[illegible]	Feb. [illegible]	Target Nevada	[illegible]
	[illegible]	Feb. [illegible]	Atoms in Agriculture [illegible]	[illegible]
[illegible]	[illegible] School	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
			[illegible]	[illegible]
			[illegible]	[illegible]
			[illegible]	[illegible]
[illegible]	[illegible]	Feb. [illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	Feb. [illegible]	do	[illegible]
	[illegible]	Feb. [illegible]	[illegible]	[illegible]
	Society of [illegible] Engineers	Feb. [illegible]	do	[illegible]
	[illegible] Hospital staff	Feb. 25	do	
	[illegible]	Feb. [illegible]	[illegible]	[illegible]
	Fire Department	Mar. [illegible]	do	[illegible]
	[illegible]water	Mar. [illegible]	do	[illegible]
	Baker PTA	Mar. [illegible]	do	60
	Eureka School	Mar. [illegible]	[illegible]	70
	Austin School	Mar. 16	Operation Ivy	60

Table 1.--Public relations--Movies--Continued

Town	Location	Date	Film	Attendance
Glendale	Mesquite School	Apr. [illegible]	A Is for Atom and Target Nevada.	[illegible]
	[illegible]	Apr. [illegible]	Target Nevada	[illegible]
	[illegible]	Apr. [illegible]	Target Nevada and Atomic Tests in Nevada.	[illegible]
	[illegible] Theatre	Apr. [illegible]	[illegible]	[illegible]
	[illegible] High School	Apr. [illegible]	A Is for Atom	[illegible]
	[illegible] (attending, [illegible] California civil defense).	Apr. [illegible]	Atomic Tests in Nevada, and Target Nevada.	[illegible]
[illegible]	[illegible]	Apr. [illegible]	Atomic Tests in Nevada	[illegible]
[illegible]	[illegible]	[illegible]	A Is for Atom	[illegible]
	[illegible]	[illegible]	do	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	A Is for Atom	[illegible]
	[illegible]	Apr. [illegible]	Atomic Tests in Nevada	[illegible]
St. George	[illegible]	Apr. [illegible]	Target Nevada	[illegible]
	[illegible]	Apr. [illegible]	Atomic Tests in Nevada	[illegible]
	Kanab High School	Apr. [illegible]	do	[illegible]
	[illegible]	Apr. [illegible]	do	[illegible]
	St. George [illegible]	do	do	[illegible]
	Ladies' relief society (Latter-day Saints).	do	do	[illegible]
	do	Apr. [illegible]	do	[illegible]
	Elementary school	Apr. [illegible]	do	[illegible]
	Dixie College	do	do	[illegible]
	[illegible]	do	Atomic Tests in Nevada, and Target Nevada.	[illegible]

Table 1.--Public relations--Movies--Continued

Place	Location	Date	Title	Attendance
[illegible]--Continued:				
	Chamber of Commerce	[illegible]	Atomic Tests in Nevada	[illegible]
	High school	[illegible]	Atomic Tests in Nevada, [illegible]	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	do	[illegible]
	[illegible]	[illegible]	do	[illegible]
	[illegible]	[illegible]	do	[illegible]
[illegible]	High school	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	do	[illegible]
	[illegible]	[illegible]	do	[illegible]
	[illegible]	[illegible]	do	[illegible]
	[illegible]	[illegible]	do	[illegible]
	[illegible]	[illegible]	do	[illegible]
	[illegible]	[illegible]	Atomic Energy	[illegible]
	[illegible]	[illegible]	do	[illegible]
	[illegible]	[illegible]	do	[illegible]
	[illegible]	[illegible]	do	[illegible]
Other:				
Beatty, Nev.	[illegible]	[illegible]	[illegible], and Atomic Energy.	[illegible]
Do.	[illegible]	[illegible]	Atomic Tests in Nevada	[illegible]
Do.	High school	Apr. [illegible]	Atomic Tests in Nevada (shown twice).	[illegible]
Chattanooga, Tenn	Division of Health and Safety, TVA.	May 9	do	[illegible]

1014866

Table 1.--Public relations--Movies--Continued

Zone	Location	Date	Title	Attendance
[illegible]				
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]				[illegible]

[illegible]

1014867

"In add[illegible] large number of individual [illegible] of this indicates [illegible] program. During a routine [illegible] Goldfield, Nev., the wearer [illegible] people at the test site, [illegible] over in a small place like [illegible], however, that although relations [illegible] generally good, there are [illegible] example of this is the attitude of [illegible], who contrary to [illegible] highly critical [illegible].

"Other [illegible] news release of the Joint [illegible] used by monitors. However, the most [illegible] material was the little yellow booklet, [illegible] Test Site Region. Thousands of [illegible] post offices, motels, and [illegible] Nevada and Utah, and in parts of Arizona [illegible] well received. In fact, some people [illegible] copies to distribute on their [illegible] were picked up by tourists and were [illegible].

