

Book Notes 13 (Notes and Research on the World Crisis)

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Editor's Note: The material in the Book Notes series is, generally speaking, not PB's writing, though Book Notes 13 is an exception, as it also contains paras written by PB himself. The material in this file is primarily about the Cold War, and fears of possible nuclear war. From approximately 1955 through 1962, as a result of a vision, PB spent a great deal of time investigating this possibility. He went as far as briefly moving to Australia, and recommending that some friends move to Bolivia, South America, as the nuclear fallout was expected to be less severe in these locations.

The vast majority of the material in the Book Notes files is excerpts from other authors; most of it has been retyped from its original source. PB considered these notes to be for his own personal reference, and never meant to publish them – as such he rarely indicates his intent for these notes, nor does he consistently cite his sources. PB usually excerpted material from books that struck him as well-written or representative of the original author's thought. He often edited these excerpts as he typed or had them typed – thus they may very well contradict the original text, as PB sometimes thought that a writer had inverted their own intuition and said black when they meant white. While these changes are informative of PB's thought-process, they are too numerous to chase down and annotate. Thus the reader should be wary of taking a quotation as a reliable extract from an original.

The archival committee continued to acquire material for the collection while the files were being processed. Often received in great disarray, we have attempted to reorganize them into similar groups by content. However, because this file was assembled from several different sources, it may lack the same internal coherence of other files that were assembled by PB himself.

For more information about the people and texts PB quotes or references here, please see the file titled "Wiki Standard Info for Comments." For more information about the editorial

standards, spelling changes, and formatting that we have implemented – including page and para numbering – please see the file titled “Introductory Readers’ Guide.” We have introduced minimal changes to the text; our changes deal with inconsistencies of spelling, educated guesses at illegible words, and the rare modification of grammar for clarity’s sake. Whenever there is any question as to whether what is typed is what PB wrote, please consult the associated scan of the original pages, currently to be found in a PDF of the same name. – Timothy Smith (TJS), 2020

Uncategorised

1

UNCATEGORISED

(1-1)¹ This practice is dangerous except in very strict moderation [and all Hatha yoga – PB].² It is usually carried on with the timing of one unit for inbreathing, four units for retention of breathing and two units for outbreathing. The unit may be one measure of time at choice, perhaps two seconds in the beginning. It is usual very gradually to lengthen both

2³

UNCATEGORISED

Harwell Report

3

HARWELL REPORT

(3-1)⁴ Harwell Report

1956 Strontium Deposition (radial annual)	Annual rainfall <u>in cms</u>
Melbourne 0.95 (38° latitude)	65 = inches
Ohakea (New Zealand) 0.97 (40° latitude)	100 =
Port Harcourt 1.40 (5° N latitude)	250 =
Singapore 1.38 (1° N latitude)	240 =

Uncategorised

4⁵

UNCATEGORISED

¹ The paras in this file are all unnumbered, except where otherwise noted. PB himself inserted “Ella n/1 with Ramana S” in the right margin of the page by hand.

² PB himself underlined “This practice is dangerous except in strict moderation” and inserted “and all Hathyog – PB” by hand.

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⁴ This para was handwritten by PB himself.

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5
UNCATEGORISED

(5-1)⁶ If you are touched by fall-out snow-dust, at once wash your skin with soap and water, or detergent and water, then go at once to an underground shelter or cave or mine or tunnel inside of a hill

6⁷
UNCATEGORISED

7
UNCATEGORISED

(7-1) copy letter Sept 19 ART Gerhart

I expect nothing catastrophic in the near future but beyond that am pessimistic. My friends are not able to serve on the physical plane. My chief contribution just now is being engaged in intercessory meditation, hence my need of obscurity and solitude during this next six months

8⁸
UNCATEGORISED

9
UNCATEGORISED

(9-1) an area in the equatorial region having heavy rainfall will receive more fallout than a desert area. I question however whether⁹

10¹⁰
UNCATEGORISED

11
UNCATEGORISED

⁶ This para was handwritten by PB himself.

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⁸ Void page

⁹ There is some partially visible text at the bottom of the page where PB cut this section out of the original page.

¹⁰ Blank page

(11-1)¹¹ As you point out the Andes do form a natural barrier. The Fallout should be heavy on both sides of them, for rain and snow form on them. Bear in mind also that the water supply of some of these countries if from the snow and rain in the Andes, will be contaminated [–Harvey]¹²

12¹³

UNCATEGORISED

13

UNCATEGORISED

(13-1)¹⁴ The higher the fruit grows, the better, like coconuts. Vegetables like tomatoes (in addition to surface root contamination) are also greater proportion of plant area and thus more contaminated. Potatoes and [surface]¹⁵ ground foods are most contaminated.

