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July 18, 1980

403103

Mr. Wallace O. Green
Deputy Under Secretary of
International and Territorial Affairs
Department of the Interior
Office of the Secretary
Washington, D.C. 20240

Dear Mr. Green:

I have been advised by Mr. Clifford Sloan, Legislative Assistant for Congressman Sidney Yates, to forward along the enclosed information concerning the proposed resettlement of Enjebi Island in the Marshall Islands. I hope this information will prove to be of some use in making your decision about the resettlement, and I must admit that I do not envy your position in having to make a determination about this most complex and difficult issue.

My involvement with the Marshall Islanders began in 1975 when I was stationed on Utirik Atoll as a Peace Corps volunteer. Despite my "official" Peace Corps task of helping to initiate an agricultural co-operative, as well as to teach school on the atoll, I soon realized that the Utirik people had more immediate concerns which stemmed from their irradiation during the BRAVO shot of March 1, 1954.

Specifically, the Utirik Council articulated to me their complaints about the Brookhaven National Laboratory medical program in the Marshalls, and the Utirik people were becoming increasingly suspicious about the nature of that program. For example, the Utirik people could not understand the logic of a program which spent millions of dollars annually, and which neglected to treat numerous illnesses in their population, notwithstanding that these illnesses were admittedly unrelated to radiation and its effects. A case in point concerns the 30% incidence rate of adult-onset type diabetes as diagnosed in the Utirik group by Brookhaven doctors several years previously: the Brookhaven doctors carefully explained that because diabetes was unrelated to radiation, it was "not their responsibility," and consequently the diabetes was left untreated. Moreover, many other cases of illnesses which were allegedly unrelated to radiation--including primary and secondary health care--went untreated. As a result, the Utirik people began to question the Brookhaven program for their atoll, and they began wondering whether the program was really intended for their benefit, or perhaps for the benefit of medical science and scientific inquiry.

It is my sincere belief that these "oversights" will be corrected with the newly enacted Public Law 96-205, and I have faith that the newly appointed Director of the Brookhaven-Marshalls medical program (Dr. Hugh Pratt) and his medical team will remedy many of the past maladies which have afflicted the past program.

The present question concerning the proposed resettlement of Enjebi presents us with an enigma involving a radiological cost-benefit analysis, and in light of the recent historical fiasco at Bikini, it seems appropriate to proceed with extreme caution as we approach the termination of the United Nations Trust Agreement with Micronesia. We must allow humanitarian concerns outweigh short-sighted political expediencies, and the entire history of United States administration in the islands clearly bespeaks the need for prudence at this time.

It has been maintained that the Enjebi people favor a return to their ancestral island, despite the potential health risks involved in such a return. Counsel for the Enewetak people -- Mr. Theodore Mitchell of Micronesian Legal Services -- has communicated to me that the Enewetak people truly understand the radiation hazards involved with their proposed return, and moreover, that the Enewetak people (including the Enjebi islanders) are prepared to live with those risks.

I must say, based upon my experience of having lived on an outer island in the Marshalls for two years, and coupled with my current graduate research concerning the sociocultural effects of radiation in the Marshalls, that if the Enjebi people truly understood the long-term effects of residual low-level radiation, then perhaps they might not be so eager to return to their contaminated island. I of course sympathize with the Enjebi peoples' desire to return home after their 33 year exile, and I cannot question the sincerity of the Enewetak counsel in attempting to relocate his clients. But I certainly question the supposed "understanding" by the Enjebi people of the long-term effects of residual low-level radiation, which is itself a major source of controversy amongst the leading radiation experts, both in this country and abroad.

For example, there is a new German study entitled "Radiological assessment of the Whyl Nuclear Power Plant" (or commonly known as the "Heidelberg Study"), which seriously questions the Nuclear Regulatory Commission's standards about radiation emissions from nuclear power plants to outlying communities. This study, which is listed as "NRC translation 520," states that "previous NRC exposure models and transfer factors for concentrations of radionuclides in foodchains are inaduquate." The findings of this German study are directly applicable to the Enjebi health risk assessment question, and the study illustrates the uncertainties connected with low-level radiation assessments and risks.