"Special [illegible] that numerous incidents requiring [illegible] of three types, as they affected [illegible]. All that came to the attention of [illegible] and are documented in the [illegible].

"With respect [illegible] number of complaints were from [illegible] nature of radioactivity [illegible] in all cases where blast damage [illegible] were mailed and these are being [illegible]. In those cases where contamination [illegible] vehicles, the zone personnel [illegible] to satisfy people during the [illegible].

"A number of [illegible] people were reported. These were [illegible] commander, Dr. Clinton [illegible] Powell, who [illegible] useful that it became apparent [illegible] medical personnel to also [illegible], a qualified doctor with [illegible] within the off-site program [illegible] of personal radiation [illegible].

"[illegible] All investigations were [illegible] procedure eliminated [illegible] ethics, increased the patient's [illegible] to educate the local [illegible].

1014868

The general [illegible] brought to the local doctor's office [illegible] provided the transportation. [illegible] and arrived at a decision. [illegible] Engineering [illegible]

"In no case [illegible] that could be definitely att[illegible] turned out to be some common [illegible]. However, the reports of [illegible] matter [illegible] be investigated [illegible] that this is due to [illegible]

"Reports of [illegible] by some personnel and investigated [illegible] Kuhn and Col. [illegible] Agricultural Farm [illegible] of the Utah State Agricultural College [illegible] livestock damage will [illegible] the tests since livestock [illegible] life of the area. [illegible] services of a veterinarian [illegible] investigative program."

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Appendix No. 7

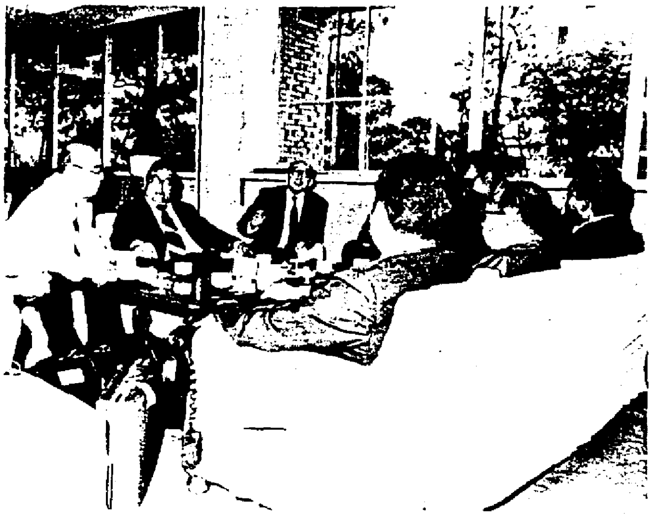
Photographs

The Committee in Tokyo during June. From left to right (l to r) are: Acting Legislative Counsel Mamoru Nakamura, Dr. Kumatori, Representative Ataji Balos, Chairman Olympio T. Borja, and Mr. Matashigi Oshi, a former crew member of the Lucky Dragon.

In Hiroshima near the Peace Park Memorial, (l to r) Representative Balos, Acting Legislative Counsel Nakamura, Chairman Borja, Representative Timothy Olkeriil, staff member Brian Farley, and Dr. Masao Kumangai.

At the Office of the Governor of Hiroshima Prefecture, Chairman Borja (l) explains the Committee's mission to the Honorable Itsuo Nagano (r) while interpreter looks on (center).

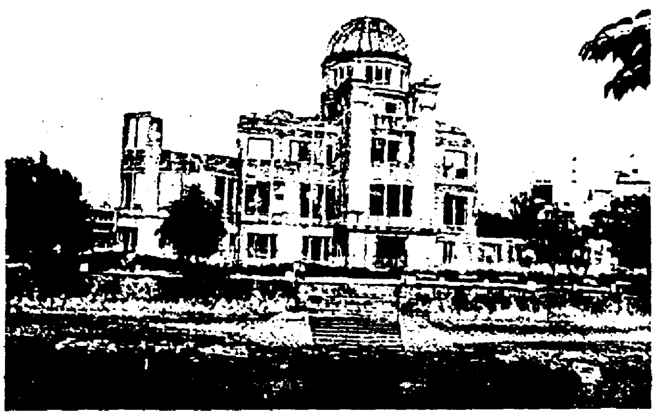
The Committee poses for a picture with the staff of the Hiroshima ABCC (l to r) Dr. Kato, Dr. Maki, Dr. Steer, Chairman Borja, Dr. Allen, Representative Olkeriil, Dr. Kumangai, Dr. Belsky, Representative Balos, Acting Legislative Counsel Nakamura, Staff member Farley and Dr. Wada.