(13-2) PB suggested Quito's height (11,000) and Okubo agrees the higher the better provided of course liveable.

14¹⁶

UNCATEGORISED

15

UNCATEGORISED

(15-1) CALTECH PROF. PHONE Reply

Adherence of Fallout to dust particles which are then conveyed by winds is just as serious a danger as contaminated rain. (2) The degree of contamination of snow will depend on the altitude at which it was formed.¹⁷

16¹⁸

UNCATEGORISED

¹¹ There is some partially visible text at the top and bottom of the page where PB cut this section out of the original page.

¹² PB himself inserted "–Harvey" by hand.

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¹⁴ There is some partially visible text at the top and bottom of the page where PB tore this section out of the original page.

¹⁵ PB himself inserted "surface" by hand.

¹⁶ Blank page

¹⁷ There is some partially visible text at the bottom of the page where PB cut this section out of the original page.

¹⁸ Void page. PB himself inserted "Palace Hotel" and "seat" by hand.

(17-1)¹⁹ the concentration of Sr⁹⁰ in rainfall at 40-50°S latitude to be about 3 times that between 10°N and 10°S latitudes. This would indicate the total deposition in the mid-southern latitudes with 50" rain to be about 50% greater than in the tropics with 100" rain. This seems to be in general agreement with our measurements of the concentration of fission products in the air along the 80th meridian.

(19-1) Brewer Royal Meteorological Institute All observed phenomena can be explained if it is assumed that air circulates by a slow mean motion into the stratosphere at the equator, moves poleward on the stratosphere and sinks into the troposphere in temperate and polar regions. Air enters the stratosphere at the equator, where it is dried by condensation, travels in the stratosphere to temperate and polar regions, and sinks into the troposphere, at the equator the ascending air must be subject to heating by [radiation.]²¹

Old ix: The Negatives ... NEW XI: The Negatives

(21-1)²⁴ Both Mai Markand and The Andavar claim that devotees of God will be guided to safety in the climax of world war danger.

¹⁹ Incomplete – the beginning of this para was not found in this file.

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²¹ PB himself deleted "very important page 59 January 58 issue of" by hand.

²² Blank page

²³ PB himself inserted "XI" at the top right corner of the page by hand.

²⁴ The paras on this page are numbered 1 through 14; they are not consecutive with the previous page.

(21-2) Those who heed this warning and depart for safer regions can rebuild their lives and renew their possessions.

(21-3) Let him search for what is hidden beneath the words, for what I thought but dared not fully or freely express.

(21-4) The disinterest in their own danger and the apathy towards impending [catastrophe] are not [accompanied by]²⁵ the sense of being helpless spectators. [Nor is there any]²⁶ feeling of guilt in allowing the use of atomic weapons.

(21-5) A new mode of thinking is required of us to meet the entirely new situation which envelops us. This calls for mental courage if we are not only to get started but also if we are not to recoil before the consequences of such thinking and run away from them.

(21-6) I am working to maintain the world's peace and to avoid the total war and mass annihilation which threatens. The opposition will probably be successful but I must still carry out the mission entrusted, utter the warning and show the solution.

(21-7) The leaders insist on racing towards disaster, in the [erroneous]²⁷ belief that they are improving defences and strengthening power.

(21-8) The international situation seems both hopeful and hopeless by turns. The chances of war fluctuate every few months.

(21-9) The utter madness, the appalling desolation and the cruel uselessness of such an avoidable and unnecessary war make the preparation for it a criminal act.

(21-10) From the time that the West lost its nuclear arms monopoly, it became silly to talk of fighting a nuclear war.

(21-11) Our leaders are bewildered in their secret hearts. For there is no way out of the world's dilemma today other than the way we propose [change their old ideas, and that quickly.]²⁸

²⁵ PB himself changed "catastrophe - these are not even derived from" to "catastrophe are not accompanied by" by hand.

²⁶ PB himself changed "Consequently, there is also no" to "Nor is there any" by hand.

²⁷ PB himself inserted "erroneous" by hand.

²⁸ PB himself moved "change their old ideas, and that quickly" from after "But it requires them to" in para 21-12 to after "we propose" by hand.

(21-12) Of what use is our contemporary civilisation if it should soon blow up in the mushroom-shaped clouds of atomic explosions? But it requires them to

(21-13) My work is quiet, unsensational [and unobtrusive],²⁹ completely and deliberately outside the possibility of any publicity.