I have enclosed a recent critique of the Bender and Brill Enewetak Assessment, which calls into serious question the analysis and recommendations contained in that study. This recent critique, performed by Dr. Rosalie Bertell of the Ministry of Concern for Public Health, challenges the interpretation of radiological data by Drs. Bender and Brill, and Dr. Bertell suggests prudence in considering the proposed resettlement of Enjebi.

Another critique (also enclosed) by Dr. Karl Z. Morgan raises very serious questions about the dose assessment calculations of Drs. Bender and Brill, and on the basis of his analysis of the Bender-Brill study, Dr. Morgan seems to suggest that their study is inadequate for making a determination about the proposed resettlement of Enjebi.

In all honesty, I do indeed favor the resettlement of Enjebi, but only on the condition that another assessment of the potential health risks be commissioned by truly <u>independent</u> and <u>non-governmental</u> radiation experts having no connection with the United States Government. The Bender-Brill assessment has been criticized by well-respected radiation experts, and as competent as these two researchers may be, they present us with an inherent conflict of interest: as you may know, both Bender and Brill are employees of Brookhaven National Laboratory, and there is an inherent conflict of interest when Government researchers assess Government data.

As an alternative, I propose that a group of truly independent radiation experts be allowed to survey Enewetak and Enjebi, as well as all of the Northern Marshall Islands which were exposed to fallout during the testing program. I have in mind several radiation experts and doctors from an independent organization known as "Physicians for Social Responsibility" (PSR), which is based in Boston, and which has a membership of more than 1,500 physicians and scientists in the United States. I have been in recent communication with members of that organization, and I am told that PSR is very interested in doing an independent survey of the Marshall Islands, and in making recommendations based upon such a survey.

Such an independent survey and assessment may cause a slight delay in the Enjebi resettlement, but I do maintain that an additional six months or so is really an infinitesimal period when contrasted with the 33 years of exile already experienced by the Enjebi people. Such a survey will go a long way to attain some degree of objectivity in the Marshalls, and it may be a way out of the "nuclear quagmire" which has caused much in-fighting between various Government agencies involved with the Marshall Islands, as well as the internal conflicts between the new Marshall Islands Government and the people of Enewetak. For me, such a survey by independent radiation experts seems like an obvious solution at the present time, and we can only benefit from another point of view

when we are dealing with so many unknowns about the effects of a new technology over the course of time.

And I might add, that despite the solace an alternative point of view of Enjebi dose assessments will have for us and the concerned United States agencies, such an independent assessment will go a long way to reassure the Enewetak people themselves about the risks involved in the proposed return.

It should be pointed out that the Enjebi people will be living in a contaminated environment, and their concerns and possible anxitites about the long-term effects of low-level radiation effects will not automatically cease upon their return. It was my experience on Utirik that the people spent much time discussing the residual radiation on their contaminated atoll, and although I must admit that many of their "theories" about possible radiation effects seemed naive and inappropriate to me at the time, the real point was that they honestly believed their intuitions and "theories" about radiation effects. I have enclosed a copy of my 1977 Congressional testimony which details some of these beliefs.

I think the very least that we can presently do to reassure the Enjebi people is to commission an independent survey with scientists having no connection with an agency of the United States Government. Also, I should mention that many people in the Marshall Islands have heard about "Physicians for Social Responsibility" and their eminent President, Dr. Helen Caldicott. It is my impression that having Dr. Caldicott and her organization attached to an independent survey and assessment of the Marshalls will help to restore some of our lost credibility with these people who have a long history of "losing" with the United States Government.

In closing, I would like to point out that in my 1979 address before the United Nations Trusteeship Council, where I represented the International League for Human Rights, I specifically requested that an independent survey be conducted in the Marshall Islands. In their recommendations to the Administering Authority, the Trusteeship Council agreed with my request and also recommended an independent survey in the Marshalls.

As we reach the termination of the Trusteeship Agreement, it seems that our legacy in Micronesia has been somewhat uneven and inconsistent. The trust of the United States Government by the people of Micronesia under the Trusteeship has become tenuous at best, and I think an independent survey in the Marshall Islands is long overdue if we are to maintain any degree of credibility, both with the Micronesians and with the international community at large.