At the Hiroshima A-bomb Red Cross Hospital are: Dr. Shigeto, Chairman Borja, Foreign Affairs Chief Kaoru Ogura, and the other members of the Committee.

At the Institute for Nuclear Medicine and Biology of Hiroshima University are (l to r) two unidentified staff members, Representative Olkeriil, Staff Member Farley, Dr. Noamasa Okamoto, Director of the Institute, Representative Balos, Dr. Ezaki, Acting Legislative Counsel Nakamura, and Representative Hans Wiliander.

The Committee on the steps of the Nagasaki ABCC. In the center of the group wearing white is Dr. Sadahisa Kawamoto of the ABCC department of medicine.



The remains of the Industrial Promotion Hall in Hiroshima, now preserved as a monument.

Elderly survivors of the Nagasaki A-bomb honor the Committee with a dance at the Old Age Survivors Home in Nagasaki.

Dr. Kumangai (l) and Chairman Borja (r) compare notes as the Committee heads back to Saipan from Japan.

At the Majuro dock prior to departing for the islands in July. In the foreground, partially facing away from the camera is the former magistrate of Rongelap, John Anjain, whose son Lekoj died of leukemia in November of 1972.

Some of the Paraphernalia of the survey team aboard the Militobi during the September survey.

Dr. Cole of the U.S. Public Health Service aboard the M/V Hafa Adai as the Committee departed for its first visit to Rongelap and Utirik.

Dr. Conard on the bridge of the Militobi, at the beginning of the September survey.

Members of the BNL team aboard the M/V Militobi (l to r) Dr. Kundsen, Dr. Sutow, Dr. Conard, Dr. Cole (consultant) and Dr. Larsen.

View of the end of Rongelap Island showing former RadSafe site constructed after the 1954 incident.

Decorations and flags were a part of the welcome the people of Rongelap gave the Committee during its July trip.

The Committee during the July trip to Rongelap (l to r) Henry Moses of the Marshall Islands District Administrator's Office, Dr. Cole, Representative Wiliander, Chairman Borja, Representative Balos, Health Aide Joe Saul, Laboratory Technician Nelson Zetika, and Dr. Kumangai.

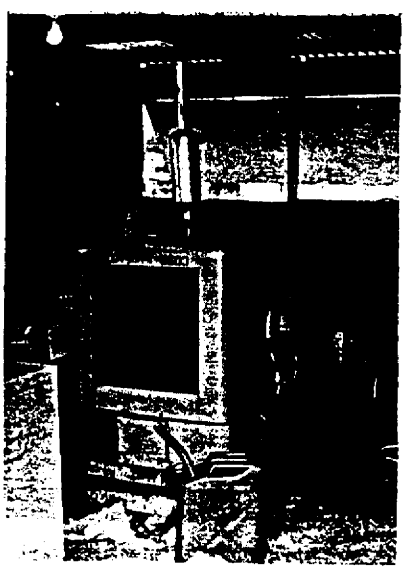
The AEC jeep and trailer on Rongelap.

The AEC deisel tractor used to load and unload equipment during the surveys on Rongelap.

The A-frame building used by the BNL team as living quarters during its stay on Rongelap.

The small trailer on Rongelap used for the taking of blood samples.

One of the two large trailers on Rongelap. This one has a room for the taking of X-ray photographs, and a section used as a mess hall.



The generator, in another building on Rongelap, which provides electricity for the team's work during the survey.

A patient giving her medical history to Dr. Ezra Riklon.

1014875

A resident of Rongelap having his X-ray photograph taken.

The other large trailer used as an examination room during the survey.

Trust Territory Laboratory Technician Sebio Shoniber taking a blood sample.

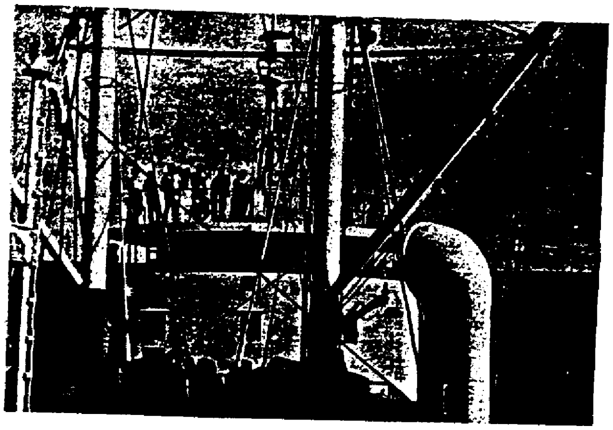
Dr. Kumatori (l) and Dr. Ezaki during the September survey.

Dr. Conard checks for thyroid nodules during examination of a resident of Rongelap.

An attentive listener at the meeting of the Committee with the people of Rongelap.