(21-14) The suspicion and distrust on both sides paralyses real progress toward peace. Why not accentuate the positive, why not give faith a chance to demonstrate its power, and thus at least let emerge a

22³⁰

IX

Operation S.A

23

IX

Operation S.A

(continued from the previous page) possibility of breaking this vicious circle? Is this not what Jesus pleaded for when he commanded his followers: "But I say unto you, That ye resist not evil." Was he not telling them, "Do not resist evil with evil, but resist it with good."

(23-1)³¹ The intellect can deal only with calculable possibilities. It cannot foresee all that God has put in our path.

(23-2) The Grace of Peace is being offered, but those who wish to receive it must first try to cooperate with it.

(23-3) If the world's leaders will not listen to the warning message I was entrusted to deliver to them, then their hopes for the future and plans for peace will fail utterly. For there is no other way to a liveable future and an avoidance of war than the way which has been indicated in that message.

(23-4) Out of this collision of negative forces, what can come but ruin, disaster and destruction?

²⁹ PB himself inserted "and unobtrusive" by hand.

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³¹ The paras on this page are numbered 15 through 23; they are consecutive with the previous page.

(23-5) The Christian's duty is to love his neighbour. The Russian is his neighbour, too. He cannot hate the Russian and remain a Christian.

(23-6) So long as the United Nations remains a place where men meet to exaggerate their differences, and not to mitigate them, so long will it continue to fail in its prime objective.

(23-7) When we use violence to achieve our ends, even to achieve peace, the alternate event is fresh violence.

(23-8) They question the future perplexedly.

(23-9) Never has war seemed so unnecessary, or peace so rational. Yes despite so much talk about it, little has been [actually]³² accomplished toward evading the suicidal destruction which war would bring. This is because thinking along patterns belonging to the pre-nuclear age cannot solve the problems belonging to the nuclear age itself.

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IX

Operation S.A

The Effects of Nuclear Weapons: U.S. Defence Dept.

25³⁴

THE EFFECTS OF NUCLEAR WEAPONS: U.S DEFENCE DEPT.

(25-1) Since no appreciable amount of thermal radiation would penetrate and the depth of soil outside the house would result in a considerable attenuation of the nuclear radiation, it would appear that basements offer possibilities as home shelters.

(25-2) In the event of a surprise attack, when there is no opportunity to take shelter, immediate action could mean the difference between life and death. The first indication of an unexpected nuclear explosion would be a sudden increase of the general illumination. It would then be imperative to avoid the instinctive tendency to look at the source of light, but rather to do everything possible to cover all exposed parts of the body. A person inside a building should immediately fall prone and crawl behind or beneath a table or desk. This will provide a partial shield against splintered glass and

³² PB himself inserted "actually" by typing it below the line and inserting it with handwritten markings.

³³ Blank page

³⁴ PB himself inserted "1" at the top right of the page by hand. Susan Lee Meeder inserted "From "Civil Defense folder (literature + notes)"

Bag Dated. 1958" in the original.

other flying missiles. No attempt should be made to get up until the blast wave has passed, as indicated possibly by the breaking of glass, cracking of plaster, and other signs of destruction. The sound of the explosion also signifies the arrival of the blast wave. A person caught in the open by the sudden brightness due to a nuclear explosion, should drop to the ground while curling up to shade the bare arms, hands, neck, and face with the clothed body. Although this action may have little effect against gamma rays and neutrons, it might possibly help in reducing flash burns due to thermal radiation.

(25-3) If shelter of some kind, no matter how minor, e.g., in a doorway, behind a tree, or in a ditch or trench, can be reached within a second, it might be possible to avoid a significant part of the initial nuclear radiation, as well as the thermal radiation. But shielding from nuclear radiation requires a considerable thickness of material and this may not be available in the open. By dropping to the ground, some advantage may be secured from the shielding provided by the terrain and surrounding objects.

(25-4) Accurate prediction of the fallout pattern is very

26³⁵

THE EFFECTS OF NUCLEAR WEAPONS: U.S DEFENCE DEPT.

(continued from the previous page) difficult and requires detailed and continuous knowledge of the wind pattern over a large area and to great heights.

(26-1) It is appropriate to emphasise here that the presence of dangerous fallout may not be visible to the eye, and its detection requires the use of suitable instruments sensitive to nuclear radiations. It is true that some (although not all) of the fallout in the Marshall Islands, after the test shot of March 1, 1954, could be seen as a white powder or dust. But this may have been due to the light colour of the calcium oxide (or carbonate) of which the particles were mainly composed. Had the material been somewhat darker in colour and the particles somewhat smaller in diameter, it is possible that the fallout would not have been seen.