Thank you very much for your time and consideration of these important matters, and I am most optimistic about an eventual positive solution for this very messy business of radiological contamination in the Marshall Islands, and I am both delighted and encouraged by the very careful scrutiny your Agency has shown in this matter.

Please feel free to contact me at any time concerning this issue if you feel that I may be of some help!

Sincerely yours,

Glenn H. Alcalay

Enclosures

xc: Clifford Sloan, c/o Rep. Yates
Arthur Paterson, National Council of Churches
Ted Davis, Physicians for Social Responsibility
Giff Johnson, Micronesia Support Committee
Anton DeBrum, Marshall Islands Government
Theodore Mitchell, Micronesian Legal Services

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June 24, 1980

Mr. Cliff Sloan
Office of Rep. Sidney R. Yates
2234 Rayburn House Office Building
Washington, D.C. 20515

Dear Cliff:

I am writing this letter as a follow-up to our meeting of April 14th, and also to bring you up to date on some points concerning the Marshall Islands and the Enewetak resettlement. By now I am certain of your growing bewilderment in these matters due to the many, and often contradictory, reports your Office receives relating to the Marshalls. I must say that you have my sympathies in attempting to untangle this "nuclear quagmire," and hope this correspondence will be of some help in your attempt to understand the myriad complexities in the Marshall Islands.

I should like to say at the outset that I have always favored prudence and caution when dealing with problems associated with radiation in the Marshalls, and the entire history of the United States' testing program bespeaks the need for very careful analysis and consideration of all relevant factors affecting the well-being of the Marshallese. A case in point is the current dilemma facing the Enewetak Islanders, and particularly the people of Enjebi, who are understandably anxious to return to their ancestral island after living in exile for thirty-three years.

It is my sincere feeling that the people of Enjebi should be allowed to return to their home island, but only on the condition that it is "safe" for them to return. I use quotations around the word "safe" because the whole question of Enjebi revolves around the meaning and interpretation of what constitutes "safe." As you are well-aware, this notion of what constitutes a "safe" level of radiation is one of the most hotly-debated issues in the nuclear field, and it is nearly impossible to find two reputable radiation experts who will agree about a "safe" level of radiation.

In the following paragraphs, I would like to briefly outline some major points which I think are relevant to the Enjebi question, and I would like to reiterate my earlier request for truly independent radiation experts in the Marshall Islands in order to prevent further conflicts of interest regarding the interpretation of radiological data in the Marshalls. If independent radiation experts prolong the Enjebi resettlement for an additional six months or so, then so be it! Six more months is a short time in relation to the thirty-three years

already spent in exile by the Enjebi people. It is my belief that prudence and caution must take precedence over expedient and often-catastrophic political considerations. In the case of the Enjebi resettlement, if history should prove that we were too cautious and that we acted too prudently, I assure you that it would be a first in the Marshall Islands. I know that I personally would rather be in the position--say ten or twenty years hence--of having to explain why there was a six-month delay in the Enjebi return, rather than have to explain why one more previously "unexposed" group of Marshallese became an "exposed" group because of a hasty decision made by some "concerned" people who thought that things were "alright" on Enjebi.

I think the following points will substantiate my present concern over the Enjebi resettlement and my request for truly independent radiation experts in the Marshall Islands. We can only stand to gain from having an alternate point of view in relation to the radiological data and the recommendations therein, and I am convinced that the Enjebi people can only benefit from our acting with caution and prudence:

1) The entire history of the "nuclear age" has been beset with the constant downward revision of what constitutes a "safe" level of radiation for humans. It was previously believed that a dose of 50 rem was "safe" for humans; the dose was then decreased by a factor of ten to 5 rem; and the current BEIR (Biological Effects of Ionizing Radiation) Committee of the National Academy of Sciences--which was itself divided over the question of "safe" radiation levels, and whose recommendations are far from being universally accepted by well-respected radiation experts--recommends a dose of 0.5 rem in its 1979 updated Report. What this adds up to is a history of continuing uncertainty concerning the assessment of "safe" levels of radiation for humans, and this ongoing debate is exemplified by Drs. Gofman and Rall in the enclosed symposium transcript of the recent American Association for the Advancement of Science (AAAS) symposium I was asked to chair.