The people of Rongelap at a public meeting requested by the Committee.

Captain Willie Poznanski preparing to pilot the Militobi through the Utirik Pass.

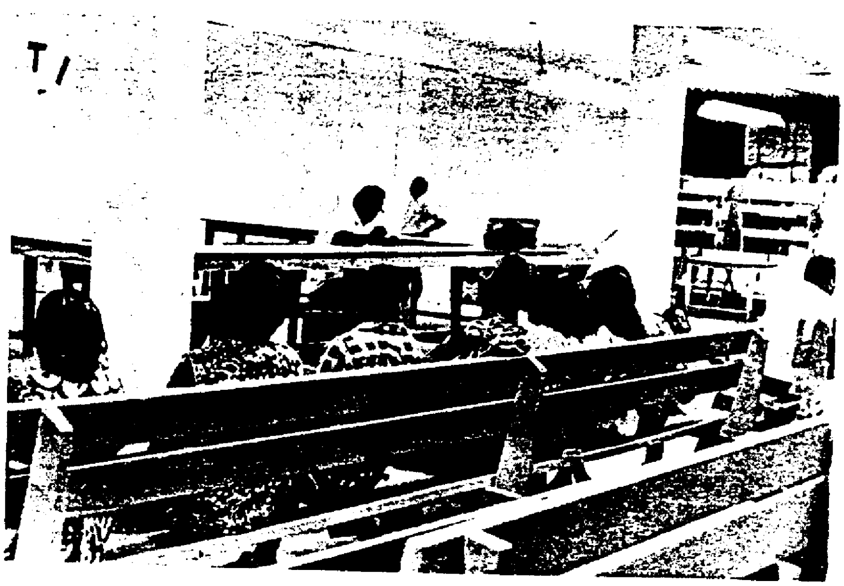


Members of the survey team with Captain Willie on the flying bridge of the Militobi as it navigates the tricky pass at Utirik.

The village pathway at Utirik.

The Committe and the people of Utirik after an island meeting, in July.

Another view after the same meeting.



Chairman Borja and people from Rongelap and Utirik during a July meeting in Ebeye.

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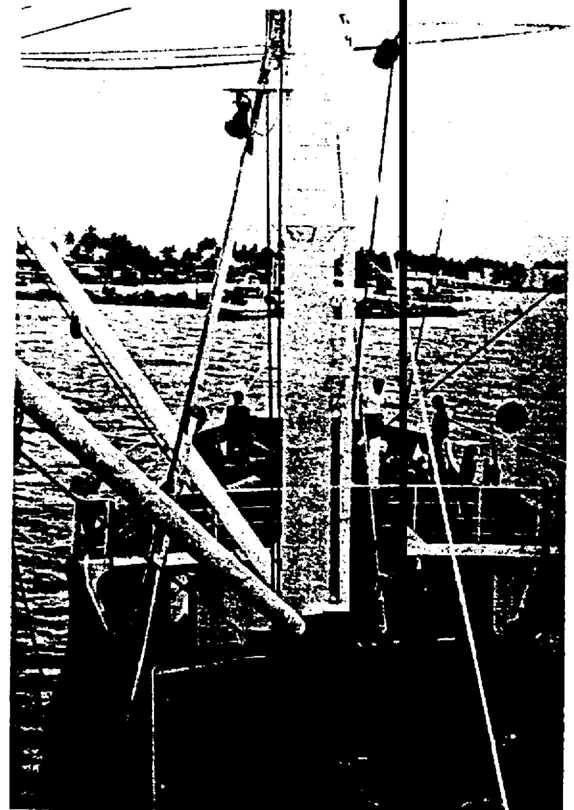
Committee member Williander talking with Dr. Rikon during the September survey.



The Militobi returns to Majuro after the Rongelap and Utirik survey.

The Committee's consultants: (l to r) Dr. W.S. Cole (United States), Dr. Kumatori and Dr. Ezaki (Japan), and Dr. E.E. Pochin (United Kingdom) prior to their departure from Majuro at the end of the survey.

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September survey team (l to r) First Row: Dental Aide Kumura Riklon, Health Aide Joe Saul, Laboratory Technician Nelson Zetika, Dr. W.W. Sutow, Assistant Medical Equipment Repair Specialist Kosang Mizutoni, Dr. Robert A. Conard, Dr. Haruo Ezaki. Second Row, standing: Laboratory Technician Supervisor Sebio Shoniber, BNL staff member Mike Makar, Dr. Jetton Anjain, BNL staff member William Scott, Dr. Ezra Riklon, Dr. Knud Knudsen, Dr. William S. Cole, BNL staff member Doug Clareus, Dr. Austin Lowery, Dr. E.E. Pochin, Dr. Toshiyuki Kumatori, and Dr. Larsen.