(26-2) Decontamination Procedures: Since radioactive material cannot be destroyed, decontamination inevitably involves transfer of the source of radiation, e.g., fallout, from a location where it is a hazard to one in which it can do little or no harm. All decontamination procedures thus have two basic aspects: first, the removal of the contaminant, and second, its disposal. Unless proper consideration is given to the latter aspect, the whole process may do little or no ultimate good. Covering the contamination without moving it, e.g., with a depth of soil, would be effectively combining both operations into one.

³⁵ PB himself inserted "2" at the top right of the page by hand.

(26-3) Foods that are properly covered or wrapped or are stored in closed containers should suffer little or no contamination. This will be true for canned and bottled foods as well as for any articles in impervious, dustproof wrappings. If the contamination is only on the outside, all that would be necessary for recovery purposes would be the careful removal, e.g., by washing, of any fallout particles that might have settled on the exterior of the container. Even vegetables could be satisfactorily decontaminated by washing. If this were followed by removal of the outer layers, by peeling, the food should

27³⁶

THE EFFECTS OF NUCLEAR WEAPONS: U.S DEFENCE DEPT.
Food and Water

(continued from the previous page) be perfectly safe for human consumption.

(27-1) In most sources of public water supplies, it is to be expected that, as a result of the operation of several factors, e.g., dilution by flow, natural decay, and removal ("adsorption") by soil, the water will be fit for consumption, on an emergency basis, at least, except perhaps for a limited time immediately following the nuclear explosion.

(27-2) Because soil has the ability to take up and retain certain elements by the process of "adsorption," underground sources of water will generally be free from contamination. For the same reason, moderately deep wells, even under contaminated ground, can be used as safe sources of drinking water, provided, as is almost invariably the case, there is no direct drainage from the surface into the well.

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THE EFFECTS OF NUCLEAR WEAPONS: U.S DEFENCE DEPT.

29³⁸

THE EFFECTS OF NUCLEAR WEAPONS: U.S DEFENCE DEPT.

(29-1) Entrance to and exit from the shelter chamber is through a doorway fitted with a 1/2-inch steel, air tight (Navy bulkhead type) door. For emergency exit there is a 3x3-foot vertical escape hatch with a steel trap door. Normally the hatch is filled with washed

³⁶ PB himself inserted "3" at the top right of the page by hand.

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³⁸ PB himself inserted "4" at the top right of the page by hand.

and dried sand, but this can be run out and personnel can escape by climbing a vertical ladder in the wall.

The ventilation system for the shelter is contained in two compartments shown at the extreme left in Fig. 12.54. Air from outside enters the inlet chamber, passes through a filter, to remove particulate matter, e.g., fallout, as well as biological and chemical warfare agents, and is then blown into the shelter through ducts near the ceiling. The return air is expelled through the exhaust chamber. Both inlet and exhaust systems are fitted with special "anti-blast closures." These are so constructed that a sudden increase in the exterior pressure, due the passage of the blast wave, will cause them to close almost instantaneously. Relief of the pressure by the negative phase of the blast wave will then open them again. The closures have been found to operate satisfactorily at peak overpressures up to at least 100 pounds per square inch.

The exhaust chamber also contains a gasoline-driven, electric generator for emergency use in the event of failure of the main power supply. An underground tank holds enough fuel for 10 days. At the other end of the shelter is a buried water tank to provide water for drinking purposes.

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THE EFFECTS OF NUCLEAR WEAPONS: U.S DEFENCE DEPT.

31⁴⁰

THE EFFECTS OF NUCLEAR WEAPONS: U.S DEFENCE DEPT.
Emergency Shelters

(31-1) From experience gained in both nuclear and conventional explosions, there is little doubt that it is, as a general rule, more hazardous in the open than inside a structure. In an emergency, therefore, the best available shelter should be taken. Many subways would provide reasonably good emergency shelter, but they are to be found in a limited number of cities. As an alternative, that is more readily available, the basement of a building should be chosen. In this connection, a fire-resistive, reinforced concrete or steel-frame structure is to be preferred, since there is less likelihood of a large debris load on the floor over the basement. Even basements of good buildings are not, however, an adequate substitute for a well-designed shelter, since the design live loads of floors over basements are usually small in comparison with the blast overpressure to which these floors may be subjected.

32⁴¹

THE EFFECTS OF NUCLEAR WEAPONS: U.S DEFENCE DEPT.

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⁴⁰ PB himself inserted "5" at the top right of the page by hand.