2) Dr. Robert A. Conard, who was the former head of the Brookhaven National Laboratory-Marshall Islands Program, expressed great surprise over the late-occurring thyroid effects in the exposed Marshallese populations. He claimed that these late effects were not anticipated before 1963, and it is fair to say that we still do not know what is going to happen in the future in this population. Again, this is a

major finding in the Brookhaven studies, and it points up the continuing uncertainties relating to the long-term effects of radiation, and the need for extreme caution and prudence when making policy decisions affecting the future health and safety of the Enjebi people.

3) The decision to allow the Bikini people to resettle on their ancestral atoll, and then the decision to quickly remove them in light of the potential threat to their health stemming from the internal deposition of radionuclides in the form of "residual" radiation at Bikini surely must not be forgotten when considering the proposed Enjebi resettlement. I have enclosed a 1975 radiation study from Lawrence Livermore Laboratory which should be compared with the current Bender-Brill study of Enewetak. It is uncanny to compare the reassuring language in both studies, and the "musical chairs" fiasco of the unfortunate Bikini Islanders--who were previously "unexposed" and who are now "exposed"--should remind us of the continuing enigmas surrounding the nuclear debate, especially as it pertains to "safe" levels of radiation for humans.

4) In retrospect, it seems clear why Japanese radiation scientists--who were invited out to the Marshalls by Marshallese and their elected representatives--were not allowed to visit the irradiated atolls of Rongelap and Utirik. The history of mistakes and mismanagement in radiation matters in the Marshalls exhibits the flaws associated with decisions being made from the recommendations of a point of view which has consistently been at odds with reality. What has sorely been needed (and wanted) in the Marshalls is an alternate point of view concerning the radiological data, and we now have the opportunity to correct our past mistakes by allowing truly independent radiation experts to assess Enewetak and Enjebi, as well as the rest of the Northern Marshalls which were affected by nuclear testing.

5) In my 1979 address to the United Nations Trusteeship Council, I requested independent and non-governmental radiation experts for an assessment of the Marshall Islands. The Trusteeship Council agreed with my request in its "Report of the Trusteeship Council to the Security Council" (in the Security Council's Official Records, Thirty-Fourth Year, Special Supplement No. 1, 9 June 1978 - 15 June 1979). To my knowledge, there has been no such survey by independent radiation experts in the Marshalls, and the time is right for such a survey. (Please see the enclosed U.N. documents)

In closing, I would like to mention that I have received a copy of a letter written by Mr. Theodore Mitchell (of Micronesian Legal Services), who represents the Enewetak people. I feel obliged to

respond to this letter, which was taken out of context from a telephone conversation I had with Mr. Mitchell in May, and which certainly calls into question my expertise as a Marshalls expert, as well as my motives for having a continued interest in the affairs of the Marshallese.

In our conversation, Mr. Mitchell repeatedly asked me about the "competence" of Drs. Bender and Brill in reference to their study entitled "Assessment of Radiation Health Effects of the Resettlement of Enewetak Atoll." I repeatedly explained to Mr. Mitchell that there was more than "competence" at stake in the study, and that I did not necessarily question the "competence" of the two scientists, but rather the inherent "conflict of interest" in having Brookhaven researchers assess United States Government data. I carefully explained to Mr. Mitchell that the history of the United States' testing program was one of repeated mistakes and miscalculations, and the very least we could now do was to show our sincerity to the Marshallese by including non-Government radiation experts in radiological surveys.