⁴¹ Blank page

Trade Winds

(33-1)⁴² When the surface heated is, roughly speaking, a whole zone, as in the case of the tropics, a surface-wind will set in toward the heated tropical zone from both sides, and uniting will ascend, and then separating, flow as upper currents in opposite directions. Hence, a surface current will flow from the higher latitudes toward the equator, and an upper current toward the poles. If then, the earth were at rest, a northern wind would prevail in the northern half of the globe and a southern wind in the southern half. But these directions are modified by the rotation of the earth on its axis from west to east. In virtue of this rotation, objects on the earth's surface at the equator are carried round toward the east at the rate of 17 miles a minute. But as we recede from the equator, this velocity is continually diminished; at latitude 60 it is only 8½ miles a minute, or half of the velocity than itself. Hence, the wind will lag behind, that is, will come up against places toward which it blows, or become an east wind. Since then, the wind north of the equator is under the influence of two forces - one drawing it south, the other drawing it west - it will, but the law of the composition of forces, flow in an intermediate direction, that is, from northeast to southwest. Similarly, in the southern tropic, the wind will blow from southeast and northwest. All observation confirms this reasoning. From the great service these winds render to navigation, they have been called the trade winds. It is only in the Pacific and Atlantic oceans that the trade winds have their full scope. In other parts of the trade's zone, such as southern Asia with intertropical Africa and America, they are more or less diverged from their course by the unequal distribution of land and sea. It is generally stated that in the Atlantic the north trades prevail between latitude 9 degrees and 26 degrees; and the south trades, in the Atlantic, between latitude 4 degrees north and 22 degrees south and in the Pacific, between latitude 4 degrees north and 23½ degrees south. These limits, however, are not stationary, but follow the sun, advancing northward from January to June and southward from July to December.

Region of Calms: - This is a belt 4 degrees to 5 degrees broad, stretching across the Atlantic and Pacific, parallel to the equator. It marks the meeting line of the north and south trades, where they mutually neutralise each other. Here also occur heavy rains and thunder storms almost daily. This belt varies in position with the trades reaching its most northern limit in July, and its most southern in January. When the belt of calms nears the African coast, in the gulf of Guinea, on the Equator, the copious rainfall gives rise to the strong steady-blowing gales of the coast, called tornadoes.

The puna winds prevail for four months in the year in a high barren table plane in Peru called the puna; as they are part of the southeast trade-wind, after having

⁴² The beginning of this para through "Hence, A" was originally in all uppcase, and has been changed to sentence case for readability. A note on the original PDF says this material came from a folder labelled "Civil Defence" in a bag dated 1959.

crossed the Andes they are drained of their moisture, and are consequently the most dry and parching winds that occur anywhere on the globe. In travelling over the puna it is necessary to protect the face with a mask from the glare and heat of the day, and from the intense cold of the night.

Earthquake: The influence of the earth-wave is communicated to the sea, when the earthquake is near the shore, or on the bed of the ocean. The sea swells, and slightly retires from the beach, and then a great wave rolls in upon the shore. At the Lisbon earthquake, this wave rose to a height of 60 ft. at Cadiz. It carries with it sea-spoil, scattering it over the surface of the earth, beyond the ordinary reach of the sea.

Rain: The temperature of the air is lowered, and the amount of the rainfall increased, by those winds which convey the air to higher latitudes. This occurs chiefly in temperate regions, or in those tracts traversed by the return trade winds, which in the north temperate blow from the southwest and in the south temperate zone, from the northwest.

(continued from the previous page) In all places within the tropics where the trade winds are blowing regularly, rain is a rare occurrence, the reason being, that as these winds come from higher latitudes, their temperature is increasing, and hence they are in the condition of taking up moisture rather than parting with it; and the return trade winds, which blow above them in an opposite direction, having discharged the greater part of their moisture in the region of the calms, are also dry and cloudless. Where, however, these winds are forced up mountain-ranges in their course, as on the east of Hindustan, they bring rain, which falls chiefly during the night, when the earth's surface is coolest. The region of calms is a broad intertropical belt about 5 degrees in breadth, characterised by calms, and toward which the northern and southern trades blow. This the region of calms, is at the same time the region of constant rains. Here the sun almost invariably rises in a clear sky; but about mid-day clouds begin to gather; and in a short time the whole face of the sky is covered with dense black clouds which pour down prodigious quantities of rain. Toward evening, the clouds disappear, the sun sets in a clear sky, and the nights are serene and fine. The reason of this daily succession of phenomena in the belt of calms is, that there is air, being heated to a high degree by the vertical rays of the sun, ascends, drawing with it the whole mass of vapour which the trade winds have brought with them, and which has been largely added to by the rapid evaporation from the belt of calms; this vapour is condensed as it is raised toward the line of junction of the lower and upper trade winds, and the discharge is in some cases so copious, that fresh water has been collected from the surface of the sea. As evening sets, as the surface of the earth and the superincumbent air are cooled, the ascending currents cease, the cooled air descends, and the dew-point is consequently lowered, clouds are dissipated, and the sky continues clear till the returning heat of the following day brings round a recurrence by the same phenomena.