When Mr. Mitchell asked me if I had the background to assess the Bender-Brill study, I said "Not exactly, because my emphasis in the Marshall Islands has been in the sociocultural domain as it pertains to my ongoing Ph.D. dissertation work." I also said that I did have "enough of a background in basic radiological studies to know that an independent survey was sorely needed in the Marshalls," but he purposely neglected to mention <u>that</u> part of our conversation in his letter to your Office. Moreover, I might mention that Mr. Mitchell, who seems to feel that <u>he</u> is some sort of radiation expert, should probably learn that the very <u>first</u> <u>rule</u> in making radiation assessments is that the long-term effects of radiation, and especially low-level radiation (like the kind the Enjebi Islanders will be exposed to when and if they return to their island) are still a major source of contention amongst reputable radiation experts: Drs. Bender and Brill, as competent as they may be, are making mere speculations about the long-term effects of radiation at Enewetak. We may not know for ten or twenty or thirty more years what the long-term effects of low-level radiation are, and to date there has been no "Nuclear Moses" who has brought these answers down from Mt. Sinai on stone tablets. At the very least, our experience in the Marshalls proves that we should <u>proceed with extreme caution</u>, and if we are to error, let us do something different for a change and error on the side of health and safety of the unfortunate Marshallese. We have been playing nuclear "roulette" with innocent lives for too long.

And it is interesting to note that the recent article in the "Micronesian Independent" about Enewetak seems to suggest that Mr.

Mitchell was behind the letter to President Carter which in fact was a very different letter than the one signed by the three chiefs from Enewetak. It was my experience while a Peace Corps volunteer on Utirik that Marshallese never use the sort of language contained in the translated letter sent to the President, and I can only surmise that the original letter was grossly distorted, and misrepresented the views and feelings of the signatories of the letter. It is very interesting to compare this incident with the letter Mr. Mitchell wrote to your Office about our telephone conversation, which grossly distorted my views about the Marshall Islands.

Cliff, you should be aware that Giff Johnson (of Micronesia Support Committee) and I have submitted the Bender-Brill study to several well-respected radiation experts for their scrutiny and comments. We shall send their analyses and comments along to your office as soon as we get them, as it is imperative that we have an alternate point of view for the Bender-Brill study: we are dealing with the health and safety of human beings who have a history of "losing" with the United States Government, and we can presently help to rectify some of our mistakes if we proceed with caution.

Thank you for taking the time to consider these thoughts and views about the Marshall Islanders.

Sincerely,

Glenn H Alcalay

Glenn H. Alcalay

Enclosures

xc: Ted Mitchell
Giff Johnson, MSC
Arthur Paterson, National Council of Churches
Anton DeBrum, Marshall Islands Government
Ruth G. Van Cleve, DOTA-Interior
Peter R. Rosenblatt

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June 6, 1980

Cliff Sloan
Office of Sidney R. Yates
2234 Rayburn House Office
Building
Washington, D.C. 20515

Re: Resettling Enewetak Atoll

Dear Mr. Sloan:

At the request of the Micronesia Support Committee in Honolulu, I have reviewed the report of Michael Bender and A. Bertrand Brill entitled "Assessment of Radiation Health Effects of the Resettlement of Enewetak Atoll." I am enclosing a copy of my curriculum vitae so that you will have some evidence of my qualifications for reviewing this document. My research experience has been with human populations exposed to low levels of ionizing radiation. I am a consultant to the committees on environmental health problems of the New York State and Wisconsin Medical Associations, a member of the British Columbia Medical Association Committee on environmental health, and a consultant to the Division of (Radiation Exposure) Standard Setting for the U.S. Nuclear Regulatory Commission.

Frankly, Drs. Bender and Brill are writing outside of their area of scientific expertise. Neither is a biostatistician or epidemiologist, nor has either been among the 127 scientists involved in the twenty-year study of the Marshallese conducted through Brookhaven National Laboratory. They have used information from the draft copy of the 1979 BEIR report which is designed to assess generalized effects on a large normal population exposed to radiation. With no appropriate modification, they use these probabilities to predict "health effects" for the small native population of Enewetak Atoll. The level of genetic problems and chronic disease already present in this population, their increased susceptibility to future radiation damage (cumulative with that already suffered), and the inadequacy of present knowledge about the long-term fertility and mild mutation effects were completely ignored.

There are inner scientific inconsistencies in this paper. For example, on page 1 the authors state: ". . . the only potential health effects are the induction of cancer among the exposed population and the induction of genetic effects . . . ." On page 13 they admit: ". . . mutations may be induced in any body cell that has a nucleus . . ." and on page 18: "Of the somatic effects of ionizing radiation, cancer induction is that of greatest concern." The population of Enewetak Atoll has the right to know that a value judgment has been made for them, namely, that induction of cancer is their only concern. They may, if informed about hypothyroidism, aplastic anemia, premature aging, benign tumors and other such disorders, make a different judgment. They also have the right to know that radiation is a promoter of cancer which is induced by other environmental factors.