Since the belt of calms, which determines the rainy season within the tropics, moves northward or southward with the sun's declination, carrying the trade winds with it on each side, it follows that there will be only one rainy and one dry season in the year at its extreme northern and southern limits; but at all intermediate places there will be two rainy and two dry seasons; at the equator they will be equally distant from each other. This state of things is only of strict application to the Pacific ocean, whose vast expanse of water, presenting a uniformly radiating and absorbing surface is sufficient to allow the law to take full effect.

(a) The U.S. is dependent for its rain not on the Pacific ocean, but on the Gulf of Mexico. There can be little doubt that, but for the high range of the Rocky mountains in Central America, the greater part of the states would be an arid waste. These mountains are so high as to present an effectual barrier to the passage of the trade winds which blow over the Gulf of Mexico; they are, on this account, turned northward, and spread themselves over the states, especially over the low basin of the Mississippi. These winds being characterised by the great heat, and loaded with much moisture, from the warm waters of the Gulf of Mexico, tend to disturb the statical equilibrium in the atmosphere. When they have blown for some time, vast accumulations of heat and moisture take place, the equilibrium is destroyed a great storm arises in consequence, sweeping eastward over the states, and in many cases crossing the Atlantic and descending with violence on western Europe. In the states, the southerly winds preceding the storm give way to the dry northwest winds, which rapidly clear the sky and bring brilliant bracing weather in their train. It appears, in short, that the southern winds from the Gulf of Mexico spread the moisture over the states, and the northwest winds thrusting them into the higher regions of the atmosphere. If this be the case, as the phenomena seems to warrant, then the heaviest rainfalls will be in the valleys, and the least on the higher grounds.

Earthquake (cont.): The influence of this earth wave is communicated to the sea, when the earthquake is near the shore, or on the bed of the ocean. The sea swells, and slightly retires from the beach, and then a great wave rolls in upon the shore. At the Lisbon earthquake this wave rose to a height of over 60 ft. at Cadiz. It carries with it sea-spoil, scattering it over the surface of the earth, far beyond the ordinary reach of the sea.

Nuclear Explosions (Indian Government Publication)⁴³

35

NUCLEAR EXPLOSIONS

(35-1)⁴⁴ A rainfall of even a tenth of an inch is enough to clear the atmosphere of practically all of its contaminants. This phenomenon is sometimes spoken of as

⁴³ PB himself inserted "Indian Govt Publication" by hand.

washout. Apart from washout there is also an appreciable dry deposition of particles on exposed surfaces due to the action of eddy currents (turbulence) in the atmosphere. This is sometimes referred to as 'dry turbulent deposition'. As the particles carried by air currents (and also helped by Brownian Motion) strike exposed surfaces they are caught on them. Observations on airborne radioactivity due to fallout from kilotons weapons - in this case the explosion cloud is largely confined to the troposphere - and also on radon and its daughter products present in the air have shown that the residence-time in the troposphere for particulate matter (including particles which are extremely fine compared to a micron) is about 3-4 weeks, on an average. (It appears that radon - chemically it is an inert gas - is not appreciably absorbed by dust nuclei in the atmosphere. Its daughter products are, however, mostly found in dust particles a few thousands to a tenth of a micron in size.) The same residence-time of 3-4 weeks applies, of course, to water molecules as these are continually condensing into water droplets. Particles when they reach the main rain-forming region - say, the lowest one-third region of the troposphere - are brought down to the surface in a week or so. We may ask: What is the mechanism which brings back into the troposphere extremely fine particles projected in the stratosphere as a result of nuclear explosions? Not much is known about this, but two recent suggestions are worth noting. One is concerned with the possible role played by the seasonal variations in the height of the [tropopause, which]⁴⁵ is generally higher in summer than in winter: The height-variation is something like a kilometre in the tropics and a few times larger in the temperate latitudes. This rise and fall of the dividing layer between the troposphere and stratosphere will constitute a type of pumping action.

(35-2) The global deposition of the fission-product strontium 90 has rather pronounced maxima in the latitudes of some 30-40 degrees North and South, and minimum in the equatorial region.