The lack of expertise in biostatistics is evident in Bender and Brill's use of averaging. For example, on page 4 they introduce a 50-year dose commitment so as to "reduce" average yearly dose of radiation. It is well known that most of the radionuclides in question deliver their dose in a relatively short time. Cs^{137}, for example, delivers its 50-year dose commitment in the first two years. On page 5, they "reduced" the radiation dose of the inhabitants of Enjebi by averaging in the population less exposed. This is like telling one member of a family his or her risk of lung cancer is lowered if the other nonsmoking members of the family are included and an "average" risk given. It is a scientifically ridiculous approach to public health!

On page 7, the authors compare the radiation dose received by the population of the Colorado Plateau with the added doses to be received by the people of Enjebi. In a recent survey of gamma radiation anomalies (OR-73), out of 6,253 high readings reported for Colorado, only 453, or 13.8%, were due to natural radioactivity. This does not include the problems in Grand Junction, Colorado, where 14,542 high gamma readings were made. There has been a remedial program in Grand Junction since 1972 under Public Law 92-314. The authors of the Enewetak position paper might better call for federal assistance for the people of Colorado, than call for increasing exposure to the population of Enewetak by a factor of 5.6 to match another polluted or high-risk area!

The authors put major emphasis on "natural background radiation," seemingly treating it as harmless. They also emphasize the inability to "detect" the difference between artificially induced and "naturally" induced cancers. These can be distinguished on the basis of longer period of debilitating disease prior to diagnosis. However, difficulty in tracing cause of cancer is hardly a reason to propose exposure of a population to radiation!

I am enclosing two papers which deal with the value of the atomic bomb casualty studies and also the health effects to be expected with exposure of already damaged people to further radiation. The approach toward measurement was in terms of the individual--not the large population. This approach could be developed to predict effects to a particular group such as the Enewetak population.

The other problems with the Bender and Brill papers include dealing only with genetic effects in live-born offspring (p. 15), neglecting to mention spontaneous abortions and stillbirths which may be expected to occur, and estimating radiation-induced cancer mortality in the lifetime of the population, ignoring other general health damage and cancer susceptibility in future generations.

Basing a resettlement decision affecting the lives of 500 people on the Bender and Brill inadequate health assessment would be extremely imprudent.

I would be glad to discuss this matter further at your convenience.

Sincerely,

Dr. R. Bertell

Rosalie Bertell, PhD, CNSH

RB:cw
Enc. - CV
Journal
Library memo 4/79
cc: Giff Johnson

June 23, 1980

Comments on Report: Assessment of Radiation Health Effects of the Resettlement of Enewetak Atoll Prepared by M. A. Bender and A. B. Brill

by

Karl Z. Morgan
School of Nuclear Engineering
Georgia Institute of Technology
Atlanta, Georgia 30332

The following are a few brief comments on this report by M. A. Bender and A. B. Brill dated October 12, 1979:

1. In general, this is an excellent report.

2. The report accepts the dose measurements of Robinson et al. (1979) without providing the reader with any of the pertinent information needed so that he can judge its adequacy. For example, there is no breakdown of the dose between that which is external and that which is internal. There is no indication whether internal dose values include a contribution from the actinide alpha-emitters, yet one would expect that some of the islands have appreciable quantities of ^{239}Pu. It is not stated, but I assume their dose values are almost entirely from ^{90}Sr + ^{90}Y and ^{137}Cs plus ^{239}Pu. I would expect the contribution from other radionuclides to be negligible.

3. It seems odd that values are given only for total body dose. Since, as stated above, the dose is mostly from ^{90}Sr + ^{90}Y, ^{137}Cs and ^{239}Pu, one would expect the external dose to be primarily beta-dose because ^{90}Sr and ^{90}Y are pure beta-emitters and ^{137}Cs is a strong beta and x-ray emitter. One wonders if the beta bremstrahlung dose was included with the total body dose.

4. What would their estimate be on the skin cancer induction from this skin dose. UNSCEAR gives a wide variation of skin cancer coefficients of 2×10^{-7} to 1.8×10^{-5} skin cancers per person rem. I doubt these values apply here, however, because some of the beta-radiation in this case has high energy and can penetrate 1 cm into

tissue (i.e., far beyond the 0.007 cm penetration depth assumed by Standards setting bodies in estimating skin dose. Also, one should determine whether or not there are co-relations or synergistic relation between beta-radiation and UV as there are between UV-A and UV-B in the induction of skin cancer. One might suspect that skin cancer is the predominate malignancy on the sun baked islands.

5. Since a large fraction of the radioactive contamination on the islands should be $^{90}Sr + ^{90}Y$, and since 99 percent of Sr is deposited in the skeleton, why did the authors not discuss bone dose and radiation induced bone sarcoma and carcinoma as well as leukemia from active bone marrow irradiation in the trabecular bone matrix?

Published values of bone cancer coefficients range from 2×10^{-6} to 2.2×10^{-4} cancers per person rem depending on age, radionuclide, type radiation, etc.

6. Some of the comparisons of population exposure given do not add to the quality of the report. If natural background radiation in the U.S. causes 6×10^{-4} (c/pr) 80 mrem/y x 220×10^{6} persons x $10^{-3} \simeq$ 10,000 lethal cancers/y in the U.S., the objective should be to reduce this background radiation - especially that due to phosphate rock, etc. - and not use this as an excuse to permit more malignancies. One bad thing does not justify another! The comparison with exposures to radiation workers in the U.S. weakens the report.

7. It seems odd that these writers were able to use data from BEIR III report. I have been trying unsuccessfully to get a copy of this unpublished report for over a year. I guess the fact that this report is paid for by tax monies does not entitle university professors to a copy?

8. In estimating the genetic risk, it is not stated whether or not the risk was reduced by a factor of 10 (as is often the practice) because the exposures are at low dose and low dose rate, i.e.:

3 (dose rate effect for spermatogonia) x 2 (2 sexes)
x 2 (dose effect) $\simeq$ 10.

Data of Lyon et al. (Nature New Biol. 101, July 1972) suggest use of this factor of 10 may not be warranted at very low dose rates.

9. When the authors suggested small doses of radiation might even be beneficial genetically, they might have added also that influenza

might be beneficial genetically because it tends to remove the weaker members of a population.

10. The report would have been improved if a Table 3 had been added giving the estimated genetic damage. The overall genetic risk was given as 6×10^{-5} to 1.1×10^{-3} genetic mutation/gentically significant rem. This upper value is greater than the upper value of cancer risk so the reader should be given the final estimates of genetic risk.

11. The report is in error in stating there are no human exposure data at low dose ranges, e.g. studies of in utero exposure and data on Hanford radiation workers are low dose studies.

12. The report uses only the linear and linear quadratic models, yet much of the data on human population exposure conforms best with a super linear model (e.g. effect = c $\sqrt{\text{dose}}$). In other words, the cancer coefficients are a power of dose less than unity in a number of cases or the cancers induced per rem are greater at low doses than at high doses because of overkill at high doses, damage to the reticuloendythelial system, etc.

13. It may not be a good assumption that the cancer risk on these islands is the same as that in the U.S. because the natural background radiation here is between 1/3 and 1/2 that in the U.S. and the Hanford radiation worker data suggest that about half the cancer per year in the U.S. are the result of natural background radiation.

14. I question that leukemia is one of the best understood cancers. The lack of leukemia induction by radiation in Olmstead County of Minnesota (Linos et al. - New Eng. J. Med. 1111, May 15, 1980) and in the Hanford worker data (Mancuso, Stewart, and Kneale) suggest that low chronic exposure to normal population (those not subjected to fire, blast, disease such an ankylosing spondylitis, etc.) die preferentially of forms of cancer other than leukemia.

15. There is a peculiar statement on page 28 to the effect that the BEIR III relative risk model gives a cancer risk 2 to 4 times the risk estimates of UNSCEAR 1977 and so it seems reasonable to accept the linear risk model instead.

16. Why was the life span of these islands chosen as 50 years? The U.S. life span is 70 years.