(35-3) At one time it appeared that the rate of strontium 90 deposition is practically uniform all over the globe. However, recent and more extensive observations

(continued from the previous page) indicate that it is probably not quite so. There is a rather pronounced maximum in middle latitudes in the Northern Hemisphere (about 30 degrees North), and another but much lower maximum in middle latitudes in the Southern Hemisphere (Note that the latitude of the US Pacific test site is about 11 degrees North, and of the Christmas Island about 2 degrees North). The deposition is

⁴⁴ The paras on this page are numbered 1 through 3; they are not consecutive with the previous page.

⁴⁵ PB himself changed "tropopause" to "tropopause, which" by hand.

minimum in the equatorial and polar regions. Also the deposition rate varies rather markedly with the season – in the Northern Hemisphere it is maximum in late spring. There appears to be a half-yearly phase difference between variations in the Northern and Southern Hemispheres. It may be mentioned here that the pattern of deposition is in general conformity with the picture of large-scale atmospheric circulation proposed by Brewer and Dobson.⁴⁶ (It is likely that the rate of stratospheric deposition from a given test explosion tends with years to be uniform over the earth's surface.)

(36-1)⁴⁷ In any belt of latitudes the annual deposition depends on the rainfall. Broadly speaking, the deposition is directly proportional to the amount of rainfall. This is to some extent understandable, for the fallout particles, once they enter the rain-bearing regions of the troposphere, are largely brought down by rain and other processes associated with the presence of water in the atmosphere. In general, the dry deposition of strontium 90 is not more than a few percent of what is brought down by rain. For instance, at Antofagasta (Chile), the amount of strontium 90 deposition up to January 1956 was 0.02 millicurie per square mile (which is no larger than the experimental error). Again, at Brawley (California) where the annual rainfall is about 2 inches the deposition was 0.6 millicurie per square mile as against the US average for January 1956 of 13 millicuries per square mile.

(36-2) Lettuce had 0.4 units of strontium 90 while green peas had 1.3

(36-3) The strontium 90 concentration in vegetables (grown in something like 'normal soil'), it appears, is considerably lower than in grass but a few times higher than in milk. The concentration is particularly high in storage organs – potatoes and carrots – and in leafy vegetables such as lettuce. Probably the same applies to cereals.

(36-4) The levels of strontium 90 in different

(continued from the previous page) items of human diet have been recently reported by Bryant⁴⁸ for the UK. For the samples collected in mid-1957 the average values in strontium units were: Milk and Milk-products: 5.45; flour, bread, etc.: 2.0; potatoes: 23; carrots: 11; cabbages (and greens): 11; peas and beans: 8; lettuce: 23; other vegetables and fruits: 15; other cereals: 10; meat: 15; eggs: 2; fish: 1; and other foods: 10. The values were measured for vegetables prepared as for cooking.

⁴⁶ Referring to Brewer-Dobson circulation proposed by Alan Brewer and Gordon Dobson.

⁴⁷ The paras on this page are numbered 4 through 7; they are consecutive with the previous page.

⁴⁸ Referring to F.J. Bryant.

(37-1)⁴⁹ The dose in the middle latitudes in the Northern Hemisphere, because of the relatively larger global fallout in these latitudes and the tropospheric fallout, is somewhat higher than in the tropics and the Southern Hemisphere generally.

(37-2) The intensity of cosmic rays depends to some extent on the altitude of the place and, to a lesser extent, on its latitude. It is minimum at the equator and sea level, and increases with increasing latitude and elevation. The variation with latitude is of the order of 10 percent. As regards the effect of altitude, the intensity at a height of 20,000 feet is about ten times that at sea level.

(37-3) The rate of increase with height is larger in high latitudes than in equatorial latitudes.

(37-4) COSMIC RAYS	EQUATOR	HIGH LATITUDES
	<u>*mr/year</u>	<u>*mr/year</u>
Sea Level	33	37
5,000 ft. (1.5 KM)	40	60
10,000 ft. (3.0 KM)	80	120
15,000 ft. (4.6 KM)	160	240
20,000 ft. (6.1 KM)	300	450

*NOTE: "mr/year" means "milliroentgen per year".

(37-5) RADIOACTIVE RADIATIONS FROM EARTH SURFACE:

Ocean: 0 mr/year.* Phosphate Rock Surface: 280-700 mr/yr.*

(37-6) The total gonad dose delivered over a period of 30 years can be taken as about 3 roentgens, on an average. It should be observed, however, that whereas this would be so in most regions of the world, the dose will be much higher in high altitude regions such as Tibet (due to increased cosmic ray intensity) and in places which have an abnormally high ground radioactivity such as parts of Travancore (India) but it is not likely to exceed 10 roentgens over a period of 30 years.

(37-7) PB: Regular daily intake of calcium via Tahini is essential to counteract strontium 90 deposited by lettuce and carrots and potatoes.

⁴⁹ The paras on this page are numbered 8 through 13; they are consecutive with the previous page.

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Uncategorised

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UNCATEGORISED

(39-1) First, it should be noted that there are not many stations for detecting fallout in South America. As a result, one cannot get a complete picture. And the impression gained by the stations that are there,⁵¹ may give an incorrect picture if the results from them alone are taken.

In "The Climates of the Continents" by W.G. Kendrew⁵² published by the Clarendon Press, Oxford 1953 there is a lot of vital information in the section devoted to South America.

Ecuador for example, inland, has the southeast trade wind hitting it after passing through Chile and Peru. Unlike them however, Ecuador also has the intertropical front passing through it half the year. The result is most of the rain hits Ecuador.

Rain alone is not all the answer. Pure wind also carries and deposits fallout. Witness Chile. It is exposed to the southeast trade wind and bounces off the Andes. This forms the stagnation area I spoke of and a deposit of fallout results, even without the rain. Same holds true for Peru.

Refer to page 471 and 471 in the mentioned book to see the pattern. By the same pages, it can be seen that the southeast trade winds on the East coast come in near the equator up around Belem, Brazil. This is a heavy rainfall area as well as the first area that the off the ocean trade winds hit. Although there seem to be no fallout stations, there should {be}⁵³ some of the heaviest fallout in South America there. Does anyone there in NY know if this is true or not? Parnaiba is just out of the heavy rainfall.

Now these trade winds travel down and in through Brazil, raining all the way, and depositing fallout all along the way. They exit from the continent around Rio. Rio lies just on the very edge of a local heavy rainfall area. But the prevailing wind is from the interior. [–Harvey

Half the year]⁵⁴

40⁵⁵

UNCATEGORISED

British Harwell Report 1957

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⁵¹ PB himself inserted a comma by hand.

⁵² Referring to Wilfrid George Kendrew.

⁵³ We have inserted "be" into the text for clarity.

⁵⁴ PB himself inserted "–Harvey" and "Half the year" by hand. This para is incomplete – the end was not found in this file.

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⁵⁶ This page is entirely handwritten by PB himself.

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11. 30

British Harwell Report October 1957

(2) The most striking features are the consistently very low STRONTIUM fallout at Singapore =1°19 North, which is nearly on the Equator, and the relatively low value in the Southern Hemisphere. All figures show a pronounced minimum near the equator and a maximum in the middle latitudes

(3) A consistently low value at Melbourne has no satisfactory meteorologic explanation. The possibility cannot be ignored that the phenomenon is not a true one but is a feature of the sampling system.

Singapore Rainfall = 240 cms

Port Harcourt 4°45 North 250 cms rain

1956 deposition of strontium, South latitude

42⁵⁷

Radioactive Fallout through September 1955

43⁵⁸

RADIOACTIVE FALLOUT THROUGH SEPTEMBER 1955

(43-1) "SCIENCE" Jul Aug 1956: Eisenbud⁵⁹ "Radioactive Fallout through September 1955"

Station	Mixed fission products	Strontium	Gamma Dose
Quito	51	2.6	10
Lima	50	1.8	5
Sao Paulo	53	2.7	9.7
Buenos Aires	60	2.8	9.4
Durban	34	1.9	4.9
Colombo	91	4.7	23
Sydney	65	3.5	12
Wellington	40	2.1	6.4
New York	110	4.2	17
Melbourne	47	2.1	6.6

Worldwide Travel of Atomic Debris

44⁶⁰

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⁵⁸ This page is entirely handwritten by PB himself.

⁵⁹ Referring to Merrill Eisenbud.

WORLDWIDE TRAVEL OF ATOMIC DEBRIS

(44-1) SCIENCE Jul Sept 1956 L. Machta on "Worldwide Travel of Atomic Debris"

(1) The most effective sampling program for debris provides only the crudest measure of fallout (2) Depositions in the Southern hemisphere may have been low because most of the debris was rained out as it passed southward through the intertropical convergence zone (This zone seems to be from Equator to 20° South latitude –PB) The belt of low pressure that tends to separate the Northern and Southern hemisphere air near the surface of the earth

British Harwell Report

(44-2) Harwell (V.R) Report (British) October 1957 Stewart AERE HP/R 2354

(1) All the washout in rainwater is by far the more important process whereby fine dust fed down from the stratosphere is removed from the atmosphere. Nevertheless if the amount of rain is small, the specific activity of water in a collecting bottle will be much higher than that of falling rain

⁶⁰ This page is entirely handwritten by PB himself.